The solution to Fermi's paradox

Abstract

This paper is the thirteenth in a series of research papers which investigate an astronomy based solution to the architecture of the Pyramids on the Giza plateau. Throughout the content of the previous twelve papers is has been clear that the level of knowledge required for the creation of the constructed system that has been identified within the pyramids and surrounding monuments is technologically advanced. However, the subtlety within the design system is such that the solutions are often obscure because they use techniques such as optical forced perspective, unique measurement units and deliberately ambiguous architecture.

In this paper, which explores the continuation of the geodesic geometry well beyond the confines of the Giza plateau, the architectural design transforms from being obscure to being explicit and therefore allows this paper to have the title which it does, because the evidence of a source of technologically advanced life existing off the planet, and which is interacting with us, is overwhelming.

A model of the Moon, 13km in diameter, is identified 1200 km to the west of Giza in the Libyan desert upon which the NASA Apollo 11 landing site is etched into the desert floor using a geometric clock face to specify the landing time of the craft. The moon model is shown to be constructed around a central temple-like building which is shown, from the analysis of satellite photography, to have been built in 2007. It is further shown that this model of the Moon is connected to a 1:300 scaled model of the Earth which sits over Cairo and which is accurately positioned through geodesic geometric alignment to the ancient temples, pyramids and obelisks which stretch from Alexandria on the north coast of Egypt down to Abusir just south of Giza. The axis of the Moon model is shown to be aligned to an artificial marker point which has been digitally superimposed onto one of the commercial satellite images. This shows that contemporary editing of the digital data on our secure computer servers, or on the transmission link between the satellites and those servers, is taking place in real time from off the planet.

The two principal alignment points of the Earth model, those being the obelisks in Alexandria known as 'Cleopatra's Needles' and the Sun Temples of northern Abusir, are shown to have numerically interchangeable latitude and longitudes on the GPS reference frame and therefore it is concluded that the ancient structures that were built some 4750 years ago are aligned to our modern day GPS satellite signals. The manner in which this was achieved is not known, but it is hypothesised that the only reasonable solution to this phenomenon is that electromagnetic waves, as well as propagating through space, must also propagate backwards through time in order for this longitude and latitude numerical reversal to be possible.

ISBN 978-1-7398691-4-4



www.giza-pyramids.com

M

The Great Pyramid papers

Copyright 2023 Stephen Brabin, all rights reserved

The right of Stephen Brabin to be identified as the author of this workhas been asserted by him in accordance with the Copyright, Designs and Patents Act of 1998

All rights reserved. No part of this publication may reproduced, stored in or introduced into a retrieval system, or transmitted , in any form, or by any means, (electronic, mechanical, photocopying, recording or otherwise) without the prior written permission of the author. Any person who does any unauthorised act to this publication may be liable to criminal prosecution and civil claims for damages.

The solution to Fermi's paradox

Introduction

In the previous paper in this series[1] the reasoning behind the layout of the buildings on the Giza plateau and at Zawiyet El-Aryan 3km south of Giza was determined. Among the fascinating details contained within the architecture was the fact that the Earth's prime meridian was defined on the plateau in three distinct formats. The average year of 365.25 days that is used for calendars and time keeping runs through the N.W. corner of the Great Pyramid, the long term average of the sidereal year of 365.2422 days runs through the rear of the main Sphinx statute, and the sidereal year length of 2729 BCE is marked out between the paws of the Sphinx and is 365.2416 days.

There is a further year length that is missing from this list and that is the instantaneous value of the sidereal year length at the moment of the winter solstice in 2729 BCE. This is a standard term used in astronomy to express the velocity of the planet at any given moment in time. Rather than describe the velocity in km/s, it is much easier to understand when it is expressed as the year length that the planet would have if it were to continue rotating around the Sun at its measured instantaneous angular velocity. For the model of the Earth in Giza to be of any practical use then this value must be written into the architecture of the system.

The same is true of the orbit of the Moon. In the previous paper the model of the moon at a 1:87500 scale was proven to be at the Unfinished Pyramid in Zawiyet El-Aryan and from using the world grid system[2] to determine the distance back to the Earth model in Giza it was established that the moon model was built at the scaled distance of its average apogee. The moon also needs to have its instantaneous orbital parameters determined from the system's architecture and therefore there must also be a measure of the orbital period of the moon at the instant of the 2729 BCE winter solstice somewhere in the architecture.

The content of this paper concerns the identification of these values all of which are marked on the ground to the west of Giza. The first section of the paper involves the identification of the instantaneous sidereal year length of the Earth, in the second section the corresponding value for the Moon is determined and is shown to be linked to the Earth value, and in the third section a massive model of the Moon is identified in the Libyan desert containing the most extraordinary details etched into the desert floor. The fourth section of the paper details a 1:300 model of the Earth that is located around Cairo and which is positioned relative to the model of the Moon by the correct astronomical distance, scaled by the same factor. The final part of the paper details how the monuments and obelisks around Cairo all link in to the Earth model and define its position through triangulation.

The content of this paper is the solution to a puzzle that was laid out 4750 years ago and one of the intrinsic parts of that puzzle is its lack of brevity.

As each piece of the puzzle is solved the thread of logic that runs through the puzzle becomes longer with the presumed intention of making the puzzle solver give up the pursuit of the work. It is worth bearing this in mind when reading this paper because the paper's structure and length is dictated by the puzzle's format and cannot be presented in a way that is more compact.

Finding the year length markers

In a previous paper[1] in this series it has been established that there is a model of the solar system on the north wall of the lower chamber of the Great Pyramid of Giza and it was shown that the invariable plane construction line on that map has been modeled from the Wall of the Crow on the Giza plateau, to a point in 1700 km away in Sicily. In the papers prior to that it was established that the Great Pyramid contains a model of the Earth. Both the invariable plane construction line, which has a length equal to the long term average aphelion distance of the Earth in its orbit, and the Earth model have been constructed to a scale to 1:87500. These two parts of the solar system map that are present on the wall are shown on diagram M0 in green and the parts of the map which have not yet been associated with ground features are shown in white.

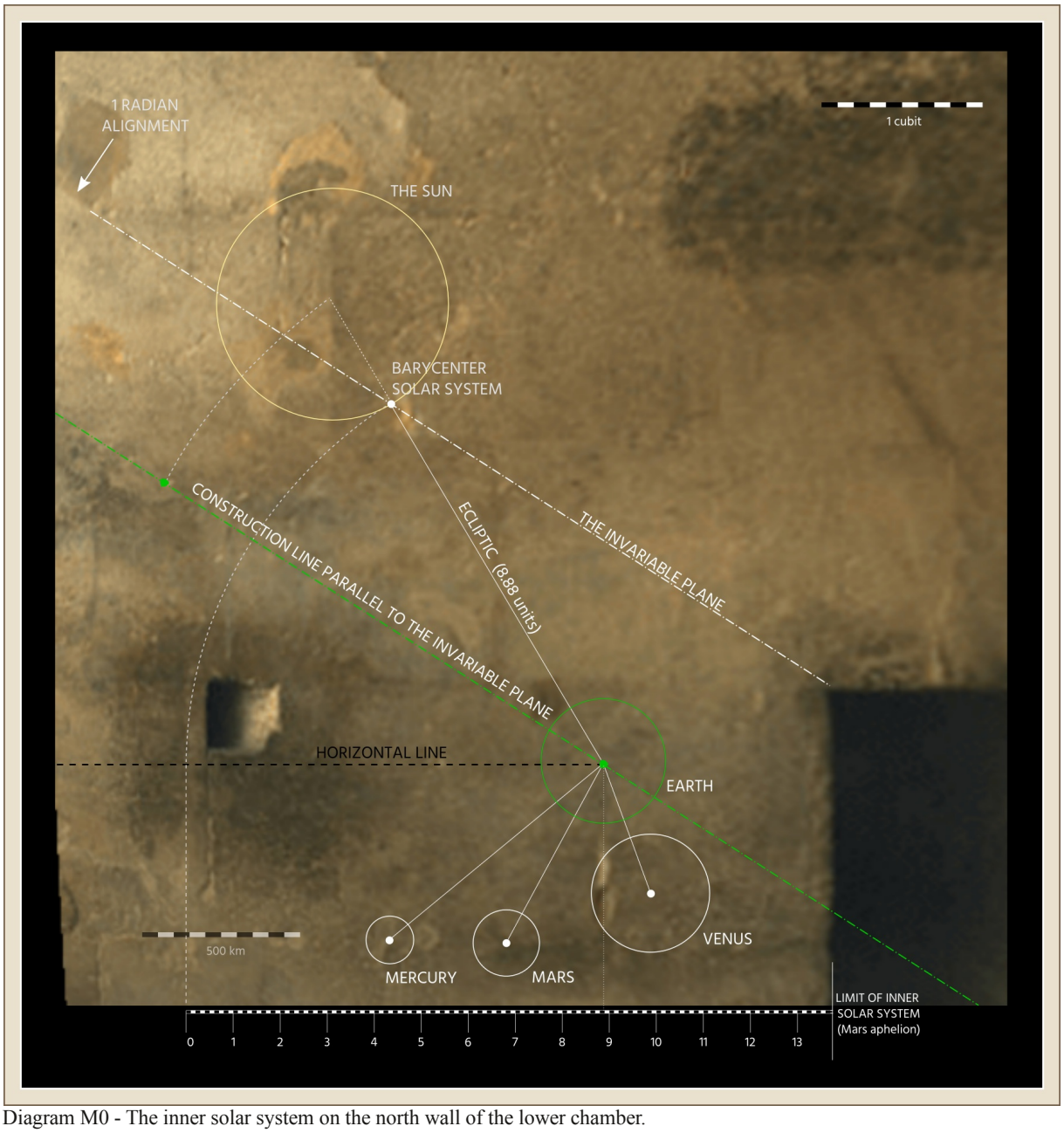


Diagram M0 - The inner solar system on the north wall of the lower chamber.

Because the invariable plane line has been ground mapped on the planet and both ends of it have been correctly identified, it is possible to take a map of the land masses of Earth from a GIS mapping system such as 'Google Earth' or 'NASA Worldwind' in Mercador projection and overlay it upon the wall map so that the ground end points of the construction line align with the points on the wall map. By doing so it is then possible so get a first impression of where the planets of the solar system on the wall map lie in relation to the land masses. This wall overlay is shown in diagram M1 where the ground image is shown as a transparency laid onto the wall.

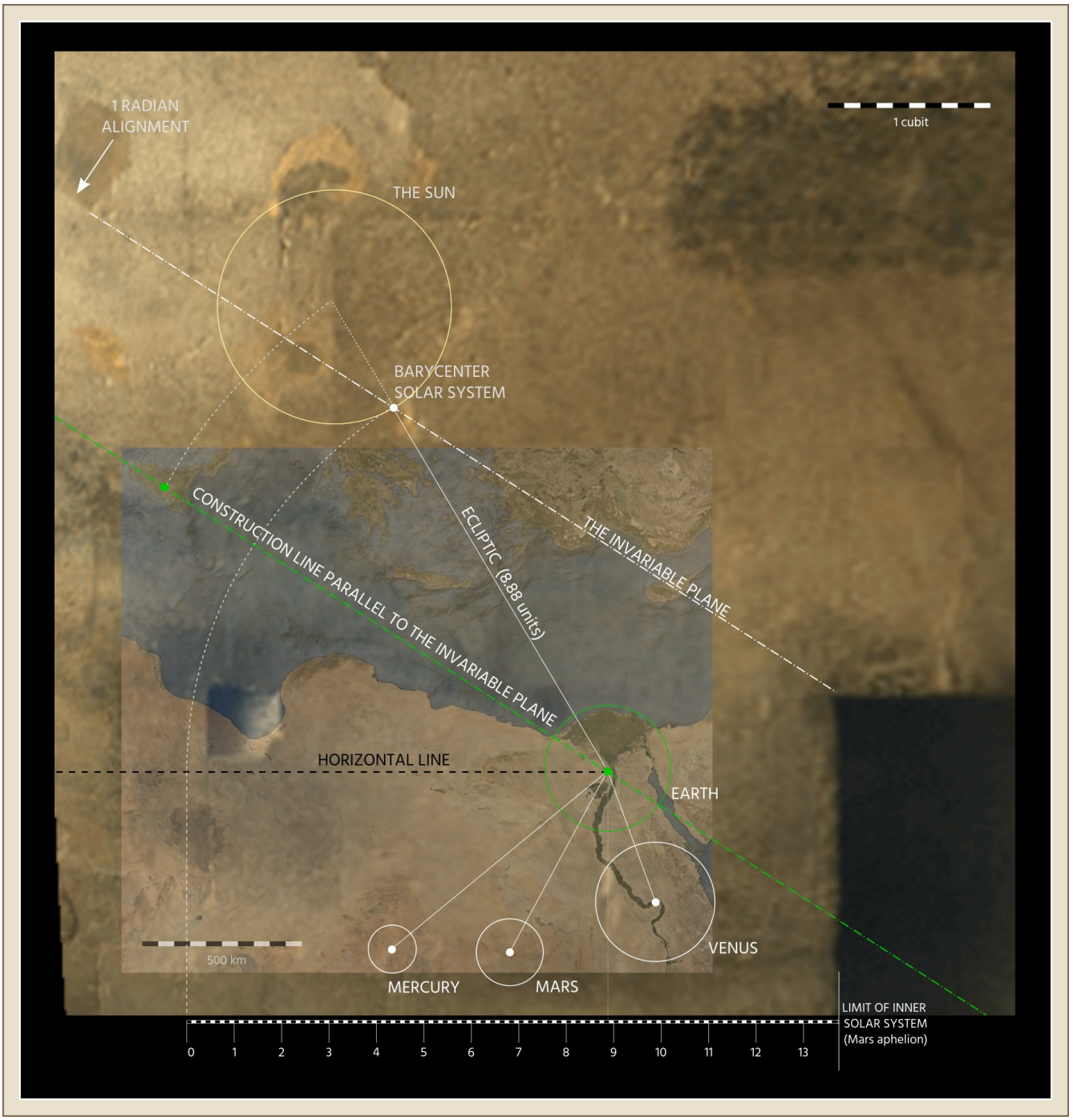


Diagram M1 - The inner solar system map with the Earth's land masses superimposed.

