# Long Count in function of the *Haab'* and its Venus-Moon relation: application in Chichén Itzá

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## The Maya count of days

In Western astronomy there is a single way to register the passage of time, one that consists of counting days from a Christian era date on January 1st, 4713 BC, at mid---day. In this system the counting goes from mid---day to mid---day ad infinitum. Since the Long Count was identified at the beginning of the twentieth century (Förstemann, 1906; Morley, 1910; Goodman 1905) as the "Maya count of days" (Lounsbury, 1978, p.766), it was considered that the method developed by the epi---olmec of mixe---zoquean filiation must have been the same as the European, since there is a never---ending succession of *k'in*.

When it came to comparing counting systems, it was proposed that the Western year calendar is different from the 365 day---cycle in Mesoamerica. Since then, whether the bissextile day was counted or not has been a controversial issue for over five decades, that is, since the first colonial registrations were made (Prem, 2008). Today Mesoamerican researchers follow two currents: the one that proposes a fixed cycle of 365 days thanks to some method for inserting an extra day (such as a repeated day, or a day without a name, or thirteen unnamed days after fifty---two years); and the one that conceives an imperfect cycle of 365 days by arguing that there is no empirical evidence of a day number three---hundred and sixty---six.

An argument in favor of the first current was proposed by Flores (1995) around the same time that Meza (1997), an independent researcher, proposed it too; the first was echoed by Mora Echeverria (1997). A central aspect of the proposal requires conceiving a tetra---partitioning of time---space on the horizontal and vertical planes. This permits spatially associating the change in orientation of the year---bearer with a change of the starting time for each 365---day cycle. The four successive year---bearers have four directions, which in sequence are: east, north, west and south. Thus, it is plausible to conceive four moments in a day cycle: dawn, mid---day, evening and mid---night. By correspondence, when the year---bearer has an eastern direction, the year cycle begins at dawn; the next year---bearer to the north makes the year start at mid---day; the western year---bearer determines the starting of the year from dusk; and the year---bearer to the south makes its days start at mid---night. Flores, Meza and Mora argue that this displacement of a quarter of a day each year solves the vague year problem by turning the cycle into a tropical year, since four quarter---days are included at the turn of four cycles of 365 days[1]. Following from this argument, by the end of four tropical years, the days counted would amount to 1461 (365.25 x 4), so in the Long Count the expression would be 1461 *k'in*.

[1] In their respective proposals, the authors do not regard the excess of 11 minutes every year---cycle.

## The *Haab'* as a Tropical Year

Since Autumn 2010 the author has been bringing into the academia a radically different proposal from what has been said: the *haab'* is mobile, a virtue that enables it to conmensurate a complete tropical year[2]. So this leads us to establish a rather strange convention: 365 k'in are equal to a tropical year. The concept of a leap day does not belong to Mesoamerica. Therefore the numerical expression for four tropical years in the Long Count is 1460 *k'in*[3]. This formulation has epistemological implications, in terms of our comprehension of the knowledge about time-space developed by cultures and civilizations in the vast territory of Mesoamerica, and also in terms of how they conceptualized it.

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[2] The mean tropical year which I am taking for the analysis is 365.24231 days; this is the number obtained by obtaining the value for year zero (365.24231), which is a rough value between the year 3000 BC and AD 2000 (see Meeus and Savoie, 1992:42).

