DOI 10.59277/RoAJ.2024.3.01

SOLAR CULT AND DANUBE RIVER: ALIGNMENT INVESTIGATIONS AT THE NEOLITHIC NECROPOLIS SULTANA - *VALEA ORBULUI*

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Abstract. In the Călăraşi County at Sultana, on the spot Valea Orbului, a Neolithic necropolis belonging to the Boian culture was discovered and researched by archaeologist Done Şerbănescu. At first glance, the orientation of the 248 burials from Sultana – *Valea Orbului* seems simple, but upon closer inspection, it proves to be slightly more complicated. The outline and depth of the burial pits were difficult to detect, as they were dug in loess and covered with earth of the same color. At Sultana - *Valea Orbului*, the burials were oriented in various directions, although the southeastern orientation generally prevailed, which was frequently documented for that period (*e.g.* the Dudeşti culture from Căscioarele, the Vinča culture). However, towards the end of the Boian period and during the Gumelniţa culture, a shift in the orientation of the dead towards the east can be observed. This burial place was in a valley with an outlet in the Mostiştea River. In that region, there was a river port, periodically flooded by the Danube, located about 11 km to southeast. Meanwhile, the settlement of the community that buried its dead in this cemetery was in the meadow, which is now covered by water. The valley has two slopes, one to the north and the other to the south. Likely due to the topography, the necropolis was used by two related communities. This valley was named intuitively by Done Şerbănescu as *the way to the world beyond*. This investigation shows that, at a specific time, the skeletons were placed parallel to the Mostiştea River with their heads toward the Danube. It is possible that, at a precise moment, a change in their religious beliefs might have also occurred regarding the conceptions and stages of the funerals and funeral rituals because we observed two principles related to the orientation of the deceased: in the direction of the sunrise (the light of the life) and the direction perpendicular to the Danube (the water of the life). That was in deep connection with the spiritual conceptions of the mentioned communities.

Key words: astronomy in Culture, Neolithic, Boian culture, solar cult, Danube, orientation.

1. INTRODUCTION

Since very remote times, as well as during the Neolithic period, orientation was crucial for every human being. This fact was always connected with the cosmos, namely with the celestial events, the movement of the Sun, Moon, and stars in the sky.

The reason for this situation could have its roots in the fact that people were fascinated by what they considered to have been supernatural phenomena, the changing positions, appearances or disappearances of celestial objects, as well as by important periodic events, like solstices, equinoxes, etc.

All these were very important for agriculture, cattle breeding, and the spiritual life of those communities.

During the Neolithic, after the settling of the people, the human being had time to observe the same sky, as well as to know and follow the movement of the stars, thus connecting everything in the cosmos with its own life (Aveni, 2019).

The annual movement of some bright stars or star groups (constellations) was linked to the timing of new agricultural works (agrarian year). As a result, agricultural tools (*i.e.* little plough, rake, sickle – asterism in Orion; scythe – Cepheus, etc.), household (*i.e.* The House with a Courtyard – Corona Borealis; The Hatching Hen with Her Chicks – Pleiades, etc.), shepherding (*i.e.* The Shepherd with his sheep – Lyra, The Herdsman – Bootes, etc.) names appeared in the sky. Let us mention that between the agrarian constellation, names of avian, and snake constellations also emerged, which rise and set in agreement with the agricultural year. In order to keep up with agricultural work, and to have a rich harvest, the first appearance of marker stars such as Sirius, Aldebaran, Vega, Deneb, Altair, Regulus, Antares, etc. needed to be predicted in advance. These predictions could only be made by systematically watching the sky to be able to detect the heavenly rules (Szücs-Csillik and Maxim, 2022).

Orientation on Earth begins with the main directions: North, South, East, and West. Alignment with the Sun (sunrise, sunset, noon) was also familiar. During the year, the points of sunrise and sunset shift on the horizon, describing the solar arc.

