

**ENEOLITHIC PROJECTION SYSTEM FOR  
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TERRITORY OF MEGALITHIC SANCTUARY  
NEAR THE VILLAGE OF KOVIL  
(MUNICIPALITY OF KRUMOVGRAD,  
KURDZHALI DISTRICT)**

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# Eneolithic Projection System for Astronomical Observations on the Territory of Megalithic Sanctuary near the Village of Kovil (Municipality of Krumovgrad, Kurdzhali District)

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**Abstract:** The archaeological rock complex near the village of Kovil, Krumovgrad Municipality is situated in a huge area, a few kilometers along the ridge, in the area "Ak Kaya" (White Rock), between the villages Kovil and Dzhanka. According to some sources, separate sanctuaries are nine in number, without a clear criterion to differentiate them. They are almost destroyed and some of them are unfinished still in antiquity. The complex has been studied in the period 1991 - 1993, from Georgi Nekhrizov and Georgi Kulov.

The studied sanctuary is located on a distinctive white rock cliff (volcanic tuff) on the crest of a rocky ridge. On the west are evident signs of wall without mortar, which hinders the accessible side. On the top of the rocks are carved a lot of facilities for religious use, altars, grooves, and a large, well-preserved basins cut in the cliffs, which were probably used as sacred water sources, as well as trapezoidal niches. Arched caves are discovered under the sanctuary. Traces of human intervention can be seen in some of them. The ceramic material found on the ridge is dated back to the Late Bronze and Early Iron Age. During the organized excavations conducted in the period 1991-1993 an idol similar to amphora was discovered. The approach to the rock complex on the ridge passes by two other ancient structures - necropolis and reservoir. Along with common of megalithic sanctuaries in the area niches, stairs, and reservoirs for wine making at a slight slope grooves are carved with a length of tens of meters, of unknown function and unintentional orientation. There are also traces of constructions that are probably from later epochs.

Results from archaeoastronomical research of the basic rock-cut shapes, located in the southern part of the rock pyramid of the sanctuary near the village of Kovil are discussed in this paper. In the biggest rock niche, situated in the middle of the rock group is carved a projective system allowing to observe the sunrise during the spring and autumn equinox. Through an oval aperture (size of the horizontal axis - 0.5 m and vertical axis - 0.4 m) drilled in the eastern edge of the rock niche solar beams can be projected on a specially cut down surface from the wall of the niche. The rock surface has a parabolic plane of cutting, which allows you to adjust the image of the solar projection of the hole due to the elevation of the Sun above the eastern horizon. The projection was possible for about 20 days, centered on the vernal (autumnal) equinox - March 10 to April 2 at the modern calendar. For more accurate determination of some specific dates fixed by using projective facility additional astronomical observations and measurements are needed.

Based on archaeoastronomical studies (determination of the sunrise astronomical azimuth, the slope of the local horizon, the erosion of rock forms, etc.) the slope of the ecliptic during the creation of the monument is determined -  $i = 23^{\circ}.99$ . It meets the period between 2600 and 2500 BC. This dating corresponds to the dating of the sanctuary on archaeological data. In all likelihood, the monument has been reworked and reused in subsequent periods, including 200 - 300 AD.

**Keywords:** rock-cut monument, megalith, sanctuary, archaeoastronomical research, projective system, equinox

## Introduction

Rhodopes are inhabited during the Paleolithic Age - 80-10 000 BC, which is evident from the presence of numerous artifacts. In the Eastern Rhodopes are

some impressive assemblies of monuments carved in the rocks - trapezoidal niches, altars hewn in the cliff, artificial caves, carved figures, carved circles and grooves. The beginning of their construction in the late Neolithic period - the end of the 7000 BC and the beginning of 6000 BC. The whole sanctuary system in the Rhodope Mountains was created in the second half of the Neolithic Age - 5000 BC.

There are not traces from metal tools used for creating the rock structures. They were probably made with stone tools. Still no conclusive data about the exact purpose of these assemblies carved into the rocks in prehistoric times. However, they are testimony to the rich spiritual life and complex religious practices during this time. They are the work of well-organized societies, leading a rich spiritual life (Stoev et al, 2013a). There were performed religious rites and were held astronomical observations. Here was the way to the eternity and contact with God. Approximately in the period about 4500 BC these societies leave the Eastern Rhodopes, and possibly the Balkan Peninsula.