[3] Sprajc (2001:145) argues that it is impossible that days may have been counted this way because then the Dresden Codex Venus Table –which, given its structure makes 584 *k'in* x 5 equal 365 *k'in* x 8 and 2920 *k'in* in order to recover Venus events every 8 years– would immediately become useless. Indeed, 365.2423 days x 8 = 2821.9385; on the other hand, 583.92 x 5 = 2919.6. After 8 days there is a negative difference of 2.33 days, that is, that after five synodic cycles any Venus event occurred two days before the annotated *haab'* date. But the table refers to dates around which the event may happen. In addition, the table has three dates close to each other for the starting of synodic cycles of Venus. For example, between 16 *Yaxk'in* on line 20, p. 49 and 4 *Yaxk'in* on line 14 p. 46, there is a difference of twelve days; and between this last one and 0 *Yaxk'in* there is a difference of four days. This means that it was foreseen that after five amounts of eight years –or 40 years– there would be a difference of 12 days (2.33 x 5 = 11.69). At that moment, the last visibility of morning Venus would not be expected on a 16 *Yaxk'in* date, but rather on a 4 *Yaxk'in*. Ten synodic cycles of Venus (or 16 years) later, the same event would not be expected on this last canonical date, but rather on 0 *Yaxk'in*, a date annotated on page 50 of the same codex. As we know, Venus can be seen some time after the 236 days (at least about 24 more days, until completing 260 days). So, if we are on 0 *Yaxk'in* and advance 8, 16, 24 or 32 years we can expect a last visibility of morning Venus until day 4 *Yaxk'in* and even until 16 *Yaxk'in* (236+16=249). Thus, based on different criteria –astronomic and augural– we can use some of these pre---established dates to expect a last visibility of morning Venus. In this way, the table is useful until 65 synodic cycles of Venus are completed. It is pertinent to mention here that the dates of the *haab'* are related to days of the *tzolk'in* that are ritually ideal for Venus in its different settings. Gibbs (1980:58) suggests that "the creator of the Venus table shows that he had a clear preference for these five days", so "the astronomical meaning of the dates…may be hidden under ritualistic interests." Hence, for instance, there are days as *Ajaw* and *Lamat* that are associated to relevant moments both for morning Venus (Dresden p.50, 47 and 49) as for evening Venus (p.47 and 49) (the same happens with *Kib', K'an* and *Eb'*); whereas other days are only referring the moment of evening rising; its crono---distance (of 90 *k'in*) since the last morning visibility is enough to ensure that the heliacal evening rising will be visible when the date arrives. I refer to days *Kimi*, *Oc, Etz'nab* and *Ik'*; in its recurring occurrence with number 9, *Ik'* is associated to Venus both in Maya territory (Temple XIX, Palenque –through Deity GI who, as I show in this paper is an advocacy of Venus) and in Central Mexico (known as 9 *Ehecatl*). In a nutshell, the Venus Table is perfectly useful when counting *k'in* as proposed here.

The most appropriate way to represent the completion of the 365 *k'in* cycle consists in enhancing, under a ritual format, the change of the year-bearer from east to north, from north to west, from west to south and back to east. The change in direction of the bearer enables integrating the additional quarter of a k'in in the apparent movement of Sun due to the Earh's translation movement.[4]

## A Simple Equation

The previous assertion[5] merges from a paradigm about Mesoamerican time---space conception insufficiently explored. As a numerical expression we have two equations: (a) and (b), both presented over two years ago in a specialized seminar:

(a) 365 *k'in* = 1 tropical year
(b) 13 *Bak'tun* = 5,182.76712 tropical years

Note that 13 *Bak'tun* ascends to 5,128 tropical years plus 280 days, thus differing from what has been established both by those arguing against the bissextile day and by who argue in favor. In either cases, 1'872,000 *k'in* = 5,125 tropical days plus 133 days.

## Venus and the Moon on 13 *Bak'tun*

What encouraged a further exploration was the astronomical fact that in 5,128.76712 tropical years there fit 63,433.980 Moon synodic cycles (29.530588 days each M.S.C.) and 3,208.0469 Venus synodic cycles (of 583.92 each) or 3,208 V.S.C. plus 27.39 days. In sum, when 13 *Bak'tun* is completed, 63,434 M.S.C. have occurred and Venus is back in virtually the same place in the sky –as