The beginning and ending of a season were connected with the solar movement (or, in some cases, with the heliacal rise of some particularly bright stars). The people had to regularly notice the equinoxes (when the days were equal with the nights) and the solstices (when a day or night was the longest in that year). That is how they could establish the solar arcs (the area described by the sunrise or sunset during the year on the horizon) (Szücs-Csillik and Comşa, 2017). Consequently, the solstices and equinoxes also give alignment positions on the horizon.

We are reminded that as seen from the Earth, the Sun, Moon, and planets all appear to move along the ecliptic, which is the Sun's apparent path among the stars

during a year. Our ancestors could use other celestial markers instead of the Sun.

Additionally, they could be utilized for orientation terrain markers such as mountain hills, river directions, megaliths, etc. For example, alignment, a monument consisting of multiple rows of large upright stones, sometimes combined with others in a different position and built during Neolithic and Eneolithic times (Thom and Thom, 1971; Heggie, 1981; Rao and Thakur, 2010; Hoskin, 2015).

Orientation served diverse purposes: finding sources of food or water; finding grazing lands for the cattle; finding new locations for establishing settlements; finding favorable hunting territories; creating routes of trade for specific raw materials or processed products; creating routes of migration when needed, etc.

The archaeologists observed that the orientations are dependent on the material culture to which they had belonged, of course, related to the spiritual domain (*i.e.* mortuary rituals).

In each material culture, no matter to which historical period it had belonged, the deceased funerals had to obey the beliefs of that community, which, as already mentioned, referred to a certain divinity, sometimes represented by a celestial body, some other times by a mountain, by a river, or by another natural element, which was very important for that specific community (Borić, 1996; Nikolova, 1994; Comşa, 1998; Maxim *et al.*, 2002; Csillik *et al.*, 2004; Morintz and Kogălniceanu, 2009; Maxim and Szücs-Csillik, 2010; Enea, 2011; Motzoi-Chicideanu, 2011; Schuster *et al.*, 2008).

In the following lines, we will present a Neolithic necropolis belonging to the Boian culture (around 4700 BC), discovered by archaeologist Done Şerbănescu and George Trohani in 1972, as a result of the surface research conducted for the development of the irrigation system in the area (Şerbănescu and Trohani, 1978; Şerbănescu, 2017; Lazăr *et al.*, 2018), namely the burial place in the Călăraşi County at Sultana, on the spot Valea Orbului (geographical latitude: $44^{\circ}16$' and geographical longitude: $26^{\circ}52$').

A number of 254 inhumation graves of the entire series of 257 have been studied, being attributed to the Boian culture, and have been discovered by (Şerbănescu, 2022). This burial place is in a valley with an outlet in the Mostiştea River (Figure 1). In that region, there was a fluvial port, periodically flooded by the Danube, which was about 11 km to the southeast; meanwhile, the settlement of the community that buried its dead in this cemetery was in the meadow, in our times covered by water (Şerbănescu and Soficaru, 2006; Şerbănescu *et al.*, 2007, 2008; Andreescu and Lazăr, 2008; Beldiman *et al.*, 2008; Andreescu *et al.*, 2009). The valley has two slopes, one to the north and the other to the south. Probably as a consequence of relief, the necropolis was used by two related communities.

Some of those graves were double, but most contained one skeleton. The individuals were placed in a crouched position, in most cases on the left side, ori-

Fig. 1 – Google Maps about Sultana - *Valea Orbului*.

ented especially towards east and southeast (Şerbănescu, 2002; Lazăr *et al.*, 2008; Kogălniceanu, 2012).

A few skeletons were arranged on their right side, with a western orientation. Of these, 81 graves had funeral inventories such as ornaments, pottery, and lithic materials. The personal adornments were made of *Ostrea sp.* (bracelets), *Spondylus sp.* (bracelets, belt elements, various beads), *Antalis sp.* (tubular beads); minerals (malachite, marble, schist – pendants and cylindrical beads) and bone (rings, ringlike elements) (Şerbănescu, 2002).