Geological foundation of the Eastern Rhodopes and the entire Rhodope massif is composed of metamorphic rocks. They form domes of tens to hundred kilometers in size. Among them, in Paleogene (60-30 000 000 BC) declines are formed that represent large water pools. They are scene of intense volcanism. Volcanic structures are islands (archipelagos) in this sea basin surrounded by coral reefs, existing in a tropical climate.

Eastern Rhodopes are characterized with its peculiar and unique landscape. Paleogene volcanic structures (relatively young, only about 35-30 million years) are well-preserved and stand magnificently in the modern landscape. These are both large volcanoes with a diameter of 10-20 km (Dragoyna, Damba, Madzharovo etc.) as well as a number of smaller rhyolite extrusions with a diameter of 1-3 km (Hisar, Yumruk Kaya, Schupenata planina, etc.).

The area is strewn with fabulous geological phenomena. Especially suitable for natural sculpting are rhyolite piroclasts that are widely available. Among them are a number of bizarre shapes (Stone wedding, Rock mushrooms, Head of the turtle) as well as majestic and inaccessible cliffs. These landmarks have attracted prehistoric man. In the beginning people deified spectacular cliffs, used their natural magnificence and created their first sanctuaries there. Later they began to hew, additionally shape and sculpt various ensembles. Eastern Rhodopes are the richest in the Balkans area with megalithic monuments from the Antiquity.

Thracian cult complex at the village of Kovil, Krumovgrad municipality is situated on the road Krumovgrad - Haskovo (through the village Studen kladenec) and it is one of the most attractive places of worship in the Eastern Rhodopes. Rock cuts include altar known as a Tripod, stone water reservoirs, hewn out trapezoidal niches, rock faces, artificially shaped caves. It is discovered a rock necropolis composed of nine graves located around the ridge, on which is located the cult complex. Kovil is surrounded by spectacular scenery, it is situated far away from the main road and offers seclusion among the remnants of the era of megalithic culture in the Eastern Rhodopes.

Field studies were conducted according to the accepted methodology for work on the Archaeology Map of Bulgaria for exploring the mountainous areas. It was made an accurate review of all relief forms, on which traces of past human activity can be founded - ridges, gentle slopes, slope steps, river terraces.

### **Megalithic Rock Sanctuary near the Village of Kovil, Krumovgrad Municipality, Kurdzhali District**

The Archaeological Complex near the village of Kovil is situated in a huge area, a few kilometers along the ridge, in the area "Ak Kaya" (White Rock), between the villages of Kovil and Dzhanka -  $\varphi = 41^{\circ} 31' 05",8$ ;  $\lambda = 25^{\circ} 39' 39",4$ ;  $h = 570$  m (Fig. 1). It is in the form of pyramid and has been investigated by a team of the University Research Centre for Ancient European and Easterly Mediterranean Cultures at South-West University "Neofit Rilski" (Bulgaria).

**Figure 1:** Megalithic cult complex near the village of Kovil, Krumovgrad Municipality, Kurdzhali district



The sanctuary is located around a wreath of white volcanic rocks (volcanic tuffs) which stands on the crest of a stony ridge (Fig. 2). The rock pyramid is oriented according to the main directions of the world and has five levels. Its length at the bottom is about 20 meters and it has the same total height. On the west are evident signs of wall without mortar, which hinders the accessible side. On the top of the rocks are carved a lot of facilities for religious use, altars, grooves, and a large, well-preserved basins cut in the cliffs, which were probably used as sacred water sources, as well as trapezoidal niches (Fig. 3). During the organized excavations conducted in the period 1991-1993 from Georgi Nehrizov and Georgi Kulov, an idol similar to amphora was discovered. The ceramic material found on the ridge is dated back to the Late Bronze and Early Iron Age. It is supposed that sanctuaries

are nine in number, without a clear criterion to differentiate them. Moreover, they are almost destroyed and some unfinished still in the antiquity.

**Figure 2:** Area of the megalithic cult complex near the village of Kovil, East Rhodopes



During the 2015 expedition of the University Research Centre for Ancient European and Easterly Mediterranean Cultures at South-West University “Neofit Rilski” fragmented ceramics found on the second and third terraces has slid down from the cultural layer which is located on top of the plateau. The earliest fragments can be dated from the Halcolite age. It is likely that one very small fragment of a ceramic cult figure, which was found on the second terrace of the pyramid, belongs to those materials. The rest of the ceramic material can be generally dated from pre-Roman and Thracian-Roman times in Thrace. In this way a wide range of possible dating of the terraced pyramid appears, which expands over several millennia, most probably from the end of 4th century BC to the middle of 1st century AD (Markov 2015).