The locations of the planets were documented in the previous paper[2] as being positioned proportional to their orbital angle to the invariable plane of the solar system. By using this alignment system it is possible to find the structures on the ground that relate to the positions of Venus and Mercury quite quickly and these are documented in subsequent papers in this series.

However there is no structure of any sort near the map position of Mars, and it is only after further investigation that the reason for this can be resolved. There is a numerical coincidence that appears to have been deliberately written in to the puzzle where the angles of Venus and Mercury to the construction line on the wall are almost identical to the angles that are obtained if a different system is used in which the 1:87500 scaled distances of each planet from Earth are the starting parameters and are mapped out onto a spiral at a ratio of 365.25 perfect kilometers per radian from east. Using this system all three of the inner solar system planet's ground structures can be identified.

Before looking at each of the planet's locations in the coming papers, it is worth summarising the system that will be used for positioning the planet locations on the ground, so that it is clear at the outset.

In the ground mapping the method of positioning the planets is as follows.

1. Position the Earth at the vertical center of the Great Pyramid of Giza.
2. Define the Earth as being at its winter solstice position in 2729 BCE.
3. For each of the planets, use modern data to determine the average distance of the planet from the Sun at its apsis, either perihelion or aphelion as specified on the wall map.
4. Calculate the distance between the apsis and the position of the Earth at winter solstice.
5. Scale this astronomical distance down at a scale of 87500:1.
6. Using East as a reference direction, determine the angle at which the planet can be found relative to the Giza survey start point, WOCC, using 365.25 pkm/radian as the rotation factor.
7. Determine the ground construction that represents the planet.

Much of the accurate data to carry out the above steps is already available from the architecture and documented in the previous papers in this series. However there is one crucial piece of information which is not, and that is the direction of East in the year 2729 BCE relative to the current direction of East.

Because of the tectonic plate movement of the African plate, which may include some rotation as well as translation, there is currently no way of knowing exactly where ground-mapped East was located in 2729 BCE. If the astronomical data that is going to be obtained from the planet's ground locations is going to be of use, there must be a way within the architectural design to determine the original position of the east-west axis line that runs through the center of the point WOCC at the Wall of the Crow from which all angular measures in North Africa will be taken.

As a concept, if each of the planets' ground constructions has an angular location relative to East that is determined from its distance from Giza, and if one were to place a monument every 100 km for example, then the locations of these points would form a spiral that starts in an easterly direction at Giza and then sweeps in a clockwise direction. Diagram M2 shows exactly this concept with the planet locations shown, the spiral onto which they should fall and the north wall of the lower chamber shown behind the ground map.

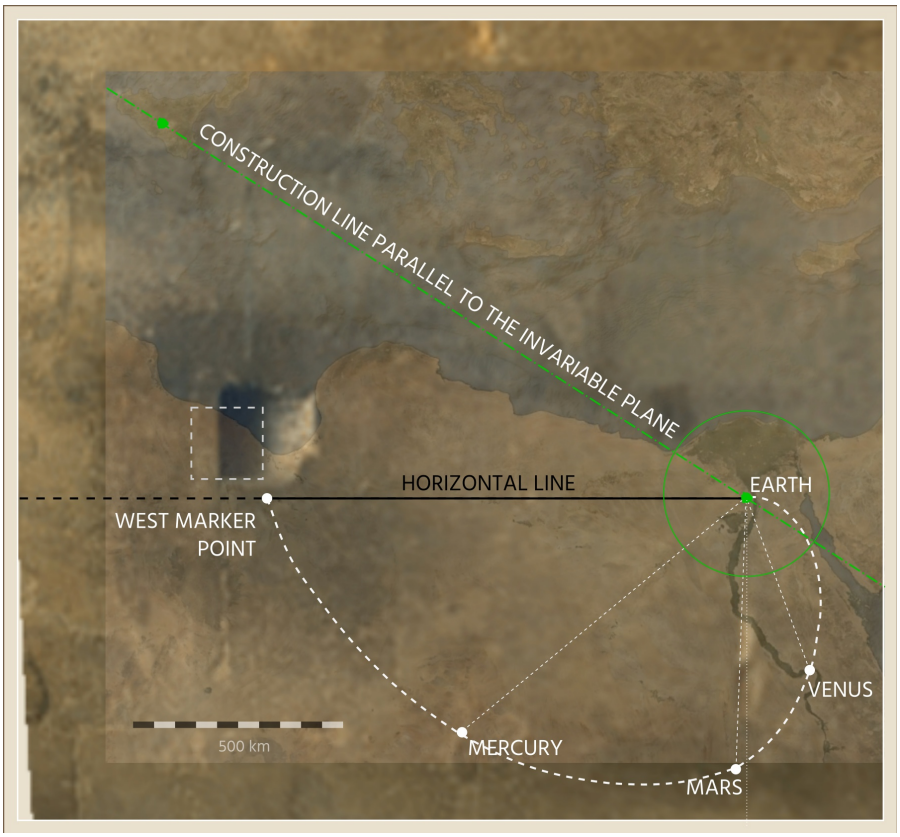


Diagram M2 - The planet alignment spiral and the west marker point.

The reason that the north wall of the chamber has been included on diagram M2 is that the horizontal line on the wall which starts at Giza (which when mapped onto the ground is pointing due West at Giza) intersects with the spiral directly below the east wall of the inner section of the lower northern shaft, which is shown by the dotted rectangle.

On diagram M2 the position of Mars has been changed from its position on the wall map so that it conforms with the 365.25 pkm / radian construction system. The spiral on which the planets should be located has been drawn for illustrative purposes and is not a perfect mathematical construction.

The ground location of the west marker point can be determined because the horizontal line has been rotated 180 degrees or pi radians from east, and therefore the marker point is pi x 365.25 pkm in distance from the Wall of the Crow, or 1147.767 pkm. This value can be converted into metric measure as 1147.692 km and the latitude and longitude of the west marker point determined using a geodesic bearing calculator.

Point WOCC (**2729 BCE**)	latitude	29.971475	N	degrees
	longitude	31.139176	E	degrees
Azimuth		270		degrees
Distance		1147.692		km
West marker point (2018)	latitude	29.437589	N	degrees
	longitude	19.289770	E	degrees

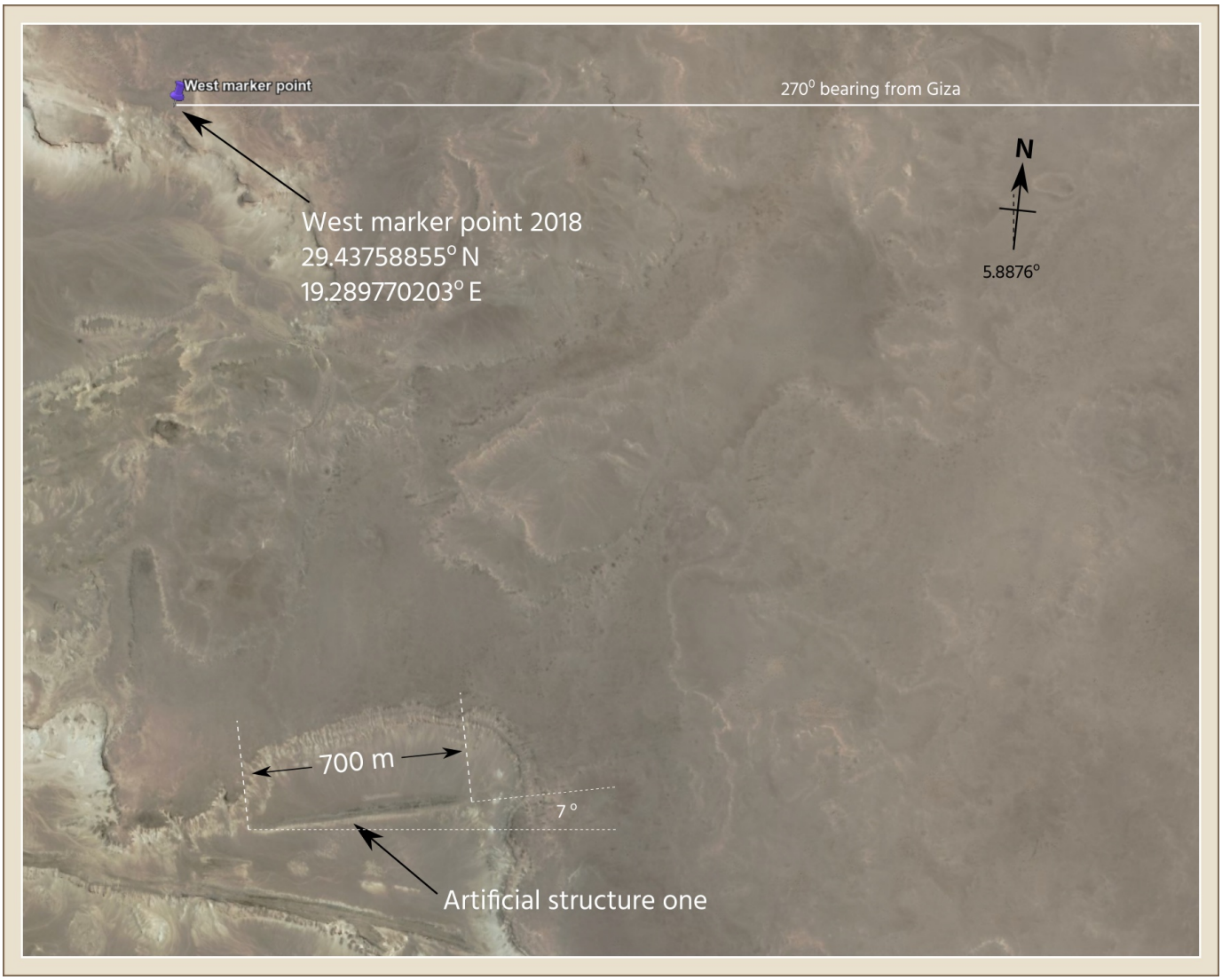


Diagram M3 - The west marker point of the survey base point on the Wall of the Crow.

The west marker point location is shown in diagram M3 at the top left of the diagram and is labeled as the west marker point 2018 because it is drawn on top of the satellite image that has been geo-referenced to current ground locations and because of the manner in which the point was calculated. The calculation has been started at the survey base point WOCC 2729 BCE latitude, the distance and bearing to the west marker point calculated, and *then* the both end points shifted north to account for tectonic plate movement involved. If the same calculation is performed starting with the 2018 survey base point, a westerly error for the location of the marker point of 82 m is introduced into the system.

The orientation of the satellite image relative to North in the diagram is important in the analysis of the architect's design system, and the satellite image in diagram M3 was obtained from the mapping software in the following manner. The map was zoomed in on the start of the line at the Wall of the Crow and the line start point positioned at the survey base point. Importantly the mapping software was adjusted at this juncture so that North in Giza was parallel to the side of the screen. The image was then zoomed out and *panned* to the left and zoomed in again on the west marker point, producing the white line on the diagram. This method preserves the easterly bearing of the image at Giza (the forward azimuth) on the screen and hence the white line on the diagram is still parallel to the top of the diagram. Consequently the north direction on the image becomes offset by the difference in angle between the forward and reverse azimuths of the geodesic line, a value which is known from the geodesic calculation software as being 5.8876 degrees, as shown on the image.

