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ORIENTATION OF BRONZE AGE MOUNDS IN MONGOLIAN ALTAI MOUNTAINS

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ABSTRACT

This article presents the results of an archaeoastronomical study on the orientation of the prehistoric funerary mounds of the Ikh Bogd Uul Mountain, in the easternmost Mongolian Altai mountain range. After introducing the results of the measurements taken in the field, we hypothesise that the localisation pattern of mounds could be connected to an alignment with a specific mountaintop that is visible in the south eastern horizon, in coincidence with a specific lunar event: the southern major lunistice. In order to build a significant interpretative framework, we also examine several folk rituals from Central Asia that could be associated with the Mongolian traditional lunar calendar, as well as other moon-related celebrations.

KEYWORDS *khirigsuur* mounds, Mongolian archaeoastronomy, calendar, lunistice

1. INTRODUCTION

Local populations in Mongolia regard mountains, streams and lakes, as well as the sky, *tengri*, as sacred entities (Davaa Ochir, 2008).

In a landscape of wide-open steppes, mountains, and deserts, orientation is a central issue in the daily life of the local herders as well as in rituals and funerary ceremonies (Delaplace, 2006; Lacaze, 2006). This focus on orientation and landscape can be found in folklore and in the written sources of the Turchik epoch, as well as the medieval and the post-medieval Buddhist period (Charleux, 2006).

We have less information about the cosmology of the prehistoric inhabitants of the Altai Mountains. Some of this information can be drawn from Chinese written sources, which highlight the importance of solar and lunar cycles in ancient Mongolia (Di Cosmo, 2002: 304). But we do not have any record on the orientation of *khirigsuur* mounds. Cultural Astronomy research applied to the archaeological landscape of Mongolia is still quite an unexplored field, and comparative investigation is scarce. Some contributions on Central Asia archaeoastronomy were recently published in English (Bekbassar, 2005; Marsadolov, 2003; Zdanovich and Kirillov, 2002). In addition, it is worth mentioning the study on the ritual significance of Mongolian Bronze Age *khirigsuur* mounds by Allard and Erdenebaatar (2005), which included an approach on orientation patterns. Unfortunately, this was not followed by further specific archaeoastronomic investigation.

2. METHOD

2.1 The area of research and the archaeological landscape

The archaeological landscape of Ikh Bogd Uul Mountain, in southern Mongolia, was investigated during the last decade by the Italian-Mongolian (CNR-MAS) geo-archaeological mission, in which the first author also took part.

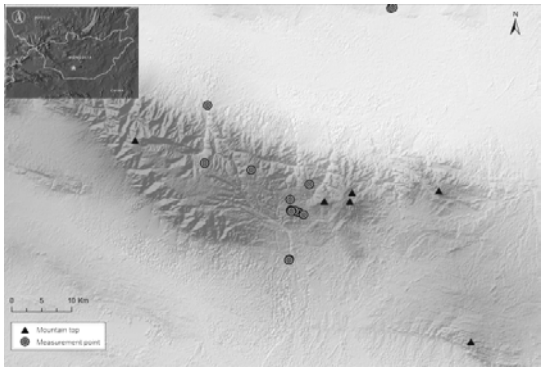

Figure 1. Ikh Bogd Uul Mountain research area, measurement points of both ethnographic and archaeological structures indicated with circles, and surrounding mountaintops with triangles.

In 2011, as part of an Italian-Spanish archaeological mission, the first and third authors surveyed and measured the orientation of a number of Bronze Age *khirigsuur* mounds and other archaeological structures in this area (see Fig. 1).

Ikh Bogd Uul (3957 m) is a large massif on the easternmost part of the Gobi-Altai range. This monumental mountain hosts many impressive archaeological sites of different periods. The name of the mountain, Ikh Bogd Uul, means 'the great sacred mountain' in Mongolian language. In fact, mountains are regarded as sacred entities or inhabited by local master spirits in Mongolian folklore. This animistic cosmology can be traced in the names of places and in local legends (Davaa Ochir, 2008; Pedersen, 2009).

