

Archaeoastronomy. On “Observational Technologies” in Ancient Armenia

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Abstract

The paper provides some general information on the recent studies of the “Zorats Qarer” megalithic monument, in particular, some “observational instruments” and the possible observational methodology. Several types of “observational tools” are described, namely “observational platforms” that have their own “guiding stones”, stones with holes and the so-called “angular stones”. Observational “stone tools” of the “mixed type” (multifunctional) were also found in the monument. Recent studies have also shown that the observations were made in 3 main positions: standing, sitting (“on the seating platform”) and kneeling. With the help of the mentioned instruments, apart from the sunrise and sunset of the solstices and equinoxes, the heliacal rising and setting of bright stars, as well as their acronycal rising and cosmical setting were observed in the monument as well. In addition to the mentioned phenomena, apparent appearance and disappearance of stars at the points above the horizon were observed. The observers were also interested in the transitions of the stars in their upper and lower (for circumpolar stars) culmination points. The mentioned “technologies” were mainly used between the 9th and 3rd millennia BC.

Keywords: *Zorats Qarer: Archaeoastronomy: Ancient Observatories: Megalithic Monuments: Observational Technologies: Armenian Calendar History: Protohaykian Calendar: Cultural Astronomy:*

1. Introduction

It is known that in ancient times, people observed the movements of celestial bodies for calendar and religious purposes. However, the methodology details of such observations are still being studied. As it is known, a complete study of all the stones of the Zorats Qarer megalithic monument has not been conducted yet. Until recently, only the stones with holes were described as observational instruments. A complex instrument consisting of several stones was also discussed (Herouni (2006), pp. 64-67). The latter is the complex of stones numbered 60, 62 and 63. The usage of this instrument is explained as follows. It is assumed that the axis of the hole made in the upper part of No. 60 or/and 62 stone is directed to the high¹ top of No. 63. These two directions extend approximately to the South, to the points significantly higher the horizon. In these directions it is possible to observe the upper culminations of some celestial bodies (Herouni (2006), pp. 64-67). Recent studies, however, are revealing new types of observational instruments². These results (Broutian & Malkhasyan, 2021, Malkhasyan, 2021b, 2022) are based solely on the 2020 measurement results with laser accuracy obtained by our expedition. Note that this report includes the complete data only on those observational instruments the study results of which have been published or are in press. In addition to the mentioned, other similar stone observational tools have been discovered, the study of which is currently in progress and promises to be no less interesting. We'll tackle some instruments briefly in this paper, leaving the details for later publications when the full results are obtained. This work also

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¹The stone No. 63 has two peaks, the northern one being higher.

²It should be emphasized that the results obtained by us do not completely contradict to Herouni's hypothesis. However, the described directions are currently being adjusted by our measurements, after which we will also address this complex separately.

describes the possible application methods of some “observational instruments” revealed as a result of the recent thorough studies of the Zorats Qarer megalithic monument (Broutian & Malkhasyan, 2021, Malkhasyan, 2021a,b, 2022), as well as the celestial phenomena that were observed with the help of the mentioned instruments. Let us now see what observational instruments have been revealed and analyzed since 2020 and what their applications were.

2. Observational Platforms



Figure 1. Observational Platform 1.

Observational platforms are areas with some marks on the ground, intended for observations in standing or sitting positions. When viewing from the observational platform in the direction of the top of the related stone (or a protrusion, concave, etc.), the points at which the rising or setting of the celestial bodies take place are marked on the horizon. In another case, the transition of the celestial body through any point of the firmament is marked in the significantly higher positions above the horizon. The menhirs (standing stones) associated with the observational platforms are referred to as marking or guiding stones. However, in reference to the Zorats Qarer monument, it is more correct to call them guiding stones. They are the stones located in front of the observer who's on the platform, and the top of which coincides with any point of the line of the true horizon in the eye of the observer. So far, 5 similar platforms have been found in the monument, 4 of which are intended for a standing and 1 for a sitting observer. We named the latter Seating Platform No. 14³. Of the remaining 4, which are numbered in the order of their discovery, only 2 have been studied so far: Platforms 1 and 2. The detailed analysis of the rest is in progress. Let us now describe the observational platforms in order.

2.1. Platform 1.

About 8 meters to the south of the central cromlech of the monument and about 7 meters to the west of the southern wing of the general row of stones, there's a fairly flat-surfaced slab with an apparent area of about 1 square meter, placed deep in a horizontal position into the ground (Figure 1). As of today, the surface of the mentioned stone is about 10-20 centimeters above the ground and it has a certain concavity on the surface near its geometrical center which is devoid of lichens. Standing in the concave, a man with an average height can observe an interesting view in the east (with the eye level of 160 cm above the platform surface). The tops of the 4 guiding stones (No. 60, 62, 64 and 66) are aligned with the visible horizon (Figure 2). Moreover, 3 of them (No. 60, 62 and 66) coincide with certain peaks visible on the horizon, and the cut of the upper part of No. 64 stone coincides with the concave of the contour of the mountain range seen on the horizon. By moving his head only 5 centimeters, the observer can see the tops of the stones touching the horizon, thus creating 4 distinct directions (P1-60, P1-62, P1-64 and P1-66), each passing through 3 points: the observation point of the observer standing on the platform, the top of the guiding stone, and the corresponding point on

³Since this stone is part of a series of already numbered stones, we have left its No.14 unchanged.

the horizon (Figure 3). It is clear that one of the most likely reasons for the use of the guiding stone was the adjustment of the observation point.

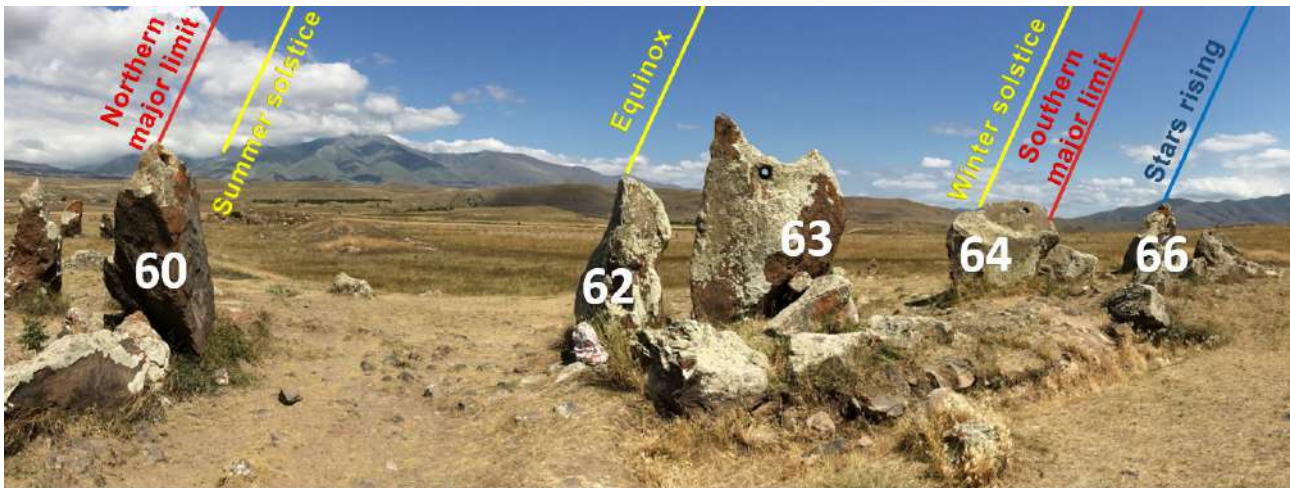


Figure 2. Eastern view from the Platform 1. Panorama.

