

# Lithitic Altar – Discovery and Study of Lithitic Structures Refurbished by Man and Probable of Ancient Period

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## ABSTRACT

Between 14 May 2014 and 12 June 2023, various scientific explorations were carried out in an inaccessible area of the Lazio Volcano, where some lithic structures were identified, which from a first series of tests, carried out by researchers, resulted to be the result of a human construct and of various alterations by

man, whose origin is in all probability ancient. In this study, the group of researchers presents for the first time the results of this discovery and puts forward hypotheses on its origin in an important archaeological context for the entire Colli Albani area.

**Keywords: Colli Albani, Ancient Site, Archaeoastronomy, Italy, Astronomical Orientation.**

## PREMISE

The Lazio Volcano, also known as the Colli Albani Volcanic Complex, is a volcanic complex located in the Lazio region of Italy, S-E of Rome. It is a dormant active volcano, the last volcanic activity of which occurred in the Pleistocene period, approximately 36,000 years ago. [36] [37]

The formation of the Latium volcano was the result of a complex volcanic process that lasted for millions of years. This volcanic complex is formed by various volcanic structures, including Monte Albano, Lake Albano and Lake Nemi. It is considered one of the most important volcanoes in the Lazio region. [38] [39]

The area of the Lazio Volcano has been populated since ancient times. Human settlements in the region date back to several millennia ago (Italian Neolithic period ranging from 6,000 a.C. to 5,000 a.C.) [57] [58] [59] [60]. However, it is important to note that studies on human settlements in the area of the Volcano Laziale are constantly evolving and can provide new information over time. Here are some general indications on human settlement in the area, followed

by some studies that may be useful for further study of the topic:

- Prehistoric settlements: The area of the Vulcano Laziale was already inhabited in the Paleolithic, as indicated by archaeological finds found in the region. During the Neolithic and Copper Ages, stable settlements and agricultural activities were identified in the area.
- Ancient civilizations: In ancient times, the area of the Latium Volcano was inhabited by populations such as the Latins, the Etruscans and later by the Romans. These civilizations left a significant imprint on the region through the founding of cities, road building, and agricultural activity.
- Roman settlements: During the Roman period, the area of the Volcano Laziale was populated by Roman villas and an urban settlement known as Alba Longa. Furthermore, Lake Albano was a popular

destination for summer residences of the Roman elites. [40] [41] [42]

The presence of lakes and springs provided a precious water resource for the ancient peoples who inhabited the area of the Lazio Volcano. Lakes, such as Lake Albano and Lake Nemi, have provided drinking water, supported fishing activities, and offered opportunities for settlement development near its shores. In ancient times there were other lakes now extinct that characterized the area and provided a valid water supply for the ancient populations.

The Vulcano Laziale region offers a variety of animal resources. The surrounding forests and grasslands

## 1.0 – DISCOVERY DETAILS

During one of the reconnaissance around the Tombs in Grotticelle [6] [7] [8] located on Monte delle Faete in the municipality of Rocca di Papa [9] [10] [11], in an attempt to identify the Village that owns the Necropolis, Riccardo Bellucci already co-discoverer of the Tombs in Grotticella with his uncle Angelo Capri, identified the stone Slab, subsequently renamed "Lithic Altar", reporting it to the Archaeological Superintendence of Rome on 25 October 2021 and precisely notifying the Superintendent Dr. Gemma Carafa Jacobini.

This site has a base entirely in peperino, without earth and approximately 200 square meters large, characterized by a protruding boulder oriented on the north / south axis and equipped with engravings on its surface. Among these are the "Coppelle" and Linear furrows, not natural but artificial [2] [3].

The Cups are petroglyphs made by man on rock in the shape of a cup or bowl, of variable size, with a circular, elliptical or flared plan. This type of engraved boulders date back to the Mesolithic, they are frequent in the Neolithic, up to the Bronze Age. There are many meanings on the "Lithic Altars" with cup marks and engravings, the most plausible is that linked to the cult of water or the cult of fertility or other [4] [5].

The large central stone with the cup marks and the incisions seems to have been modeled so that seen from above it resembled a lot a "Maternal uterus", with

provided habitats for various species of wild animals, such as deer, wild boar and birds, which were hunted for food and skins and furs. [43] [44] [45]

A place therefore, which allowed the ancient populations to settle in this area and to allow them to live, thanks to the numerous natural resources. Precisely in this place, these ancient peoples must have built their sanctuaries, their areas for religious worship, linked to ancient customs that are starting to resurface today. It is here, in this precious place, that the discovery of the Lithic Altar and the structures associated with it takes place, the object of study by the group of researchers.

the depressions in the rock, filled with "sacred" water of the Goddess Giver of life, spring of life and health, connected with the Divine eye" [1].

Extraordinary and fascinating, a few meters from the central stone, always on the same platform, on the left side at 11.22 meters, an extraordinary Pyramidal Stone with three sides about 40 cm high, oriented on the East-West axis, emerges from the rocky plane. The first photos are by Dr. Daniele Cataldi and date back to May 14, 2014.

Thanks to the video-photographic shots made together with Dr. Daniele Cataldi which for the first time ever made it possible to create a three-dimensional model of the entire stone structure in order to be able to better identify the characteristics otherwise not visible with simple photographic shots.

On June 12, 2023, the last scientific expedition was undertaken, together with Marco Tudini, and on this occasion it was possible to better observe the stone Slab and collect further data that will be presented in this study. The origin of this structure, to date, is not certain, it could be something very ancient and on which there is no written documentation.

This lithic structure (Slab) is located in the following decimal GPS geographical coordinates: Lat: 41.742222, Long: 12.728192 and can be reached after having climbed part of the internal walls of the Lazio volcano (Map. 1 and 2).

The walk, along rural paths, extends for over 2.5 km and was undertaken entirely on foot by the study team

(Associazione Arco di Diana APS).



**Map. 1** – Digital satellite map of the area where the stone Slab and the stone Pyramid are located. Credits: Google Earth, Google Maps.



**Map. 2** – Digital satellite map of the area where the stone Slab and the stone Pyramid are located. Credits: Google Earth, Google Maps.

## 2.0 – EXPLORATORY AND DOCUMENTATIVE EXPEDITIONS

In this chapter, the various aspects of the discovery and exploration of this archaeological site will be treated

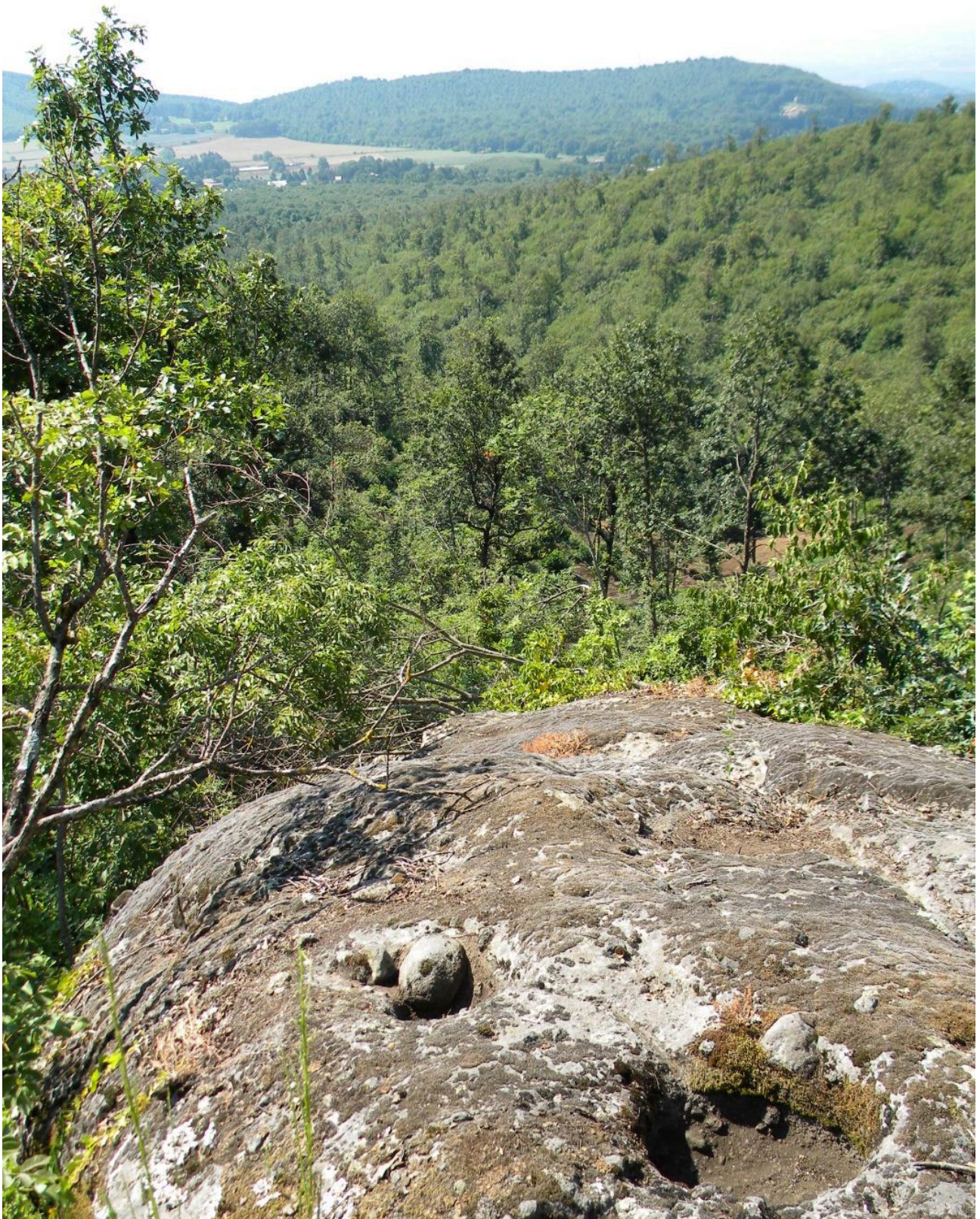
separately, with particular reference to its extension. These data will be divided according to the type.