Pontsag Oboo rises in the high pastures of Ikh Bogd Uul Mountain, where local herders spend the summer with their flocks. This flat volcanic hill dominates an important mountain pass, which is a node for current regional mobility, and possibly had the same role in the past, as the first author points out through accurate spatial analyses in her PhD dissertation (Dal Zovo, C. *forthcoming*; *Archaeology of a sacred mountain of Mongolian Altai*. University of Santiago de Compostela, Unpublished PhD dissertation).

Local informants told us that some traditional ceremonies, such as the Mongolian summer games (*naadam*), were usually celebrated at Pontsag Oboo Hill.

The Bronze Age inhabitants of Ikh Bogd Uul Mountain built a remarkable *khirigsuur* mound at the top of the hill.

Figure 2. Ikh Bogd Uul mountaintop and Orog Nuur Lake, seen from the north.

Khirigsuur mounds are one of the most common archaeological features in the landscape of Mongolia and Central Asia (Littleton & al. 2012: 3361). They are ritual and funerary monuments, which are also well known in northern and western Mongolia (Allard and Erdenebaatar, 2005: 552; Fitzhugh, 2009; Frolich & al. 2009).

The typological characteristics of these monuments and their chronology have been closely examined by several authors: Allard and Erdenebaatar (2005), Fitzhugh (2009), Frolich & al. (2009), Marcolongo & al. (2005), Volkov (1995), Wright (2007). Although mounds might vary considerably in form, scale of construction and the pattern of ground level features (Wright, 2007), *khirigsuur*s typically consist of a central mound of stones and dirt, surrounded by a square or circular stone-fence, with spokes from the centre and different satellite features. *Khirigsuur* mounds and *stelae* can be confidently assigned to the Late Bronze Age period (from the end of the second millennium to the beginning of the first millennium BC), based on recent radiocarbon dates obtained from excavations in northern and western Mongolia (Fitzhugh 2009: 80, table 1; Frolich & al., 2009: 106, table 3; Littleton & al. 2012).

Pontsag Oboo *khirigsuur* is a complex structure, with a central mound, a circular stone fence sixty metres wide, and four stone lines, radiating from the central mound in the shape of a cartwheel.

Figure 3. View from the east of the Bronze Age *khirigsuur* mound (in the background) and a West-Eurasian type deer stone set on one of the thirteen cairns, on the top of Pontsag Oboo hill.

There are also a number of smaller satellite features, such as small mounds, stone platforms and thirteen cairns, with two fragmented Bronze Age deer stone *stelae,* placed in a straight row on the eastern side of the mound (see Fig. 3).

Although this is one of the largest structures of the Ikh Bogd Uul Mountain, we have also documented smaller Bronze Age and Iron Age mounds in the area. We have measured four more *khirigsuur* mounds on the eastern slope of Pontsag Oboo hill, in a close spatial connection with the mound located at the top. One of them has a circular wall, while the remaining three have rectangular stone walls. The mounds of Pontsag Oboo Hill form a significant monumental cluster. Moreover, all the Pontsag Oboo mounds present a clear and open visibility focus towards the far eastern and southeaster horizon.

Besides the Pontsag Oboo *khirigsuur* mounds, we have also measured another cluster of mounds on the Ikh Bogd Uul southern slope, at the entrance of Uchetiin Am valley. We have also taken measurements of the mounds located at the entrance of Bituutein Am valley, on the Ikh Bogd Uul northern slope. In total, we have included the measurements from eleven mounds (see figure 5). During our fieldwork we have measured several other

structures but they are out of the scope of the present paper.

2.2 Previous research

Most archaeological studies highlight the importance of the eastern half of the horizon for the *khirigsuur* (Allard and Erdenebaatar, 2005; Fitzhugh, 2009; Jacobson-Tepfer, 2009; Wright, 2007: 358). In fact, Mongolian mounds are very often located on the eastern slopes of the hills. Satellite elements such as platforms, small mounds, rows of stone cairns and *stelae*, are commonly located on the eastern side of the mound (See fig. 3). Most of the excavated satellite mounds and standing stones contained traces of fire and horse skulls oriented to the east (Fitzhugh, 2009: 79). In addition, the inhumed individuals are usually oriented towards the east, or the southeast (Allard and Erdenebaatar, 2005; Fitzhugh 2009; Marcolongo & al. 2005). This has been interpreted as a peculiar understanding of the landscape among the ancient inhabitants of the Altai Mountains, who seemingly organised the space in terms of the four quarters, within which east could be the dominant direction (Jacobson-Tepfer, 2009: 144). Besides, Bronze Age mounds, as well as other archaeological features of the Iron Age and medieval period, are seemingly located in relationship with the sacred mountains of the surrounding landscape (Jacobson-Tepfer, *ibid:* 142).