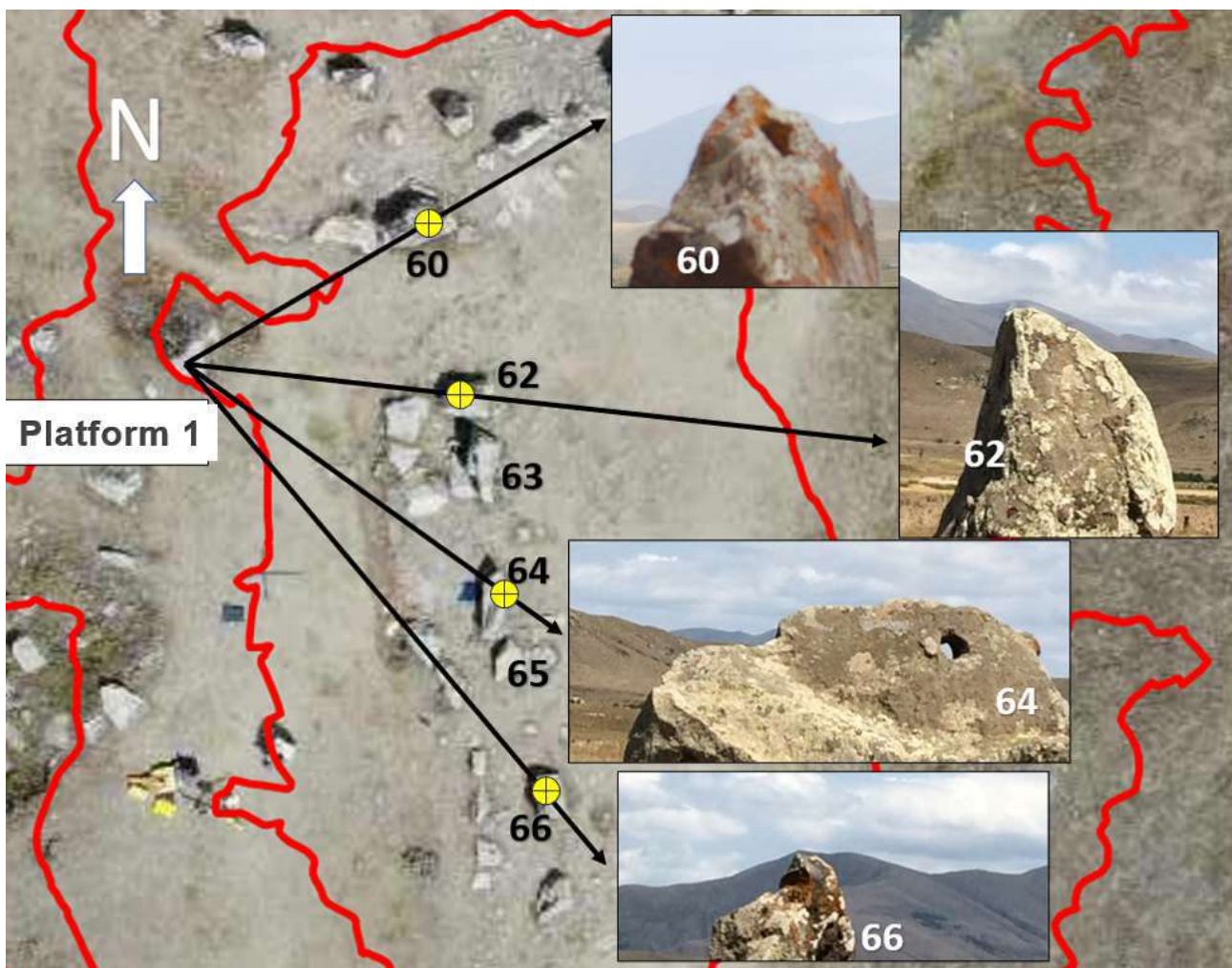


Figure 3. The simplified scheme of the 4 directions from the observation point on the Platform 1. Azimuths and Elevations of the directions are given in Table 1. The scheme is made according to the author of this article.

The study of these directions (Broutian & Malkhasyan, 2021)⁴ revealed that the two of them are directed to the points of the equinox and the sunrise of winter solstice, the days of astronomical importance. The visible celestial bodies in all directions are given in Table 1.

2.2. Platform 2.

In the “northern wing” (Herouni (2006), pp. 21-22)⁵ of the “Zorats Qarer” monument, we discovered another observational platform similar to Platform 1, naming it Platform 2 (Figure 4a). It is located about 16 meters to the south of No. 160 stone of the northern wing of the monument. It looks like a slab with an area of about 2.2 square meters, almost in the center of which there is a cone-shaped artificial⁶ concave with a diameter of 25 centimeters and a depth of 15 centimeters.



Figure 4. Observational Platform 2. a) The arrow shows the cone-shaped artificial concave in the center of the platform. b) View to the North. The brightest stars of the constellations Ursa Major and Bootes being seen in the directions. Reconstructed in Stellarium v0.20.4 (<http://www.stellarium.org>)

When standing in the center of this concave, a man with an average height can observe in the north the tops of 2 guiding stones (No. 158 and 160) touching the horizon (Figure 4b), as in the case of Platform 1. At the same time, the top of No. 160 stone is combined with the mountain peak that is quite clearly highlighted on the horizon (Malkhasyan, 2021b). In Figure 3, the touch of the tops of the two stones with the horizon is clearly visible. One of them, No. 160, touches the mountain top, and the other, No. 158, touches the point of the eastern slope of the same mountain where the incline changes. Unlike Platform 1, Platform 2 has some peculiarities. The first and most important difference is that the guiding stones associated with Platform 2 (No. 158 and 160) point in directions very close to the northern horizon (Figures 4 and 5). As it is known, in such directions only circumpolar stars (stars that do not set) can be observed, or in other words, stars that “touch” the horizon in their lowest position. It follows that the observation of a star at some point in the northern horizon for calendar purposes can make sense only if the apparent appearance or disappearance of the given star in the specified position has been observed. Such phenomena can occur only once a year. The other difference is that the guiding stones of Platform 1 have holes in their tops, while in the case of Platform 2, No. 158 stone doesn’t have a hole unlike No. 160. However, the two observation angles on the same No. 158 (Malkhasyan, 2021b) are especially noteworthy, which we will refer to further in the paper. Table 1 shows the stars that were observed at different times from Platform 2 in the direction of the tops of No. 158 and 160 stones (P2-158 and P2-160) (Malkhasyan, 2021b).

⁴The cited article details all the numerical data and the methods used to identify the possible time of the observable celestial bodies.

⁵The stone row which P. Herouni called “North Wing” arranged to the north from the central cromlech.

⁶The fact that the concave is artificial is evidenced by its smooth edges and the conical depth.