### 2.1 – Exploration of May 14, 2014

The main photographic video footage was obtained on May 14, 2014 by Riccardo Bellucci, and for the first time, this archaeological site was documented in a

precise way. The exploratory shots were mainly concentrated on the main stone structure (Slab), where some peculiar characteristics were present:



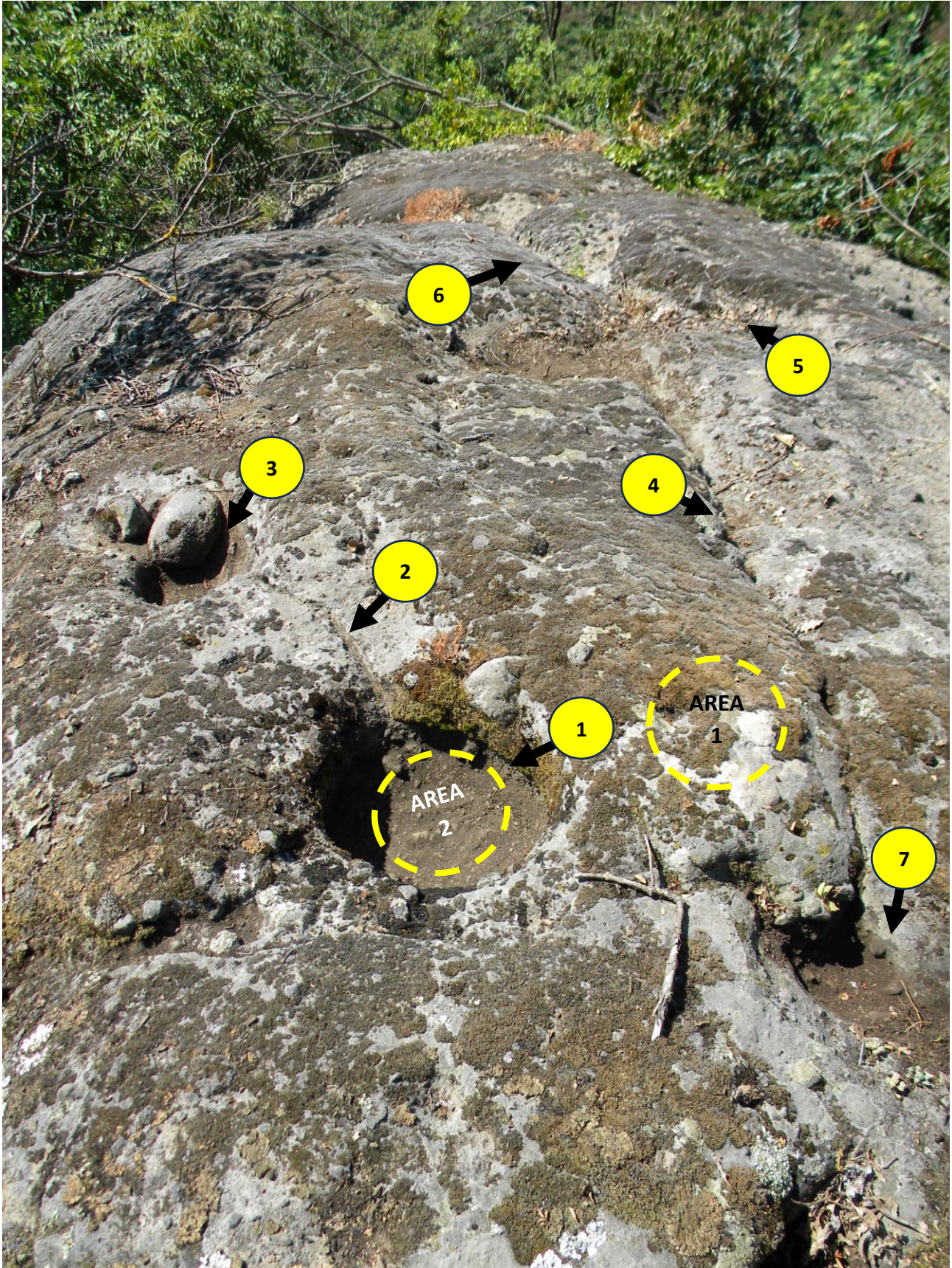


**Fig. 1** – *Stone Slab documented on 14 May 2014 by Riccardo Bellucci. Credits: Arco di Diana APS.*

The first photographic shots, together with the first explorations carried out in 2014, underlined how this



"lithic monument" was particularly exposed to sunlight, in a sloping position and facing south (Fig. 1).



**Fig. 2** – Stone Slab documented on 14 May 2014 by Riccardo Bellucci. Credits: Arco di Diana APS.



Some precise characteristics were then documented on this lithic structure which demonstrated how the surface of the "Slab" had been reworked by human

1. Lithic cup n.1.
2. Communication furrow between stone cup n.1 and n.2.
3. Lithic cup n.2.
4. Sulcus oriented on the N-S axis.
5. Sulcus oriented towards SW.
6. Sulcus Oriented to S-E.
7. Cup n.3,

hands. Among these characteristics there are for example (Fig. 2):

These characteristics demonstrated unequivocally that this stone structure had been remodeled by human hands in ancient times and that these grooves and cavities must have had a precise use, perhaps of a religious nature.

These structures had to fill up with water during storms and this water was collected and diverted to run along the surface of the stone structure, thanks to engraved grooves. But we will talk about the possible hypotheses of the construction of these elements on the surface of the rock in a specific chapter.

## 2.2 – Exploration of March 12, 2017

Near this lithic structure, in an easterly direction, about 11 meters away, the presence of a lithic Pyramid with a triangular base and further furrows engraved in the rock was discovered, which upon careful analysis

resulted oriented with respect to the cardinal points and the position of the Sun (Sunrise and Sunset) on the Winter Solstice. This structure was called: Pyramid (Fig. 3).



**Fig. 3** – *Lithic Pyramid, taken on 12 March 2017 by Dr. Daniele Cataldi and Riccardo Bellucci. Credits: Arco di Diana APS.*



In this context, according to the data collected, this stone Pyramid must necessarily have been associated with the stone Slab, just over 11 meters away and in a westerly direction, precisely due to the presence of the

same grooves engraved in the rock (Fig. 4) and their astronomical orientation, with respect to the geographical context.



**Fig. 4** – Engravings facing the stone Pyramid, taken on 12 March 2017 by Dr. Daniele Cataldi and Riccardo Bellucci. Credits: Arco di Diana APS.



**Fig. 4b** – Engravings facing the stone Pyramid, taken on 12 March 2017 by Dr. Daniele Cataldi and Riccardo Bellucci. They document the orientation of the groove present near the lithic Pyramid, which looks from North to South. Credits: Arco di Diana APS.





**Fig. 4c** – Engravings facing the stone Pyramid, taken on 12 March 2017 by Dr. Daniele Cataldi and Riccardo Bellucci. They document the orientation of the furrow present close to the stone Pyramid, which looks on the N-E - S-W axis, and that highlighted in the southern part of the stone complex which remains perfectly oriented on the N - S axis. Credits: Arco di Diana APS.

Figs. 4b and 4c identify the orientation with respect to the cardinal points of some incisions present close to the lithic Pyramid, in this case those of the groove oriented on the N - S axis, and the one in correspondence with the northern part of the Pyramid

### 2.3 – Exploration of May 14, 2017

On 14 May 2017 the third exploration by Dr. Daniele Cataldi and Riccardo Bellucci took place, to verify the astronomical orientation of the lithic structures, both of the lithic Pyramid (Fig. 5), and of the engravings associated with it and the Slab. On that occasion it was evident that part of the surface of the Slab had particular magnetic characteristics in which the compass rotated up to 15° with respect to the position of the natural magnetic north pole. This suggested two hypotheses:

- The Slab had metal structures inside.
- The Slab had undergone alterations on its lithic surface, such as to be able to determine the variation of the orientation of the atoms.

oriented on the N-E – S-W axis. These are the first measurements of this type carried out on this archaeological element, the findings of which attribute a precise geographical orientation to these lines.

To date it has not been possible to ascertain any hypothesis, but these characteristics remain and are still detectable today on some points of the stone structure of the Slab. These areas are located:

- Area 1 - By placing the compass in this area, the rotation of the magnetic needle of 15° is observed.
- Area 2 - Placing the compass inside the cup n.1, the rotation of the magnetic needle of about 11° can be observed. (Figs. 1 and 6).

The observed characteristics are very interesting, as is the magnetic index in microtesla ( $\mu\text{T}$ ) measured close to the stone Slab, which reaches 49  $\mu\text{T}$ , when the natural index of the area should not exceed 33  $\mu\text{T}$ . A very high and interesting index.





**Fig. 5** – *Magnetic measurements on the lithic Pyramid, carried out on 14 May 2017 by Dr. Daniele Cataldi and Riccardo Bellucci. Credits: Arco di Diana APS.*



**Fig. 6** – *Magnetic measurements on the lithic Pyramid, carried out on 14 May 2017 by Dr. Daniele Cataldi and Riccardo Bellucci. It can be seen how the compass inside the cup n.1 presents a variation of the magnetic North compared to the one positioned outside it. Credits: Arco di Diana APS.*



## 2.4 – Exploration of June 12, 2023

On June 12, 2023, the last exploration by the Arco di Diana APS Association took place, on this occasion the footage confirmed the data that had already been obtained during the previous explorations that took place between 2014 and 2017.

On that occasion, precise measurements of the stone Slab and of the lateral structure (lithic Pyramid) were obtained, thanks to a series of georeferenced shots that produced various three-dimensional models on which

it was possible to work. Thermographic shots were also taken to understand some characteristics of the grooves present on the structure of the Slab and the stone Pyramid.

In this context, the research carried out by Dr. Daniele Cataldi, Riccardo Bellucci and Marco Tudini, have highlighted important characteristics of this archaeological site.

## 2.5 – The astronomical context

The use of astronomy in ancient times, such as that of the Neolithic, is an interesting research topic. Ancient civilizations often observed the sky and used astronomical knowledge for various purposes, such as determining the seasons, navigation, regulating calendars and organizing agricultural activities [12] [13] [14] [15]. Here is some information on the use of astronomy in the Neolithic:

- **Astronomical observations:** Neolithic populations were interested in observations of the sky and celestial events such as the movement of the sun, stars and moon. These observations provided important information for establishing time cycles, such as the seasons and the length of days and nights.
- **Calendars:** Observing the positions and movements of the stars allowed ancient Neolithic cultures to develop calendars to regulate agricultural activities. These calendars were instrumental in planning planting, harvesting, and other agricultural-related activities.
- **Megalithic Monuments:** Numerous megalithic monuments were built in the Neolithic period and show a link between megalithic architecture and astronomy. These sites appear to have been designed to align with significant astronomical events, such as the summer solstice or equinox, suggesting that they were used as instruments for astronomical and calendar observations.

- **Primitive astronomical instruments:** Ancient astronomical observatories could use rudimentary instruments such as sticks, holes in the ground or alignments of stones to mark landmarks and observe the progress of the stars over the course of the year.