The approach to the rock complex on the ridge passes by two other ancient structures - necropolis and reservoir. Along with common of megalithic sanctuaries in the area niches, stairs, and wells, grooves with a length of tens of meters are carved at a slight slope. They are of unknown function and unintentional orientation. There are also traces of constructions that are probably from later epochs.

### **Archaeoastronomical Research and Hypothesis (Projective System for Sun Observations)**

Archaeoastronomy is the study of how people in the past have understood the phenomena in the sky, how they used them, and what role the sky played in their cultures. Archaeoastronomy uses a variety of methods to uncover evidence of past practices including archaeology, anthropology, astronomy, statistics and probability, and history. Material evidence and its connection to the sky can reveal

how a wider landscape can be integrated into beliefs about the cycles in nature and their relationship with agriculture. Solar observatories from the Late Eneolithic to the Bronze Age have functional elements tracing astronomically significant directions to characteristic points of the local visible horizon line - sunrises and sunsets during solstice or equinox. Usually, sunrises and sunsets are connected with specific days and festivals from the calendar, agricultural or religious year of the ancient socium (Stoev et al., 2013b).

**Figure 3:** Facilities for religious use - altars, grooves, and a large, well-preserved basins, as well as trapezoidal niches - carved on the top of the rocks



An archaeoastronomical research has been conducted of the basic rock-cut shapes, located in the southern part of the rock pyramid of the sanctuary near the village of Kovil. In the biggest rock niche (length - 12.00m, average height - 2.20m and averaged width - 3.50m) situated at the second level of the rock pyramid is carved a projective system allowing to observe the sunrise during the spring and autumn equinox (Fig. 4). Through an oval aperture (size of the horizontal axis is 0.5 m and of the vertical axis - 0.4 m) drilled in the eastern edge of the rock niche solar beams can be projected on a specially cut down surface from the wall of the niche. The rock surface has a parabolic plane of cutting (Fig. 5), which allows you to adjust the image of the solar projection of the hole due to the elevation of the Sun above the eastern horizon. The measurements in a rectangular coordinate system (the origin is projection of the opening on the floor of the terrace, y-axis is

along the length of the terrace,  $x$  - distance to the carved surface against the aperture) shows that the plane curve is a cubic parabola which is described by the equation  $y = x^3$ . The projection was possible for about 20 days, centered on the vernal (autumnal) equinox - March 10 to April 2 (September 11 to October 5) at the modern calendar (Fig. 6). Maximal height of the sun, at which the opening can be projected on the north wall of the niche is not greater than 30 degrees above the horizon (Fig. 7). For more accurate determination of some specific dates fixed by using projective facility additional astronomical observations and measurements are needed.

**Figure 5:** Parabolic plane cut at the second level of the sanctuary



### **Chronological Boundaries of Existence of the Sanctuary**

Based on archaeoastronomical investigations (determination of the astronomical azimuth of sunrise, height of the local horizon, the erosion of rock forms, etc.) the slope of the ecliptic during the creation of the monument has been determined -  $i = 23^{\circ}.99$ . This value corresponds to the period between 2600-2500 BC. Most probably the monument has been reworked and reused in subsequent periods, including 200-300 AD.

### **Magnitometric Picture**

We - the people - live in the heliosphere, on a planet with a relatively strong magnetic field. Earth is the natural source of the Earth's magnetic field and it is called "geomagnetic field". It is the major «conductor» of solar activity that affects Earth processes and phenomena, including biological. The magnetic anomalies have psycho-physiological effects on the human body. It is assumed that these effects were used in ancient times during cult and religious festivals.

With the help of a specially developed magnetometer for weak magnetic fields -  $\mu$ Meter vertical and horizontal gradient of the magnetic field is measured,

on the surface and in the volume of the largest terrace at the second level of the rock pyramid. This is a digital 3D magnetometer, which measures the magnitude and direction of the magnetic vector simultaneously on the three coordinate axes  $x$ ,  $y$ ,  $z$  (Fig. 8). It is based on the HMC5883L integrated circuit of the Honeywell International Inc. The device communicates with the PC via USB 2.0 interface, receives commands and sends the resulting measurement data which are displayed on the computer screen and saved on the hard disk for further processing and storage (Benev et al., 2013, Maglova et al., 2013). The measured magnetic field is a function of interaction of geomagnetic field and magnetic properties of the surface and deeper layer of the array, where is developed rock sanctuary. The magnetic field measurements are made with such density that ensures continuity of data in order to detect local geomagnetic anomalies. Compilation of graphics from system of profiles allows for the obtaining of volumetric picture of the peculiarities of the morphology of the magnetic field of the local structure of the investigated sites.