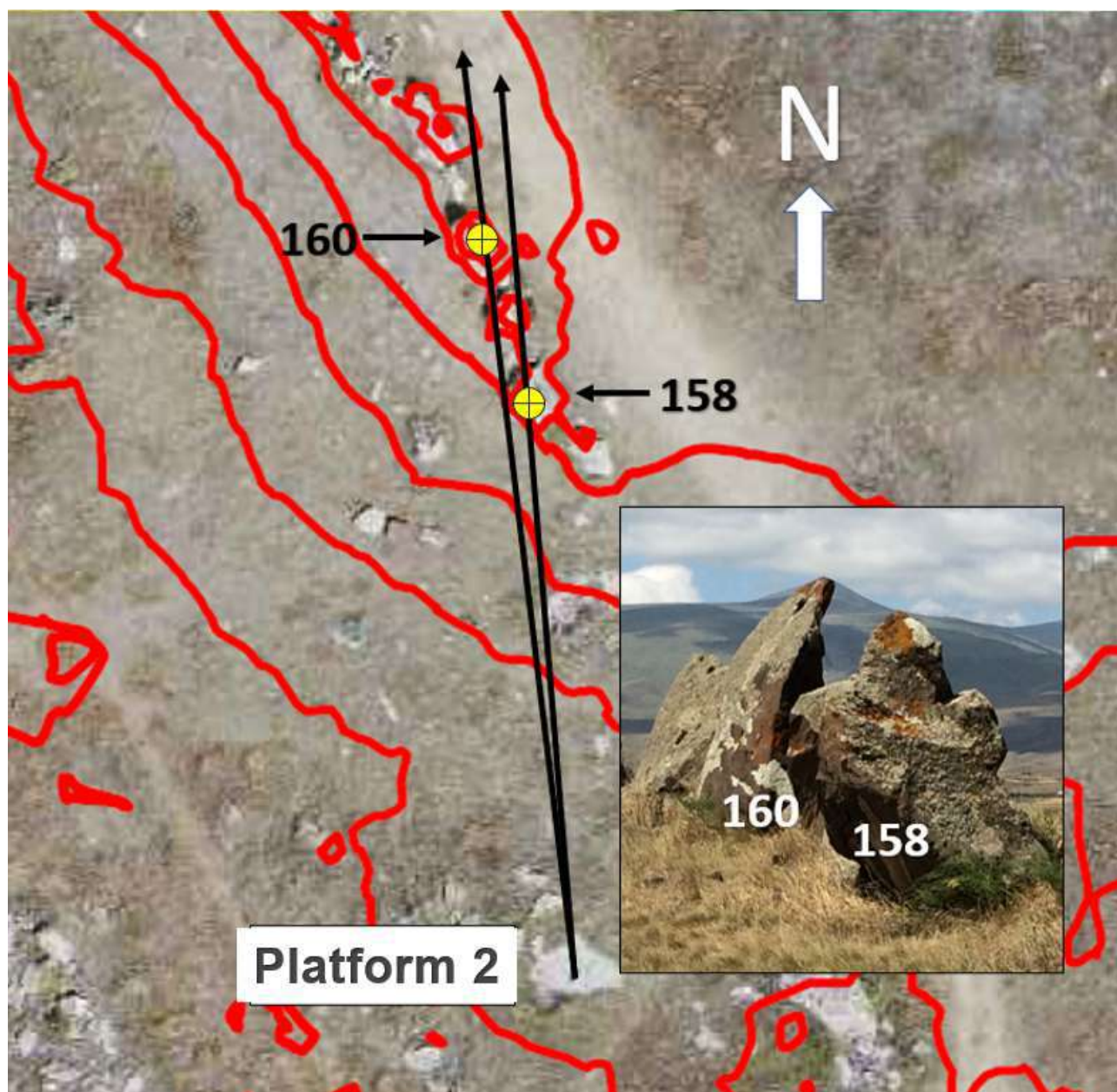


Figure 5. The simplified scheme of the directions and guiding stones No. 158 and 160. The scheme is made according to the author of this article.

2.3. Platform 3.

As it was mentioned above, only the 2 of the observational platforms found in the Monument have been studied (Platforms 1 and 2). Although a full analysis of the other two Platforms (Platforms 3 and 4) and the directions formed with their help has not been done yet, we will also give their brief description and list the associated guiding stones.

Further in the paper, we will refer to No. 29a slab⁷ as Platform 3. It is somewhat different from Platforms 1 and 2. If the latter two have a more horizontal position, then Platform 3 is placed with a certain slope. However, the western part of the slab, which is positioned higher, is somewhat flattened. This is important for the reason that it is rather uncomfortable to stand in the section, and at the high point it resembles a pedestal-platform (Figure 6). Standing on this high point and looking to the

⁷In the numbering of P. Herouni, this slab is marked as number 29a and is considered one of the fallen and displaced stones of the central cromlech (Herouni, 2006).

East, the tops of 4 stones (No. 7, 19, 27 and 201) touch⁸ the horizon (Figure 7. The first three stones are part of the central rhombusly “cromlech” and are placed in the ground vertically (Figure 8). It is interesting that each of them (No. 7, 19 and 27) is different from the others and from the rest of the stones in the monument. **It is also worth noting that No. 7, 19, and 27 guiding stones are the eastern, southern, and western peaks of the diagonal of the cromlech, respectively.**