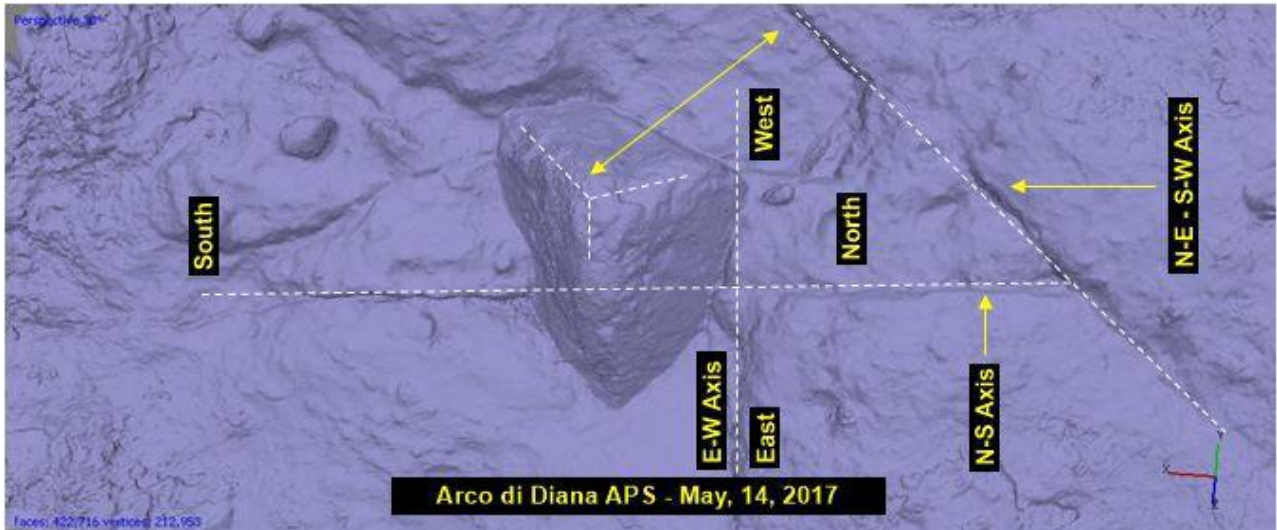
In this field of research, the archaeo-astronomical environment was of particular interest to the group of researchers.

Since the first exploration of the stone Slab, it emerged that this subject of study was astronomically oriented in the direction of the geographic South and on what were solstitial landmarks (Winter Solstice).

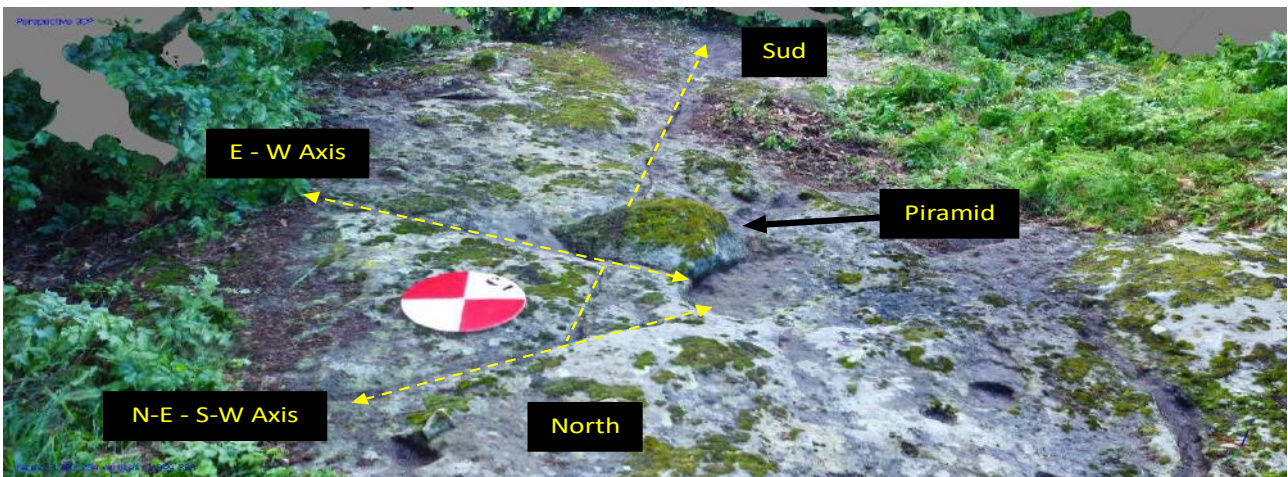
As regards the area of the lithic Pyramid, a three-dimensional model was created using SFM technology – Structure From Motion, [46] [47] [48] [49] [50] [51] [52] [53] [54 ] [55] [56] a technique used in computer vision and photogrammetry to reconstruct the 3D geometry of an object or scene using a sequence of images or video. The results were the same (Fig. 7 and 8):

- The lines engraved on the Slab referred to the astronomical goal visible towards the South, where it is possible to observe the largest area of the celestial vault (Fig. 8).
- The lines that move obliquely with respect to the line that moves towards the South, refer to the direction of the Sun visible both at the Winter Solstice Sunrise and at the Winter Solstice Sunset (Fig. 8).

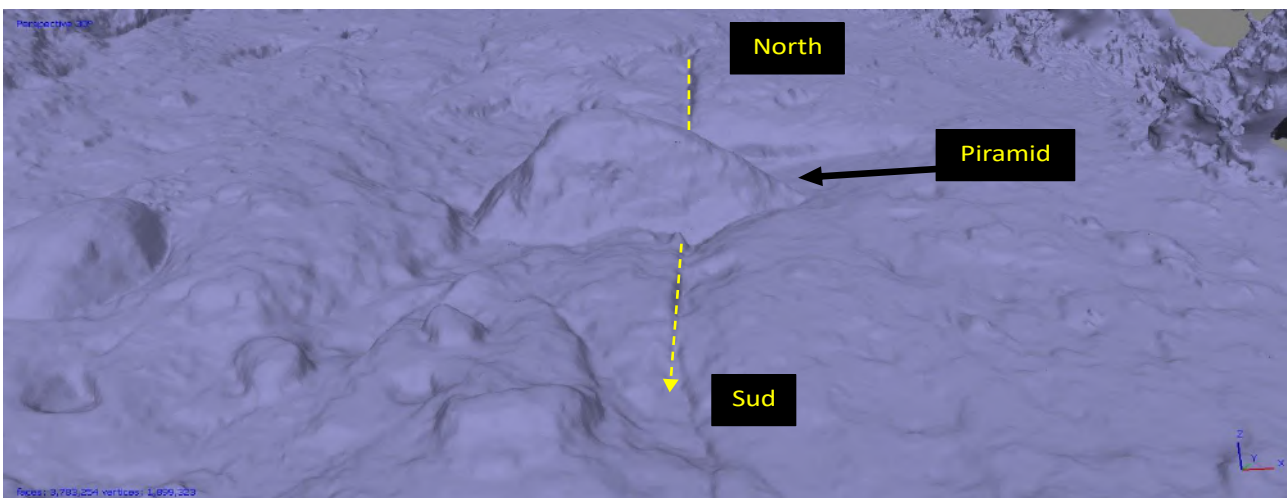




**Fig. 7** – Three-dimensional model of the Lithic Pyramid, carried out by Dr. Daniele Cataldi on 14 May 2017. Credits: Arco di Diana APS.



**Fig. 7b** – Three-dimensional model of the Lithic Pyramid, carried out by Dr. Daniele Cataldi on 12 June 2023. Credits: Arco di Diana APS.



**Fig. 7c** – Three-dimensional model of the Lithic Pyramid, carried out by Dr. Daniele Cataldi on 12 June 2023. Credits: Arco di Diana APS.



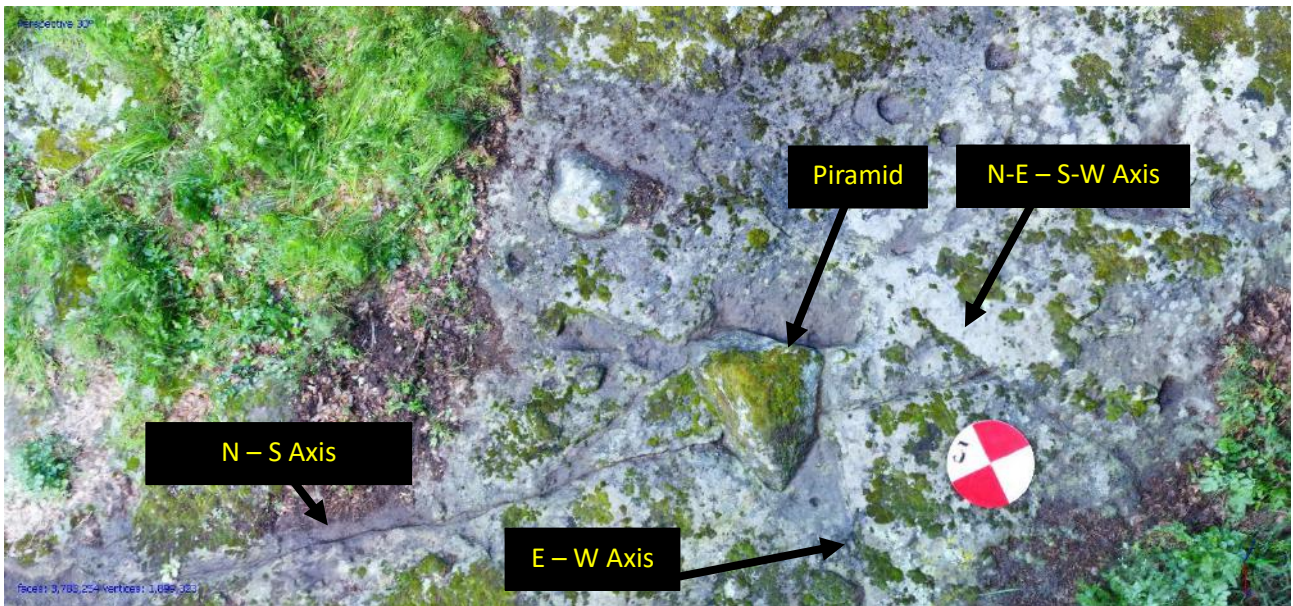
- The lines observed instead close to the lithic Pyramid are those relating to the direction of the position of the cardinal points (N, S, E, W,) and that relating to the N-E – S-W axis, as visible in Fig. 7.

This whole series of important elements demonstrates that whoever built these structures knew a part of astronomical mechanics and precisely the movement of the Sun in the sky, with respect to the various periods of the year.