Allard and Erdenebaatar (2005: 554) conversely argue that the orientation of *khirigsuur* mounds of northern Mongolia would be more consistent with an event in the sky, rather than with a single marker in the landscape. They suggest that one possibility is that "the sites were oriented toward the setting of the sun or Venus in the western sky during the spring-summer months or toward the rise in the eastern sky during the autumn-winter months" (Allard & Erdenebaatar, *ibid.* 556).

It is worth noting that nowadays, east is considered a privileged direction for several orienting purposes in both ritual and daily life of the nomadic herders of Mongolian Altai. In the Ikh Bogd Uul Mountain area, the doors of the rounded felt tents are opened to the eastern side, in order to guarantee a dominant view towards the horizon. This orientation has clear cosmological implications, as it symbolises the traditional worldview and the conception of the universe (Delaplace, 2006; Lacaze, 2006). Moreover, the reverence towards sacred mountains and the importance of cardinal directions can be traced in both Mongolian folklore and Buddhist rituals (Charleux, 2006; Davaa Ochir, 2008; Evans and Humphrey 2003; Pedersen, 2009). In traditional ceremonies celebrated around *oboo* stone cairns, the officiants also face the east (Wright, 2007: 354, fig.2; we use the term *oboo* to refer to the traditional Mongolian cairns made of stones and earth, to differentiate them from the Bronze Age mounds or *khirigsuur*). In the construction of Buddhist monasteries there is a special attention to cardinal orientation principles, namely the east together with prominent mountains of the surrounding landscape (Evans and Humphrey 2003), which seems to be the expression of a peculiar conception of religious architecture and landscape (Charleux, 2006).

2.3 Data collection

The fieldwork was carried out during the months of August and September 2011. We measured the orientation of mounds by taking into account relevant architectonic features, such as the radiating stone spokes of the mounds, as well as possible alignments towards relevant mountaintops in the surrounding skyline.

Orientation data were collected using a Suunto Tandem 360PC. This instrument includes a high-precision compass, plus a clinometer. The face value of the azimuth measurement has an intrinsic error of ¼°, and ½° in horizon altitude. However, the estimated true error in azimuth is probably ~1°, due to the different uncertainties in the measurement process, which translates into an error ~1° in declination. The readings were corrected in two ways for magnetic

declination. We obtained measurements to conspicuous mountaintops that were later compared to the readings of highly accurate military maps of the area. Such measurements were further compared to satellite images and magnetic models from the NOAA (http://www.ngdc.noaa.gov). The relevant measurements for the results presented here are included in Table 1.

Figure 4. Taking measurements from a *khirigsuur* mound on the eastern slope of the Pontsag Oboo Hill, towards the Khalbagant Mountain, visible in the farthest horizon.

3. RESULTS

Here we analyse the 38 measurements obtained from the eleven *khirigsuur* mounds (see Table 1).

The Bronze Age *khirigsuur* mounds, and, in particular, all the mounds of the Pontsag Oboo hill, consistently display a significant focus towards a specific mountaintop. This mountain, located forty kilometres away, in the southeaster skyline, is known as Khalbagant Uul, which in Mongolian means Spoon Mountain (see Fig. 4). The Khalbagant Uul mountaintop concentrates the maximum of visibilities in the viewsheds, calculated from the Pontsag Oboo mounds in a Geographic Information Systems (GIS) environment (see Fig. 5). This means that the Spoon Mountain is the most prominent and the farthest feature visible in the southeastern skyline from the Pontsag Oboo mounds.