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[4] For this case I am providing a possible solution to the problem derived from the fact that the ritual represents the sum of all the daily advancements as if a quarter of a *k'in* had advanced when in fact it is a ¼ *k'in* minus a small fraction. During most of the *bak'tun* the *haab'* can start on the following *k'in* ritually without there being a noticeable error. But when the *bak'tun* is completed the accumulation of small fractions ascends to 72 hours and 20 minutes in our time scale (due to excess 11 minutes per year, hence 4339 minutes in 394.52 tropical years = 72.328 hours). This means that the ritual act of change in direction would have produced and excel of 3 *k'in*. This does not mean that, as the *haab'* were advancing excess time was being accumulated. No: rather, that is something happening only in the ritual realm, so it is only in that context, that the ritual acquires full sense. It is plausible that the falling of one of the five *bak'ab* that keep the world in order and that enable the advancing of cycles may have responded that need. With the falling of a deity that was holding the sky from its corner, the ritual change of a *haab'* from one direction to the next would become impossible. If in a tropical year the *haab'* bearer ritually advances ¼ *k'in* and in four tropical years it ritually advances 1 *k'in*, then in twelve tropical years the *haab'* ritually advances 3 *k'in*. Let there be an impediment for this ritual advancement of the *haab'* bearer for twelve consecutive years and the three *k'in* will become 'nullified'. On the thirteenth *haab'* the *bak'ab* would have to be ritually raised in order to let the *haab'* to keep counting its *k'in* from the moment of the day that follows from that of the *haab'* thirteen years ago.

[5] I only know of the work of an independent researcher, Francisco Miguel Ramírez Bautista, who proposes the same concept, as I came to hear at the Symposium Knórosov---Xcaret on November 21st, 2012.

long as the beginning of the 13 *Bak'tun* cycle did not start just before or around inferior conjunction. Considering how Mesoamerican cultures were following Venus and the Moon with such precision –as shown by the Mayan codex found by Förstemann (1906) in the Dresden Library in Germany– it would seem probable that both celestial bodies played a key role on Creation day, i.e., on 13.0.0.0.0, and that such dual event would have been recorded. If the corresponding data could now be recovered it would be simple to calculate when, at present time and around December 2012[6], Venus and the Moon would repeat, almost identically, respective acts. A thorough search for information regarding Venus's and Moon's position on Creation day in Maya epigraphy, produced four fine texts: three concerning Venus and one regarding the Moon. Venus's are: Dresden Codex p.51a (Figure 1); Passage 4 of the Tablet of the Cross, Palenque (Figure 2); and the jade mask (unknown provenance) of Deity GI which refers to the presence of this deity on Creation day. The one on the Moon is found in Cobá, Stela 1, where the Initial Series mentions that its age on 13.0.0.0.0 was 23 days.[7]

4 *Ajaw*

8 *Kumk'u*

12 *Lamat*

*Waxak k'in ti ha*

**Figure 1.** Extract from the opening text of the Eclipse Table, p.51a. Image from digital version at FAMSI website.

The translation of text on Dresden p.51a is "4 *Ajaw* 8 *Kumk'u*, 12 *Lamat*, 8 days since water". A semantic and semiotic analysis of this sentence requires considering that glyph *Lamat* symbolizes a star; in addition, date 12 *Lamat* appearing at the end of Eclipse Table (Dresden p.58b, see Figure 2) is associated to the personification of Venus, so it is probable that the analyzed text consists on the date on which Venus 'starred'.

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[6] Here I am taking December 2012 as if it was the approximate date for the closing of 13 *Bak'tun*, since I consider that the Goodman---Martínez---Thompson Correlation is the most acceptable among over a hundred 7roposals, due to its relative synchronicity with colonial dates.

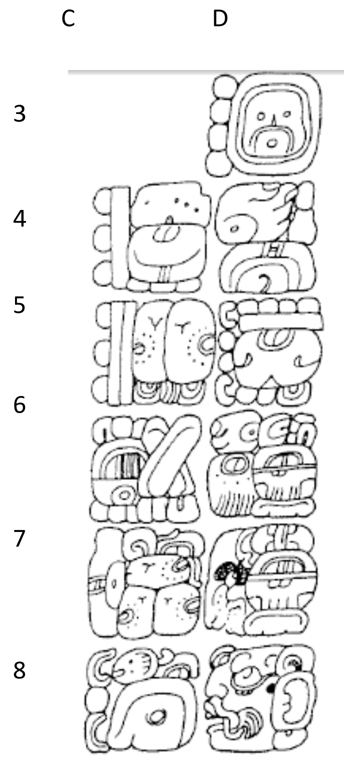
[8] Note that among Maya astronomers, the Moon age in days requires that days are counted since its first day of visibility in the west sky.