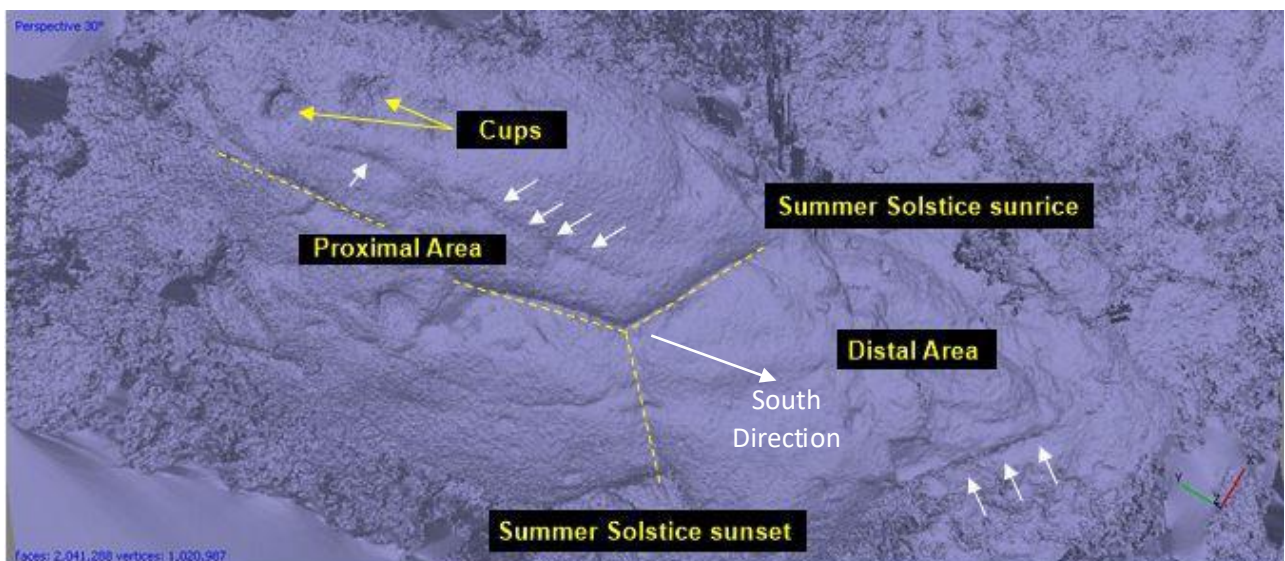
This also indicates that the makers of these lithic structures knew the geography very well and used this archaeological site as a real astronomical clock for (perhaps) religious purposes. From a careful analysis it

can be seen that in a southerly direction, the stone Slab is oriented with the most sloping part of the external wall of the Lazio Volcano (Fig. 9).

Observing the images relating to the lithic Pyramid (Fig. 7a, 7b and 7c), it can be seen how this part of the archaeological area was sculpted and engraved in a very precise way, particularly straight lines if observed from above and which instead follow the roughness of the terrain.



**Fig. 7d** – Three-dimensional model of the Lithic Pyramid, carried out by Dr. Daniele Cataldi on 12 June 2023. Credits: Arco di Diana APS.

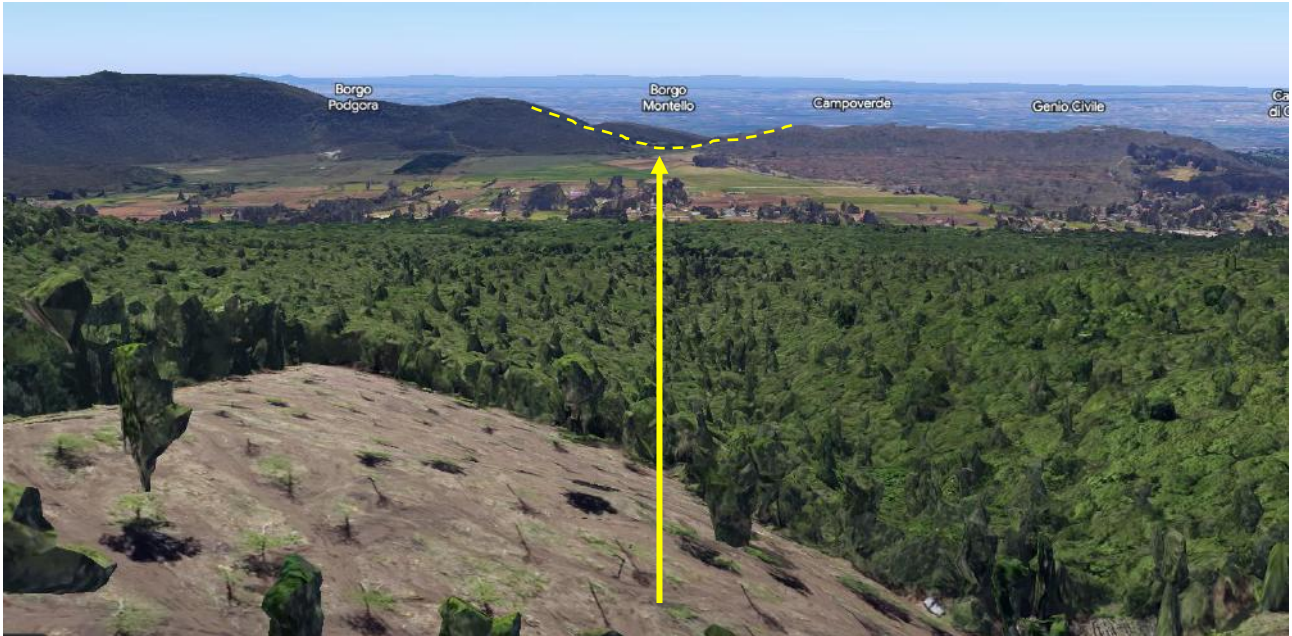




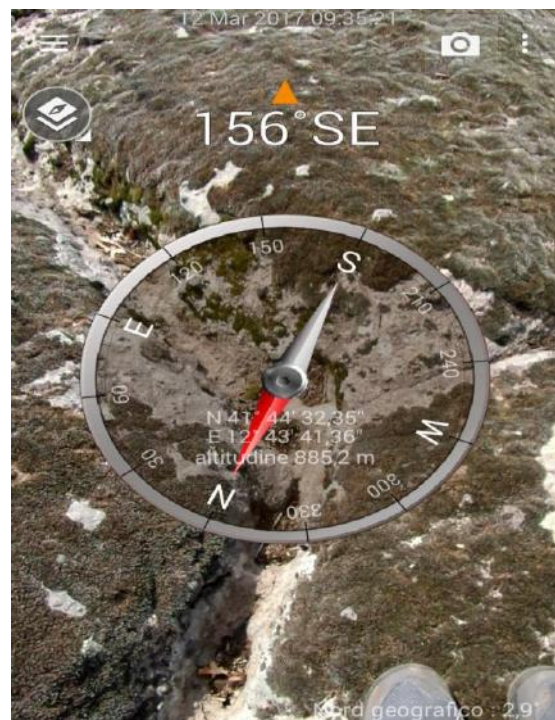
**Fig. 8** – Three-dimensional model of the stone Slab, carried out by Dr. Daniele Cataldi on 14 May 2017. Credits: Arco di Diana APS.

What can be the reason for this human construct? Can it have a purely astronomical meaning? Can it have a religious meaning? It is something rudimentary but

highly indicative from an astronomical point of view and this, according to the researchers involved in this study, should not be underestimated.



**Fig. 9** – View in a southerly direction from the geographical point where the stone Slab is located with particular reference to the most sloping part of the southern wall of the Lazio Volcano where the Slab itself is oriented. Credits: Google Earth, Google Maps.



**Fig. 10** – Measurements of the azimuth of the grooves engraved on the stone Slab, performed by Dr. Daniele Cataldi on 12 March 2017, together with Riccardo Bellucci. They highlight the southern orientation of the Slab and of the main furrow that cuts the stone structure in two. Credits: Arco di Diana APS.



Fig. 10 unequivocally shows the orientation of the central groove of the stone Slab oriented on the N-S axis, while in Fig. 10b the orientation in azimuth of the solstice lines recreated on the stone Slab by means of deep grooves is highlighted. They head in the S-E and S-W direction.

## 2.6 – The study of Heaven

To corroborate the data relating to astronomical orientation, the group of researchers had to consider the elements of theoretical astronomy which are the basis of solstitial and equinoctial phenomena, then going on to verify if the position of the Sun and other astronomical objects could be indicated from the position of the furrows present on the lithic elements of the archaeological area.

First of all it should be considered that the solstice occurs twice a year and marks the moment in which the Sun reaches the maximum angular distance with respect to the celestial equator. During the summer solstice (in the northern hemisphere), the longest day of the year, the Sun reaches its maximum height in the sky. This occurs around June 21 in the Northern Hemisphere and December 21 in the Southern Hemisphere. During the winter solstice (in the northern hemisphere), the shortest day of the year, the sun reaches its lowest point in the sky. This occurs around December 21 in the Northern Hemisphere and June 21 in the Southern Hemisphere. The equinoxes, on the other hand, occur twice a year and mark when the Sun is exactly above the celestial equator. During the equinoxes, the length of day and night is approximately equal all over the world. The vernal

- March 20 – Spring Equinox.
- June 21st – Summer Solstice.
- September 22nd – Autumn Equinox.
- December 21st – Winter Solstice.

In ancient times, many man-made sites were oriented precisely in the direction where the sun was these days, especially at dawn.

Since the dawn of human civilization, ancient peoples have been faced with the wonder and enigma of the celestial world around them. Through careful observation and interpretation of astronomical phenomena, they discovered that the sun, stars and moon followed a cyclical rhythm, marking the passage

The data recorded in Figs. 4b, 4c, 10 and 10b have a certain angle of error, but this error does not in any way affect the precision of the orientation of the anthropic grooves present on the stone Slab and near the lithic Pyramid.

equinox occurs around March 20 in the northern hemisphere and September 22 in the southern hemisphere. The autumnal equinox occurs around September 22 in the northern hemisphere and March 20 in the southern hemisphere. The winter solstice is an astronomical event that occurs around December 21 in the northern hemisphere and June 21 in the southern hemisphere. It marks the beginning of winter in the northern hemisphere and summer in the southern hemisphere. During the winter solstice in the Northern Hemisphere, day reaches its minimum length and night reaches its maximum duration. This occurs because the Earth's axis of rotation is tilted relative to its orbital plane around the Sun. During the winter solstice, the Northern Hemisphere is tilted away from the Sun, resulting in fewer hours of sunlight and colder temperatures. In the Northern Hemisphere, the winter solstice marks the point at which the Sun reaches its lowest height in the sky during the year. After the winter solstice, days gradually begin to lengthen, sunlight increases, and temperatures begin to rise, marking the transition into spring. In essence, the days in which the Sun reaches certain important positions (in the northern hemisphere) to mark the slow and incessant passage of time on the celestial vault are the following:

of time and the seasons of the year. Among these celestial events, the solstices and equinoxes occupied a role of particular importance, influencing their beliefs, religious practices, agriculture and the construction of extraordinary monuments.

The solstices and equinoxes were key points in the astronomical calendar for ancient peoples. The summer and winter solstices marked the longest and shortest days of the year, respectively, while the spring and autumn equinoxes represented times when day and night were approximately equal in duration. These celestial events were closely related to the agricultural cycle, religious practices and beliefs about life and death.