For this study, we investigated the skeleton's orientations from this Neolithic cemetery, and we found two main principles regarding the orientation of the corpses: in the direction of the Sun and the one of the Danube River.

2. THE SKELETONS' ORIENTATIONS

The Romanian prehistory is rich in various spiritual aspects, some of them being known for a longer time, some others being slightly outlined and requiring further investigations.

Once an individual departed from this life, the entire community took care that the complete funerary ritual should have been fully accomplished, otherwise existing the belief that the dead could return for revenge against the community.

The ancient mortuary rituals and customs indicate the Sun's influence on human affairs in the ceremonials which took place during the burial of the deceased.

The funerary rites of ancient people from all over the world reveal the universal

belief that the East is the source of all that men hold dear, light, life, warmth, and happiness, while the West, on the contrary, is said to be the abode of darkness and death. The worshiping of the Sun had "cultivated" and strengthened this idea, and down through the ages, the influence of this belief has swept, retaining even today much of its ancient force.

According to Olcott (1914): "It seems to be the working out of the solar analogy on the one hand in death at sunset, on the other in new life at sunrise, that has produced two contrasted rules of burial, which agree in placing the dead in the Sun's path – the line of east and west."

The investigations related to Neolithic and Eneolithic cemeteries show that bearers of the Boian culture were digging grave pits, or even buried their dead in the morning, at sunrise, by orienting them towards the Sun. Thus, the practice could be admitted as a special funerary ritual, which consisted of orienting the deceased towards the sunrise. The goal of the mortuary ritual could be a last, desperate attempt to bring the dead back to life, the solar rays providing it with energy at the time of its return.

About 250 skeletons from Sultana – *Valea Orbului* seem to have been orientated in the sunrise direction (Figure 2). The outline and depth of the burial pits were difficult to detect, being dug in loess and covered with earth of the same color.

Fig. 2 – Graves M179 and M248 oriented E and SE.

The orientation of the skeletons towards the southeast direction is frequently encountered at that time (Figure 3).

Doubtless, a close study of local customs prevailing in different parts of the world will reveal many similar examples and survivals of Sun worshiping. This topic is a fascinating one and, above everything else, it demonstrates the great importance that this practice had held for the people of the Earth.

As for example, the cases of the two tombs of the Dudeşti culture from Căscioarele (Şerbănescu and Comşa, 2012), or in several necropolises of the Vinča culture (Lichter,

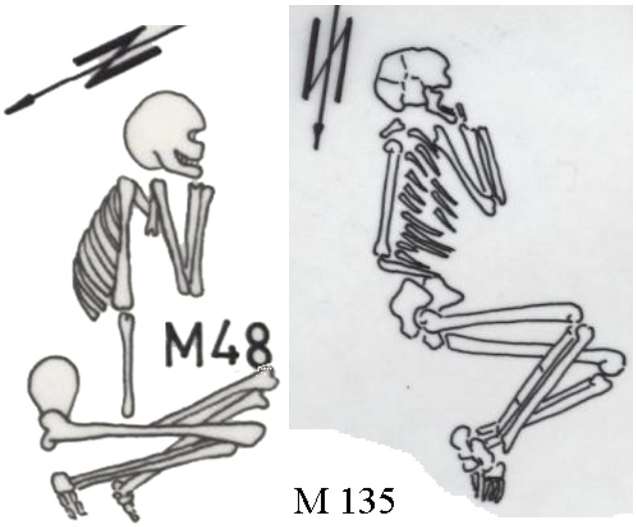

Fig. 3 – Example of skeletons (M48 and M135) facing southeast and south.