All *khirigsuur* mounds share this open visibility to the east and southeast, but the visibility in the opposite direction is extremely limited. Moreover, the largest mound on the top of the Ponsag Oboo hill is not visible from the other mounds located on the eastern slope. This could be interpreted as a choice for a specific location that could guarantee an open view from the *khirigsuur* to some characteristic feature in the eastern skyline, to some astronomical object in the eastern sky, or both of these possibilities together.

In fact, the alignments towards Khalbagant are in the range between –27.1° and –28.1°, which is also consistent with the southern major lunistice declination (see Table1)

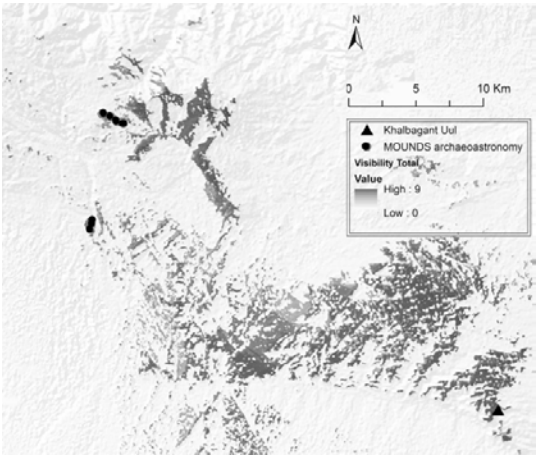

Figure 5. Sum of the viewsheds from the measured mounds (circles). The visibility is significantly open to east and southeast, especially in correspondence with Khalbagaant Uul mountaintop (triangle on the right).

The alignment towards the Khalbagant Uul Mountain and its correspondence with the lunistices seems common to all mounds of the Pontsag Oboo complex, plus other mounds on the Ikh Bogd Uul Mountain (see Fig. 6 and Table 1).

In Figure 6 the values of the frequency of occurrence are normalised to provide a measurement of the significance of the orientation in our sample. We obtain such normalisation by subtracting the mean value of the relative frequency and dividing by the standard deviation of the relative frequency. In this way, the values in the *y*-axis provide a measure of how many times a concentration of orientations is above the standard deviation.

We find four maxima with values above the 3σ level. The most prominent has a maximum of –27°, in good agreement with

both the direction of the Khalbagant Uul Mountain and the southern major lunastice. The second has a maximum close to –18°, which is a declination that can arguably be related to the minor lunastice. The third maximum, located near declination –6°, could be related to the declination of the full moon after spring equinox, and in this sense it could also be considered as related to the moon. However, this is less obvious and subject to larger errors due to the arguably low numbers included.

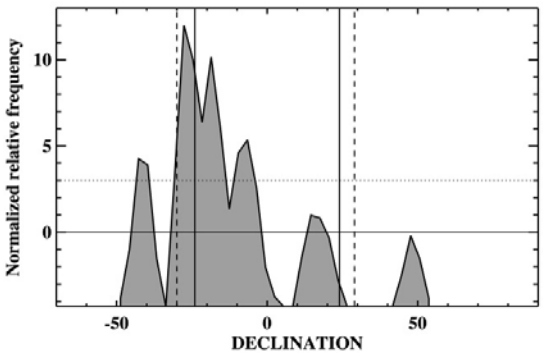

Figure 6. Declination histogram of measurements taken from *khirigsuur* mounds. Vertical solid lines indicate the limits of the solar range (solstices), while vertical dashed lines indicate the lunar extremes. For details, see text.

4. DISCUSSION

On the basis of these results, we suggest that the *khirigsuur* mounds of the Ikh Bogd Uul Mountain display an orientation consistent with the lunastice, in conjunction with the Khalbagant Mountain in the southeaster skyline.

In analysing this hypothetical relevance of the moon for the Bronze Age pastoral groups of Mongolian Altai, we can partly rely on ancient written sources. Written information on such a distant epoch of Mongolian history is scarce and it mostly comes from neighbouring areas that had a significance influence throughout Mongolian history: China and India.

The moon was a focus for rituals in China since the Neolithic period, and the influence of Chinese astronomy on Mongolian cosmology was certainly active long before the end of the first millennium BC (Major, 1999; Pankenier, 1992).