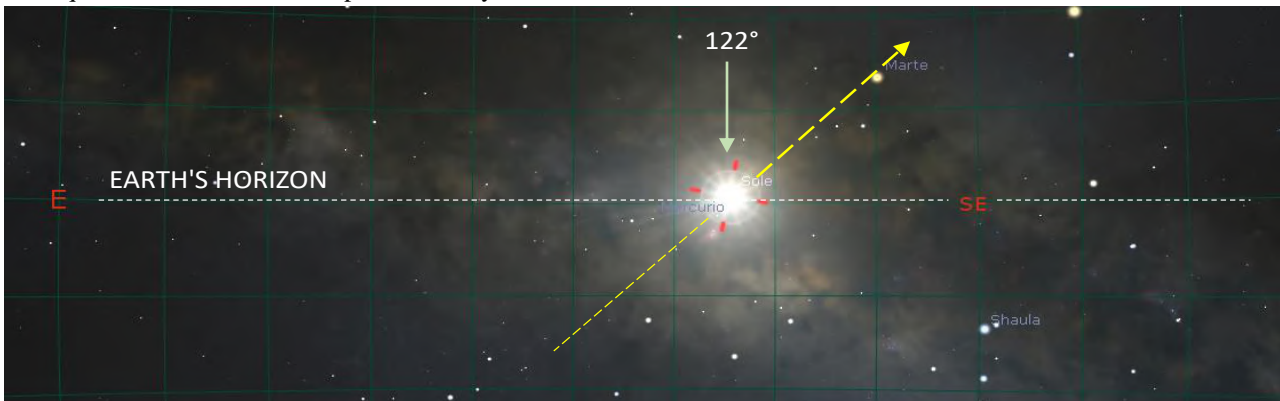
For ancient farmers, the solstices and equinoxes were essential for planning agricultural activities. The



summer solstice, with its longest day, marked the time for planting and the beginning of a new cycle of plant growth. The spring equinox, on the other hand, represented the awakening of nature after the harsh winter, marking the moment for the beginning of sowing and more intense agricultural activities. These celestial events provided an astronomical framework for crop management and food resource planning.

Ancient peoples attributed a deep meaning to the solstices and equinoxes, often associating them with religious and mythological beliefs. Ancient cultures believed these celestial events represented the interaction between the divine and the earthly, marking the cycle of life, rebirth and recurrence. Many religious celebrations, such as the winter solstice and summer solstice, were closely related to the solstices and equinoxes, celebrating the power of the sun and the influence it had on the earth and life itself. Ancient peoples left a legacy of extraordinary monuments that were designed and aligned to interact with the solstices and equinoxes. A notable example are the Pyramids of

Ancient Egypt, such as the Great Pyramid of Giza, which were precisely aligned with the winter solstice. During that day, the Sun rose exactly above one of the fissures of the Pyramids, creating a symbolic effect of rebirth and divine power. Similarly, Stonehenge, the mysterious complex of standing stones in England, was built in such a way as to capture the illumination of the Sun during the solstices and equinoxes. The stones are strategically placed to follow the astronomical alignment, and during these events, the sun's rays enter through the arches and create suggestive plays of light. Ancient Mesoamerican civilizations, such as the Aztecs and Mayans, built complex calendars and temples to observe and celebrate the solstices and equinoxes. For example, El Castillo, a Mayan Pyramid at Chichén Itzá, Mexico, was constructed in such a way that during sunset on the summer solstice, the shadows cast by the stairs look like a snake descending the Pyramid, representing the link between the cosmos and earth. [61] [62] [63] [64] [65] [66] [67] [68]



**Astronomical Map 1** – Astronomical map of December 21 (Winter Solstice) in which the Sun reaches 122° azimuth at *amba*, and in which the duration of the day hours is minimal compared to the night ones. Credits: Dr. Daniele Cataldi, Arco di Diana APS.



**Astronomical Map 2** – Astronomical map of December 21st (Winter Solstice) in which the Sun reaches 237° azimuth at sunset, and in which the duration of the day hours is minimal compared to the night ones. Credits: Dr. Daniele Cataldi, Arco di Diana APS.



We therefore started from this information to understand if the orientation of the grooves present in this archaeological site were actually to be confused by the position of the Sun or other astronomical elements. The corroborated data demonstrate how the position of the Sun during sunrise and sunset on December 21st (Astronomical Map 1 and Astronomical Map 2), matches the orientation of the solstice lines present on

the stone Slab (as visible in Fig. 10b ). This indicates precisely that the two furrows, initially considered to be of natural origin, in reality are not and are the result of subsequent processing by man.

This was one of the tests that the researchers involved in this study were waiting for, i.e. the confirmation by the azimuth data, of their initial working hypotheses.

### 3.0 – THREE-DIMENSIONAL MODELING

On 12 June 2023 it was possible to process the recorded data, in order to digitally reproduce the stone Slab and the lithic Pyramid.



**Fig. 11** – Three-dimensional model of the stone Slab, created by Dr. Daniele Cataldi on 12 June 2023. Credits: Arco di Diana APS.



**Fig. 12** – Three-dimensional model of the stone Slab, created by Dr. Daniele Cataldi on 12 June 2023. Credits: Arco di Diana APS.



These data represent important information, combined with those obtained from the three-dimensional models developed by Dr. Daniele Cataldi.

The realization of the three-dimensional model has allowed to evaluate the spatial position of the stone Slab and the stone Pyramid, in this case the elaborations (through specific software), have allowed to obtain interesting results on the characteristics of the archaeological site.

For example, it was possible to calculate the height difference of the entire area characterized by the archaeological site, and effectively understand how

this stone Slab is oriented with respect to the sloping areas of which it is characterized.

The digital elevation model (Dig. Model 1) shows just this, and it does it through a coloring (false colors) of the whole area, starting from the highest parts which are represented by the trees (red coloring), to the lithic slopes of the structure del Slab (blue color). It is evident how the Slab itself is inclined above all in its southern portion (green/light blue colour).

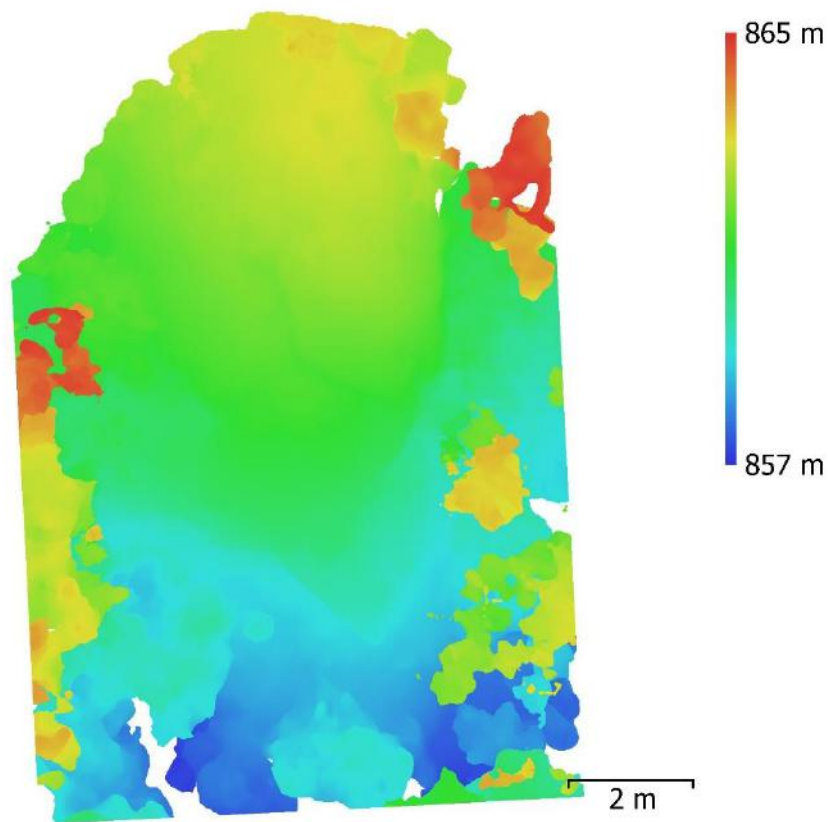


Fig. 4. Reconstructed digital elevation model.

Resolution: 5.09 mm/pix  
Point density: 3.86 points/cm<sup>2</sup>

**Fig. Model 1** – Digital elevation model of the stone Slab, created by Dr. Daniele Cataldi on 12 June 2023. Credits: Arco di Diana APS.

In this case the analyzes of the digital elevation model tell us that the northern portion of the Slab is the one responsible for collecting the water, having a lower inclination and therefore on this point of the rock, the meteorological precipitations accumulate more before being converged towards the southern portion. Further

indications from the digital elevation model (Dig. Model 2) are provided to us on the lithic Pyramid and on the rocky surface where it is located. Also in this case the higher areas are those relating to vegetation (trees), while the more sloping and lower ones are



those relating to the lithic surface (peperino) of the soil where the entire archaeological site rests.

This digital model also provides us with the metric indications in scale of the entire digitized surface and indicates where rainwater can mostly settle, in this case

the point is the one where the stone Pyramid is positioned which, by means of its highest position and faces of which it is characterized is able to capture a greater quantity of rainwater. This is an important fact which was also observed by the thermography carried out (Fig. 20).

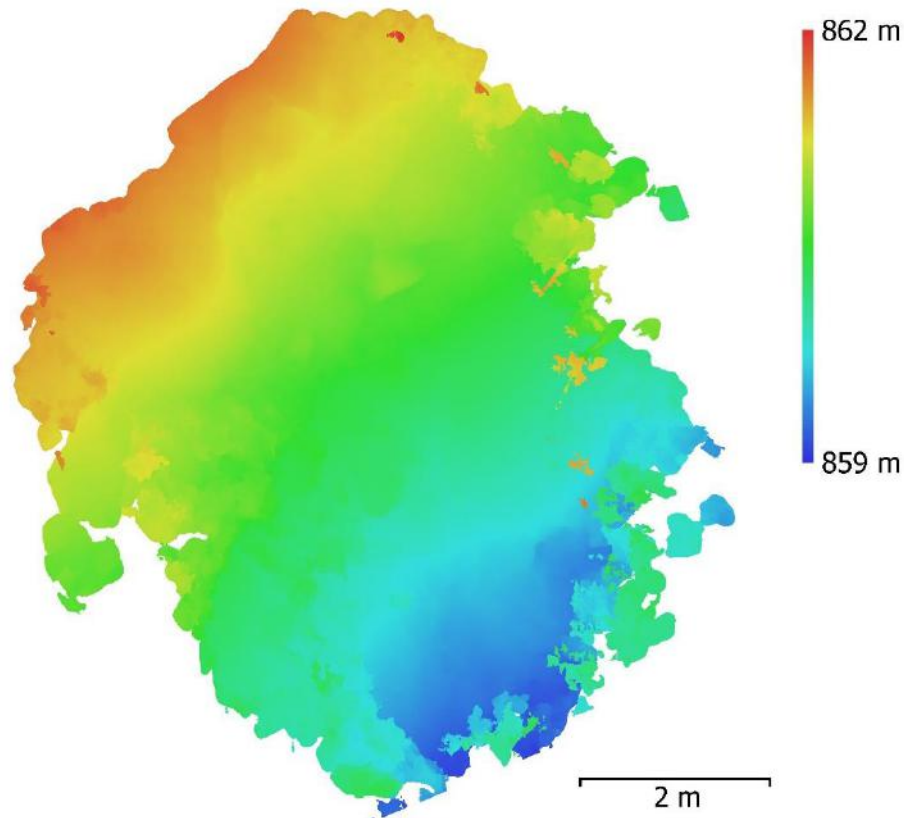


Fig. 4. Reconstructed digital elevation model.