In the lower portion of diagram M3 is a distinct 700m long artificial structure on the desert floor which is a straight line and which very closely resembles the construction of the Wall of the Crow, and which is set at an angle on the image in diagram M3 of about 7 degrees relative to the image's lower border and therefore at about 12.89^{o} degrees to east-west. This structure is shown in more detail in diagram M4.

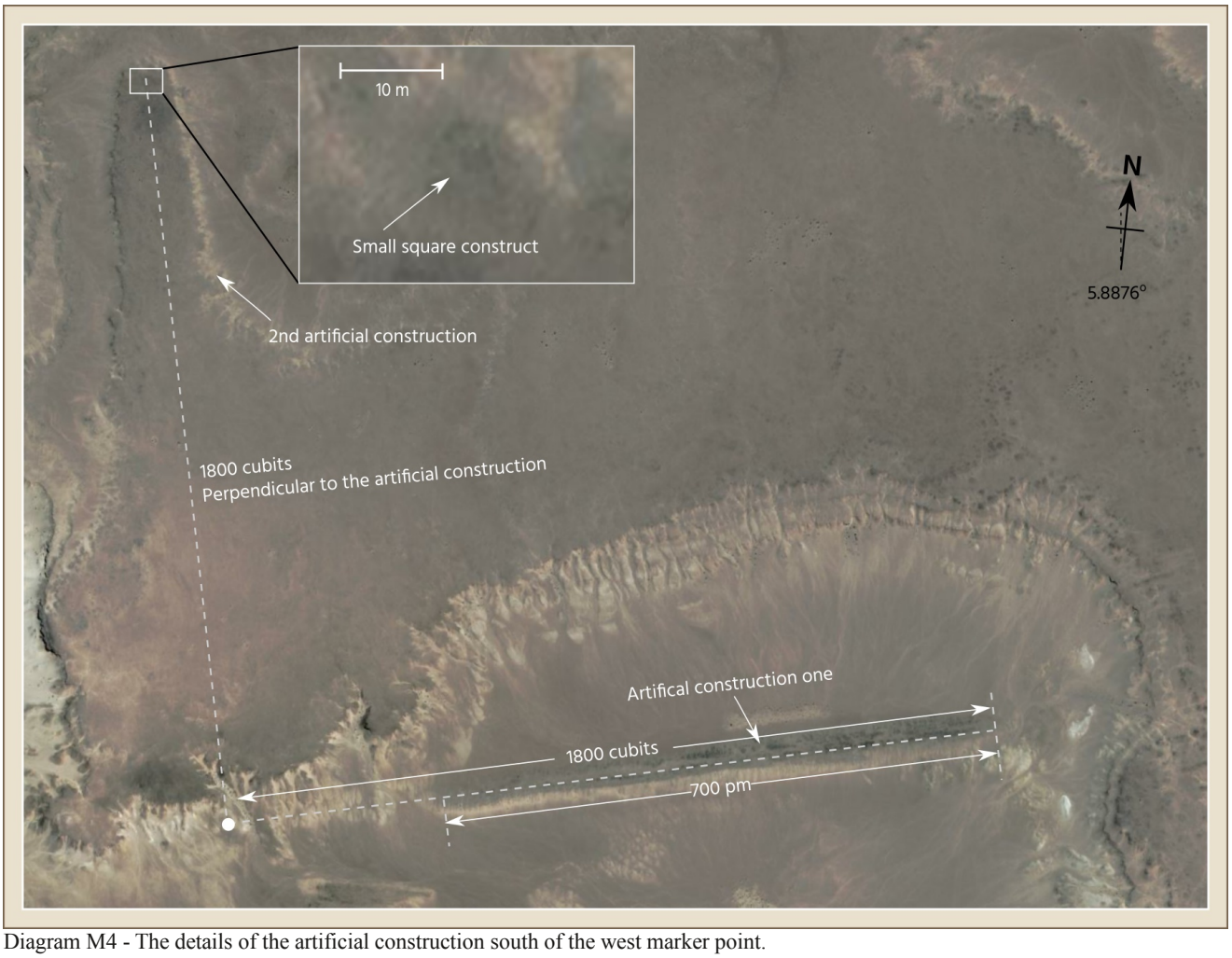


Diagram M4 - The details of the artificial construction south of the west marker point.

There are two artificial constructions, each of which is 1800 cubits in length and which are perpendicular to each other. The angle of north on the diagram is the reverse azimuth angle of 5.8876 degrees from an easterly line on the reference ellipsoid from the Giza survey start point running for 365.25 x pi perfect meters. The inset image shows a close up of the top of the perpendicular line and it can just be made out that there is a small square construction, the top and bottom of which are parallel to artificial construction.

The 700m long artificial construction is a scaled duplicate of the Wall of the Crow, and because it marks out the 365.25 pkm/radian spiral, the scale factor between it and the Wall of the Crow has been chosen in the architecture to be 3.6525 : 1. Diagram M5 shows the Wall of the Crow at the bottom and the west marker point artificial structure at the top with the scaling factor between them applied to the images and with the upper image set at an azimuth of 5.8876 degrees so that the east-west axis line from Giza runs across both images parallel to the top of the image. There can be little doubt from this comparison that the artificial structure has been correctly identified as being directly related to the Wall of the Crow. If the 700m long line that makes up the construction is scaled down by 3.6525:1 then the resulting length is that of the Wall of the Crow, 191.65 m and the system can also be used to correctly determine the angle of the Wall of the Crow.

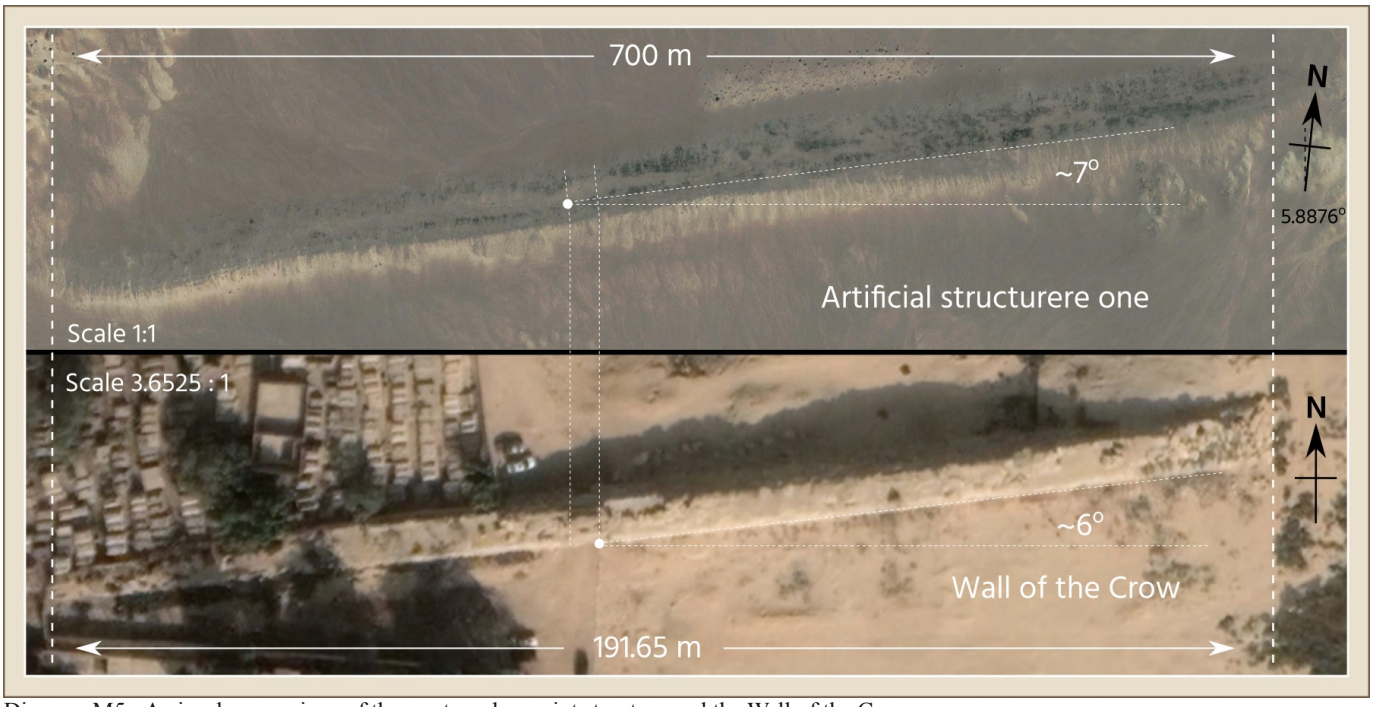


Diagram M5 - A visual comparison of the west marker point structure and the Wall of the Crow

If this system is considered as being a correct analysis of the architecture, then there is a discrepancy within it that needs to be explained. The artificial construction is set at an angle of about 7 degrees relative to the reverse azimuth of the westerly line from Giza, but the Wall of the Crow is set to match this reverse azimuth angle and is about 6^{o}.

The only way that the artificial structure's angle could be greater than the reverse azimuth angle at the west marker point would be if the line from Giza continued beyond the artificial structure, and that the analysis just carried out is of a point that is only part way along a longer line, because the further the line length from Giza the greater the reverse azimuth at the end of the line. This implies that the west bearing line from Giza needs to be extended by a significant number of kilometers, but at the same time the length of the line has been determined from the Earth's average year length of 365.25 days and any adjustments to this value, such as using the exact average long term year length of 365.2422 days, would only result in a change to the reverse azimuth of a few thousandths of a degree.

After analysis, there is only one logical parameter that can be used to produce this additional length to the line, and that is the orbit period of the moon, so that the resulting line length would be a combination of the orbital periods of the both the Earth and the Moon.

Referring to the NASA's DE-441 ephemeris data it is possible to extract the sidereal orbit period of the moon at the moment of the Earth's winter solstice 2729 BCE, which has a value of 2,329,603.439044 seconds or 26.963003 days. To understand how to apply this value as an additional line length it is necessary to refer back to the construction of the gabled roof sections above the upper chamber of the Great Pyramid where the mass of the moon was given as *a proportion* of the mass of the Earth. The moon's sidereal orbit period needs to be expressed as a ratio relative to the Earth's orbit period and the ratio is therefore 365.25 : 26.963003 days, or 13.54:1 .

Through investigation of the architecture it was discovered that this unitless ratio is used as a value in days and then added to the Earth's orbit period to get a total of 378.80 days. This is an astronomically meaningless value but a numerically sensible one, because it can be split back down into its component parts if, and only if, the method of its construction is known. In other words it is an encrypted value.

The location that is represented by this value can be determined in the same way that the previous marker point was determined, by multiplying the day value by pi to get 1190.04 pkm from Giza which gives the metric value of 1190.27 km, performing a geodesic distance and bearing calculation from the survey start point, and then looking for the end point on the mapping software. The result is shown in diagram M6.