Also in ancient India the moon played an important calendric value. In the ancient Vedic sources, attributed to pastoral and nomadic populations crossing Central Asia in the second millennium BC, the moon was *masa-krit* 'the maker of the month' (Sidarth, 1998). The Indo-European phenomenon appears to be significant in Central Asia during the Bronze Age, and in most Indo-European languages the word for moon also contains the idea of measuring time (Mallory & Adams 2006: 128-129).

The earliest Turchik-Mongolian calendars show clear connections with the ancient Indian astronomy (Petri, 1967). The moon, in the sense of 'the measurer of time', which implies an active role, is masculine in Sanskrit (West, 2007:351). S*ar* in Mongolian equally means moon and month, and it is also masculine.

Figure 7. The N-S oriented thirteen cairns on the eastern side of the Bronze Age mound (in the foreground, a spoke and a stone fence portion), on the top of the Pontsag Oboo hill.

One can reasonably argue that the moon was a fundamental time-counting device in Mongolia and Central Asia, at least since the end of the second millennium BC (Ekvall, 1959). Lunar cycles could have marked the seasonal activities of the local pastoral communities, as well as the cyclical ceremonies celebrated by the Bronze Age mounds-builders of the Mongolian Altai.

The number thirteen, arguably a number with a lunar relevance, had a significant symbolic value in the luni-solar calendar of the Eurasian herders, as well as in epic tradition, folklore and divinatory practices,

(Chiodo, 2009:188; Ekvall, 1959; Onon, 2001).

One present-day Mongolian tradition that displays a connection with the lunar cycles and the number thirteen is the celebration of the *Tsagaan Sar* (De Priest 2008:105; Evans and Humphrey, 2003). *Tsagaan Sar* means either 'white month' or 'white moon', and it marks the beginning of the year in traditional Mongolian calendar. As a New Year celebration, it was probably connected with the (thirteenth) intercalary month. Nowadays, it is a three-day feast, celebrated during the second new moon after the winter solstice (the day of dark moon, *bituun*, and the first days of the first quarter). At sunrise, on the first day of the year, men (including boys that are thirteen years old) climb to the *oboo* cairn located on the nearest mountaintop, or in other cases the row of the thirteen *oboo* cairns, which are usually visited for such special occasions (Davaa Ochir, 2008:57-58). People offer white food and drinks to the local mountain deities. The New Year celebration includes purification rituals, rich meals with white food and drinks, and the celebration of family roots, kingship and identity, in close connection with the mountain landscape (Davaa Ochir, 2008; Tucci, 1966). In particular, the north-south oriented lines of thirteen *oboo* cairns are connected with the cult of the thirteen Altai sacred mountaintops (Charleux, 2006; Evans and Humphrey, *ibid.*; Pegg, 2001: 108-112).

Based on this comparison with the folkloric sources it is difficult to disentangle whether in the past the Khalbagant Uul Mountain and the moon could be regarded as two separate targets or a single one.

On the one hand, Khalbagant Uul seemingly catches the traditional worship paid to conspicuous mountains and mountaintops in Mongolia. Its characteristic shape might also have attracted the attention of the inhabitants of the Altai in the past. Indeed, the name of the place, Spoon Mountain, is especially significant. Spoons are important items in Mongolian folk rituals, such as in the morning libation to the spirits of the eight cardinal directions. Besides, spoons have been found in several Central Asia burials since the Bronze Age, and they are usually interpreted as ritual objects (Fitzhugh, 2009: 86-87).

On the other hand, the possibility of an orientation towards lunar events is fascinating. Indeed, in Mongolian folklore, the moon is a clear reference, especially in terms of time counting and ritual practices (Bekbassar, 2005). We argue that the possible orientation pattern of the Bronze Age mounds towards the Khalbagant Spoon Mountain could be understood both in the sense of an astronomical alignment, as well as the expression of an ancestral mountain cult.

The integration of a variety of stone elements from different time-periods in the same spatial context at the top of the Pontsag Oboo hill can be read as an adaptation of ancient astronomical knowledge and ritual practices. Indeed, we propose that the spatial and structural connection between Bronze Age *khirigsuur* mounds and the thirteen cairns, as well as the possible astronomic, calendric and ritual implications, may represent the materialisation of a long-term dialogue between different cosmologies and different material cultures.