**Figure 2.** Extract from Dresden Codex, p. 58b, related to the last date of the Eclipse Table on 12 *Lamat*, with a Venus glyph between the shoulders and two eclipse symbols, one on each foot. They correspond to the Moon eclipse of February 788 and the Sun eclipse of March 788, happening while Venus was ending its trajectory as morning star.

Moreover, the water that is mentioned refers to the primordial waters on Creation day and so too to the marine horizon. Date 12 *Lamat* depicts that there is enough distance between the solar halo and the water horizon, so then the star can be seen. Knowing the synodic cycle of Venus, there are two possible interpretations for the first visibility event on 12 *Lamat*: one is that it corresponds to a heliacal rising of evening Venus and the other is that it concerns a heliacal rising of morning Venus. Next step is to determine whether the description refers to one or the other.

## Deity GI of Creation, a personification of Venus

The inscription in Passage 4, Tablet of the Cross, says, according to Stuart (2006): "542 days since 4 *Ajaw* 8 *Kumk'u*, when the hearth was changed (at) the Edge of the Sky, (at) the New Hearth? Place, then *Juun Y---e*? (proper name for Deity GI) descend(ed) from the sky" (Figure 3). A semiotic and semantic analysis of this phrase implied consulting at least two sources of information. One is astronomic (Aveni, cited by Gibbs, 1980:57), regarding the canonical periods of Venus (see Table 1). The other tells of the possible identity of Deity GI. Stuart (2005:161---3) explains that several authors consider that Deity GI may be linked to Venus because its date of birth is 9 *Ik'* (9 Wind) which in turn is the birth---date of Eécatl---Quetzalcóatl. But after a long note about this possible astronomical link, Stuart does not provide a concluding remark.




D3: *chan Ajaw*

C4: *waxak(---te') hulohl(?)*

D4: *tzutz---uy*

C5: *uxlajuun(---te') pik*

D5: *cha'---b'olon---winik---ij---iiy*

C6: *juun ha'b'(---iiy) jel(?)---(a)j---iiy*

D6: *k'oob' ti' chan*

C7: *yax? nal*

D7: *ehm(---ey) ta chan*

C8 : *Juun Y---e? ?*

**Figure 3.** Inscriptions in D5---D8, Passage 4, Tablet of the Cross, Palenque. Glyph drawings by Linda Schele in Stuart (2005:165, fig. 130); transliteration by Stuart (2006).

| Venus Events | Modern Observations |
|---|---|
| Visibility as morning star | 263 days |
| Day interval around superior conjunction | 50 days |
| Visibility as evening star | 263 days |
| Day interval around inferior conjunction | 8 days |

**Table 1.** Canonical periods of Venus. After Aveni, cited by Gibbs, 1980:57.

Passage 4 was analyzed in the supposition that Deity GI was a personification of Venus, a hypothesis that was strengthened upon identifying that the 542 days can be split into 8+263+8+263, all numbers concerning Venus, as seen in Table 1. Figure 4 shows a model of the circuit of Venus based on what is told both in Dresden p.51a and in Passage 4. On Creation day (13.0.0.0.0, 4 *Ajaw* 8 *Kumk'u*) Venus was eight days from emerging as evening star, at which time it made a first heliacal rising on 12 *Lamat* 16 *Kumk'u* (0.0.0.0.8). It remained in the evening sky for 263 days, after which it became invisible for 8 days around inferior conjunction and then rose as morning star, shining in the east sky for another 263 days. Only then (and exactly 542 days since Creation day) did it end its cycle as morning star, an act expressed as a 'descent'.