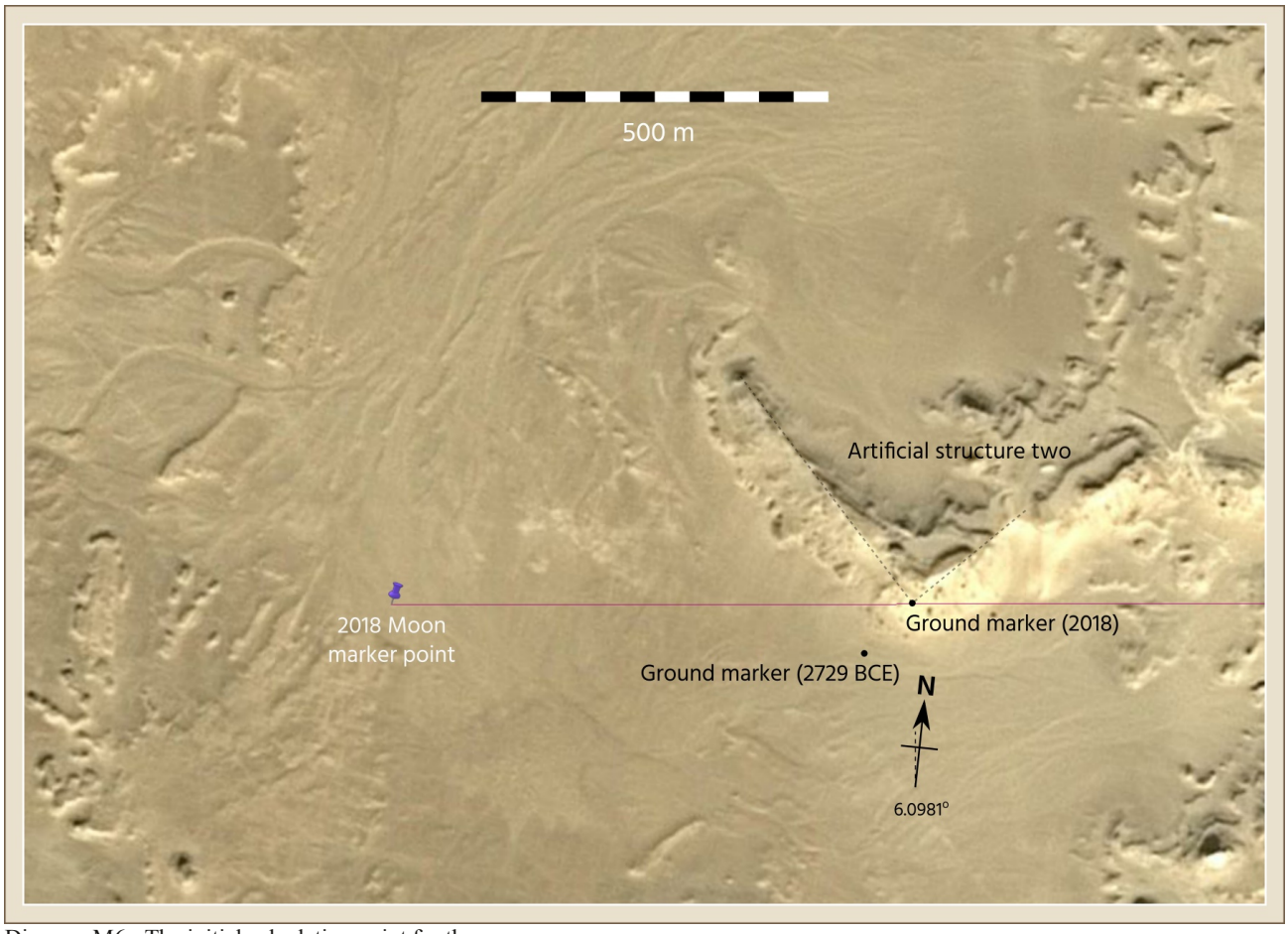


Diagram M6 - The initial calculation point for the moon.

In diagram M6 the calculated point for the encoded moon location is shown on the left side by the pushpin and is dated, to show that its coordinates are modern day. To the right on the drawing is a point shown with a small black circle that marks out the apex of a another artificial construction in the desert, shaped like a down turned arrow head. The corresponding 2729 BCE ground marker point is also shown, the distance and angle between these two points being the tectonic plate movement between the dates.

The geodesic bearing line with an azimuth of 270° at Giza is shown by the purple line, which is parallel to the top and bottom of the diagram's frame, and which runs through the ground marker arrow head point. This point is the starting reference point for the whole of the west alignment system for the Giza plateau. The reverse azimuth back to Giza from this point is 6.0981 degrees, as shown by the North marker on the diagram, the angle which correctly defines the Wall of the Crow's construction angle.

If you consider the manner in which this point has been designed, by taking the average length of the year and adding to it an encrypted value for the instantaneous sidereal orbit period of the moon at the 2729 BCE winter equinox, there is a mismatch in the data being used. One orbit period is an average, and one orbit period is an exact instantaneous value. To rectify this anomaly the down arrow point on diagram K-6 needs to be used as the definitive west-of-Giza line end point and then the value of the encrypted moon orbit length deducted from it to get the instantaneous sidereal orbit period of the Earth at the 2729 BCE equinox.

The ground marker point on the geodesic line at the bottom of the arrow head has the WGS-84 coordinates of 29.398821° N and 18.862015° E. To calculate the original distance back to the survey base point in Giza the point needs to be shifted to compensate for the tectonic plate movement over the last 4750 year to the original 2729 BCE coordinates of 29.398204° N 18.861273° E. This results in a point to point distance from the survey base point of 1189.503 pkm which when divided by pi gives the value for the encrypted line length of 378.630 days. From this value the moon proportion of 13.54634 can be deducted to give the instantaneous orbit period of the Earth at the 2729 BCE equinox as 365.084 days.

The system that has been used is ingenious and the resulting value for the instantaneous sidereal orbit period of the Earth compares favourably at this stage with the 365.05 value obtainable from the modern ephemeris. There is no point in looking further into the precise value at this stage because there is a substantial amount of further alignment required before the exact location of the arrow head marker point can be determined. What is of interest is to go back to the initial west marker point of the Earth and plot the 365.08 days along the west bearing line from Giza. Diagram M7 shows the location of the recalculated marker point at 29.438895° N 19.298161° E.

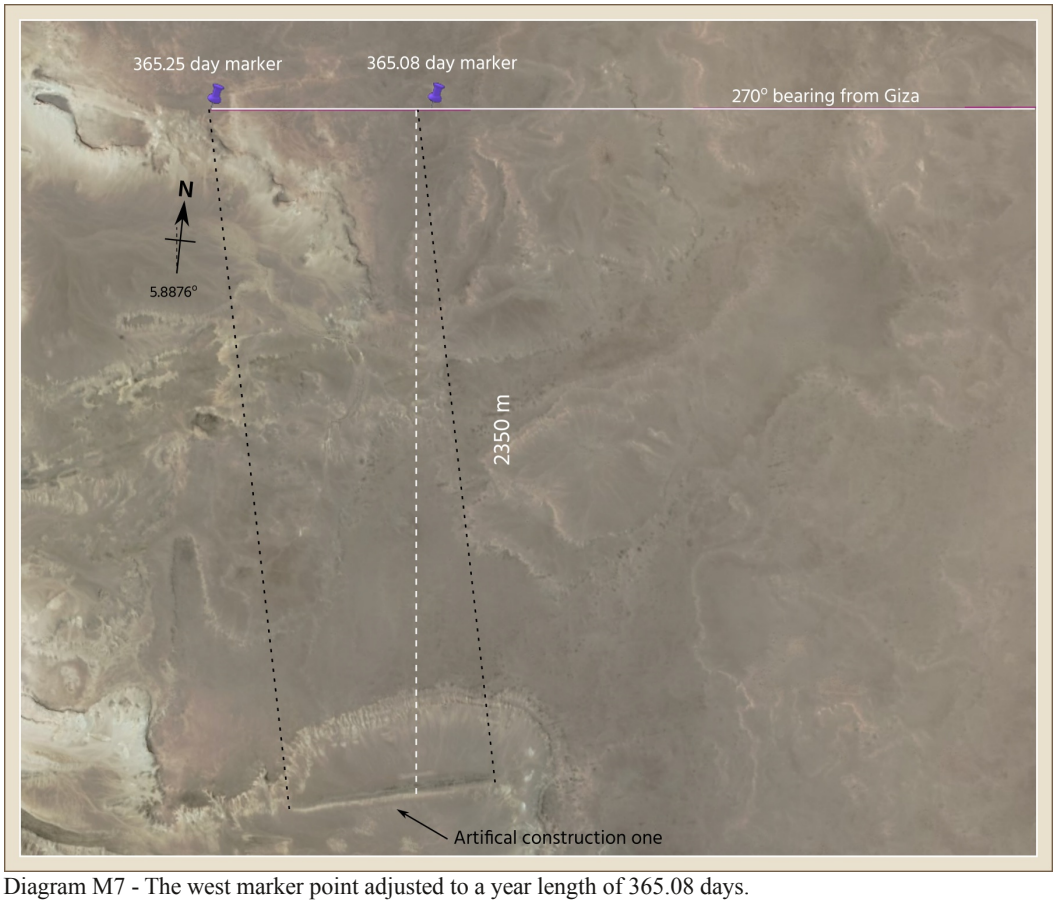


Diagram M7 - The west marker point adjusted to a year length of 365.08 days.

The dotted black lines on diagram M7 are perpendicular to the artificial construction's line and it can be seen that the two ends of this construction should be formed from the two west marker points which are shown at the top of the diagram. The 365.25 day marker point is correctly placed, but the 365.08 day point is too far to the east, from which it can be deduced that the correct value for the instantaneous sidereal orbit period of the Earth will be slightly larger, which will then align the east end perpendicular and also align the white dotted line to the equivalent of the passage through the Wall of the Crow on the artificial construction. This white line is parallel to the diagram's side and therefore at an azimuth of -5.8876 degrees and has a length of 2350 m.

There is no obvious way to geometrically transfer from the points on the upper 270^{o} bearing line coming from the survey start point in Giza down to the artificial construction and it can be correctly deduced that there must be a mechanism for performing this translation at the far end of the line where the moon is represented. Specifically, there must be a point 2350 m to the south of the down-pointing arrow head on diagram M6 that will then connect back to Giza and pass through the artificial construction on diagram M7.

Diagram M8 shows a line from Giza point WOCC with a construction on the desert floor identified at 2350 m approximately south of the down pointing arrow head from diagram M6. The inset image shows a closer view of the ground location which, at this resolution of satellite image which is pre-2008, contains a distinct square construction that has a 52m side length, or 100 cubits, and quite clearly is part of the construction system being investigated.

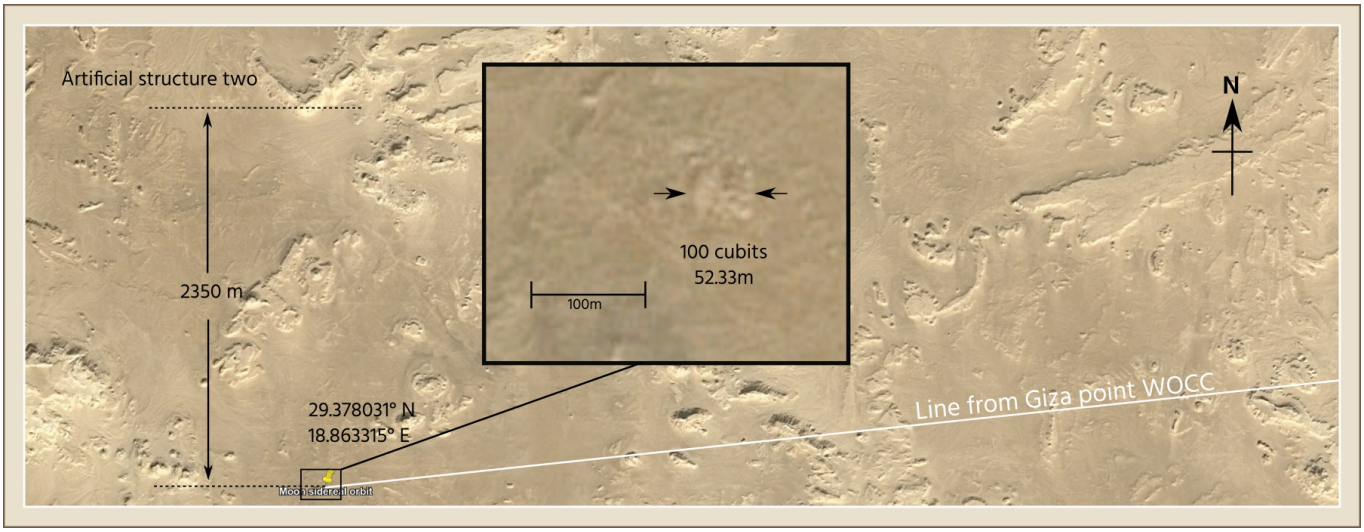


Diagram M8 - The lower moon marker point.

Diagram M8 has north parallel to the page sides rather than being set to the reverse azimuth of the Giza line end point because the 100 cubit square structure has no discernible angular relationship with the bottom of the down arrow head. It is neither due south of it nor is it below it when the image is rotated to the reverse azimuth angle and therefore this diagram shows that lack of north-south correlation between these two points.

What is required at this stage is more detailed satellite images, and these can be obtained from the "NASA Worldwind" software package which contains recent 'Landsat' images of this area of the Libyan desert. To keep the analysis based on just one piece of mapping software the Worldwind package was used to obtain the modern higher resolution satellite images, the system was placed in Mercator projection mode, and then a screen shot of the image was taken and placed as an image overlay into the Google Earth system. The overlay was then geo-aligned with the features on the lower resolution image using the transparency function of the software system. The resulting composite images are used throughout the rest of this paper and can be detected quite easily as the overlaid detailed image has a significantly different hue to the underlying base image.

The lower moon marker point

The lower moon marker point on the higher resolution satellite image shows some fascinating details which are illustrated in diagram M9, the left side of which shows the raw satellite image and the right side of which shows the geometric markings and their linear and angular details.

