What is the Minor Standstill of the Moon?

Lionel Sims

University of East London
lionel.sims@btinternet.com

Introduction

2014–2015 was the period of the minor standstill of the Moon. Archaeoastronomy has shown that many prehistoric monuments in northwest Europe have horizon alignments on the Sun’s solstices and the Moon’s standstills (North 1996; Ruggles 1999). These are horizon range properties of the risings and settings of the Sun and the Moon. In northern latitudes, at summer solstice, the Sun rises in the northeast and sets in the northwest, while at winter solstice, the Sun rises in the southeast and sets in the southwest (Figure 1). For a given latitude and horizon elevation, the horizon positions for these solar events are fixed.¹ The unaided human eye cannot detect any change in its horizon rise or set position during a solstice for three days before or after the day of the solstice (Ruggles 1999, 25) and, for the monument builders of prehistoric Europe, each solstice is therefore a seven-day event. After the week of the summer solstice, the Sun begins to rise and set further south on the horizon. Pendulum-like, these horizon positions are slow to change close to the solstices and fastest in mid-swing during the equinoxes. At winter solstice, the Sun once again rises in an apparently fixed horizon position for a week, but now in the southeast. A monument that has a horizon alignment on a solstice Sun (summer or winter, rise or set) is therefore a selection of one seven-day event of sunrises or sunsets out of a total 353 (365–14+2) events in any one year.

There are important differences when a monument is aligned on the Moon. Unlike the Sun, the limits to the Moon’s horizon range fluctuate. When the Moon’s range is at its greatest extent, what Thom (1971) called the major standstill of the Moon, at the latitude of Stonehenge, the Moon’s horizon range is 10° of azimuth further north or south on the horizon than the Sun ever reaches at each of its four solstice positions. Nine or so years later, the Moon’s horizon range has shrunk to about 10° within the extreme horizon

¹ This is leaving aside the 40-second-per-century decrease in the obliquity of the ecliptic (Thom 1971, 16).
range of the Sun. Thom called this the minor standstill of the Moon. These horizon range fluctuations are governed by the 18.61-year nodal cycle of the Moon – the number of degrees above or below the celestial equator (Figure 2). While modern celestial mechanics defines lunar standstills in this way, many archaeoastronomers also interpret the prehistoric appropriation of lunar standstills from this cycle length (Thom 1971; Morrison 1980; Heggie 1981; North 1996; Ruggles 1999; Hoskin 2001; Silva and Pimenta 2012). But this would not have been the view of Neolithic monument builders who had a geocentric flat earth, not heliocentric spherical earth, understanding of the cosmos (Heggie 1981, 88 and below).

There are, therefore, four horizon limits for the Sun and eight horizon limits for the Moon (Figure 1). During both the major and the minor standstill of the Moon, 13 times over the course of each standstill year, the Moon returns to these range limits every 27.3 days as it completes its orbit of the Earth (the sidereal month). Unlike the Sun’s seven-day sojourn at the same solstice horizon rise and set position, the Moon’s standstill horizon limit is therefore a more complicated exercise in time-lapsed observation. It selects just one day or night’s horizon rise or set position and ignores the ensuing 26 before the Moon once again returns to its southern or northern standstill horizon limit upon which an alignment is made. And while the Moon is circulating the Earth every 27.3 days, it takes another 2.2 days for the Moon’s synodic month of 29.5 days to catch up with the Earth’s movement round the Sun to return to the same lunar phase from which any lunar count is begun. Each Moon that returns to its horizon range limit is therefore always
in a 2.2-days-earlier phase than that which previously appeared in that position. Solar and lunar monument alignments are therefore both abstractions from the total possible observations that could be made of them at all their horizon positions or from their full transit across the sky, but the Moon’s abstracted horizon properties display complexities above and beyond those of the Sun and its horizon movements. Scholars’ variable engagement with these manipulatively displayed abstractions in prehistoric monument alignments contribute to the present level of debate in archaeoastronomy. Since horizon movements alone do not exhaust the complex phenomenon of lunar standstills, they cannot define it. Within archaeoastronomy there are three types of theories for lunar standstills, varying according to the researcher’s understanding of the relation between the minor and the major standstill. Together they account for the six main theories of monumentalising lunar standstills.