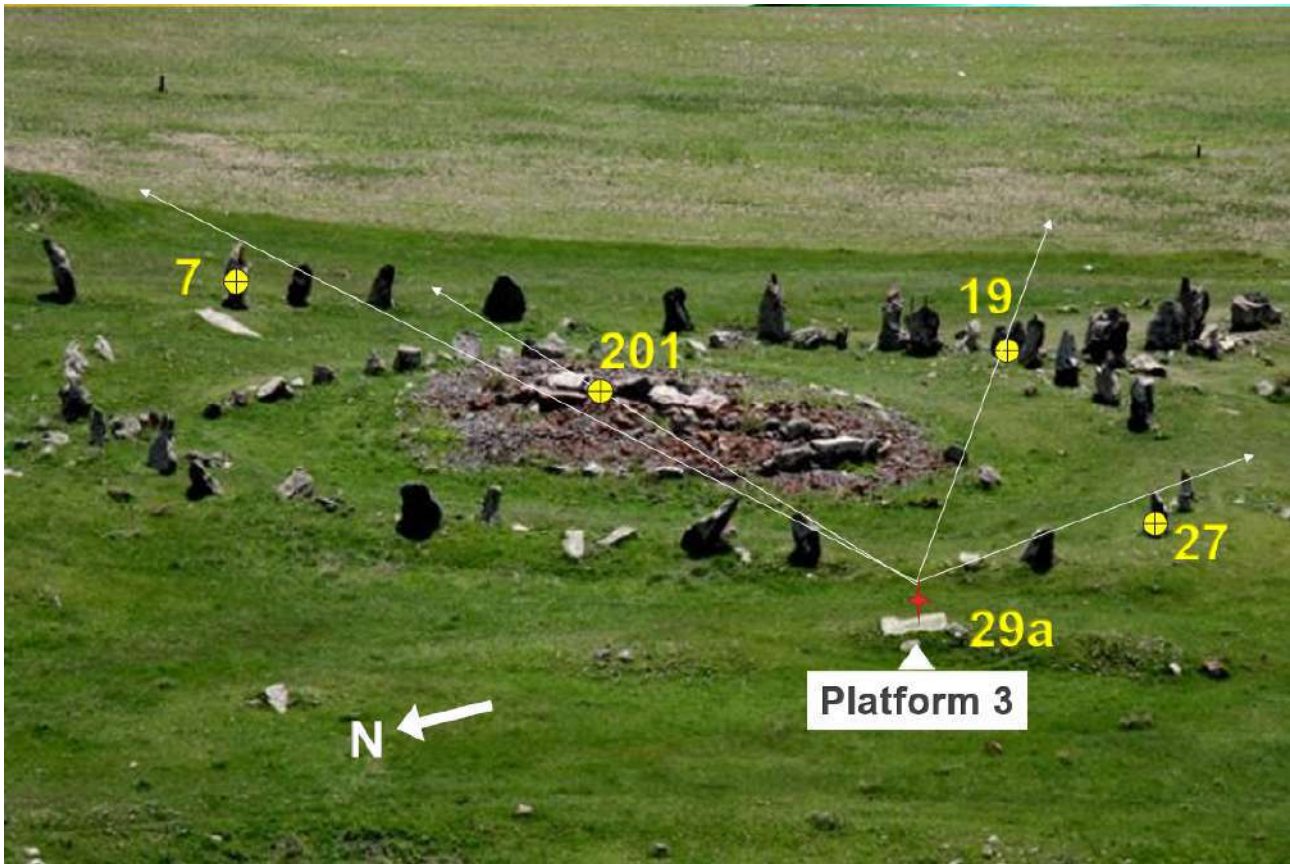


Figure 6. Observational Platform 3 and the locations of guiding stones No. 7, 19, 27 and 201. The scheme is made according to the author of this article.



Figure 7. View from the Platform 3, Panorama. the arrows show the guiding stones.

⁸The content of the stone No. 19 is slightly different. It has a hand-made cut and touches the horizon with the lower horizontal side of its cut.

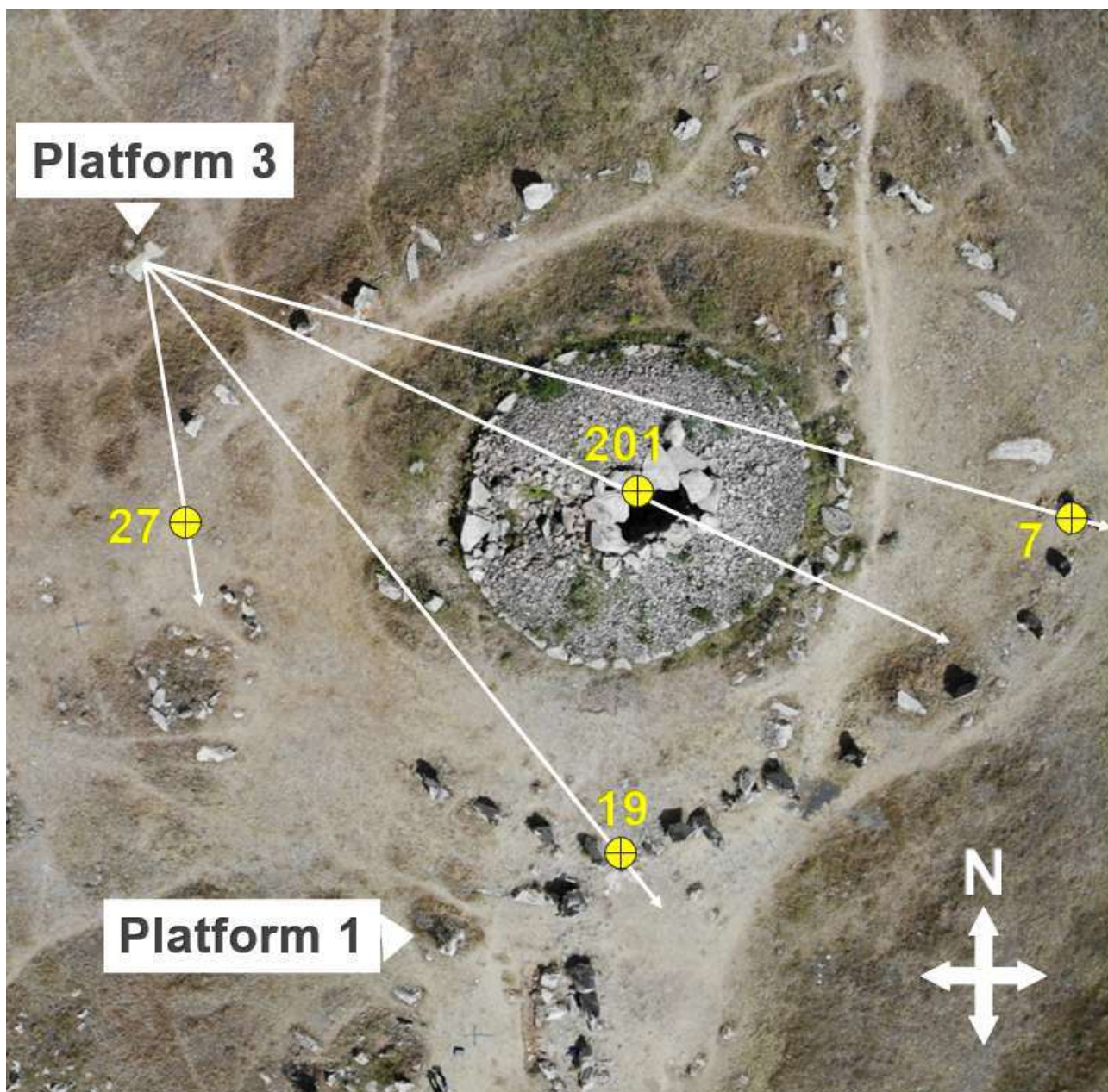


Figure 8. The locations of the Observational Platforms 1 and 2. The arrows show the directions and the yellow points marked the guiding stones. The drawing is made according to the author of this article.

As for issue No. 201, the problem here is a little different. First, this is located on the central structure (in the center of the cromlech), forming part of the roof slabs. In other words, as such, it is not part of the stone rows and it is difficult to consider its position as preliminary in any way. On the other hand, stone No. 201 also stands out from the stone rows. The peculiarity is that this stone has 3 holes in its upper part, of which only one is complete. The other two are broken, but it is obvious that they were holes before. At the same time, during the excavations in the central structure, the initial positions of the roof slabs were most likely violated. This is evidenced by some photos from the excavation process. However, on-site inspection suggests that the position of the stone No. 201 has remained unchanged in the roof structure. The question on which point of the Platform the observer was standing should be secondary, since the azimuths deviations of these parameters are quite small and such problems can be ignored. Another feature of Platform 3 is that only one of the guiding stones connected to it (No. 27) has a correspondence with its top and horizon outline, the others have some

explainable features that will not be covered here. What celestial bodies have been observed and in which millennia will become clear only as a result of a systematic examination of these directions.