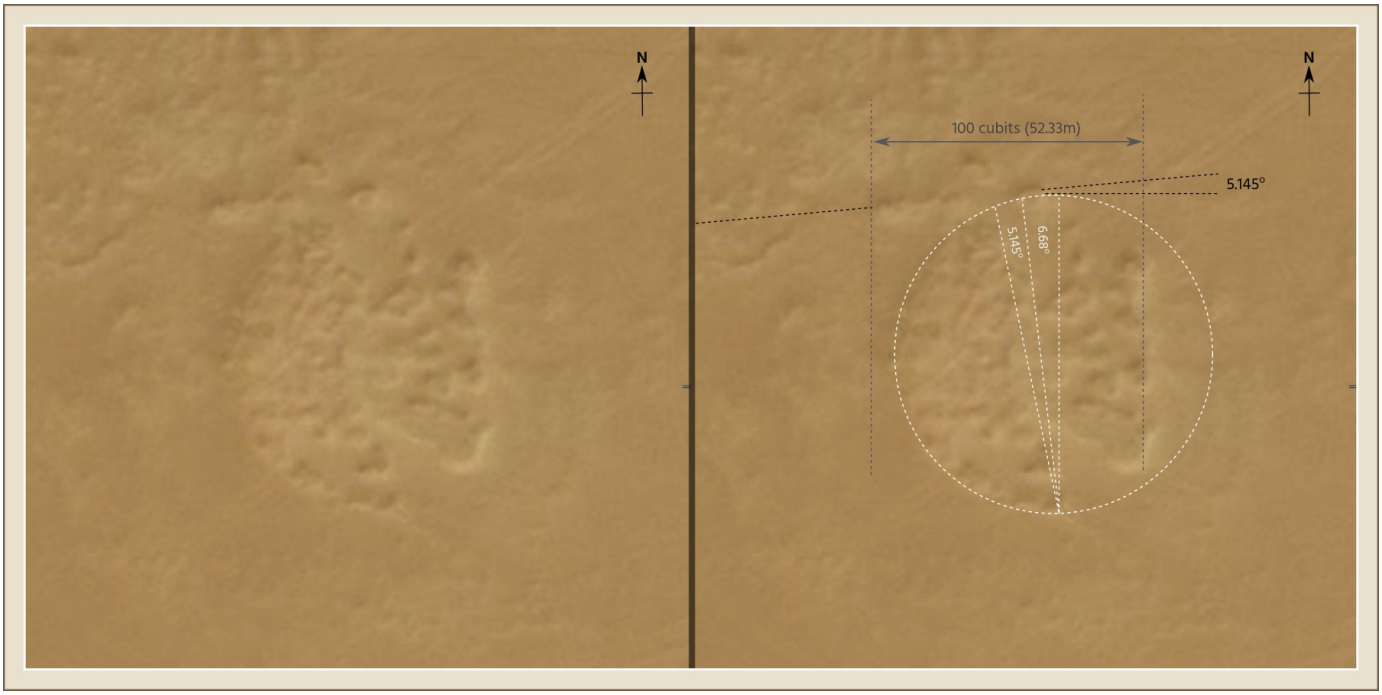


Diagram M9 - The lower moon marker point.

The impression that the structure is a 100 cubit square when viewing the lower resolution satellite image is created by the two line features, one running north-south on the east side of the structure, and one running at a slight angle to east-west at the top of the structure. This upper line of features is set at an estimated angle of 5.145 degrees north of east, and that numerical value is taken from the NASA moon fact sheet and is the current angle of the moon's axial tilt to the ecliptic. The quite distinct partial circle on the left of the structure represents the moon tilted at an approximate angle of 11.825 degrees, that being the addition of the previous angle plus 6.68 degrees which is the angle of the moon's poles to it's orbit. The radius of the circle is 29 m which is most likely a 60,000:1 model of the moon. Calculating from the current data on the moon fact sheet, which gives the equatorial radius of the moon as 1,738.1 km, this would define the circle's radius as being 28.97 m.

What you are looking at is the setting out of the next stage of the architect's puzzle, where in diagram M8 the starting point at the down-point arrow has been defined, and at the lower moon marker point the angular details that are required to solve the puzzle are explained. There must be a way in which the upper point and the lower point can be connected using just the data on display, and this is the puzzle that needs to be solved during which process the angular and linear values taken from the NASA data will get replaced by high precision values from the architecture.

The solution to this puzzle is contained in the next section of the paper, and at the time of writing this paper, the details are astonishing.

Solving the moon puzzle

The area of the desert around the down-arrow head for several kilometers in every direction is full of unusual looking ground structures which do not look natural, and are not. One of the most striking features when first looking around this area of desert is the repetitive wave pattern, sometimes clearly marked on the desert floor and sometimes only very feint. Diagram M10 shows a satellite image of the most distinct area of these waves.

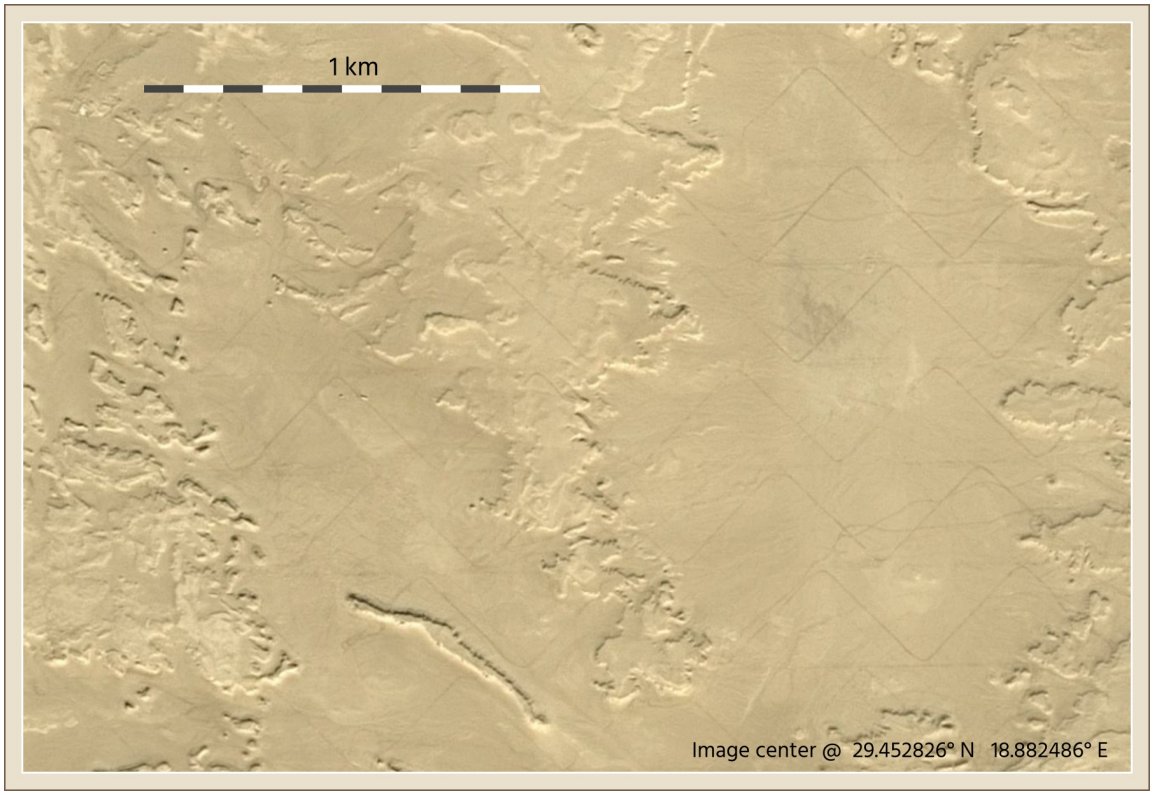


Diagram M10 - The wave pattern on the desert floor.

The wave length is exactly 500m on all of the waves, regardless of where they are found, and they continue without interruption as they cross over between the flat areas of desert floor and the elevated areas of land. Diagram M11 shows the elevation profile of a section of the previous diagram and demonstrates how the wave length is maintained regardless of the terrain features, which have a significant 14 m elevation change.

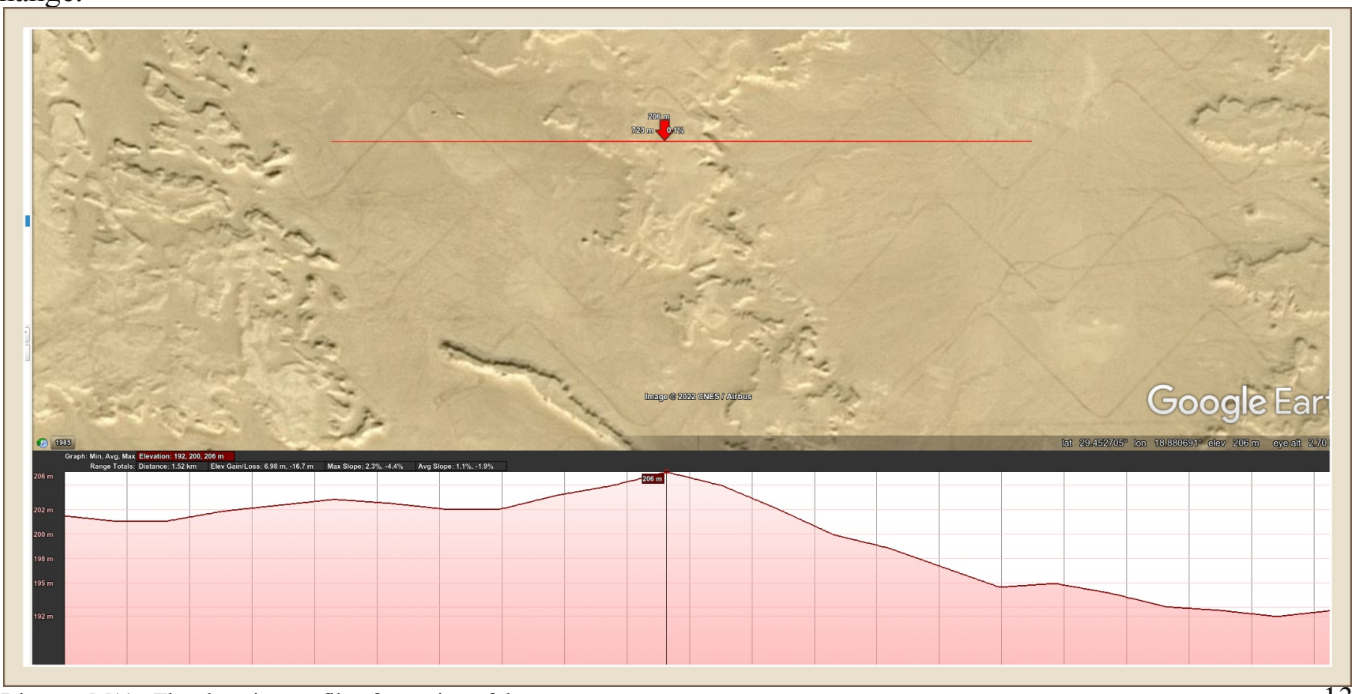


Diagram M11 - The elevation profile of a section of the wave pattern.

These wave patterns are also distinguishable to the west of the marker point at the artificial construction arrowhead, and diagram M12 shows this area with the wave sections highlighted for clarity because the ground markings are deliberately disjointed and incomplete.

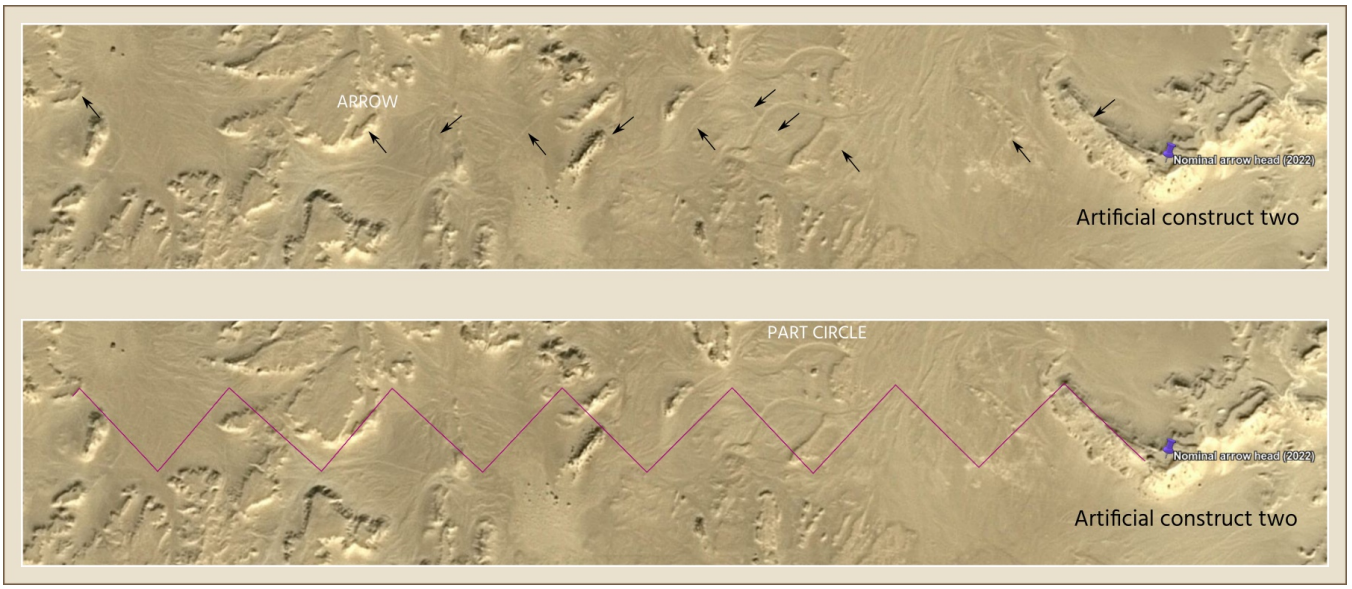


Diagram M12 - The wave pattern to the west of the arrow head.