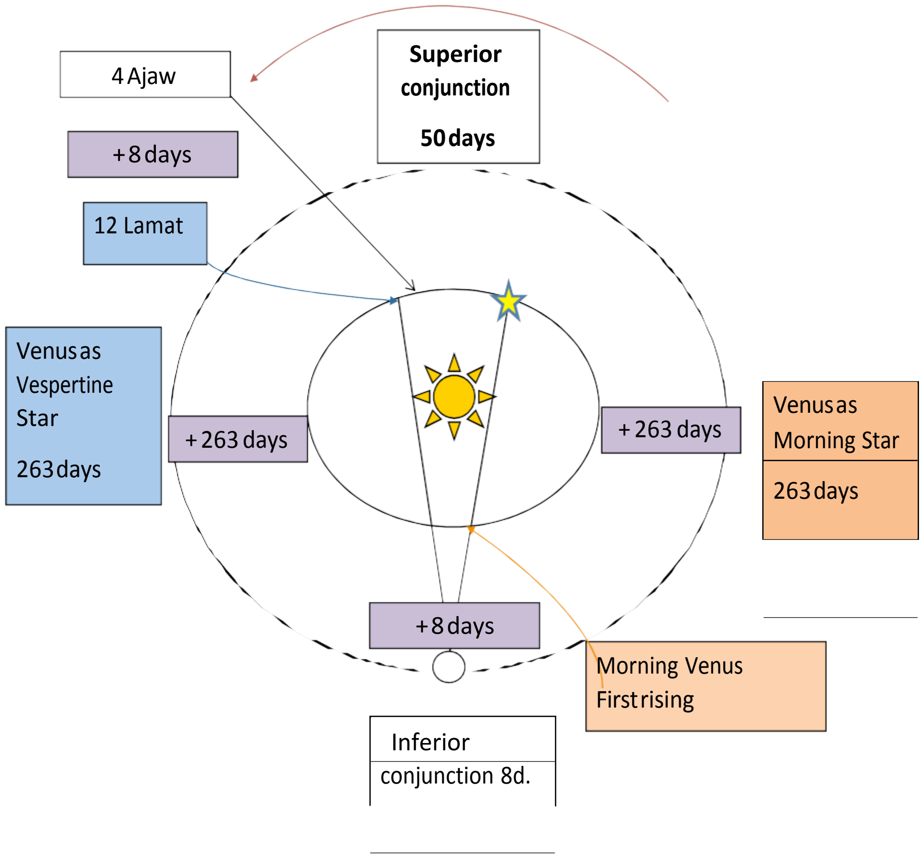



**Figure 4.** First 542 days of Venus as Deity GI. In purple, time lapse from one event to the next, i.e.: 8 days from 4 *Ajaw* to 12 *Lamat*, when it was visible for the first time in the evening sky; 263 days of visibility as evening star; 8 days of invisibility around inferior conjunction; 263 days of visibility as morning star, when it descended, as told in Passage 4 of the Tablet of the Cross, Palenque, referring to the personification of Venus *Juun ye ?* (proper name for Deity GI).

Such an exact fit between Venus's circuit since Creation day until completing its cycle as morning star, and the advancing of Deity GI from Creation Day until day 542, enables us to assert that GI is one of Venus's personifications. Even more: from that day, on 13 *Ik'* end of *Mol*, Passage 5 goes on to tell of the earth---touching of *Juun ye* ?(proper name for GI) happening one *bak'tun*, eighteen *k'atun*, three *tun*, twelve *winal* and zero *k'in* later. Precisely so, 275462 *k'in* after, or 764.6904 tropical years later, on 1.18.5.3.2, 9 *Ik'* 15 *Keh*, Venus was exactly on its first day of visibility as an evening star, the date being April 5, 2362 BC (fictitious Gregorian). Such event is possible only if no *k'in* are considered as leap days within that time lapse, and if the date from which to count the time lapse (i.e., 13 *Ik'* end of *Mol*) has Venus 'descending' as told on Passage 4.