**Figure 4:** Megalithic rock sanctuary near the village of Kovil. Second level of the rock pyramid with the opening and part of the eastern horizon



Precise measurements were made of the vertical and horizontal gradient of the magnetic flux density of the rock terrace with astronomical facility. It was found that there are two centers of positive gradient of the magnetic field. One of them (Western) is located near the screen of the positional astronomical system and the other center, near the oval opening. Most probably, these magnetic anomalies were entered in a certain way in the overall structure of the functional elements of the sanctuary as well as in the observational and religious practices performed there.

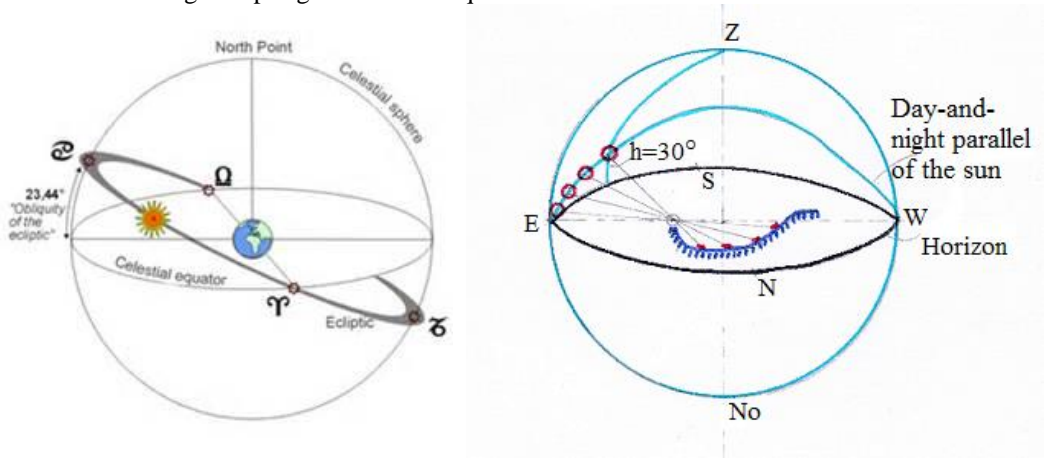
### **Cults**

Earth and air, water and fire are the four elements that stunned man at the beginning of his historical existence. In southeastern Europe, they were recognized as universal forces that created the world. This recognition began to be perceived in archaeological and linguistic data after 4000 BC, i.e. from the beginning of the so-