Other than the waveform there are two interesting points of note on these images. The first is that there is an arrow structure, shown on the top image to the left, which is aligned on part of the wave and which is required so that you continue and find the final wave node on the left of the image, as there is nothing marked off between these two points. The second feature is that there is a distinct part circle etched into the desert floor shown at the top of the lower image just to the right of center.

The east end of the wave pattern contains artificial construction two, and diagram M13 shows this end of the wave in more detail.

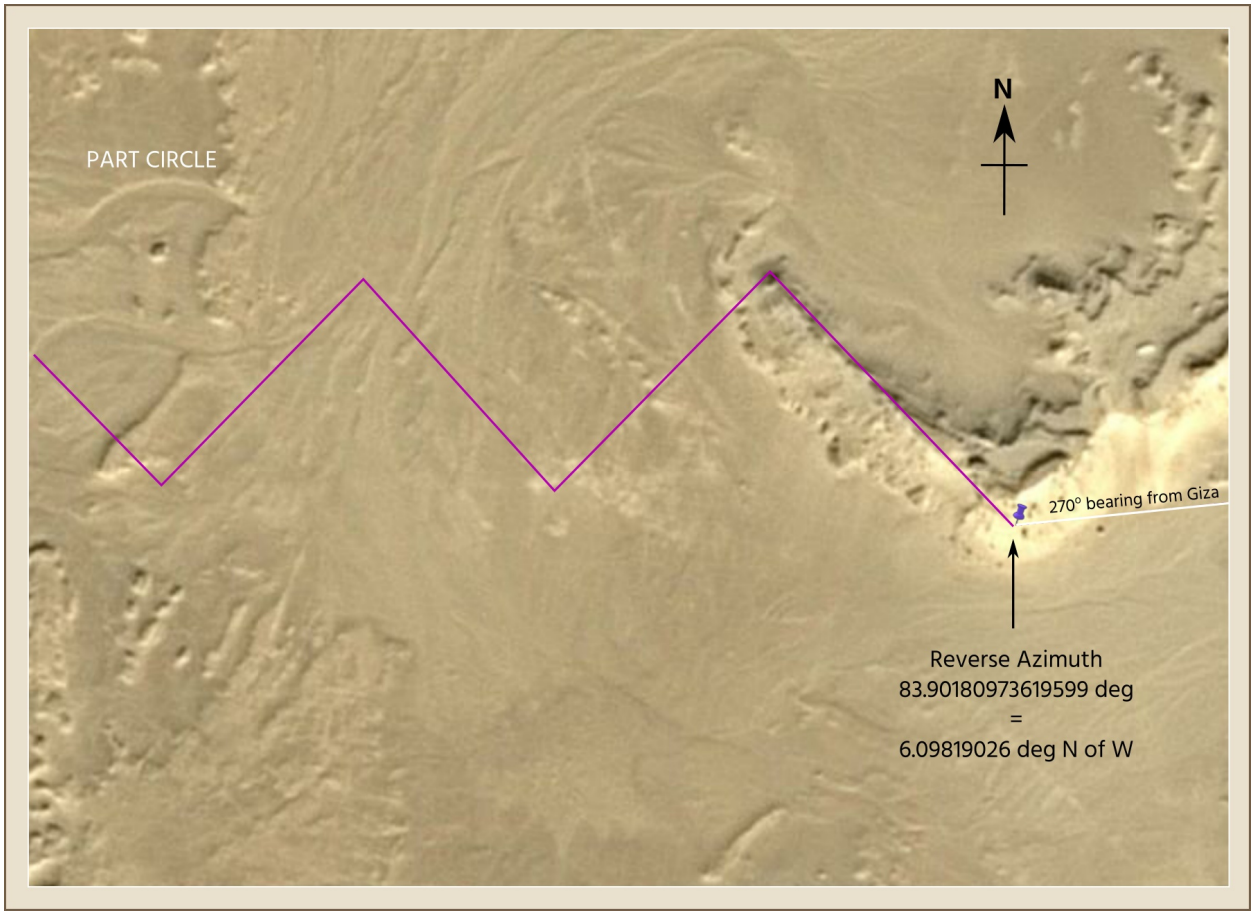


Diagram M13 - The start point location on the east end of the wave.

The last line of the wave structure is also the left side of the down-arrow feature and it can be seen that this extends to the south significantly past the previous lower turning point on the wave and meets up with the arrow head point that was placed on the mapping software previously at the end of the bearing line from Giza.

Through deep investigation into the possible arrangement of the geometric features that have been uncovered up to this stage in relation to the known parameters of the moon it is possible to determine that there is a 1:1000 model of the moon's polar cross section drawn into the desert floor which is shown in diagram M14.



Diagram M14 - The 1:1000 moon construction and the enclosed waveform with initial values.

The construction shown in the diagram is a 1:1000 scale model of the moon using the commonly known modern values for the radii of the ellipse.

The mathematically derived length of the radius from the center of the ellipse to the Giza line end point is shown on the right of the diagram where the down arrow head is shown in black. The waveform terminates at the bottom of the arrow head which gives 13 cycles to the wave representing the 13 moon cycles of the year, with the additional line length on the wave portion on the left of the arrow head correctly showing that there are just more than 13 full cycles of the moon in an average year.

The center of the moon is marked on the desert floor as shown in diagram M15.

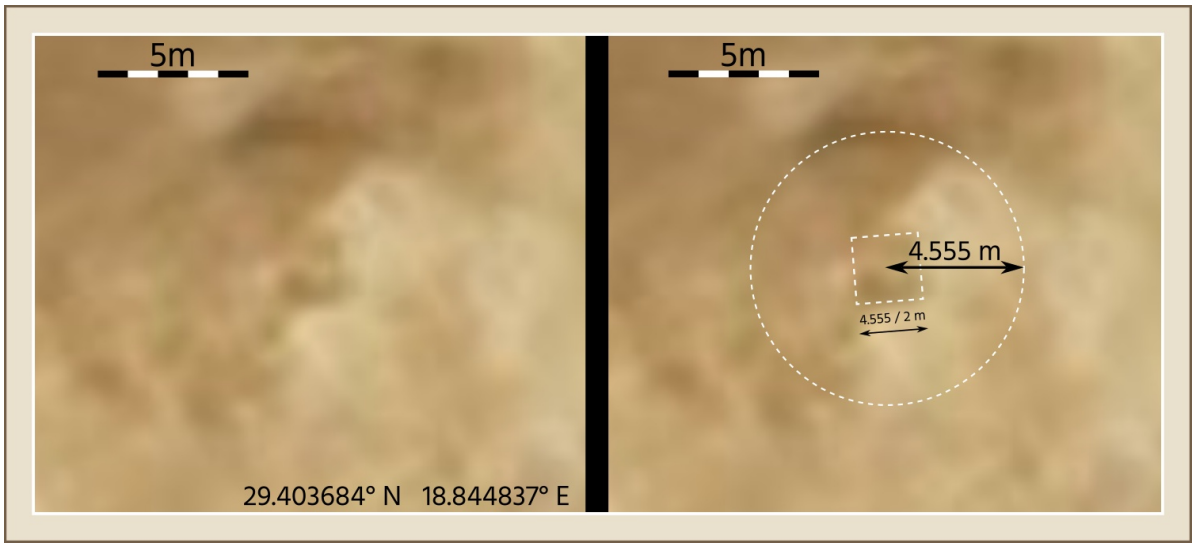


Diagram M15 - The 1:1000 ground structures at the center of the moon model

The moon center is marked by a 4.555 m radius circular structure inside of which there is a square structure with a side length of half this amount or 2.277 m. The square is rotated by 4.555 degrees in an anticlockwise direction. The value of the radius of this structure is not arbitrarily obtained and nor is the rest of the moon drawing in diagram M14. The whole construction is astronomically and geometrically precise and is determined as follows.

The initial data of the moon's axial tilt shown on the previous page from the NASA moon fact sheet is data that relates to modern epochs. Using the DE441 ephemeris data it is possible to determine the inclination of the moon to the ecliptic at the winter solstice of 2729 BCE on January 15th at 11:22:33 hrs TDB as being 4.5554738 degrees. This is the numerical value that has been used to describe the center point structure of the moon drawing, converted into perfect meters.

The 2018 initial axial tilt data from the moon fact sheet gave the tilt of the moon to its orbit as 6.68 degrees and the tilt to the ecliptic as 5.145 degrees, giving the angle between the orbital planes of the Earth and the Moon as the difference between these two values and therefore of 1.545 degrees, a value which varies very little over time. If the 2729 BCE ephemeris value of the moon's inclination to the ecliptic is added to this value the result is 6.100 degrees: the 2729 BCE tilt of the moon to its own orbit. This angular value is instantly recognisable as being the same as the reverse azimuth of the end point of the line from the Wall of the Crow WOCC point to the downturn arrow marker on diagram M13, and also the same as the azimuth of that wall's construction.

From this value it is possible to understand how the radius line of the moon model from the down arrow marker point to the center of the model has been constructed, because it is taken at a bearing of 3 x 6.100 degrees, or 18.3 degrees as shown on diagram M14.

Once again this system it superbly designed because the distance from the Giza WOCC point can now be adjusted so that the location of the down arrow end point changes. This in turn changes the reverse azimuth of the line at that end point, and this reverse azimuth is then used to plot a line up to the moon center point at a bearing of three times the angle.

The software of the geodesic calculator was re-written so that it was able to cope with the systems that have been seen so far in this paper - continuation lines can be calculated from line end points and lines can be split at any point along their length and side lines then calculated from these points. This allows both the moon system to be solved and will allow the initial Earth point location to be solved once the moon section has been completed.

The complete path from the Wall of the Crow to the center of the model of the Moon was computed on the updated geodesic path creator software at 2729 BCE locations and the results transposed through tectonic plate shift to the 2018 values with the following results.

WOCC point	latitude	29.97208	degrees
	longitude	31.1399	degrees
West line	bearing	270	degrees
	distance	1189.5118	km
Moon marker end point	latitude	29.398797	degrees
	longitude	18.861841	degrees
	reverse azimuth	83.9016601	degrees
		6.0983399	degrees N of E
Moon radius	bearing	288.29502	degrees
	distance	1737.783	m
Moon center point	latitude	29.403718	degrees
	longitude	18.844842	degrees

From the reverse azimuth of the line from Giza, and knowing the input parameter for the moon's tilt taken from the DE441 ephemeris, the angle between the orbital plane of the Earth and that of the Moon at the winter solstice 2729 BCE can be calculated as 1.5428661 degrees.

It is now possible to draw the complete astronomical system of the moon. Diagram M16 shows a screen shot of the mapping software with 'push pin' icons showing the Giza line end point, the moon center and the two ends of the moon's equator on the polar cross section ellipse.