**Lunar Standstills as Extended Horizon Range**

The first theoretical position assumes that the greater horizon range of the Moon during its major standstill than that of the Sun accords it special significance. According to Silva and Pimenta (2012, 206), this is the view of most archaeoastronomers. By selecting only the Moon’s major standstill horizon range compared to that of the solstice Sun as the defining criteria, the implication is that the Moon behaves as if it were a “super-Sun”. In contrast, the minor standstill Moon’s range is within that of the Sun’s solstice extremes and, therefore, according to this criterion, provides no horizon interest (Figure 1). If this

---

**FIGURE 2.** Variation in lunar geocentric extreme declination over 18.61 years (North 1996, 560).

---
was the understanding in prehistory, then there would be no monuments aligned on the minor standstill of the Moon. This is not the case: Ruggles found that while 37 sites amongst 300 in western Scotland had alignments within 2° of declination of the southern major standstill, there were also 21 with alignments on the southern minor standstill, and for 22 found on the northern major standstill, there were 17 on the northern minor standstill. While these sites had variable architecture, amongst the group of similar eastern Scottish recumbent stone circles, 26 were aligned on the southern major standstill and five were aligned on the southern minor standstill (Ruggles 1999, 207–212, 96). If we were to ignore minor standstills, we would therefore be under-interpreting our data.

Minor Lunar Standstills as Distinct

There are two theories for the explanation of a minor standstill alignment as something distinct from a major standstill.

North (1996, 441–475) argued that the southern minor standstill moonsets can be seen through the small upper Grand Trilithon window when viewing Stonehenge from the left-hand side of the outlying Heel Stone near the end of the approaching Avenue, and the winter solstice sunsets can be seen in the lower window when standing on the right-hand side of the Heel Stone (Figure 3). He claimed that small perturbation movements of the minor standstill limiting declination can be observed from the left-hand side of the Heel Stone, zigzagging in alternating reverses across the width of the 1°-wide window (Figures 3 and 4). Since the Sun has no comparable reversals during its solstice extreme, he suggested this might have been perceived to be “magical” compared to the pedestrian Sun. However, these regular perturbations are less than 10’ of declination and are modified by the declination changes which take place at any point in the Moon’s orbit round the Earth and do not usually occur when the Moon is on the horizon. The association of the two effects means that by the time the Moon is setting in the upper window, no regular zigzag can be observed with the resolution available in the Stonehenge alignment (Figure 5). In addition, refraction effects would variably affect these small movements (Sims 2006, 2007). This is consistent with Thom’s own view that the geocentric extreme declination of both types of lunar standstill could not be observed directly on the horizon and had to be inferred from “elaboration devices” (Thom 1971, 83–90). In his re-examination of Thom’s field work, Ruggles (1999, 61–63) found no evidence for such devices. As Heggie (1981, 88) and Ruggles (1999, 61–63) observed, Neolithic sky watchers would not have used declination measures for mapping horizon observations and the modern heliocentric definition of a standstill by an 18.61-year cycle would have had no relevance to the monument builders.

The second theory specific to the minor standstill is the solstice lunar crescent crossover model (Silva and Pimenta 2012). Concentrating on just the winter solstice first crescent crossover for this forum piece, the authors claim that “monuments aligned with the winter first crescent would be indistinguishable […] from monuments oriented towards the setting southern minor standstill […] This provides a completely new and alternative interpretation for alignments to such directions” (Silva and Pimenta 2012, 206). As Stonehenge is one architectural culmination of the northwest European
Neolithic / Early Bronze Age monument building culture, then claims such as this can be tested by the many details we now know of this particular monument, considering it as an expression of this wider culture’s ritual focus. Since Stonehenge has an axial orientation on the setting southern minor standstill, this then implies that the crossover model is a better explanation for its alignment. This model draws upon the property that the Moon is constantly changing its declination throughout its orbit round the Earth. The authors noted that during the summer and autumn months the first crescent horizon setting point is always to the left of the Sun’s horizon set but, by the winter months, its change in declination leads it to setting to the right of the Sun’s horizon position (Figure 6). The precise horizon crossover event takes place annually within a 150-day period in a non-Gaussian distribution with a pronounced peak at the declination of the southern minor standstill (Figure 7). The authors suggest that this property would have been useful for calendrical purposes and separate from the meaning of major standstills, which they imply would have been associated with its greater horizon range than that of the Sun (Silva and Pimenta 2012, 206).

This model poses a number of problems. The crossover event for the minor standstill of 2014–2015 took place, not at winter solstice, but on 12th December, 2014. Further, since the crossover event is not fixed and can happen at any time within a 150-day period, then other, more stable, horizon markers such as the solstice Sun would be more appropriate and simpler for a calendar. It is also widely accepted in archaeoastronomy that since just two posts can mark a horizon event, calendar models significantly under-interpret the huge investment in building stone monuments such as Stonehenge (Ruggles 1999, 83).
And while the peak crossover event coincides with the southern minor standstill, their total range spans from -25° to -12° of declination and 89% of these events occur outside the range of the southern minor standstill’s perturbations of -19.7° ± 10' of declination (Figure 7). As the upper window width at Stonehenge subtends an angle of declination...
What is the Minor Standstill of the Moon?

of 0.5° from the Heel Stone, the great majority of crossover events will not be captured by this axial design property of the monument. These are qualitatively different distributions, indicating that we are dealing with two different types of phenomenon. The crossover model abolishes any intrinsic significance to both types of lunar standstill by reducing the minor standstill to the Moon’s annual crossovers with the Sun and by the solarist assumption that the meaning of the major standstill can be limited to its horizon range.

