A Prehistoric Solar Observatory in the Middle of Sahara Desert

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Abstract

The prehistoric stone funerary monuments of the Sahara desert, distributed in a huge geographical area, had been created in several different shapes. Some of them have a design that looks like a keyhole, and therefore are known as keyhole tombs. Since they are facing the sunrise, these tombs were also considered as places for the worship of the sun. In this paper, we show that one of them, in Algeria, has two radial lines oriented with the sunrise azimuths of winter and summer solstices. This monument is then a prehistoric solar observatory in the middle of Sahara.
Keywords: Solar Observatories, Solar Orientation, Satellite Images, Google Earth, Sollumis.com, GIS, Archaeoastronomy, Archaeology.

Introduction

All around the world, the prehistoric cultures have created monuments the existence of which has led to several speculations about their origins and purposes. Some symbolic elements, added by ancient people in the planning of these structures, can help us in understanding their purposes. Several alignments made of stones, for instance, are oriented to the sunrise and then we can guess that these stone structures were used for the worship of the sun such as some stone circles, the most famous of which being Stonehenge, the prehistoric monument of England. Some stone alignments and circles of the Syrian Desert seem to have a solar orientation too [1,2].

In references [1] and [2], we have used Google Earth for a survey of the prehistoric sites of the Syrian Desert. In fact, where vegetation is lacking such as in deserts or in areas where forest canopy had been removed, the remote sensing is quite suitable to investigate ancient structures and their planning. When the satellite images are showing alignments, straight lines or lines radiating from a center, we can use software, such as that provided by sollumis.com, to compare them to the directions of sunrise and sunset. Sollumis.com is giving the direction and high of the sun throughout any day of the year, working on a Google Map. The use of these two GIS (geographic information) systems, Google Earth and sollumis.com, was applied in [1] to investigate the stone circles of the Syrian Desert: of course, it can be applied to any sort of monument. In this paper, we will use them again, to study a prehistoric monument located in the middle of Sahara desert, in the province of Illizi, the southeastern corner of Algeria. This is one of the countless prehistoric stone funerary monuments of Sahara.

The prehistoric Saharan monuments can have several different shapes; several are showing a design that looks like a keyhole (Figure 1), and therefore are known as keyhole tombs (monuments en trou de serrure, in French). These structures consist of mounds surrounded by a circular stone enclosure having inside another stone circle, and a pathway crossing them.The keyhole tombs had also been proposed as places for the worship of the sun [3,4], due to the alignment of their pathway towards the sunrise. Here, using the sollumis.com software, we show that one of these keyhole structures has its stone lines aligned along the azimuths of sunrise on the solstices. For this reason, this monument could be considered a prehistoric solar observatory too.

Figure 1: A keyhole tomb (trou de serrure, in French). Courtesy: Google Earth.

Using Google Earth and sollumis.com

It is evident that satellites improved the aerial archaeology, the archaeology which is studying the ancient remains by surveying them from some altitude. A high viewpoint permits a better appreciation of large sites; in this manner, they can be viewed in their entirety and within their landscape. Early investigations of aerial archaeology were made using hot air balloons; after, airplanes were used, with the support of aerial photography. Today, we have satellite images, often with the required high resolution, freely available in GIS software such as Google Earth. These systems allow making a remote survey of regions the total coverages of which by photographic images were impossible, or permit the study of areas which are unreachable for several reasons. In the case of Sahara, we have huge parts of it that can be the subject of a satellite archaeological investigation, because, among the collected images of Google Earth for instance, there are large bands with high resolution [5,6]. An example of such work is shown in the Figure 2; the image gives the result of a preliminary survey we made of the province of Illizi, Algeria, with pins indicating the positions of keyhole tombs. A detail of this area is shown in Fig.3. In fact, with Google Earth, it is possible to mark the places concerning the specific research we are making; then the list of the placemarks can be used to create a KML file.

Figure 2: The region of Algeria where we find the prehistoric keyhole monuments. The placemarks, more than a hundred, are indicating their positions. Note the bands having a high resolution.