### On 13.0.0.0.0, 4 *Ajaw* 3 *K'ank'in*, Venus and the Moon as on Creation Day

As shown above, the analysis of both hieroglyphic texts made it possible to identify Venus's position in its cycle on Creation day: it was eight days before first heliacal rising as evening star. Knowing that after 5128 years plus 280 days it would complete 3208 synodic cycles and 27 days, its position at the end of 13 *Bak'tun* would have to be 19 (27---8) days after its first heliacal rising in the evening sky. Also, by the end of 13 *Bakt'un* the Moon must be age 23 just as on Creation day, since after this long cycle it completes 63434 synodic cycles. I proceeded to search for a Venus---Moon event that would accomplish these two requirements on a date close to December 2012. By using Starry Night (MEADE) program, one can observe that on December 2012 Venus was still two months from ending its morning star phase. I advanced day by day until the next evening heliacal rising of Venus and until Moon was age 23 (counting days from its first visibility as mentioned above), and obtained a date: May 3, 2013. Given that the proposal states that the *haab'* is a tropical year cycle with no time---lag, then 3 *Kank'in* is always linked to May 3. When distributing all *haab'* dates throughout the Gregorian calendar based on that May 3---3 *K'ank'in* binding, I obtained 0 *Pop* = August 13. This result –a date of utter importance in archaeological sites (Galindo, 1994, 2007; Sprajc, 2010)– was, at that time of the research, revelatory and motivating.

What remained was to find Creation date. When retrospectively counting 5128 tropical years and yet another 280 days from May 3, 2013, one arrives at July 27, 3117 BC (on a fictitious Gregorian calendar), which is equivalent to August 21 ---3116 (Julian date). Venus was exactly eight days before first visibility as evening star, while the Moon was age 23. As can be noted at first glance, this date is three years earlier than the date agreed among Goodman (1906), Martínez (1926) and Thompson (1927). Of course, that difference is explained when considering all the *k'in* that were taken from the Long Count as if they were leap days belonging to leap years: a total of 1242 of them.

### Some tests on astronomical and colonial dates

Once having the two flanking Gregorian dates for cycle 13 *Bak'tun* (July 27, 3117BC and May 3, 2013), I proceeded to test two types of dates: 1) colonial and 2) astronomical. From the first group (colonial dates) three that have been used to support GMT 584 283 –the most accepted one: 12 *Kan* on 1553 after Landa (**date a**); the ending of *K'atun* 13 *Ajaw* on 11.16.0.0.0 (**date b**); and a date that Thompson (1935, p.59) refers for the beginning of *K'atun* 3 *Ajaw* in 1618 (**date c**).

From the second group dates belong to the Eclipse Table in the Dresden Codex, and to the Lunar series in a Lintel located in association with a small structure south of the Monjas complex, in Chichén Itzá (Grube *et al*., 2003). The first three base dates of the Eclipse Table were correlated: 9.16.4.10.8, 12 *Lamat* 1 *Muwan*, 9.16.4.11.3, 1 *Ak'bal* 16 *Muwan* and 9.16.4.11.18, 3 *Etz'nab* 11 *Pax*. The date on the Lintel, 10.2.0.1.9, 9 *Muluk* 7 *Sak*, and the corresponding moon age 5---K'AL---ji "25 days ago" were compared with the Gregorian date and the moon age on that day.

### How to use the proposed correlation

Briefly, I explain how to obtain a Long Count date in the Gregorian calendar and then provide the results for the dates being tested.
The proceeding is simple:

1. Sum up the total number of *k'in* expressed in *bak'tun* (x144000), *k'atun* (x7200), *tun* (x360), *winal* (x20) and *k'in* (x1)

2. Divide the total sum of *k'in* by 365 to obtain tropical years
3. Take note of the result, which is an expression of tropical years –to the fraction
4. Subtract 3117 from result in (3)
5. Add one year if surpassing year 1 BC
6. Convert fraction of tropical year obtained in (4) or (5) into *k'in* (fraction x 365)
7. Add days obtained in (6) to July 27
8. If the date arrived at in (7) is between January 1 and July 26, the resulting year date is the one after the Gregorian year obtained in (4) or (5)

**Results for the group of colonial dates**

**Date a**: August 5 (Julian) 1553. Commentary: Teeple (1931:105) says that the date provided by an acceptable correlation must be around 20 to 30 days from July 16 (Julian) 1553. This is 20 days ahead.