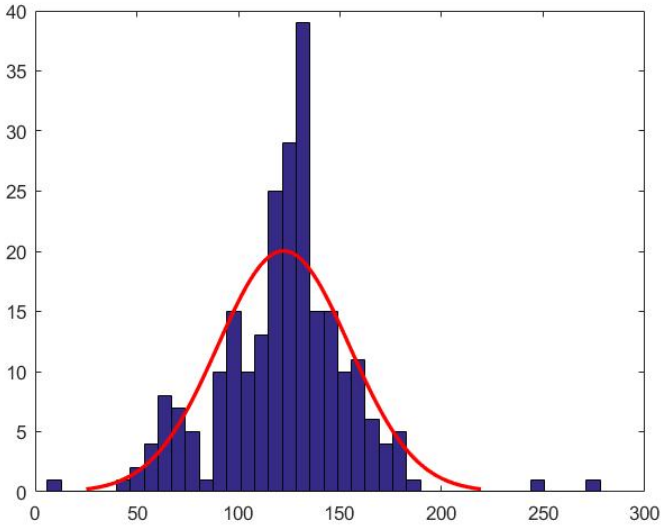

Fig. 4 – Histogram of the orientation of the skeletons from the Sultana necropolis - *Valea Orbului*. Grave number vs. Azimuth angle in degrees.

2001).

Therefore, this orientation was a habit (a common practice); it is not an anomaly in Valea Orbului. Towards the end of the Boian culture and in the Gumelniţa culture,

Table 1

Statistics of the orientation of the skeletons from Sultana-*Valea Orbului*

Orientation	Azimuth	No. of graves
NE	33°-56°	5
ENE	56°-78°	18
E	78°-101°	28
ESE	101°-123°	53
SE	123°-146°	90
SSE	146°-168°	30
S	168°-191°	10
SSW	191°-213°	1
WSW	213°-258°	1
Not specified	-	12
Total	-	248

they will strictly respect the orientation to the east, but even then there is still some deviation (Comşa and Szücs-Csillik, 2013; Ignaţ, 2018).

To investigate the relationship between the skeletons and the sunlight (Sun), we need the orientation data, *i.e.* the azimuths for each of the burials.

Generally, the orientation data of the skeletons is based on the azimuths of the head of the skeleton or the long axis of the skeleton (line of spine) or the grave. The calculation data of azimuth is measured in degrees from the north and clockwise from due north. Hence, the east is 90°, the south is 180°, and the west is 270°. The excavators systematically recorded the azimuth of each skeleton. Most of the orientation data were obtained by aligning the pubic bone to the top of the skull (line of spine). Despite that, some skeletons underwent disturbance, leading to the relocation of human remains from their original position. In such situations, orientation data were ascertained by measuring the long axis of the grave. The impact on our overall results is negligible, despite the variability in data sources. These measurements were later documented and published in the excavation report by Şerbanescu (2002).

In this research, the burial orientation data relied on compass measurements. Following the establishment of the measurement direction, alignment with the north is attained, and upon stabilization, the compass graduations traced the skeleton's orientation. There is an inherent error associated with the nominal orientation measurements of around 1°. Let us underline that azimuth measurements, referenced to magnetic north, necessitate correction for magnetic declination. Consequently, the measured azimuthal error can be approximately 5°, due to the complex uncertainties of the measurement methodology.

Moreover, the relationship between skeletons' orientation and the sun was clarified using the solar arc, which is a variation of sunrises' and sunsets' azimuths throughout the year on the horizon. The solar arc limits are defined by the winter

and summer solstices, with the northernmost point being the summer solstice and the southernmost point being the winter solstice.

We calculate the azimuth of the Sun (the angles are measured from the North to East) at the latitude of Sultana (44°16') for the summer and winter solstice for 4700 BC. Moreover, we account for the influence of the height of the horizon. However, the survey reveals that the height of the horizon varies between 0° and 0.5° (near-flat horizon near the river Danube). Consequently, we assumed in the computational analysis that the horizon is flat.