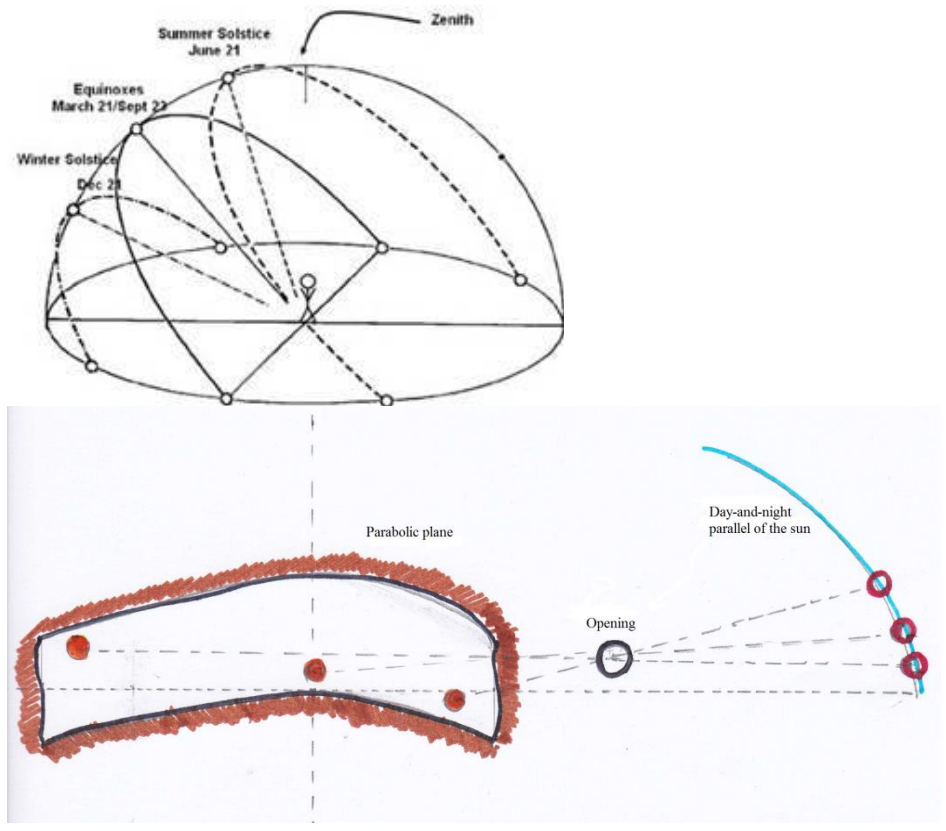


called age of use of bronze alloy for tools, weapons and different items. It has already been documented by written records for the second half of 2000 BC.

**Figure 6:** Scheme of the projection system of the megalithic rock sanctuary near the village of Kovil during the spring and autumn equinox



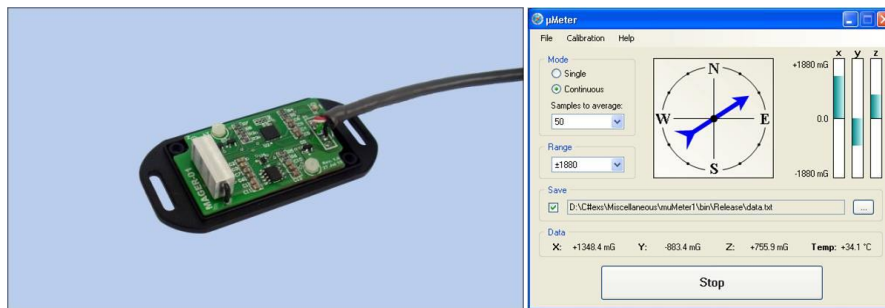
**Figure 7:** Movement of the sun projection on the parabolic plane cut at the second level of the sanctuary for observation of the sunrise during the spring and autumn equinox



Then (In the period of 3000 - 2000BC), in the vast area where eastern half of the Balkan peninsula (Thrace), northern Greece and northwest Asia Minor (Phrygia) meet, ideas, skills and possessions was exchanged and people realized four elements-forces as energies. Their energy impulse was naturally personified in the most appropriate natural environment, in the mountains, which was given the place of the Great Mother-Goddess. Her bosom-womb in the cave bowels of the Earth was purified and slightly wetted from the gushing Water, and Her rocky peak surrounded by the Air (sky), sparkled from the Fire of thunderstorms (Fol 1986).

Mountain worship is confirmed for the second half of the second and first centuries of the first millennium BC by the mighty megalithic culture in Thracian-Phrygian zone. It is represented by well preserved and numerous monuments, such as hewn out of the rock rectangular, circular or trapezoidal niches for votive gifts, sites for sacrifices with basins and grooves for bleeding, "sacred steps" that lead to springs or rock sanctuaries as well as entire megalithic complexes.

**Figure 8:** Specially developed digital 3D magnetometer, which measures the magnitude and direction of the magnetic vector simultaneously on the three coordinate axes x, y, z. Data are displayed on the computer screen and saved on the hard disk



The movement of the world, however, depends on universal fertilization of all its hidden germs, whose doctrine of implementation is by the sacred marriage (hierogamy - incest) between the Great Mother-Goddess and her Son. Sacred Marriage releases other energies and creativity, which are personified in the native son of the Son. This Son is the first initiated in the mystery of the movement, He is the King-priest bearing the doctrine of himself, but He is also destined to settle social order. Just in this moment the relationship Cosmos-socium begins to function and the world is built. In the Hellenistic literary version of Orphism, Apollo and Dionysus were named after the Son-Sun/Fire. These theonyms are exact correspondences of uranic and chthonic God who was worshiped in both its images in the Delphic sanctuary after 800 BC. Delphi on the Mount Parnassus was still a religious center just in pre-Hellenic era and secure center of the Thracian Orphism, which, however, is not left God names there. They are attested after 600 BC when theonyms Sabazius and Zagreus were already pronounced in the Thracian-Phrygian area (Marazov 1994).

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