Resolution: 1.75 mm/pix  
Point density: 32.7 points/cm<sup>2</sup>

**Fig. Model 2** – Digital elevation model of the stone Pyramid, created by Dr. Daniele Cataldi on 12 June 2023. Credits: Arco di Diana APS.

#### 4.0 – THERMOGRAPHIC SHOTS

A thermal imaging camera, or thermal camera, is a device that uses the principles of thermal imaging to detect and display the temperature differences of objects. It works through the use of a thermal sensor that converts the thermal (infrared) energy emitted by objects into electrical signals, thus creating a thermal image [16]. When it comes to detecting water or moisture with a thermal imaging camera, there are a few key concepts to consider:

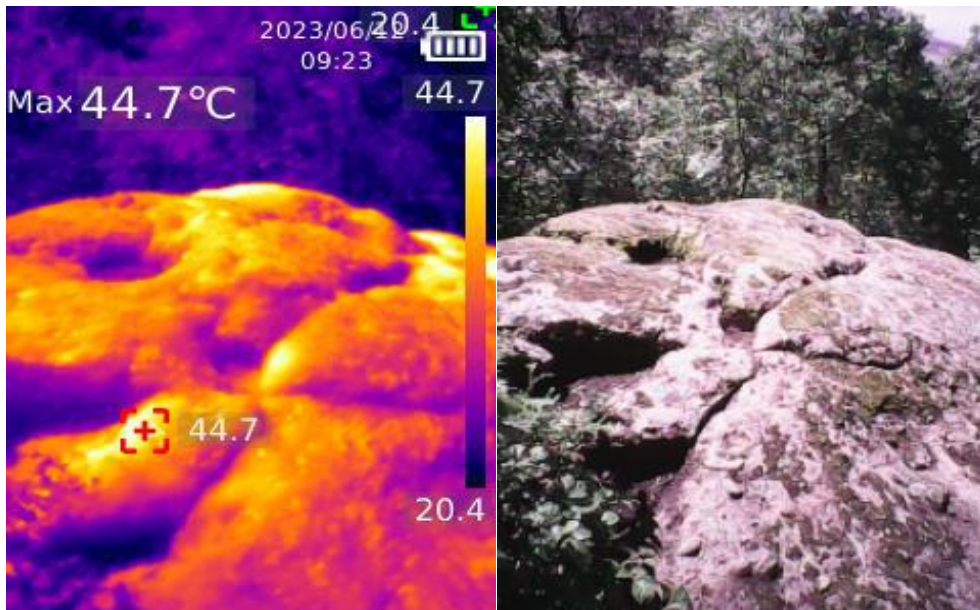
- **Water Absorption:** Water has an ability to absorb and retain heat. When the camera detects a damp or wet area, the water present will absorb the surrounding heat, appearing cooler than the surrounding dry surfaces in the thermal display.
- **Convection:** The evaporation of water causes a cooling effect on the surface. When water evaporates from a surface, there will be more



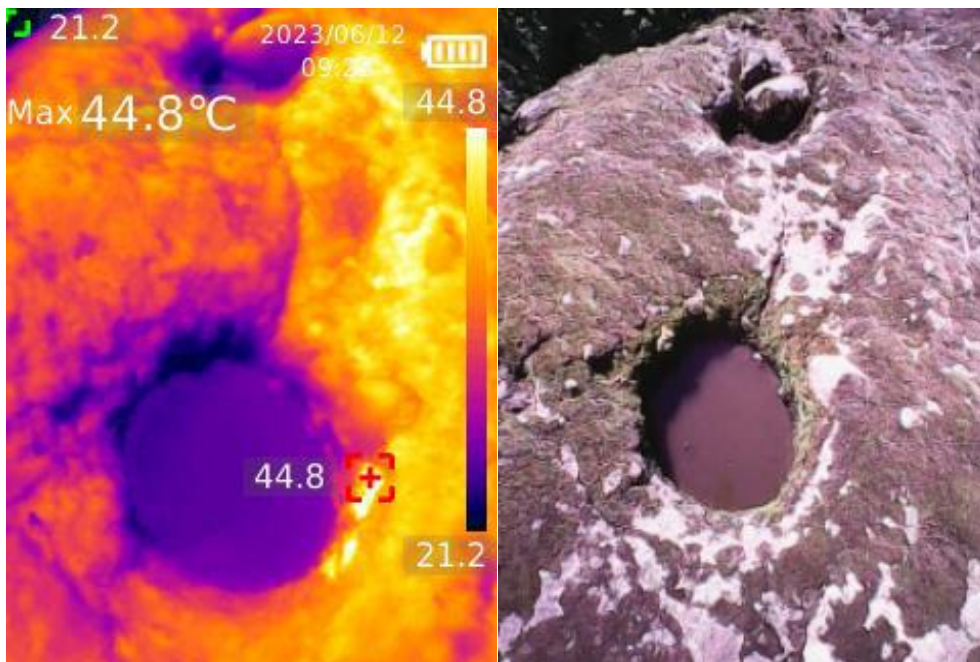
rapid heat loss in that area. This can be seen as a colder area in the thermal view. [17] [18]

During the last exploration that took place on 12 June 2023, it was possible to take thermal shots of the stone structure to confirm how rainwater and humidity in general were channeled into the grooves present on the stone surface of the Slab and here forced to descend along the sloping part of the structure itself. This confirmed how the entire structure of the Slab was used for this purpose.

The thermal images ranging from Fig. 13 to Fig. 18, document for the first time ever the thermal behavior of the stone surface of the Slab, in relation to the presence of water, and it is evident that this is present above all inside the furrows and of the cup marks, where it is mostly deposited due to the effect of gravity and the shape of the stone surface. This indicates that in this case the rainwater is channeled into these alterations and partly conserved here.