For the calculus, we used the formula:

$$\cos A = -\frac{\sin \delta}{\cos \varphi}, \tag{1}$$

where δ is the Sun's declination, φ is the geographical latitude of Sultana-*Valea Orbului*, A is the azimuth (Szücs-Csillik and Comşa, 2017). During one year δ changes between the limits of $+\epsilon$ and $-\varepsilon$, where ε is the angle enclosed by the celestial equator and the ecliptic.

Using Wittmann's theory (Wittmann, 1979) and following the next algorithm, we will obtain the limits of the solar arc. Let us calculate the angle ε:

$$\begin{aligned} \varepsilon &= \varepsilon_0 + \varepsilon_1 \sin \varepsilon_2 (T + \varepsilon_3), \\ \varepsilon_0 &= 23^\circ.496932 \pm 0^\circ.0012, \\ \varepsilon_1 &= -0^\circ.86 \pm 0^\circ.005, \\ \varepsilon_2 &= 0.01532 \pm 0.0009 \quad rad/century, \\ \varepsilon_3 &= 3.4 \pm 0.1 \quad century. \end{aligned} \tag{2}$$

Let us determine T for the epoch of 1900.0, measured in Julian Centuries. JD = 4748 Julian Days (Jan. 1, 4700 BC). $T = (JD - 2415020)/36525 \approx -66$. The substitution of $\delta = \varepsilon = 24.26$ in equation (1) gives the following results: The azimuth of sunrise for summer solstice is 54°.9828, the azimuth of sunrise for winter solstice is 125°.0172. The azimuth of sunset for winter solstice is 234°.9828, and the azimuth of sunset for summer solstice is 305°.0172.

According to the distribution of the skeletons' azimuth (Figure 4) and the data in Table 1 one can see a shift from E to SE alignment. Additionally, if we take the distribution charts of the skeletons' orientation divided into the two phases on the two slopes of the Mostiştea valley (Figures 5) one can realize in both cases the shift towards the SE direction. On the histograms with Gaussian distribution, the same phenomenon can be seen (Figures 6). As a result, the two slopes had served as burial places in the same Neolithic period.

A closer inspection regarding the orientation in this necropolis shows that it is slightly more complicated than it seemed at first glance because the orientation of the skeletons was not just related to the Sun.

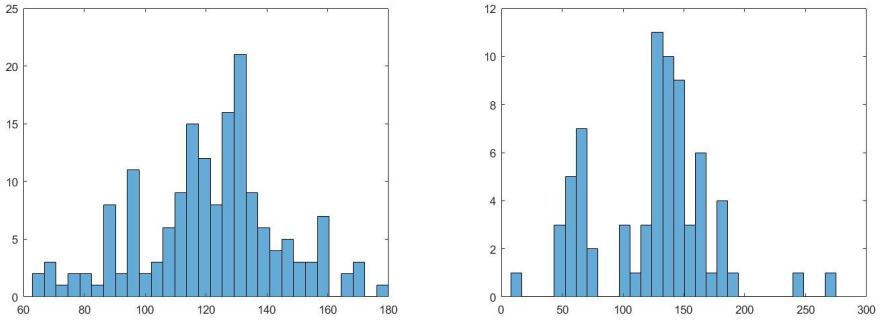

Fig. 5 – Distribution charts of the orientation of the skeletons from the Sultana - *Valea Orbului* cemetery divided into two phases. Grave number vs. Azimuth angle in degrees.