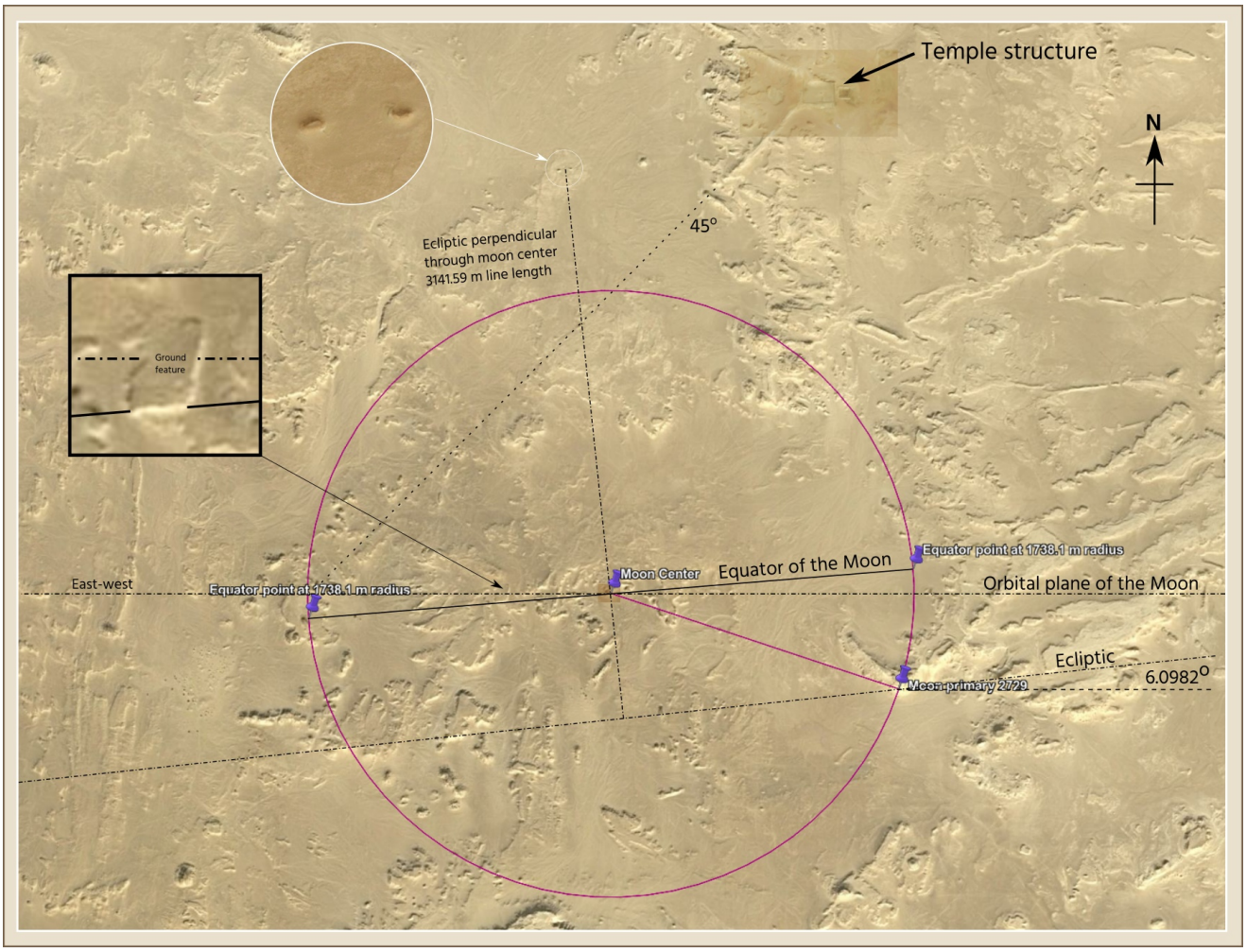


Diagram M16 - The refined moon model.

The ecliptic on the diagram is angled at 6.0982 degrees, that being the reverse azimuth of the line from Giza at the down turned arrow point, marked as 'moon primary 2729' on diagram M16. The orbital plane of the moon is an east-west line that runs through the center of the moon ellipse, and the moon is angled at 4.555 degrees anticlockwise to this line with the equator end points marked.

There is a check feature built into the desert floor which aligns with the angled equator line and this is shown in the square inset image to the left of the moon drawing. The bottom of this structure is angled at the same 4.555 degree angle as the moon equator. There is a second checking feature on the system which is the line that is perpendicular to the ecliptic line which terminates at a check point structure to the north of the moon drawing and which is 3141.59 pm in length. This check point is shown in more detail in the circular inset image.

The most striking visual part of the M16 satellite image is the temple structure at the top which is positioned at the end of a 600m long land structure which is set at exactly 45 degrees east of north, and which geometrically connects back down to the intersection of the moon's surface with the orbital plane line of the moon on the west side. This temple area is shown in diagram M17 which is taken from the more recent satellite image that is currently available on the NASA 'Worldwind' system which has more detail.

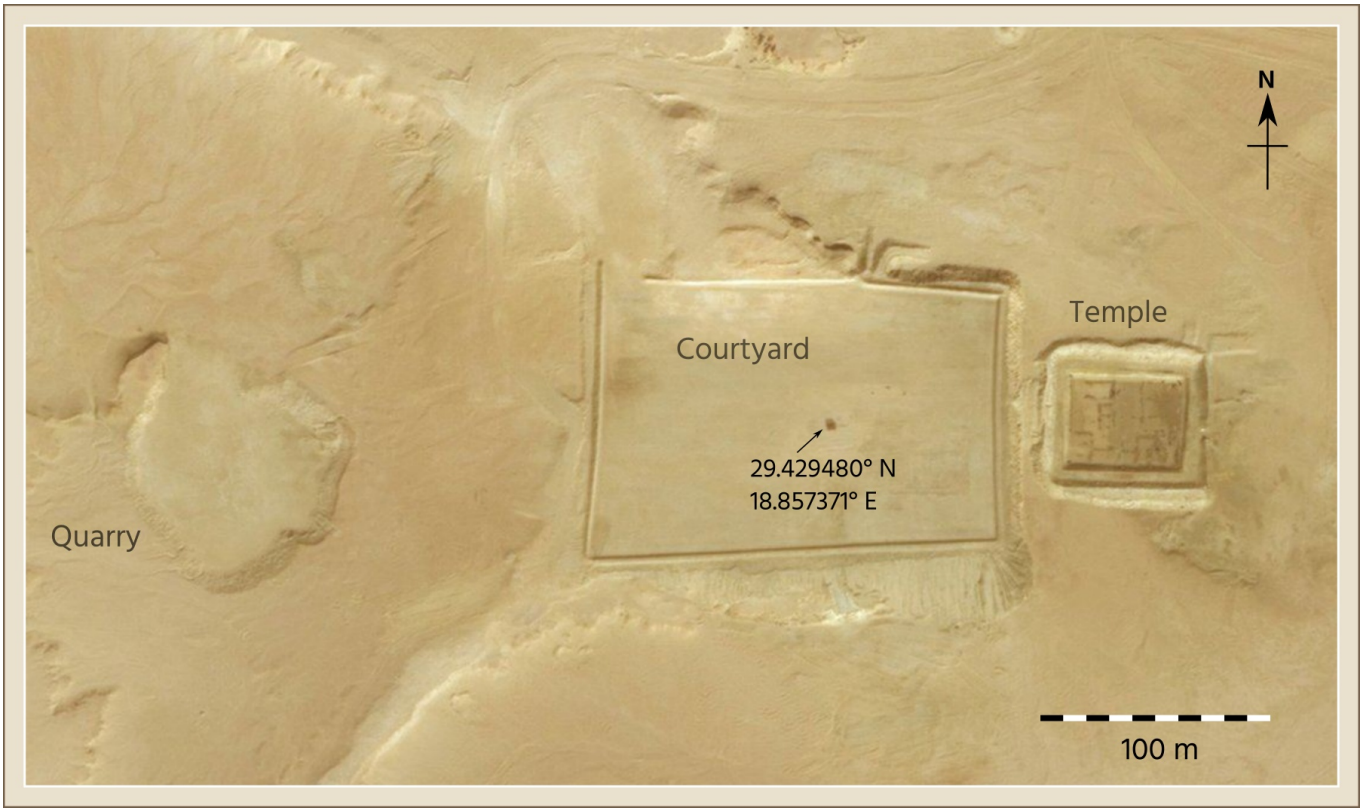


Diagram M17 - The temple structures to the north of the moon model.

The area comprises of a 50 m x 30 m temple on the right side, an irregular walled 170 m x 120 m courtyard area in the center of the image and a quarry area to the left where the stones for the structure's walls have been taken from. Because this structure is 1200 km to the west of Giza in the Libyan desert, the first task is to show that this structure was built by the same architect's as the Giza complex and this can be done without having to use the quite obvious geometric connections that have been explained up to this point. Diagram M18 shows the temple from the M17 satellite image placed next to the temple structure that is located in front of the third pyramid of Giza, the "Menkaure Mortuary Temple", so that the wall structures of the two temples can be compared.

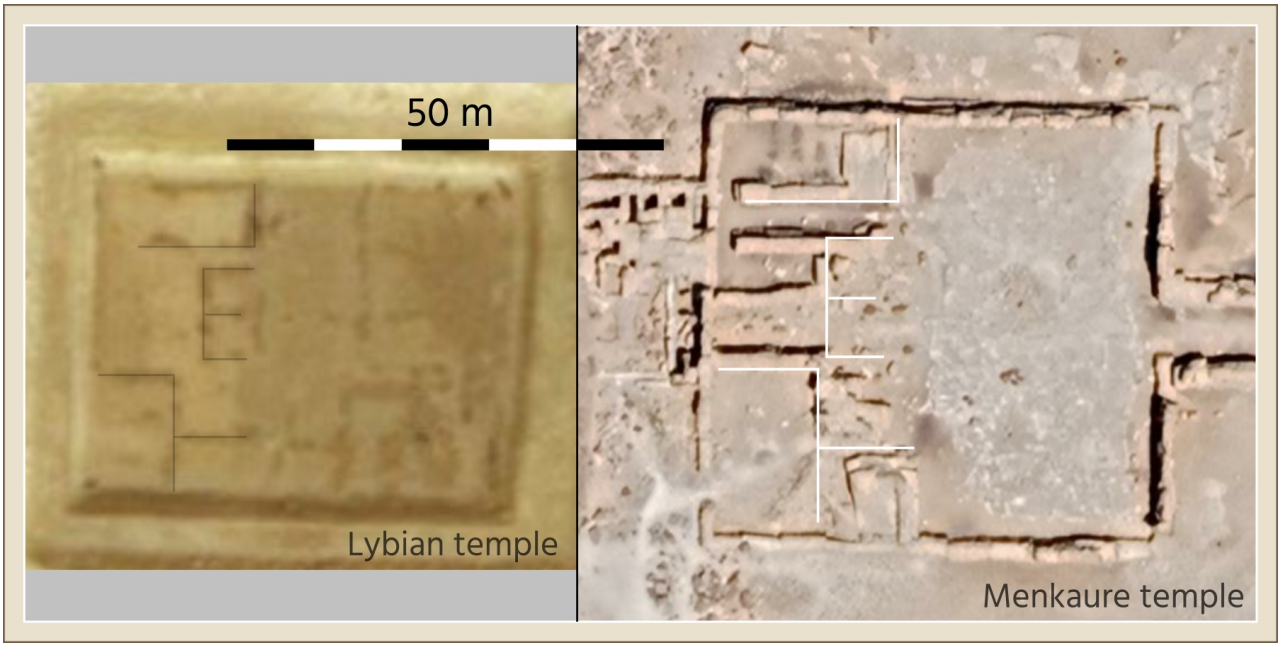


Diagram M18 - A comparison of the wall structures of the Giza temple and the Libyan temple.

The is a striking resemblance between the wall structures of the west sides of the two temples, strongly indicating that the same architect is at work on both of these structures, because the overlaid black lines on the left image can be digitally copied onto the right image, re-scaled and then match the wall structures of the Giza temple.

From the geometric and astronomical perspective there is also a clear link between the geometry of the moon that has already been described and the temple, as shown in diagram M19. A line of length equal to the diameter of the moon structure, 3476.2 m, taken perpendicular to the reverse azimuth of the Giza line at the line end point, defines the north east corner of the courtyard structure to well within a meter.