**Date b**: November 19 (Julian) 1539. Commentary: Teeple (1931:106) says that the date is November 3 (Julian) 1539, while Thompson (1935) comments that it must be on mid---November 1539.

**Date c**: October 25, 1618 (Gregorian). Commentary: Thompson (1935:59), based on notes written by Orbita and Fuenzalida, calculated that the event must have taken place towards the end of October 1618, in spite of the fact that with his correlation he obtains an incompatible date: September 20, 1618.

**Results for the group of astronomical dates**

a) Table of Eclipses

9.16.4.10.8, 12 *Lamat* 1 *Muwan* = May 21, AD 755: Sun eclipse

9.16.4.11.3, 1 *Ak'bal* 16 *Muwan* = June 5, AD 755: Moon eclipse, visible in Mesoamerica

9.16.4.11.18, 3 *Etz'nab* 11 *Pax* = June 20, AD 755: Sun eclipse, visible in Mesoamerica

Commentary: note that the dates are provided in the fictitious Gregorian Calendar, i.e., using dates of Gregorian Calendar, even though it did not exist at the time. For the referred year, the Julian date was four numerals before. On the Eclipse Table there is a window of three consecutive days in which the eclipse may occur, and the dates used for all calculations is the third day, so the Sun eclipse which happened on Julian date June 14, AD 755, fits within this range, since when adjusting to the Gregorian system (14 + 4 = 18) it becomes June 18, AD 755 = 1 *Kib* 9 *Pax*, two days before 3 *Etz'nab* 11 *Pax*.

b) Lunar Series of Lintel at Chichén Itzá

10.2.9.1.9, 9 *Muluk* 7 *Sak* = March 8, AD 878 (in the correlation here proposed)

“The Moon arrived 25 days ago” = 25 days (counted from the first day of visibility, with the correlation proposed here).

Commentary: the GMT correlation gives the Julian entry July 30, AD 878, with moon age 23.

## Is the *Haab’* the Basis for Chichén Itzá Alignments?

Sprajc (2009) argues that alignments of the main ceremonial and civic buildings of Maya architecture must have been sustained in cosmovision and religious aspects, and not solely in utilitarian aspects, such as taking records of the horizon---calendar for the benefit of agriculture. I consider that the *haab’,* in articulation with the *tzolk’in,* is a synthesis of cosmovision and time---space conception enabling the registration of cyclic and orderly celestial events which, according to a principle of equivalence, are believed to reverberate on the terrestrial level and beneath. Maya thought and action produced a ‘science---philosophy---religion---art---polity---way of production’ which we cannot arbitrarily split apart. Respecting and comprehending this interlocking enables to identify the *tzolk’in---haab’* as a lattice which, cycle after cycle, sets order in Maya thinking, feeling and making. This explains how hierophantic[8] dates in Chichén Itzá are in perfect agreement with the *haab’*.

| | | |
|---|---|---|
| *Pop* | August 13 – September 1 | Temple of the Jaguars<br>Alignment towards sunset |
| *Wo* | September 2 – 21 | |
| *Sip* | September 22 – October 11 | El Castillo<br>Alignment towards autumnal equinox |
| *Sotz’* | October 12 – 31 | |
| *Sek* | November 1 – 20 | Temple of the Jaguars<br>Alignment towards sunrise |
| *Xul* | November 21 – December 10 | |
| *Yaxk’in* | December 11 – 30 | |
| *Mol* | December 31 – January 19 | |
| *Ch’en* | January 20 – February 8 | |
| *Yax* | February 9 – 28 | Temple of the Jaguars +3d<br>Alignment towards sunrise |
| *Sak* | March 1 – 20 | |
| *Keh* | March 21 – April 9 | The Castle<br>Alignment towards vernal equinox |