2.4. Platform 4.

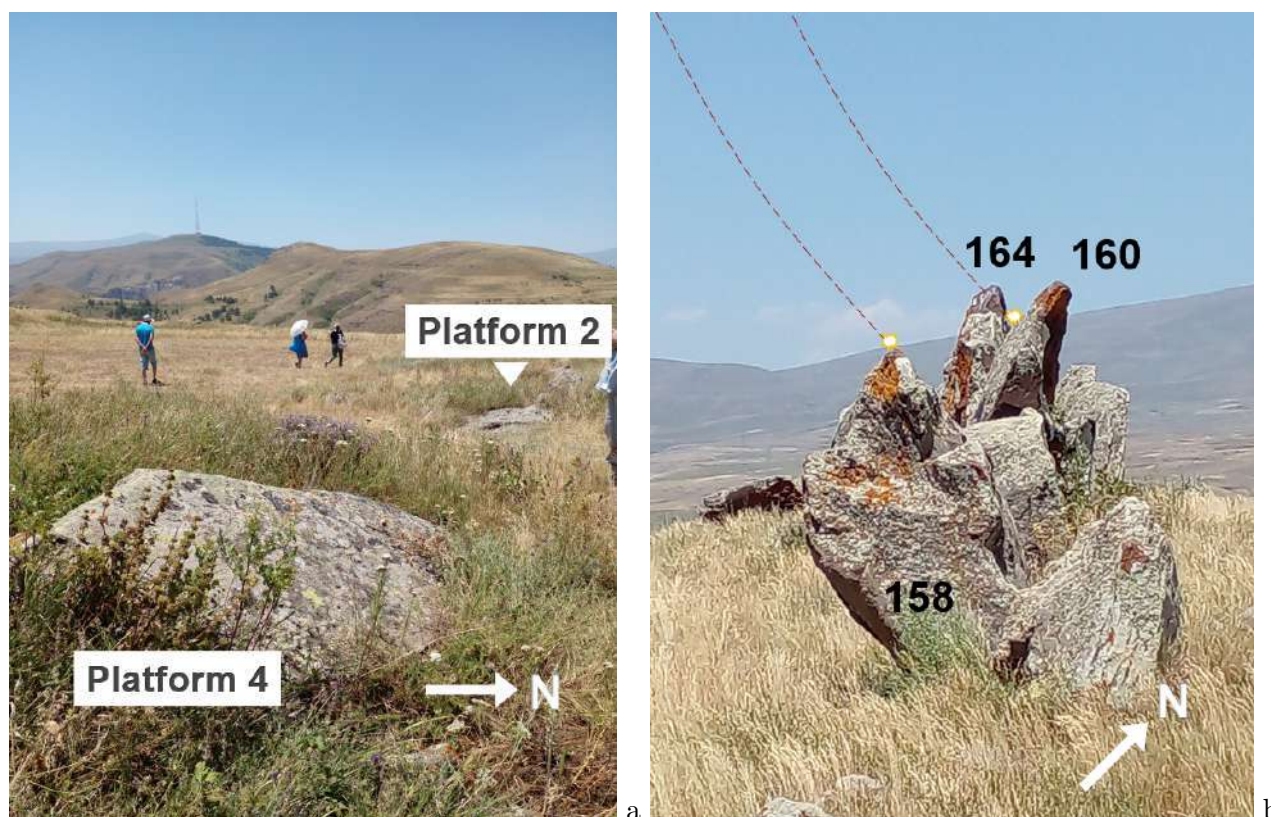


Figure 9. Observational Platform 4 and 2. a) The surface of the Platform 4 is directed to the north. b) View from the Platform 4 and guiding stones No. 158, 160 and 165.

Due to certain peculiarities, Platform 4 was discovered later, in the summer of 2021 during the reexamination of the monument. The point is that from Platform 4 the line of the horizon in the observer's field of view is quite flat, i.e., there are no obvious peaks and concaves. It was this feature that is largely reflected in the arrangement of the guiding stones associated with Platform 4, as the observer needed two guiding stones instead of one to adjust the observation point in one direction. Therefore, the following image was obtained. Platform 4 is located to the east of Platform 2, in the part of the monument where the range of stones interrupts.

It has a surface of about 2m^2 and is placed on a slight slope, the surface of which is directed to the north (Figure 9a). Standing in its center and looking to the north, we will see the following picture. Between the Platform and the horizon 4 guiding stones are standing in 2 directions (Figure 9b). In other words, two directions are formed with the 4 guiding stones. To identify the guiding stones, we have named them proximal (closer to the viewer) and distal (closer to the horizon). No. 158 and 160 guiding stones are proximal, and No. 164 and 165 are distal (Figure 11), respectively. It should be emphasized that the stones No. 158 and 160, as mentioned above, are guiding stones for the Platform 2 as well (Figure 10). There is another feature in the case of guiding stones No. 160 and 165. The point is that if in the observer's field of the view from the platform the tops of the stones No. 158 and 165 align with each other and the horizon, then in the case of the stones No. 160 and 168 the alignment is not with the tops. In the field of view, the narrow upper parts of these stones cross each other and create a V-shaped marking on the horizon, that is, the low vertex of the V is aligned with the horizon outline (Figure 9b). It should also be noted that the 2 directions formed with the help of Platform 4 are show the points on the horizon which are very close to the North (to the north-west), where only setting of the stars can be observed (Figure 9b). Ecliptic celestial bodies never appear at

these points. The analysis of the mentioned directions is also not done yet, as in the case of Platform 3.