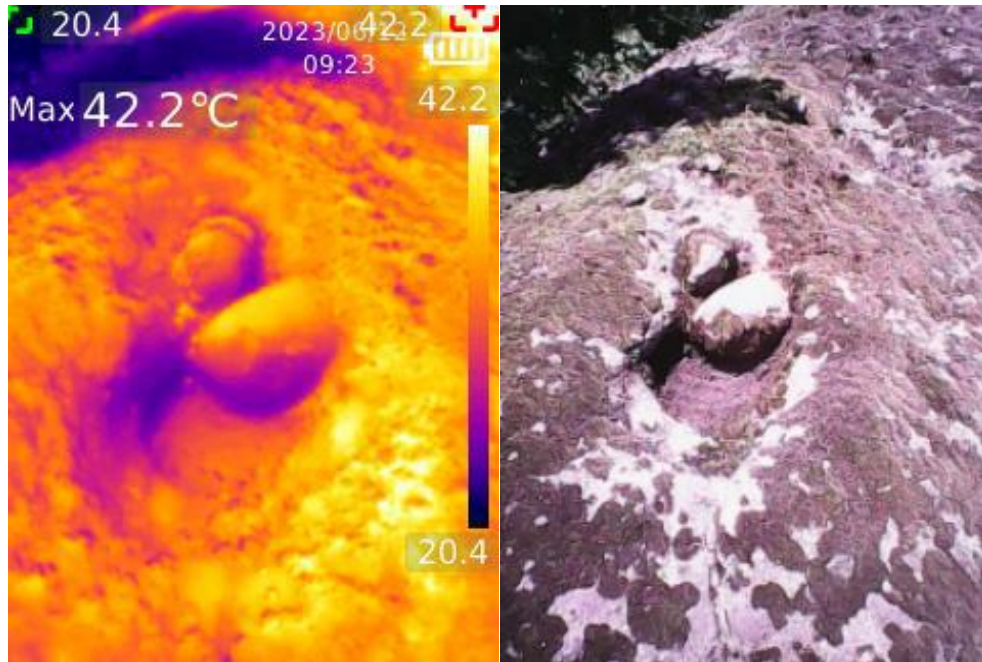


**Fig. 13** – Thermographic shots of the Slab, taken by Dr. Daniele Cataldi on 12 June 2023. Credits: Arco di Diana APS.

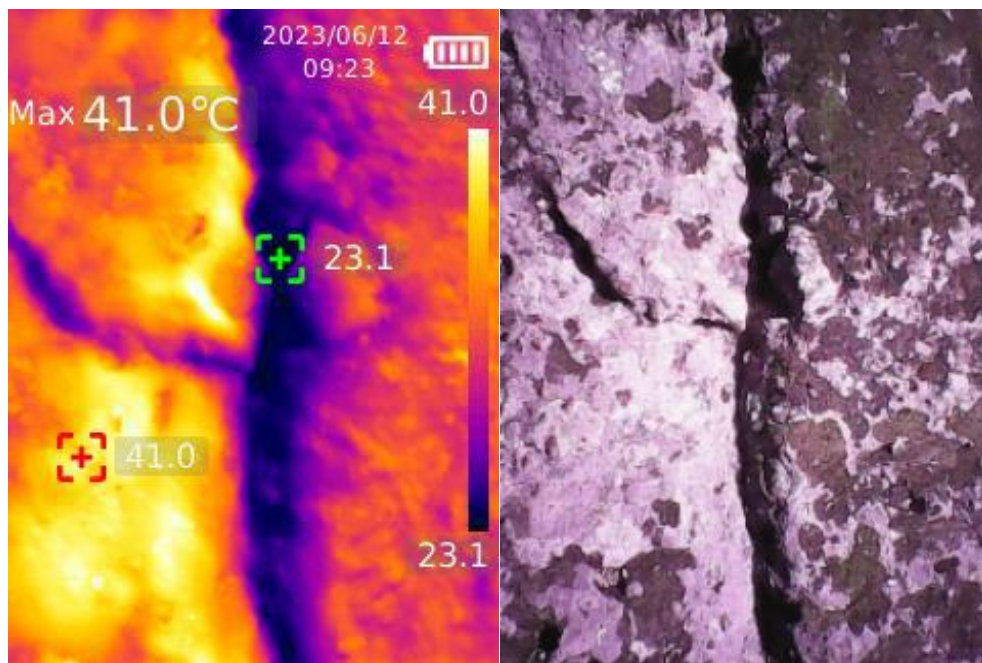


**Fig. 14** – Thermographic shots of the Slab, taken by Dr. Daniele Cataldi on 12 June 2023. Credits: Arco di Diana APS.



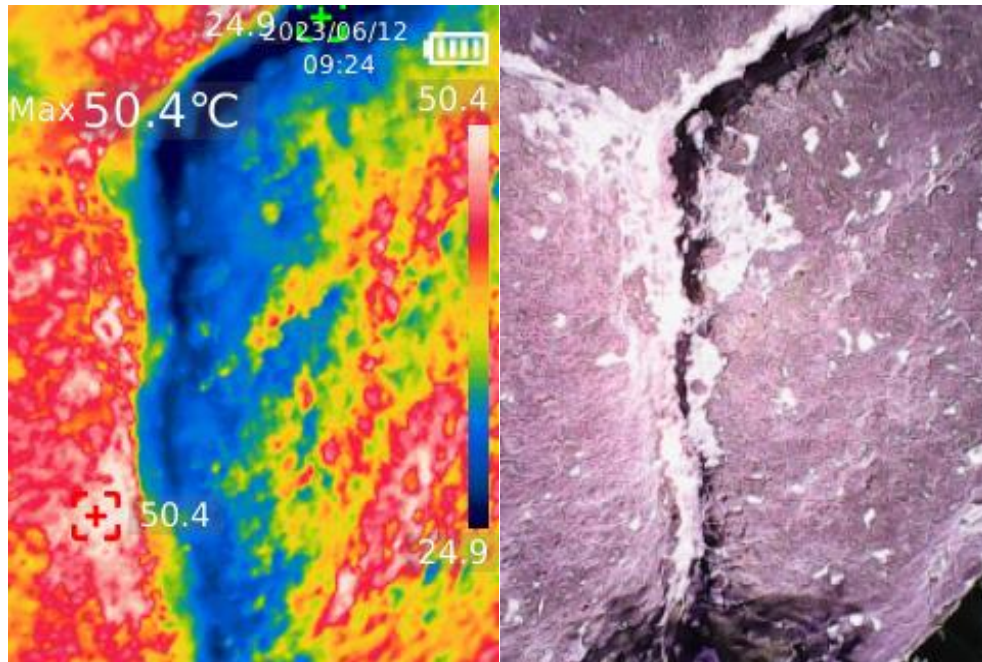


**Fig. 15** – Thermographic shots of the Slab, taken by Dr. Daniele Cataldi on 12 June 2023. Credits: Arco di Diana APS.

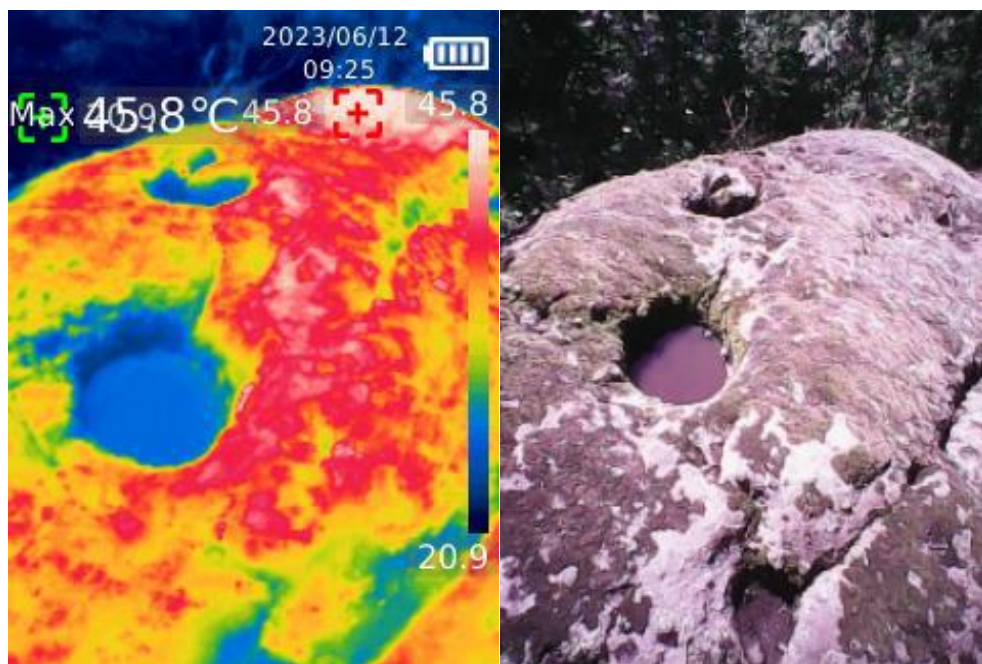


**Fig. 16** – Thermographic shots of the Slab, taken by Dr. Daniele Cataldi on 12 June 2023. Credits: Arco di Diana APS.





**Fig. 17** – Thermographic shots of the Slab, taken by Dr. Daniele Cataldi on 12 June 2023. Credits: Arco di Diana APS.

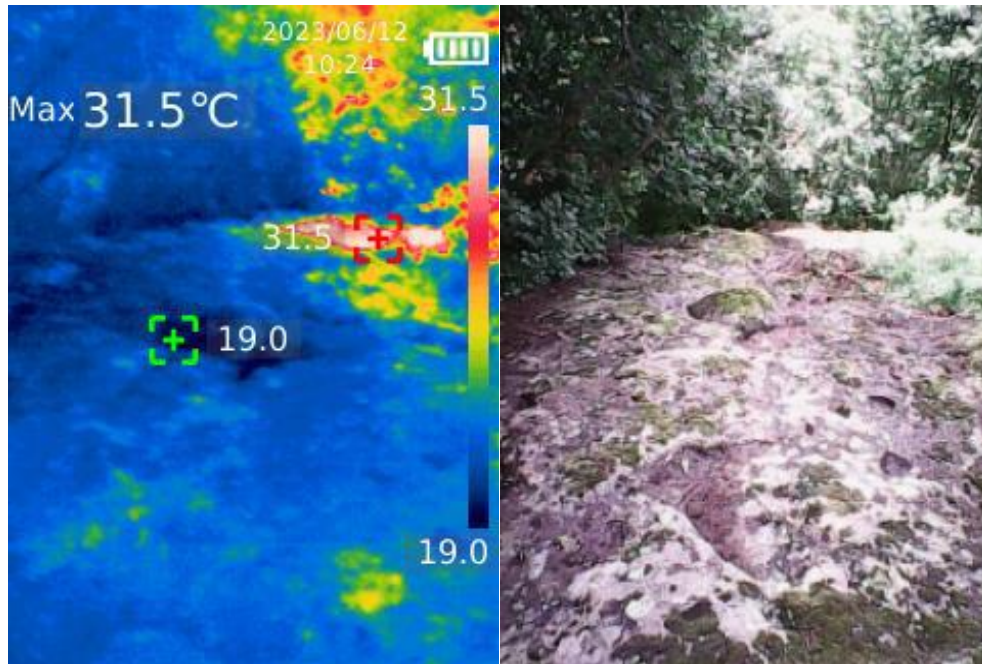


**Fig. 18** – Thermographic shots of the Slab, taken by Dr. Daniele Cataldi on 12 June 2023. Credits: Arco di Diana APS.

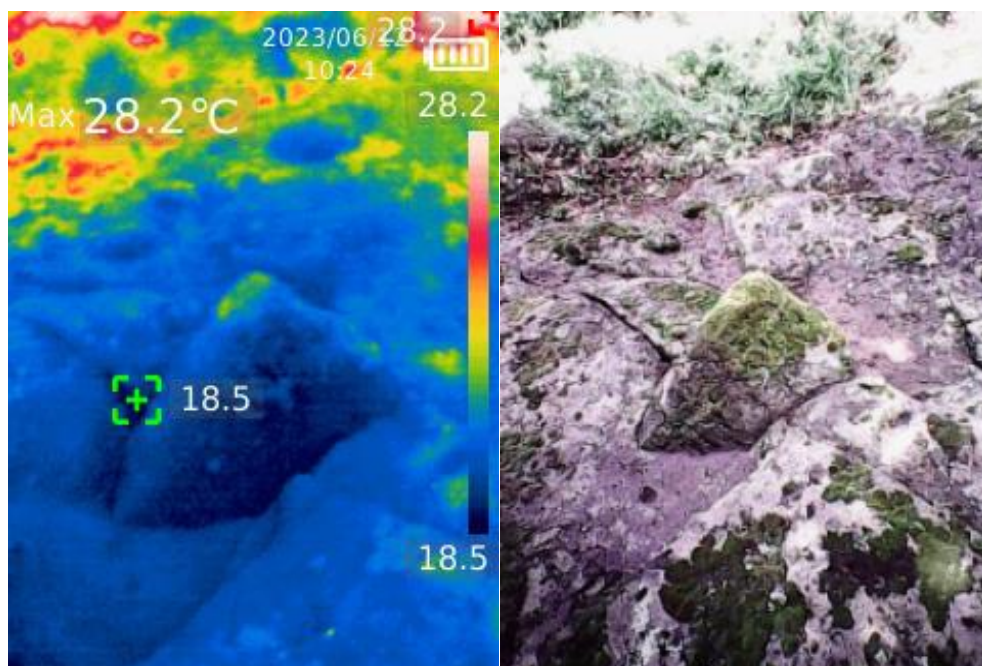
As regards the presence of water near the lithic Pyramid (Fig. 19, 20 and 21) it is evident that this is subject, in the same way, to a water drainage system through the presence of oriented grooves, even if this network draining is not as efficient as the one present on the stone Slab.

In this case, the most humid element is precisely the triangular-based Pyramid (Fig. 20), where the totally bluish and dark blue color is particularly visible, compared to the rest of the thermal photo.





**Fig. 19** – Thermographic shots of the stone Pyramid, taken by Dr. Daniele Cataldi on 12 June 2023. Credits: Arco di Diana APS.