[8] A hierophantic event is one consisting in the effect of light and shade produced by the setting of one or more bodies in relation to a shining body such as the Sun, and so it occurs in a particular solar date (better say, in two dates). It can also be appreciated by the effect of Full Moon in certain moments of a year, every eighteen years, i.e. within a Metonic cycle.

| | | |
|---|---|---|
| *Mak* | April 10 – 29 | |
| *K'ank'in* | April 30 – May 19 | Temple of the Jaguars<br>Alignment to Sunset |
| *Muwan* | May 20 – Junes 8 | El Castillo Bay + 3d<br>Zenithal passage in Chichén Itzá |
| *Pax* | June 9 – June 28 | |
| *K'ayab* | June 29 – July 18 | |
| *Kumk'u* | July 19 – 7 August | El Castillo Bay<br>Zenithal passage in Chichén Itzá |
| *Wayeb'* | August 8 – 12 | |

**Table 2.** Twenty---day intervals (*winal*) of the proposed *haab'* associated to hierophantic events in structures at Chichén Itzá. Note: colors link starting date of *winal* with the hierophantic event. Note: 'bay' is the space between two walls. Dates of hierophantic events were obtained from personal communication with several colleagues.

Six hierophantic events coincide with six starting dates of *winal* (twenty---day) periods according to the proposed *haab'* (see Table 2). Three matching events are observed in the Temple of the Jaguars: two sunsets on August 13 and April 30, plus a sunrise on November 1. Two matching events are given by the alignment of El Castillo towards Equinox dates September 22 and March 21. The sixth coinciding event is the one seen in the bay of El Castillo on July 19.

There are two more events with a three---day positive difference in relation to the starting date of the corresponding *winal*. One of them is the sunrise of February 12 observed from the Temple of Jaguars, when the *winal* starts on February 9. The other is the first zenithal passage of Chichén Itzá, which occurs on May 23, while the *winal* starts on May 20. This difference is totally acceptable if one considers the day interval in the *winal*, i.e., of twenty days. Only solar events separated by multiples of 20 days or by multiples of 20 days or by multiples of twenty plus five days –considering the *wayeb'* between August 8 and August 12, may be located in significant moments of the *winal* such as their respective starting dates.

It is well known that: between August 13 and April 30 there are thirteen *winal* (where Winter solstice is exactly in the middle); from August 13 to September 22 there is one *winal*; from August 13 to November 1 there are three *winal*; from August 13 to March 21 there are eleven *winal*; from March 21 to July 19 there are six winal; from August 13 to July 19 there are seventeen *winal*; from November 1 to March 21 there are seven *winal*; and from November 1 to July 19 there are thirteen *winal*. The dates taken here for calculating time intervals in function of the *winal* are those being emphasized in Chichén Itzá.

What calls our attention is that, at least for the monuments in Chichén here mentioned, it can be said that they express a synthesis of, and an articulation with, the *haab'* here proposed –a proposal which has resulted from an independent search route to elucidate the Long Count structure, and concomitantly, the *haab'* structure. If that was the calendar used by the Maya during all the Classic period and beyond, then it can be further understood why this site in Yucatán attracted so many people and personalities from very distant regions, as Grube *et al*. comment (2003).

## Conclusion

In conclusion, eight solar events in Chichén Itzá are articulated with eight starting dates of the *haab'* as conceived here: it is a calendar to measure a tropical year cycle which starts with 0 *Pop* on August 13. The proposed correlation, which is based on the Venus---Moon relation established both at the beginning and at the closing of 13 *Bak'tun*, is being further submitted to rigorous tests and the results shall be presented in a gradual form. The intention to share it is to motivate its use in, for instance, the reinterpretation of political events whose linkages to astronomical events had been thrust *par terre* when using the GMT correlation (in any of its variants).

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