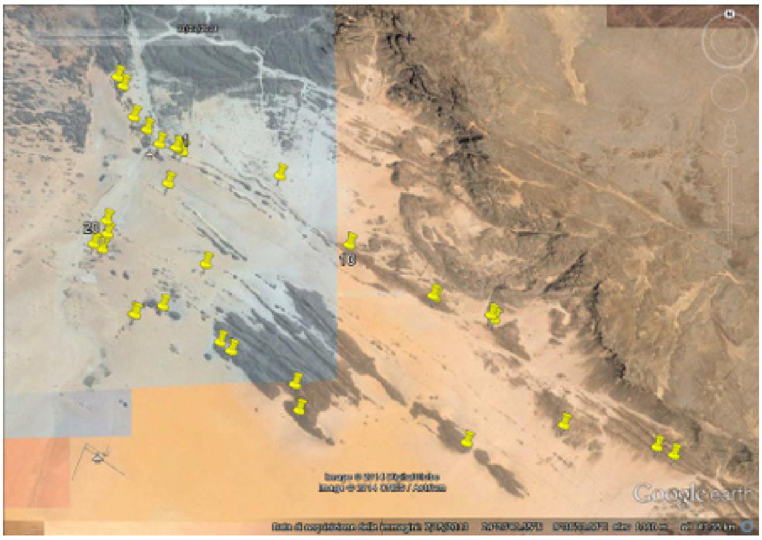

Figure 3: A detail of the region south of Djanet, Algeria.

In the Figure 2, we can see the placemarks of about a hundred of keyhole tombs. However, the number of these monuments is quite larger. As told in [6], some researchers, using Google Earth, were able to increase the collection of the 158 monuments recorded in 1966 to around 435 in 2007 and then to more than 600 in 2009. Therefore, although the bands of high resolution are often irregularly arranged, these remote explorations can greatly enrich the archaeological databases of Sahara, allowing a statistical approach to the distribution of ancient monuments [6].

If we find an interesting site in the Google Earth images and its planning is showing some peculiar alignment, it is possible the site has a solar alignment. We can verify it at http://www.sollumis.com/, a site which is giving a model of the sunlight direction on any day of the year and at any location of the world. A polar diagram, overlaying a satellite map, shows the direction and height (altitude) of the sun throughout the day. Thicker and shorter lines mean the sun is higher in the sky. Longer and thinner lines mean the sun is closer to the horizon. Sollumis.com software had been used for several monuments (see [7] for instance, and references therein).

Keyhole monuments

Several pre-Islamic funerary and religious monuments are visible in the Google Earth satellite images of North Africa. The time span of these monuments is extremely wide, from Neolithic up to Arabic invasion. However, as remarked in [4], we find enduring patterns in the orientations of these monuments, most likely related to the ritual and symbolic importance of the rising sun. These patterns are confirming the solar aspect of the North African religion indicated by some ancient writers [4].

Figure 4: Keyhole tombs near Djanet, Algeria.

Today, Tuareg call the prehistoric funerary monuments of the Sahara, which can have different forms, with the general term of ‘idenan’ (sing. adebni, [8]). The earliest type of adebni is the ‘keyhole’ monument. Radiocarbon dates those in Niger from 3600 to 220 BCE [4]. As already observed by the early European visitors, a large number of idenan had their main distinctive elements facing the rising sun. Actually, in 1966 [9], archaeologists obtained that the orientations of 158 keyhole monuments in Fadnoun (Algeria) lie in the azimuth range of the sunrise. A similar result was obtained for the corridors of some keyhole monuments at Emi Lulu, Niger [4].

Another relevant type of dry stone prehistoric burial place is the so-called V-shape monument, which is a tumulus having two lines or arms of stones – the antennae – that are some tens of meters long [4]. The earliest examples of this kind of stone structure are dated about 3200–2900 BCE. Again, the analysis of the V-shape idenan in Tassili is showing that their antennae are towards the rising sun [4]. Several of these monuments are located in the middle of the wonderful landscape of Tassili: an Italian writer and explorer, who loved and visited several times this part of Sahara, Cino Boccazzi (1916 – 2009), defined them the “stone flying swallows” of Amguid [10].

Other types of Saharan stone burials are the ‘crescent’ mounds, the ‘crater’ tumuli and the ‘mounds with an alignment’, which are ranging from 1900 BCE to the beginning of the local Islamic culture: inside them, the bodies have head or face oriented eastward [4]. In the Figure 5, we can see different types of monuments in the same landscape. Other kinds of monuments exist as reported in [4].

Figure 5: A landscape with keyhole, crater and crescent mounds. Courtesy: Google Earth.

A solar observatory

If we observe the keyhole tombs with Google Earth, we see that they have a long pathway generally aligned toward the rising sun. As previously told, this caused these structures to be considered places for a solar worship too [3]. Let us concentrate on a specific monument, which could be an example of a peculiar kind of keyhole monument. It is located in the most populated left band of Figure 2; we can see it in the Figure 6. Note the two lines radiating from the center of the inner circle. This is a structure, resembling some of the Syrian Desert, on which we can apply the sollumis.com software. Using it we can see the directions of sunrise on the winter and summer solstices (Figure 7). We find that the two lines radiating from the center of the inner circle have the directions of these sunrises. Of course, it is necessary to observe that the actual direction of sunrise could be slightly different, for a possible inclination of the ground. In any case, this monument is peculiar because it is precisely oriented eastwards. If we imagine the ancient local population using this monument to view the motion of the sun during the year, this site can be considered a solar observatory too, a sort of 'Stonehenge' in the middle of Sahara.