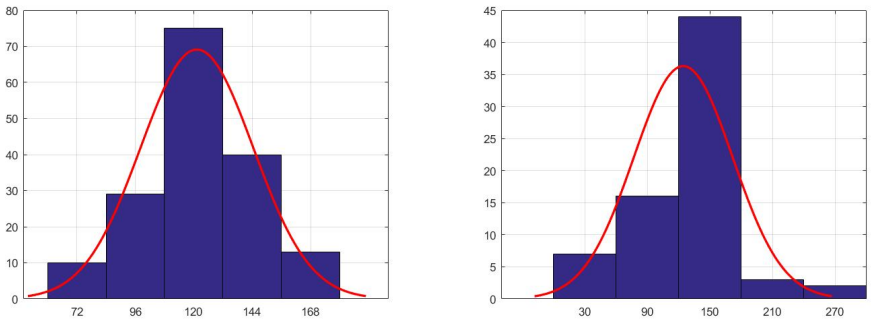

Fig. 6 – Histograms with Gaussian distribution of the orientation of the skeletons from the Sultana necropolis - *Valea Orbului* in two phases. Grave number vs. Azimuth angle in degrees.

The skeletons' orientation in the ESE direction (more than 125° in azimuth, which is near the sunrise's azimuth at the winter solstice) as we can see in Figure 4 and Figures 5, 6 indicate that some skeleton's orientation is outside the solar arc (Szücs-Csillik and Maxim, 2013).

In accordance with (Szücs-Csillik *et al.*, 2010), the positions of the skeletons in the graves were not accidental; if the body of the dead was oriented with the head in E-SE direction, and it was crunched on the left side, then the view is to S-SW directions.

We draw attention to the fact that the horizon is flat around the Sultana-*Valea Orbului* necropolis, the altitude drops to the south by 33 meters, and the Danube is about 11 kilometres away from the necropolis. This evidence in the distribution of orientation of the skeletons and the terrain marker in this direction on the horizon led us to the conclusion that the orientation of the skeletons at a given time was not

according to the Sun, but in close connection to the nearby rivers, with the Mostiştea and the Danube.

We presume that the bearers of Boian culture near the Danube at Sultana-*Valea Orbului* buried their deceased after two rules perhaps in two distinct periods: in an earlier period they buried their deceased towards the river's direction (funeral rituals preserved and continued since Mesolithic) and in a later period they buried their dead towards the Sun direction (funeral rituals established in Neolithic).

Related to the anthropological study at the Sultana - *Valea Orbului* necropolis (254 graves) the age and sex of the individuals had been established as follows: mature and adult men (92), mature and adult women (74), infants I and II (71), juveniles (14) and undetermined (3).

Let us mention that The Sultana-*Valea Orbului* necropolis represents a particular case due to the presence of bracelets made from both left and right *Spondylus valves* (Mărgărit and Dimache, 2019). As the archaeological discovery shows, those people had often buried their dead simultaneously with beads, symbolic objects, and prestige goods. Burial rituals heightened the group's memory of the deceased person. These rituals may imply a belief that a person's identity extends beyond death, or they could have thought that the deceased would have needed these objects in the after world and this was the reason why they were buried together with him.

The bracelet of the *Spondylus* valves suggests that shells, which also symbolize water, were considered valuable (Bajnóczi *et al.*, 2013). Moreover, they were precious items, because *Spondylus sp.* shells were not to be found in the Black Sea at that time because it preferred warm waters. Thus, it was brought by exchanges from long distances, especially from the Mediterranean region, to be used for making prestige goods (Séfériadès, 2010).

3. WATER, AS AN ELEMENT OF VITALITY, REGENERATION, RESURRECTION

Water is an essential element for life, which is why the ancient people attributed it sacred connotations. For the first nine months of our existence, we are immersed in the primordial matter of the mother's womb, which is fluid. We know that 70% of the human body is water, which plays a key role in many of our body's functions by bringing nutrients to cells, eliminating waste, protecting joints and organs, and maintaining body temperature, but also in cleaning, disinfection, etc.

Water is considered a sacred offering from nature because life is impossible without it. In ancient times, water was believed to have been one of the four elements (air, water, earth, and fire) from which the cosmos was made. It is a fundamental element and is at the core of all cultures and religions. For example, in Eastern cultures, water is considered to have been primordial. Furthermore, water cleanses

and purifies the body, which gives it a symbolic and even sacred status, and makes it a core element in religious ceremonies.

