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# The Zenith Passage of the Sun at Candi Borobudur

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## Abstract

Here we discuss the link of the 72 stupas on the top platform of the Borobudur temple to the number of days between the solstice and the zenith passage of the sun. This link is strengthened by the recent find of an alignment of Borobudur and the satellites Mendut and Pawon temples, along the sunset azimuth on the day of zenith passage of the sun, proposed by G. Magli in arXiv.

In some previous papers [1-8], I have discussed alignments to sunrise/sunset azimuths on the days of the zenith passage of the sun, for architectural complexes in the tropical zone. In [1], I considered Sigiriya, the Lion Rock in Sri Lanka. I showed that the main axis of this archaeological complex is aligned along the sunset azimuth on the two days of zenith passage of the sun. Also in the case of the Buddhist complex of Sanchi [2], which is at the latitude of the Tropic of Cancer, we have an alignment along the sunset of the day of zenith passage, the summer solstice (the solstice alignment was found by Kameswara Rao [9]). At the Mesoamerican sites of Tula and Chichen Itza [8], again, we have alignments along the sunset azimuth of the zenith passage of the sun (the alignment of Chichen Itza is well-known and was discussed in [10,11]).

Of the temples of Sewu, Prambanan and Borobudur in Java, I wrote in [5-7]. In [5], it is discussed in particular the Sewu temple, an eighth century Buddhist temple complex of Java. The layout of the temple is a Mandala, oriented along the cardinal lines. Using ephemeris software, we can easily see that there is an alignment along the sunrise on the days of the zenith passage. Moreover, the temple has in the first and second rows of the Mandala a number of ancillary temples, seventy-two, which is also the even number of the days passing from the zenithal passage of October to the December solstice (inclusive of the mentioned days), and also from the December solstice to the zenithal passage on the end of February (or first of March).

The Sewu temple is predating the nearby Rara Jonggrang, simply known as Prambanan, by over 70 years and the Borobudur by about 37 years. Prior to the construction of these temples, probably the Sewu temple served as the main temple of the kingdom [12]. Since Candi Sewu was built before the other two temples, we can suppose that it was a model for them, in particular for what concerns the number of ancillary temples and stupas (in Java, "candi" means "temple").

Let us consider the Borobudur temple (Figure 1), one of the greatest Buddhist monuments in the world. "The temple consists of nine stacked platforms, six square and three circular, topped by a central dome. The temple is decorated with 2,672 relief panels and 504 Buddha statues. The central dome is surrounded by 72 Buddha statues, each seated inside a perforated stupa" [13]. In the Figure 1 (right panel), we can see the 72 stupas on the top platform of the temple.



Figure 1: Borobudur (left image, Courtesy Gunawan Kartapranata; right image, Courtesy Google Earth).

Again, we have the number 72; as we have previously told, this number is equal to the even number of the days passing from the zenithal passage in October to the December solstice, and from the December solstice to the zenithal passage on the end of February or first of March. In fact, in [6], I stressed the possibility that the number of the ancillary temples or stupas in the temples of Sewu, Prambana and Borobudur, had a calendrical link to the path of the sun.

In [13], where the Candi Borobudur is discussed, we can find another important evidence for the link of the 72 stupas to the zenith of the sun. The link is concerning the mudras of the statues of Buddha. "At first glance, all the Buddha statues appear similar, but there is a subtle difference between them in the mudras, or the position of the hands. There are five groups of mudra: North, East, South, West and Zenith, which represent the five cardinal compass points according to Mahayana. The first four balustrades have the first four mudras: North, East, South and West, of which the Buddha statues that face one compass direction have the corresponding mudra. Buddha statues at the fifth balustrades and inside the 72 stupas on the top platform have the same mudra: Zenith. Each mudra represents one of the Five Dhyani Buddhas; each has its own symbolism" [13].

Another link to the zenith passage of the sun is an alignment of three temples, Borobudur and the satellites Mendut and Pawon temples, along the sunset azimuth on the days of zenithal sun, alignment proposed by G. Magli in arXiv [14]. In [13], we read that "During the restoration in the early 20th century, it was discovered that three Buddhist temples in the region, Borobudur, Pawon and Mendut, are positioned along a straight line. A ritual

relationship between the three temples must have existed, although the exact ritual process is unknown". In [14], G. Magli has proposed that the line indicated the azimuth of the sunset on the days of zenithal sun (let us note that, for the line of the three temples, an alignment along sunrise was proposed too in [15]). It is easy to test the alignment proposed by Magli using software such as SunCalc.org for instance. Using date 12 October, as in [6], we can see the alignment as in the Figure 2. Actually, SunCalc.org and the Photographer's Ephemeris give this day for the zenith passage.



Figure 2: The alignment of the three temples along the sunset on a day of zenith passage of the sun, obtained by means of SunCalc.org.

For what concerns the architecture of Borobudur, let me add to the references also the very interesting article [16] on the algorithm used for building the temple.

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