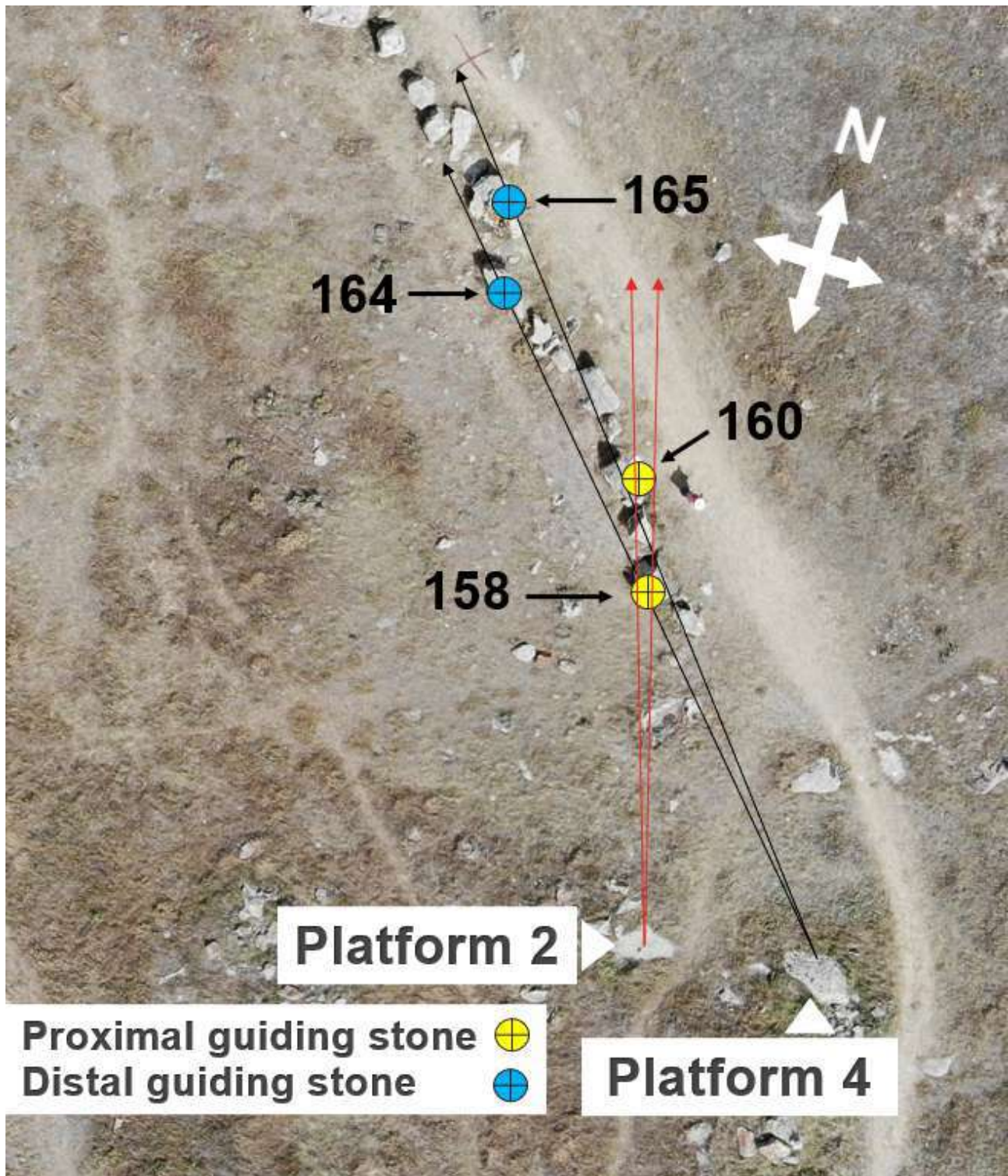


Figure 10. Observational Platforms No. 2 and 4. The red arrows show the directions formed with the help of guiding stones No. 158 and 160. The black arrows show the directions formed with help of proximal and distal Guiding stones. The drawing is made according to the author of this article.



Figure 11. Distal guiding stones No. 164 and 165. View from the west.

2.5. Seating Platform 14.

Although No. 14 seating platform is a part of the central cromlech, it is distinguished both by its form and position. It has the appearance of an irregular parallelepiped, and its upper horizontal face somewhat resembles a flat surface. During the detailed inspection of the visible part of the stone, no cut, angle or hole was found. Only the upper surface being flat is noticeable. It should be noted that the direction of the angle of the upper part of the stone No. 13, while continuing in the opposite direction, quite precisely coincides with the eye of the observer sitting on the edge of the stone No. 14 (Figure 14) (Malkhasyan, 2022). It should also be noted that in this direction also, as in the case of Platform 2, it is possible to observe only transitions of the stars, that is, ecliptic celestial bodies never appear in this direction. The observable stars in this direction (SP14-13) are given in Table 1.

3. Angular Stones.

In addition to the described observational platforms, other types of observational instruments were found in the monument, which we referred to as “angular stones” (Broutian & Malkhasyan, 2021). Only 6 of these stones have been studied so far: No. 7, 12, 13, 158, 197 and 198 (Figure 12).

The 4 of them have cut angles (7, 13, 197 and 198) and the other two have binary angles (12 and 158) (Broutian & Malkhasyan (2021), Malkhasyan (2021a,b, 2022)). In the mentioned publications,

Direction	Azimuth	Elevation	Star	Date	Phenomenon
P1-60	236° 54'	6° 40'	α Aurigae	VE (2341 BC)	HR
			Moon	<i>Northern major limit</i>	R
P1-62	276° 19'	4° 13'	Sun	VE	R
P1-64	304° 47'	1° 57'	Sun	WS	R
P1-66	321° 02'	2° 27'	γ Crucis*	AE+7 (2341 BC)	HR
			α Canis Majoris	SS-8 (5800 BC)	HR
			λ Velorum	SS+42 (5800 BC)	HR
P2-158	175° 01'	5° 59'	α Boötis	SS-5 (9000 BC)	AA
			β Ursae Minoris	VE+12 (9000 BC)	AA
P2-160	172° 30'	6° 45'	α Draconis	VE-38 (2341 BC)	AA
			η Ursae Majoris	VE+45 (9000 BC)	AA
SP14-13	232° 51'	44° 22'	α Ursae Minoris	SS+36 (5800 BC)	AA
			β Ursae Majoris	SS-34 (5800 BC)	AD
			α Cygni (Deneb)	SS-44 (9000 BC)	AA
A-197	110° 52'	21° 55'	α Aurigae	VE (2341 BC)	AA
			β Cassiopeiae*	WS-7 (9000 BC)	AA
			α Virginis**	SS-48 (9000 BC)	HS
A-198	262° 50'	19° 34'	β Persei	VE+10 (2341 BC)	AD
			β Pegasi	AE+45 (9000 BC)	AD
			α Virginis	SS (9000 BC)	AD
WA-158	101° 55'	24° 01'	α Leonis	WS-5 (2341 BC)	AD
			γ Leonis	AE+24 (5800 BC)	AD
			δ Cassiopeiae	SS+32 (5800 BC)	AD
			α Cassiopeiae	SS+27 (5800 BC)	AD
			α Cassiopeiae	SS+1 (9000 BC)	AD
			γ Cassiopeiae	SS+4 (9000 BC)	AD
EA-158	194° 56'	12° 26'	β Draconis	AE+8 (2341 BC)	AD
			α Boötis	SS-23 (5800 BC)	AD
			ε Boötis	VE-34 (9000 BC)	AD
			α Ophiuchi	SS+4 (9000 BC)	AD
			δ Cygni	AE-13 (9000 BC)	AD
SA-12	67° 30'	12° 48'	γ Orionis	VE-4 (2341 BC)	AA
			α Scorpii	AE-38 (2341 BC)	AA
			θ Scorpii	SS+8 (5800 BC)	AA
			β Geminorum	SS+48 (9000 BC)	AD
NA-12	71° 44'	11° 45'	α Hydrae	VE+15 (5800 BC)	AA
			β Tauri (γ Aur)	AE-30 (5800 BC)	AD
			α Lupi	SS-47 (9000 BC)	AA
			α Geminorum	SS+47 (9000 BC)	AD
A-7	230° 06'	62° 58'	β Ursae Majoris	SS-1 (5800 BC)	AD
			γ Cygni (Sadr)	SS-27 (9000 BC)	AA

Table 1. The observable celestial bodies. 1st column - P-platform, SP-sitting platform, A-angle, WA-western angle (large), EA-eastern angle (small), NA-northern angle, SA-southern angle. 4th column - *-less reliable, **-alleged. 5th column - VE-vernal equinox, SS-summer solstice, AE-autumn equinox, WS-winter solstice. 6th column - R-rising, HR-heliacal rising, HS-heliacal setting, AA-apparent appearance, AD-apparent disappearance. All the azimuths, presented in the table, are calculated from the South point, as it is accepted in astronomy.