Almost all religions use water for ritual purposes. Spiritual water is believed to have the power and ability to transform the world, to redeem sins, and to sanctify. Water removes contamination and purifies both physically and symbolically. It is a living, spiritual substance that acts as a mediator between people and the gods.

Water is often perceived in religions as a divine entity. Rivers, rainwater, pools, lakes, and glaciers are some forms of water that can be interpreted in culture and religion. In most religions, holy water means purification, renewal, regeneration, liberation, fertility and abundance. Different religious beliefs have used water as interpretations and applications that are quite similar in terms of the duality of life and death, thus, water represented the border between the world of the living and that of the dead.

As we know, there are different funerary rituals practised around the world, and they often vary depending on the culture, religion, or tradition of the person who had died. For instance, in recent times, the practice of a priest sprinkling water on a coffin during a Catholic funeral is known as the rite of *Commendation of the Dying*. This ritual is a way of offering blessings and prayers for the deceased. The holy water, blessed by a priest with special spiritual significance, would be used to be sprinkled on the coffin.

The priest and the family members ask for God's mercy and protection for the deceased and give comfort to the living. Additionally, the rite of Commendation of the dying is also seen as a symbol of purification and cleansing of the soul, the cyclical nature of life and death. It is believed that the water sprinkled on the coffin symbolically washes away the person's sins, as well as any other imperfections of their life.

Ancient funerary customs had the same meanings. Paying respect for human life and its fate after death has already manifested beginning since the Paleolithic period, as well as within groups of burials, known from the Mesolithic period (Lichter, 2003; Bonsall, 2008).

Later on, burial practices reflected the beliefs of the Neolithic society concerning death, which was not considered just a simple form of sleep. Burial offerings of vases and other objects in ancient graves suggest a belief in life after death.

Regarding the ritual use of water, we can highlight some of its significant meanings: purification, which is the most common use of water in rituals, both in settlements and cemeteries; source of life; apotropaic or protective role (usually, in combination with other substances); psycho-pompous role (escort for the newly departed souls from Earth to the afterlife); protector of the beings, including humans. (Comşa, 2011).

It is worth mentioning that the Dacians and Romans believed that springs, and

still or running waters in general, had a patron deity who had to be invoked when using the water or prayers had to be offered to thank for the help provided by that god in the everyday life of that community, or just on special occasions (Comşa, 2011).

4. SUMMARY AND CONCLUSIONS

The Neolithic in Romania is a fascinating and provocative historical period, which has more information to provide for the following studies, no matter if they are archaeological, or archaeoastronomical ones. The diversity of beliefs and spiritual conceptions of the mentioned Neolithic communities was reflected in the symbolism, which accompanied their everyday life.

Their beliefs were also reflected in their funerary customs, in the position of the dead, in the grave goods which accompanied them, but also in their orientation.

Besides, ethnographically, any water (river, lake, etc.) has served as a barrier between the two worlds, the same as is the path of the Sun during the day in the sky and at night in the world beyond. The Sun and the water are symbols of messengers and transition.

At Sultana - *Valea Orbului* there was a community that had preserved and continued a funerary ritual from the Mesolithic, with the orientation of the deceased towards the Danube and Mostiştea rivers. Their main concern was agriculture and fishing, which was related to the nearest river. Afterwards, another ideology of the Neolithic had been applied: the funerary ritual involving the solar cult. These two funerary rituals may have merged, with the practices evolving over time.

Archaeoastronomical investigation at Sultana - *Valea Orbului* brings further arguments regarding the beliefs and manner of thinking of the Neolithic people, such a topic being vital and worthy to be studied further.

Acknowledgements. We want to extend our sincere gratitude to archaeologist Done Şerbănescu for his support and collaboration. We acknowledge the editorial team's and reviewers' contributions, which strengthened the clarity and consistency of this research paper.

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