The comparison of archaeological materials and local folk traditions, especially when they are established to understand ancient orientation patterns, mythical cosmologies and the prehistoric knowledge of the landscape and the sky, might be troublesome (Gazin-Schwartz and Holtorf, 1999). However, thanks to both the archaeological information and the ethnographic record, we have formulated and investigated the hypothesis that both the eastern horizon and the mountaintops could be the point of convergence of astronomic alignments in the past.

We consider that this intriguing possibility of the persistence of cult sites and related ceremonies could also inspire a novel and original interpretation of

archaeoastronomic data. In our case, such could include both the moon and the mountain as targets of ancient orientation practices.

CONCLUSIONS

In this paper, we have analysed and interpreted the hypothesis that the moon, as well as significant mountaintops, could be the target of consistent orientation patterns that we have detected among the Bronze Age mounds of the Ikh Bogd Uul Mountain, in the Mongolian Altai. Although we are aware of the preliminary character of this study, we believe that our work may pave the way for much-needed further investigation on orientation and alignments of prehistoric monuments in the Ikh Bogd Uul Mountain survey area as well as throughout Mongolia.

Nevertheless, we consider that we have found elements that support the hypothesis that ancient populations could have considered Khalbagant Uul, and perhaps other mountains, to be in conjunction with the moon.

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Table 1: Measurements taken at the eleven *khirigsuur* mounds analyzed in the text. The columns indicate the site of the mound, the element measured and the direction. In several locations such direction coincides with a conspicuous mountain top, indicated in italics. Then we give the azimuth (A), the horizon altitude (h) and the corresponding declination (δ). Finally, a possible astronomical target is identified. SML stands for Southern major lunastice, NML for northern major lunastice, SmL for Southern minor lunastice and Nml for Northern minor lunastice.

Site	Element	direction	A (°)	h(°)	δ(°)	possible target
Pontsag oboo	Entrance	*Khalbagant*	127½	-2	-27.4	SML
	North radius		13½	-2	41.2	
	South radius		193½	-2	-45.9	
	East radius	*Bada Bogd*	97	-1½	-6.3	
	West radius	*Ikh bogd*	294½	3½	19.1	NmL
	Mounds alignment		307½	-2	23.7	S. solstice
	Mounds alignment		314½	-2	27.8	NML
Gegenii oboo		*Ikh bogd*	287½	2	13.2	
Tsonj oboo		*Ikh bogd*	287½	4½	15.0	
Ks	Entrance		102½	-1	-9.9	
KSM1		*Khalbagant*	128	-1½	-27.4	SML
		Bada Bogd	95½	-1½	-5.3	
KSM2		*Khalbagant*	127	-2	-27.1	SML
		Bada Bogd	95½	-2	-5.61	
KSM3		*Khalbagant*	128½	-2	-28.07	SML
		Bada Bodg	96½	-1	-5.7	
		KSM 4	108½	-4	-15.9	
KSM4		*Khalbagant*	128½	-2	-28.07	SML
		Bada Bodg	95½	-1	-4.96	
KSM5		*Bada Bogd*	103½	-1	-10.6	
		Tosnj	166½	20	-24.7	W. Solstice
		Ikh Bogd	218½	16	-20.5	SmL
UCHETTLIN AM KSM6		*Pontsag*	8½	6	49.7	
		Khalbagant	115½	-1	-18.9	SmL
		Bada Bogd	90½	-1	-1.42	
KSM7		*Khalbagant*	125	0½	-24.05	W. solstice
		KSM8	123½	0	-23.5	W. solstice
KSM8		*Khalbagant*	114½	-0½	-17.9	SmL
Tsagan Oboo		*Pontsag*	165½	5	-39.1	
	East radius		114½	1	-16.8	
	West radius		292½	4	18.1	NmL
	North radius		13½	4	46.7	
	South radius		190½	0	-44.7	
Oboo Bogd		*Ikh Bogd*	241½	4	-17.2	SmL
		Pontsac	198½	3	-40.0	
		Bada Bogd	117½	1	-18.8	SmL
		Dulan Bogd	173½	3	-42.4	
		Jaran Bogd	194½	3	-41.0	