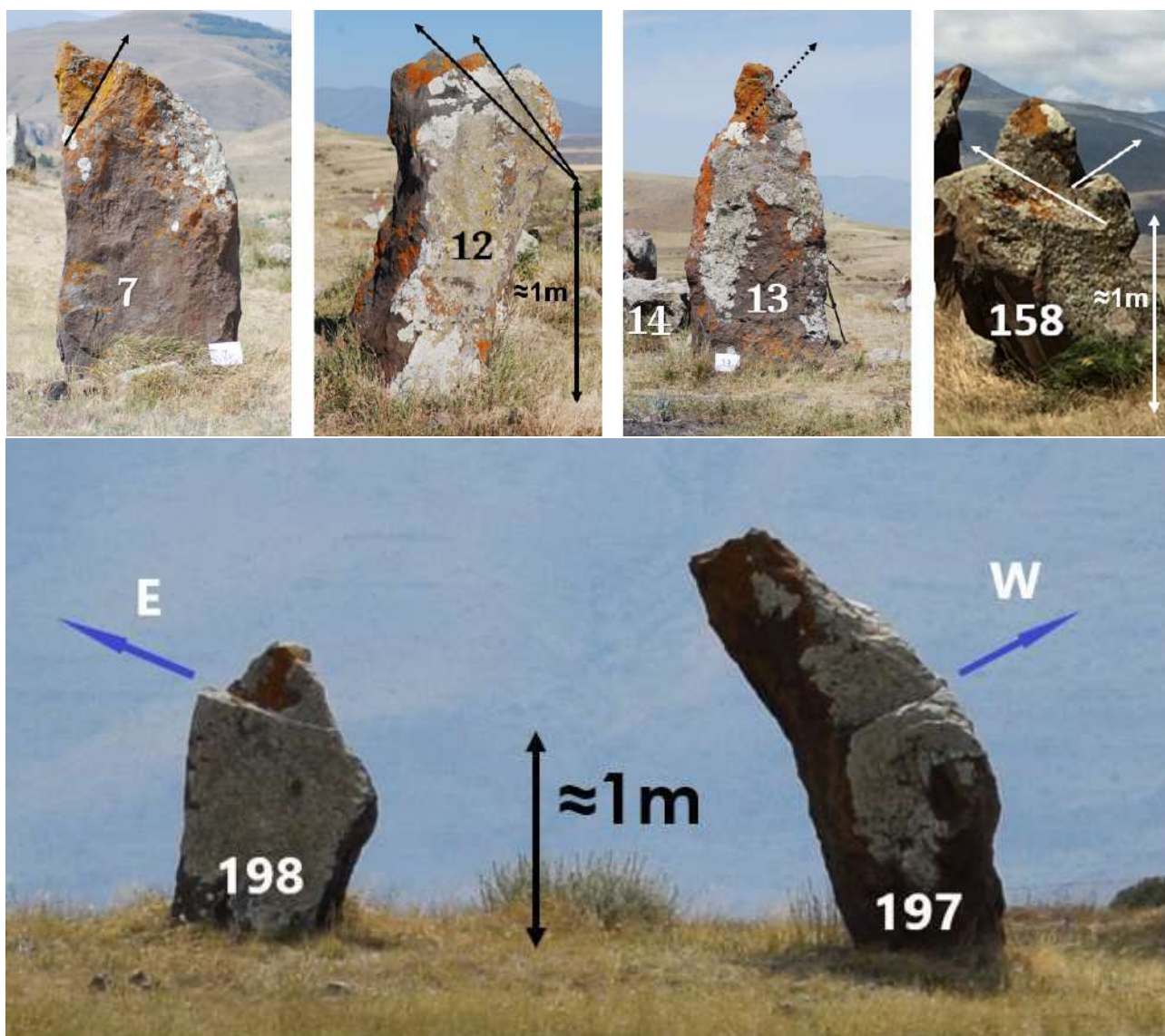


Figure 12. The photos of angular stones No. 7, 12, 13, 158, 197 and 198. The arrows show the directions of the angles.

their full descriptions and the observation principles are presented, so we will not detail them here. We would like only to note that the directions formed with the help of angular stones mark significantly high points above the horizon. The observer's position while using these stones can be considered the other peculiarity, as it was most likely the kneeling one. In the case of stone 12, the reality of the observer's kneeling position is substantiated in detail (Malkhasyan, 2022). In the case of the angular stone No. 13, as mentioned above, the observations were probably made in position sitting on the Platform 14. In the case of the remaining stones No. 158, 197 and 198, the angles on the stones are made at such a height that the position of the observer's eye should be about 1 m above the ground (Figure 12). This circumstance surely implies that the most convenient position for the observer, which will allow him to adjust the height of his eyes to the specified height, will be the kneeling position. In addition, this is one of the most stable and comfortable positions used in modern shooting.

Thus, the angular stones No. 7, 197 and 198 found in the monument can be used as separate instruments. 158 with its two angles can also be considered as a separately used instrument. In addition, the angular stone No. 158 is connected to Platform 2 and Platform 4 as a guiding stone, and the angle of the stone No. 13 is actually a guide for the observer sitting on the Seating Platform 14. The picture is different in the case of stone No. 12, here the angle of the stone No. 13 serves as a guide. As mentioned, the angular stones were intended to observe the apparent appearance and

disappearance of bright stars high in the sky (Broutian & Malkhasyan (2021), Malkhasyan (2021a,b, 2022)). The celestial bodies observable with the help of all mentioned angular stones (in the directions A-7, NA-12, SA-12, EA-158, WA-158, A-197 and A-198) are given in the Table 1.

4. Regarding the shape of the tops and location of the stones.

As it turned out, the listed observational instruments, especially the guiding and angular stones, apart from being mere observational tools had other functions as well. In particular, the shapes of the upper parts of some stones repeat the lines of the given part of the horizon. In case of others, we are dealing with figures formed and specially cut as a result of religious ideas. Let us give only one of such examples here. The fact (Malkhasyan, 2022) that the pair of bright stars of the Gemini constellation were visible at the same time from the pair of angles of the upper part of the stone No. 12 (Figure 13). Such coincidences are numerous and impressive in the monument. In addition, the previously revealed connection to the arrangement of the stars of the Angh-Vulture-Swan constellation in the main plan structure of the monument (Malkhasyan (2020), Vahradyan & Vahradyan (2010)) is confirmed again. The basis for this is the probable observations of the brightest stars of this constellation (Table 1). In terms of calendar, undeniable connections are revealed between the structural-functional description of the monument and the Early Bronze Age Armenian Calendar (Malkhasyan, 2022). **The described observational instruments and the developed observational methodology allow us to confidently call this megalithic monument an observatory built for calendar and ritual-worship reasons.**