**Figure 5.** Three angular measures of the Moon at the southern minor standstill of 2490 BC at Stonehenge (Geocentric Extreme Declination; Topocentric Declination; Transformed Azimuth – azimuth at altitude of upper window at Stonehenge transformed to fit declination scale [Sims 2007, 163])

**Major and Minor Lunar Standstills Considered with Shared Properties**

The final approach to lunar standstills finds shared properties between both major and minor standstills. There are three main theories in this approach. Thom (1971, 17–19) argued that precision alignments on both major and minor lunar standstills, allied with elaboration devices to extrapolate the small perturbation movements of the Moon which could be discerned at varying points in its declination cycle, allowed the monument builders to predict eclipses. But as mentioned above, Ruggles (1999, 63) discounts any evidence for such devices and Thom’s own evidence showed that the eclipse cycle migrates through the year over the 18/19-year cycle to occur only during the equinoxes for both standstill years (Thom 1971, 20). Since the monuments included design elements which overwhelmingly paired alignments on the solstice Sun with the standstill Moon, it would be more appropriate to characterise them as eclipse *avoiders* rather than eclipse...
predictors, therefore implying some deeper solstice engagement with the symbolism of uninterrupted lunar phases (Sims 2006).

This suggestion is picked up by the two remaining positions. Ruggles argues from five regional groups of monuments that many of them were aligned on southern standstill moonsets, and argues that this would have favoured observing the southern full Moon at summer solstice (Ruggles 1999, 75, 96–98, 107, 128, 130, 138–9, 149, 154). Yet his data shows that the monuments are designed for double axial alignments to the southwest which allow the lunar standstills to be paired with the winter, not the summer, solstice Sun. He characterises these double alignments “anomalous” (Ruggles 1999, 142, 158). Of course if this is data, it cannot be anomalous and it must be the interpretation which is anomalous.

Anomaly cancellation is suggested by the third approach of Sims (2006, 2007), which shows that unlike the Sun, the horizon properties of both the major and the minor lunar standstills, when conflated with the solstice Sun, display emergent characteristics that reverse those of the lunar phase (synodic) cycle. This selects only those lunar characteristics at the horizon extremes, and this sidereal cycle of 27.3 days abstracts out time-lapsed characteristics that systematically reverse the Moon’s synodic properties while
What is the Minor Standstill of the Moon?

continuing an emphasis on dark Moon. As can be seen in Figure 4, the Moon’s phases at both the southern major and the southern minor lunar standstills (contra Silva and Pimenta 2012, 206) show clockwise movements in the sky through a reversed set of 13 lunar phases spread over the course of one year every 27.3 days. These thirteen phases climax at winter solstice with dark, not full, Moon. The architecture of Stonehenge, which combines an upper window on the southern minor standstill with a lower window on the winter solstice sunsets – a pairing repeated with a different architecture on the southern major standstill in Ruggles’ findings in five other regional groups of monuments and North’s study of Avebury (North 1996, 271–276) – therefore focuses any rituals that took place there on the beginning of the longest darkest night possible. Similarly, northern major and minor standstills culminate with dark Moon at summer solstice (Figure 4). This is an invariant feature of all lunar standstills and is not included in other model interpretations.

**Conclusion**

Of the six archaeoastronomy theories discussed, this brief review has argued that the first five are inconsistent with our present understanding of the “astronomy” of most late Neolithic monuments of northwest Europe. The sixth model, the archaeoastronomy...
of reversal within continuity of Sims (2006, 2007), argues that all of the world’s cosmologies and religions are transformations of an original lunar-scheduled cultural template that derives from our Palaeolithic ancestors. While these hunters recorded the monthly phases of the Moon with an emphasis on dark Moon (Rappenglück 2010), by the time of Neolithic pastoralists, many northwest European monuments display alignments that over the course of 13 sidereal Moons scroll through an annualised reversed suite of lunar phases that culminate at the solstices with dark Moon. Instead of the minor standstill of the Moon being the poor relation to the major standstill, the archaeoastronomy evidence alone suggests that both types of lunar standstill were appropriated as “the instruments of darkness” (Lévi-Strauss 1973, 359–475), and early in this transition displaced monthly dark Moon “death” and resurrection rituals onto a solarised time scale culminating every nine or so years (not 18.6 years). According to this model, the minor standstill of the Moon has a part to play in the discipline’s future, equal in meaning to that of the major standstill of the Moon.

References