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Correlation between the Mayan calendar and ours: Astronomy helps to answer why the most popular correlation (GMT) is wrong

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The Maya used their own very precise calendar. When transforming data from the Mayan calendar to ours, or vice versa, a surprisingly large uncertainty is found. The relationship between the two calendars has been investigated by many researchers during the last century and about 50 different values of the transformation coefficient, known as the *correlation*, have been deduced. They can differ by centuries, potentially yielding an incredibly large error in the relation of Mayan history to the history of other civilizations. The most frequently used correlation is the GMT one (of Goodman-Martínez-Thompson), based largely on historical evidence from colonial times. Astronomy (celestial mechanics) may resolve the problem of the correlation, provided that historians have correctly decoded the records of various astronomical phenomena discovered, namely, in one extremely important and rare Mayan book, the Dresden Codex (DC). This describes (among other matters) observations of various astronomical phenomena (eclipses, conjunctions, maximum elongations, heliacal aspects, etc), made by the Maya. Modern celestial mechanics enables us to compute exactly when the phenomena occurred in the sky for the given place on the Earth, even though far back in time. Here we check (by a completely independent method), confirming the value of the correlation obtained by Böhm & Böhm (1996, 1999). In view of these tests, we advocate rejecting the GMT correlation and replacing it by the Böhm's correlation. We also comment on the criticism of GMT by some investigators. The replacement of GMT by another correlation seems, however, unacceptable to many Mayanists, as they would need to rewrite the whole history of Mesoamerica. The history of the Maya would be – for example with Böhm's correlation – closer to our time by 104 years.

1 Introduction, the problem, and aim of this work

1.1 Introduction

The Maya had a very elaborate and accurate calendar, as is well known (see, e.g., Morley 1956; Thompson 1962; Knorozov 1963; Coe 1968, 1972; Ruz 1981; Santos 1981). Partly the so-called Long Count (LC) was used (with days counted from a selected "beginning of the world"), and partly the 260-day tzolkin (religious calendar). Also in use was a 365-day year (called a haab), a nine-day cycle and a 'katun cycle' of 93 600 days (consisting of 13 katuns, each of 7200 days). A katun contained twenty tuns, each 360 days long. Whether the Maya took this system from the Olmecs before them is not so important; the fact is that they developed it significantly (Drucker 1959; Palacios 1965; Wicke 1966; Bernal 1968; Coe 1968).

After the Spanish conquest (1521) very few written documents of Mayan culture survived. Those that did were in the form of hand-written folded books known as *codices*. Not all various "symbols" in them have been decoded, but the calendar system has been deciphered. The codices are named according to the place of their re-discovery for our civilization; thus, we have now the Dresden Codex (found in 1813), the Paris Codex (1859), the Codex of Madrid (1865), the Grolier Codex (1971) and the Prague-Liberec Codex (1956) (Villacorta & Carlos 1930; Knorozov 1963; Santos 1981; Loukotka 1956; Böhm & Böhm 2003).

The most important for our work is the Dresden Codex (DC), which could be called a "bible of Mayan astronomy". Already Förstemann (1880), Meinshausen (1913), Guthe (1921, 1932) or Spinden (1924) recognized that some data in the DC may contain astronomical information, namely tables of solar eclipses and of the visibility of Venus. Now we know that besides these there are tables with heliacal rises and settings of planets, their maximum elongations and conjunctions (probably even multiple conjunctions).

Other astronomical information is available from hieroglyphic texts (inscriptions) on monuments in temple cities (e.g. in Copán, Piedras Negras and Quiriguá about equino-

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