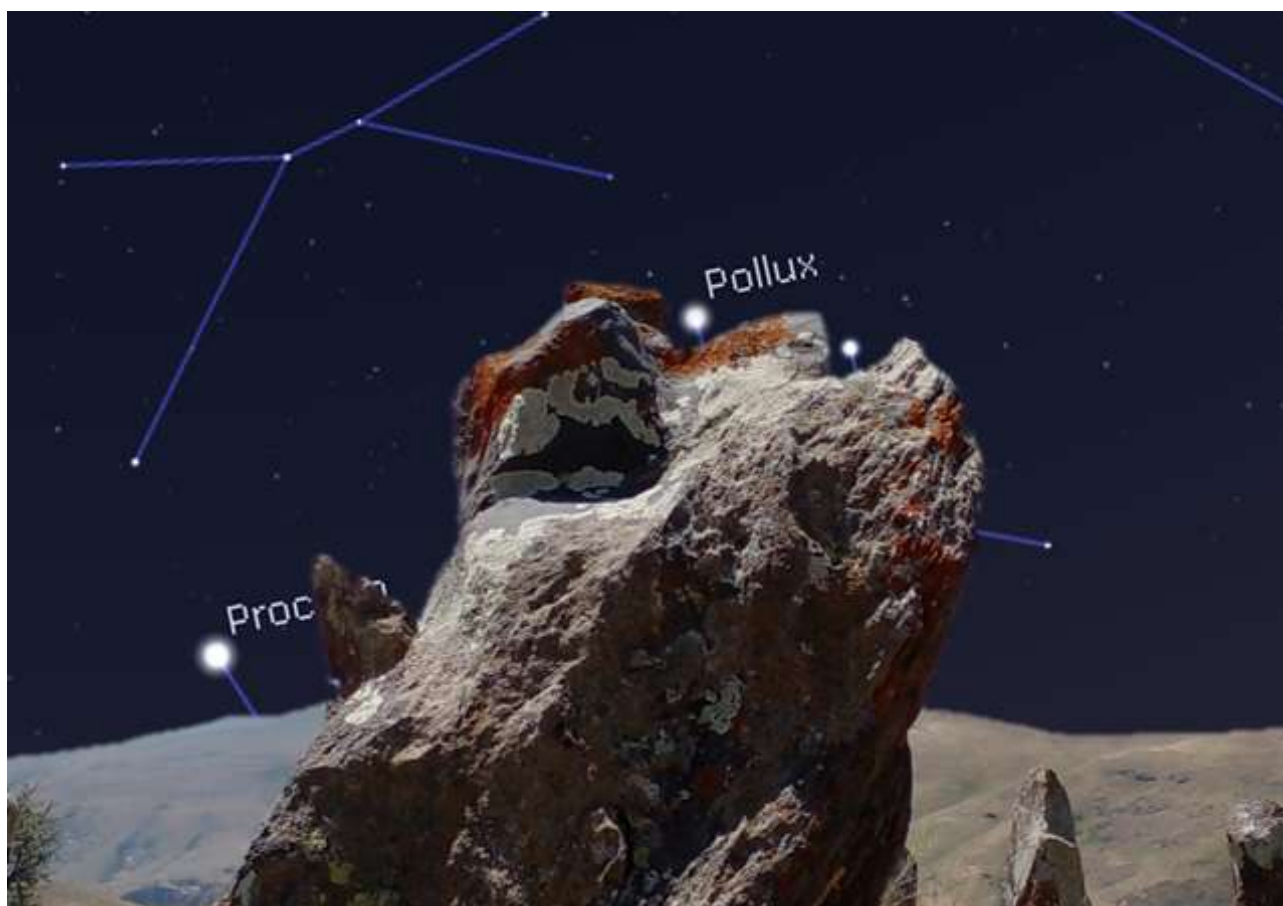


Figure 13. The brightest stars of the constellation Gemini being seen simultaneously in the directions of the angles of the stone No. 12 from the kneeling position. Reconstructed in Stellarium v0.20.4 (<http://www.stellarium.org>)

5. On the significance of the observed celestial bodies.



Figure 14. Observational Seating Platform 14.

In the tables (tables 1, 2, 3, 4 and 5), we have listed the celestial bodies observed with the help of the described observational equipment. However, what's more important is the purpose and significance of these observations, especially in terms of the ancient Armenian calendars. Before the mentioned studies, it was known that the beginning of the Armenian Protohaykian calendar was in 9000 BC and that the main star of this calendar was Spica of the Virgo constellation (Broutian, 2016, 2017). In addition, it was known that this calendar was closely related to the stages of grain cultivation in its structural and content features. It was also known that in 2341 BC, the Haykian calendar was founded, the main star of which was Betelgeuse of the Orion (Haykn) constellation (Broutian, 1985a,b, 1997). In other words, more than 6,500 years after the beginning of the Protohaykian calendar, the main star of the calendar was changed in order to observe its heliacal rising to keep it unchanged on the day of the beginning of the year, Navasard holiday. It was logical to assume that another change in the main star during these 6,500 years would be inevitable, but there was no information about this (Malkhasyan, 2021a). In addition, the other stars related to the same year and the days of their observations confirm again

the connection of this calendar and the monument with the phases of grain cultivation.

Studies of the monument bring some clear clarifications to the above issues. In particular, the fact that Spica is the main star of the Protohaykian calendar is confirmed by observing it in the monument in 9000 BC (Broutian & Malkhasyan (2021), Malkhasyan (2021a)). In addition, the other stars related to the same year and the days of their observations confirm again the connection of this calendar and the monument with the phases of grain cultivation (Broutian & Malkhasyan (2021), Malkhasyan (2021a,b, 2022)). The obtained results also reveal that there really was a change of the main star in the Protohaykian calendar. This change took place in 5800 BC. Instead of Spica, the beginning of the year was determined by observing the heliacal rising of Sirius on the day of Navasard (Broutian & Malkhasyan (2021), Malkhasyan (2021a)). There are also other remarkable details in the mentioned publications that shed light in the dark corners of the astronomical content of the Armenian folklore and ethnographic material that has reached us from ancient times. The continuous studies of the monument are very important also in this sense.

Summary

Summarizing the listed observational instruments, methods and the observed celestial phenomena, we have come to clear conclusions that the stones of the monument were used for observational purposes in a number of ways. Yet, only several types of instruments are clearly distinguished.

- 1) Stones with holes
- 2) Observational Platforms
- 3) Seating Platforms

4) Angular stones

This of course does not exclude, and it is evident, that instruments of the mentioned type were possibly used in combination. Moreover, it is possible that new types of instruments will be revealed in the future. Especially since it is already clear that there are also **mixed types** of instruments. Regarding the observer’s positions, three main positions have been identified:

- Standing
- Sitting
- Kneeling

As can be seen in the Table 1, the following celestial phenomena were in the center of the ancient observer’s attention:

- 1) Sunrises and sunsets of solstices and equinoxes
- 2) The rising of the Moon
- 3) Heliacal rising and setting of bright stars
- 4) Acronycal rising and cosmical setting of bright stars
- 5) The apparent appearance and disappearance of bright stars at significantly high points above the horizon
- 6) The celestial bodies transitions through their upper and Lower culmination points.

The use of such technologies, as has been convincingly demonstrated (Broutian & Malkhasyan (2021), Malkhasyan (2021a,b, 2022)), refer mainly to 9th-3rd millennia BC (Table 1) and is directly related to the ancient Armenian calendar culture.

These conclusions further increase the already unfading scientific interest in the Zorats Qarer monument. In the upcoming publications, it is planned to describe the mentioned Platforms 3 and 4, in particular the directions formed with their help. The identification of observable celestial bodies and the chronology of observations promise to be quite interesting.

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