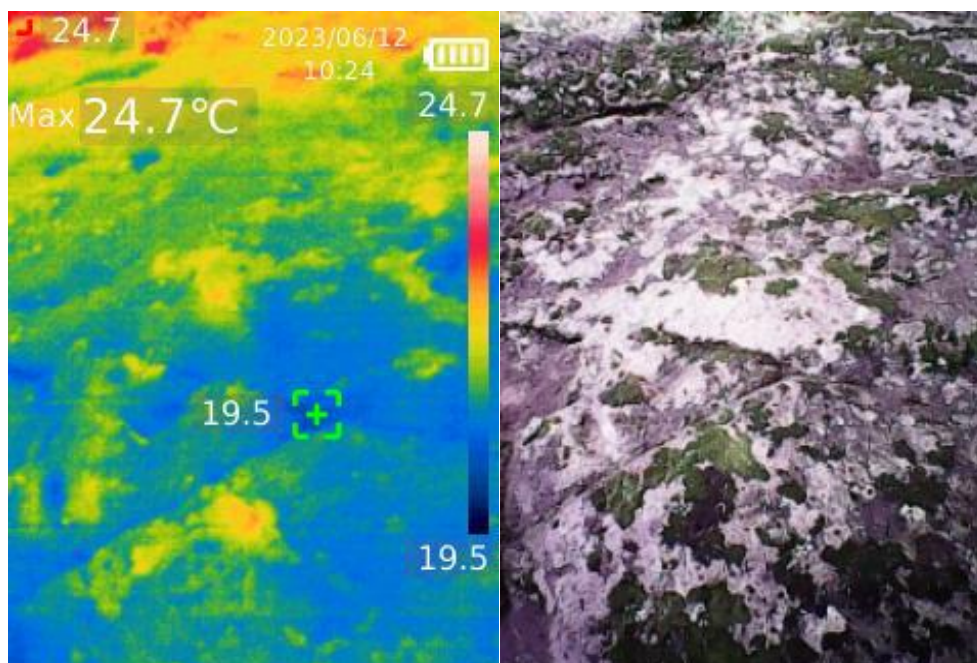
**Fig. 20** – Thermographic shots of the stone Pyramid, taken by Dr. Daniele Cataldi on 12 June 2023. Credits: Arco di Diana APS.

In this case the thermographic shots observe the thermal emission and not that of the visible spectrum such as shadows and illuminated areas.

This ensures that the instrument checks for the presence of water, with respect to the drier green, orange and reddish parts (Fig. 20).

Fig. 19 shows how the lithic Pyramid is in fact the most humid element ever, compared to all the rest (dark colour).





**Fig. 21** – Thermographic shots of the stone Pyramid, taken by Dr. Daniele Cataldi on 12 June 2023. Credits: Arco di Diana APS.

The thermography shows, especially on the Slab, the presence of furrows in which the water seems to flow, as visible in Fig. 18, in which the presence of humidity, associated with the flow of water, is detected

by the thermography (blue and dark areas ). This makes us understand where and how the water moves and spreads on the structure.

## 5.0 – HYPOTHESIS ON ITS CONSTRUCTION

This chapter will deal with the various hypotheses that saw the construction of this important archaeological site, a site completely carved out of the rock and (probably) remodeled in very ancient times, perhaps

the Neolithic, given that there are other constructions in the area which date precisely at this human historical epoch.

### 5.1 – The Neolithic period of Central Italy

The Neolithic period in Central Italy is commonly dated between 6000 and 3000 BC. During this period, the Neolithic populations adopted a sedentary lifestyle, starting to practice agriculture and cattle breeding. This has led to major social and economic changes. [19] In Lazio, several evidences of ancient Neolithic culture have been discovered, such as those in the province of Frosinone. As regards the Lazio Volcano, which includes the volcanic areas of the Alban Hills, several Neolithic sites have been identified. One of the best-known sites is that of Monte Cavo, where housing structures and burials dating back to the ancient Neolithic have been discovered. Other relevant sites in the Latium Volcano include the Hunters' Cave in Marino, which has yielded flint tools and animal bones, and the Sant'Angelo Cave in Rocca Priora, which has revealed evidence of ancient human

presence. [20] It is important to underline that archaeological research, in these places, is constantly evolving and new discoveries can be made over time due to the particularity of the territory, often impervious and able to hinder research.

The use and remodeling of natural rocks was the prerogative of Neolithic peoples. During the Neolithic era, human communities began to develop more advanced rock processing techniques than in the previous period, the Paleolithic. This has led to the use of new tools to extract, work and shape the stone. The main techniques used during the Neolithic era include hammer working and pressure working. In hammerwork, harder stones were used to strike the target stone, removing chips or creating a desired shape. In pressure machining, on the other hand,



pressure was applied to a stone core to obtain thin and regular chips. The stones most commonly used for working in the Neolithic culture include flint (present in the area of the Lazio Volcano and a short distance from the archaeological site of the stone Slab and the lithic Pyramid), obsidian and quartz. These stones were plentiful and offered good strength for making tools such as scrapers, arrowheads, axes, and blades. [25]

Working the rock during the Neolithic era was a laborious process and required specific skills. Neolithic craftsmen were familiar with the characteristics of different stones and their fracture properties. They also knew how to select, prepare and process the raw material to obtain the desired tools. [21] [22]

## 5.2 – The Water

In the context of the cults and rites of ancient Neolithic religions, water was often considered an element of great importance and symbolism. Although there is no single Neolithic religious practice, we can find some evidence of the importance of water in different cultural contexts of that period.

- **Sacredness of Water:** Water was often considered sacred and associated with deities or spirits. In many Neolithic cultures, rivers, lakes and springs were considered sacred places inhabited by spiritual beings. Water was often revered as a source of life, purification and fertility.
- **Rites of purification:** Water was used in many purification rites. People bathed in sacred rivers or lakes to wash themselves of sins or to be spiritually cleansed. These rites represented a symbolism of rebirth and regeneration.
- **Offerings and sacrifices:** Water was often offered as a gift to deities or spirits. People could pour water or throw ritual objects into the sacred waters as a sign of devotion or

## 5.3 – Hypothesis on the Slab and the lithic Pyramid

The hypotheses that emerged during the explorations by the researchers involved in the study considered the presence of water and the salient astronomical characteristics of the archaeological site itself. The presence of water and its use suggests a religious explanation, for an ancient place of worship, in which water was used for rituals and religious functions. The

Interestingly, rock working during the Neolithic period was not limited to tools only, but was also used for the creation of decorative objects, such as stones that were polished or carved with symbolic or figurative motifs. [23] [24] [26] [27]

The knowledge that science has in relation to the Neolithic period requires evaluating important hypotheses to understand or hypothesize the age of the archaeological site in question, but to do so we must also understand what importance the use of water must have for those ancient populations who they had once colonized central Italy.

request for divine favors. Sacrifices of animals or objects, included in some rituals, could be performed in bodies of water.

- **Fertility symbolism:** Water was strongly associated with the fertility of the land and people. In Neolithic agricultural societies, water was essential for irrigating fields and growing crops. In religious rites, water was often used to invoke the fertility of the earth and of women.
- **Seasonal Rites:** In many Neolithic cultures, religious rites were tied to the seasons and natural cycles, such as rain, harvest, or plant growth. Water was central to many of these seasonal rituals, representing the life cycle and continuity of natural resources. [28] [29] [30] [31]

Just think of the importance of water in the Catholic religion, used for millennia to purify people through the famous baptism. In this context, the use of water on the stone Slab and near the stone Pyramid confirms how this can actually be a place of worship linked to water. [32][33] [34] [35]

astronomical characteristics, on the other hand, suggest that this presence of water should also be associated with a precise temporal context, such as the equinoctial and solstice and in general with the position of the Sun.

All this shows that the builders were learned people and not simple nomadic hunters/gatherers, or who



lived without particular scientific knowledge. Far from it, we are faced with a series of constructs that indicate, unequivocally, that there was an ancient people capable of making something advanced and that they used it.

From an astronomical point of view it must have been built, at least in the oriented furrows, in an era very close to ours, and therefore not too many millennia

## 6.0 - CONCLUSIONS

The exploration and study work of the Slab and the lithic Pyramid led the researchers to hypothesize that this area was, in the past, a place of worship linked to water. A place where even the Sun had a clear cult meaning.

It is not possible to know when this archaeological site was built, at least at this time with current knowledge, but there is no doubt that this must have extended beyond its southern portion, where other furrows and cup marks have been identified, as well as a certain amount of water. The area would need further studies and insights which could confirm the reason for its construction and its real extension within the wooded area.

However, it was possible to ascertain that the entire lithic structure is related to the Winter Solstice, and this means that we are probably dealing with a place of worship.

For example, Sol Invictus was a Roman religious cult that venerated the Sun as the main deity. While not specifically a holiday, Sol Invictus was closely associated with the winter solstice, which fell around December 21, and celebrations in its honor could therefore be related to the December period.

We know that the cult of Sol Invictus reached its peak during the Roman Empire in the 3rd century a.D. The emperor Aurelian, in 274 a.D., proclaimed Sol Invictus as the main deity of the state and instituted the dies Natalis Solis Invicti, the "birthday of the Invincible Sun", on December 25th. This date coincided with the winter solstice in the northern hemisphere, the time when the days begin to get longer after the longest night of the year.

Interestingly, the choice of December 25 for dies Natalis Solis Invicti may have been influenced by the Christian Christmas tradition. In the 4th century, Christianity was gaining popularity and the Catholic

ago, otherwise the variation of the position of the Sun, with respect to the cardinal points, would be greater than that today, due to the precession of the equinoxes.

The data obtained from the azimuths of astronomical orientation at the Winter Solstice of the furrows present on the stone Slab (Fig. 4b, 4c, 10 and 10b), confirm the astronomical orientation of the lithic structure, and this in an unequivocal way.

Church decided to celebrate the birth of Jesus Christ on December 25 to overlap with the Sol Invictus celebrations and facilitate the conversion of pagan Romans to Christianity.

While Sol Invictus was not a Roman holiday in the strict sense, solar worship and its connection to the winter solstice has had a significant influence on the celebrations and traditions of the Christmas season. [69] [70] [71]

Could this archaeological site have ancient correlations with solar worship, in an era prior to the Roman one? This hypothesis, put forward by the authors, highlights the possibility that this lithic construct could be an ancient testimony, prior to the Roman era, referable to a particular solar cult that spread in the great and ancient civilizations that arose later such as the Roman one.

As regards the presence of the triangular-based lithic Pyramid, we know that the cult of the Pyramids has a long history that also refers to ancient Egypt, where the Pyramids were considered sacred monuments and symbols of power and immortality.

- Solar cult: An important aspect of the cult of the Pyramids was the connection with the cult of the Sun. The pharaohs were considered sons of the sun god Ra, and the Pyramids were often aligned so as to capture the sun's rays at specific times of the year, as at the Summer Solstice.
- Funeral rites: Funerary rites associated with the Pyramids included processions, offerings of food and precious objects, incense, and the recitation of prayers and incantations to ensure the protection of the deceased pharaoh and his passage to the afterlife. [72] [73] [74] [75] [76] [77] [78] [79]



It is therefore conceivable that in this archaeological find discovered by the authors of the study, the lithic Pyramid had a similar meaning, and probably referred

to ancient cults in which the sun god could be identified with the Pyramid.

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