Figure 6: A keyhole monument province of the Illizi province, Algeria. Note the two lines radiating from the center of the inner circle.

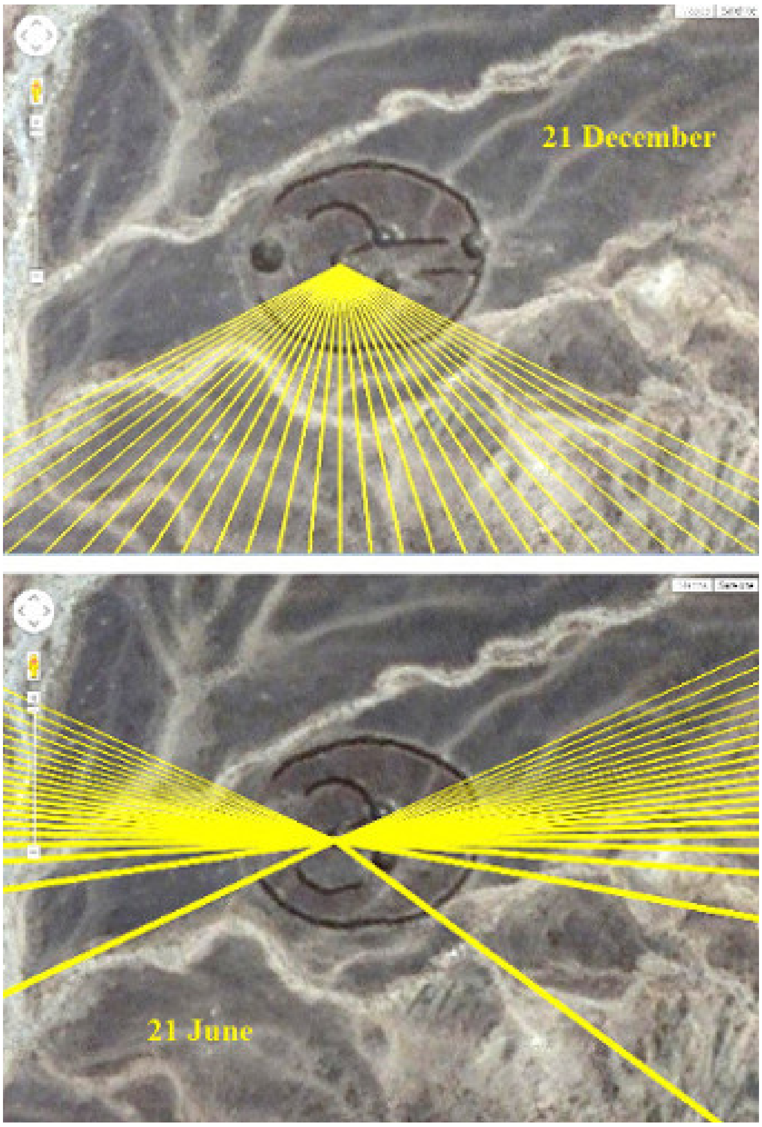

Figure 7: Using sollumis.com, we can see the sunrise azimuths on solstices. Note that the two lines radiating from the center of the inner circle correspond to the directions of these azimuths.

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The region where we can find key-hole tombs is largest that than shown in the Figure 2. Gregory Fegel, an independent researcher and writer living in the United States, discovered five key-hole tombs, located to the east and southeast of Idared village, Illizi Provice. Here in the following, the locations of these tombs and some Fegel's observations.

Keyhole tomb 1 (25 degrees 20'02.28",8 degrees 35'45.64"). This ellipse-shaped keyhole tomb has four small circular structures located in close proximity to it;
Keyhole tomb 2 (25 degrees 20'05.04", 8 degrees 35'54.45");
Keyhole tomb 3 (25 degrees 19'58.11", 8 degrees 39'07.91"). This is a circular keyhole tomb. Approximately 300 meters due west are two additional circular forms, which might, or might not, be man-made;
Keyhole tomb 4 (25 degrees 18' 06.00", 8 degrees 33' 32.50");
Keyhole tomb 5 (25 degrees 21' 04.54", 8 degrees 30' 52.42").
As Fegel observed in his e-mail (sent me via Academia.edu on April 29,2016), these five tombs have the two parallel lines of their key-hole design which are pointing toward the east.
Fegel had also discovered in this area a very interesting crater-like structure (25 degrees 18' 37.05", 8 degrees 30' 15.00"), about 400 meters in diameter. In his e-mail, Fegel remarks the absence of any paleo-stream-bed intersecting this structure, and therefore he is suggesting this crater might be an impact crater, and not the result of erosion. Gregory Fegel will post a detailed report of his discovery on Academia.edu

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