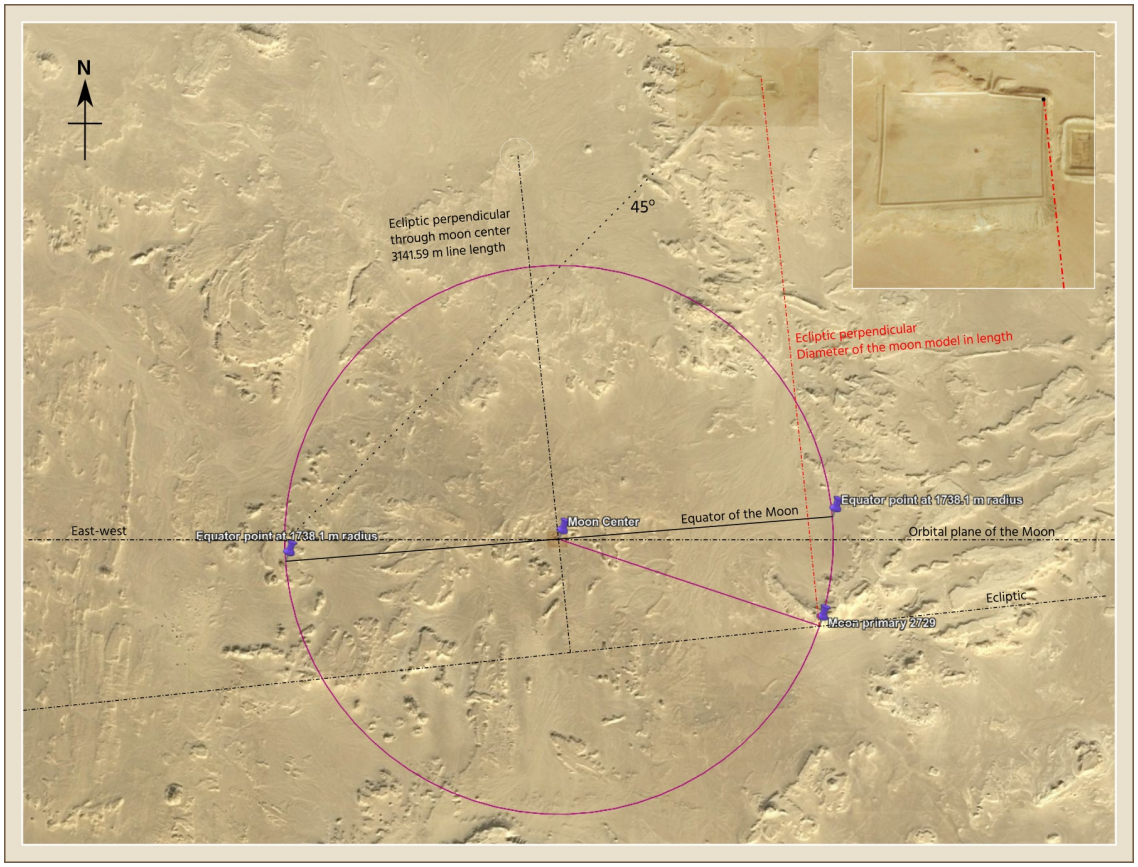
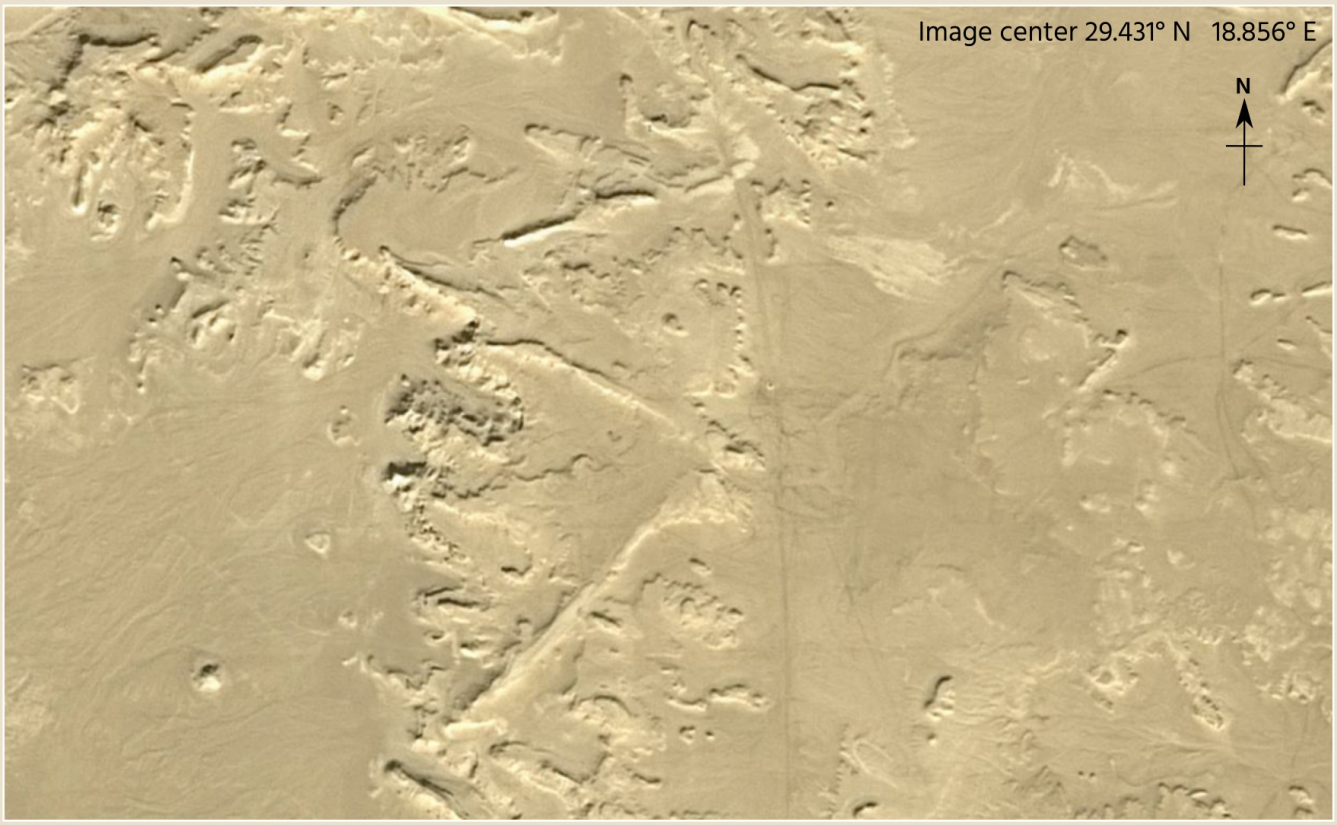


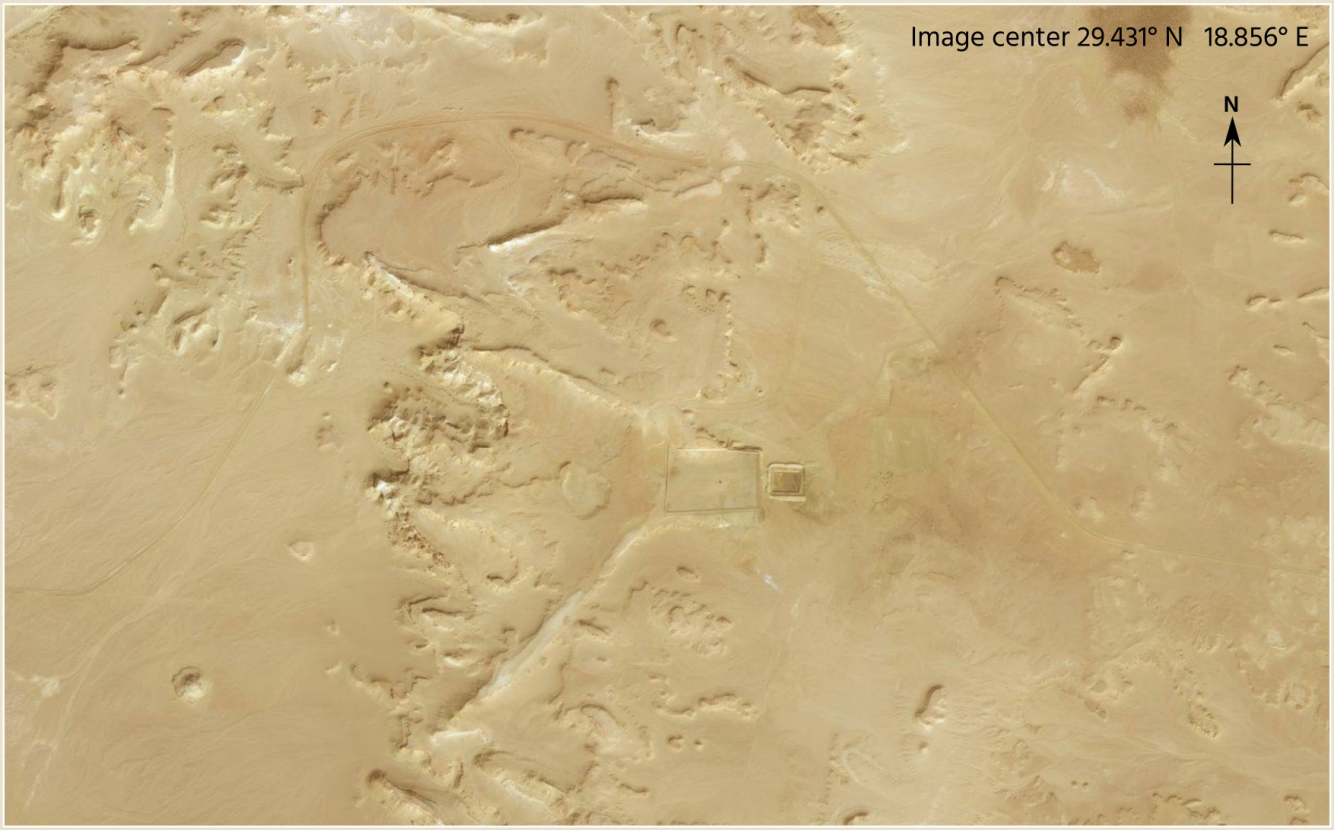
Diagram M19 - The moon diameter line from the marker point to the courtyard corner.

It is more than reasonable to state that it is established that this temple area is built by the same architects as the Giza system. But there is something most unusual about the temple structures.

Diagram M20 shows two different satellite images of the same area of the Libyan desert where the temple is located.



Satellite image from Google Earth, accessed on 7th August 2022 9:42 hrs UTC



Satellite image from NASA Worldwind, accessed on 7th August 2022 9:42 hrs UTC

Diagram M20 - The mismatching satellite images.

The upper image in diagram M20 is an older satellite photo used on Google Earth and the temple structure, the courtyard structure and the stone quarry area are not present on this image. They have been built at a time between the two satellite images being taken.

The Maxar commercial satellite imagery company, previously known as Digital Globe, has a browsing area on their company website where older satellite images can be found and dated, and from this it is possible to determine when the temple structures were built. Diagram M21 shows two consecutive satellite images of the temple area with the company's reference numbers and dates marked on the images.

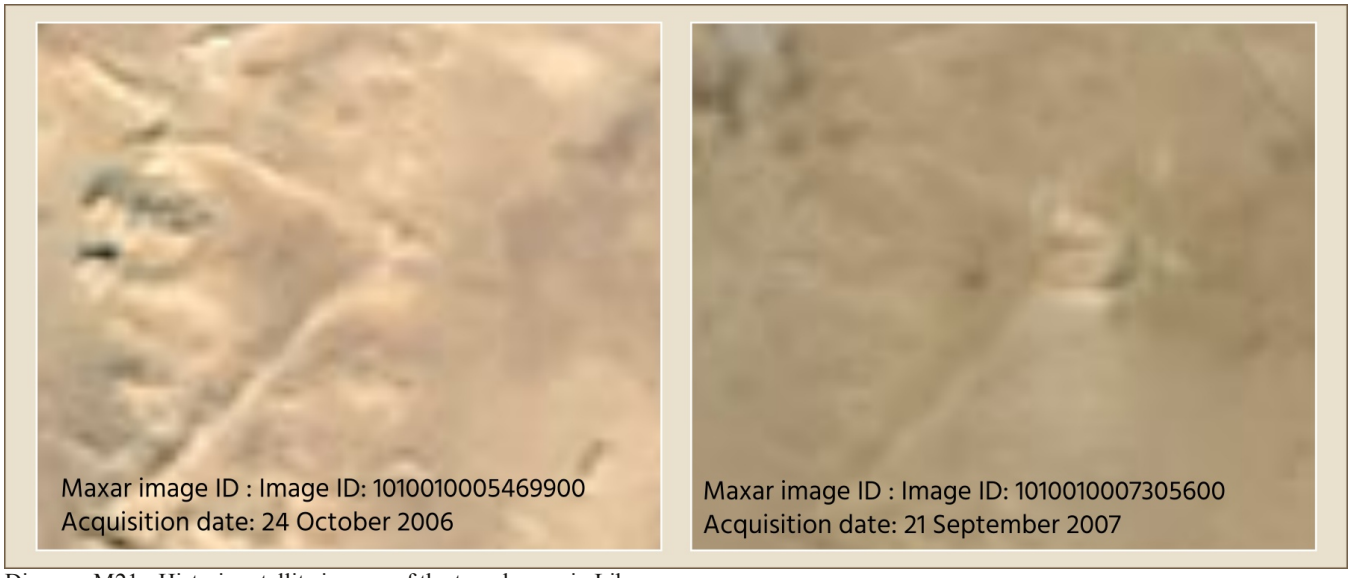


Diagram M21 - Historic satellite images of the temple area in Libya.

Although the image resolution is not high, it can still be made out that on the left image the temple structures are not present and on the right image they are, and therefore they were built between 24 October 2006 and 21 September 2007.

The advanced moon model

The preceding proof of the date of construction of the temple is a simple factual proof. The satellite images show the date of construction with no ambiguity. However, within the framework of current understanding, this proof is astonishing if the temple structures are indeed part of the Giza astronomical geometry system. The architects have therefore gone out of their way to establish this fact to a much greater level of detail, and the geometric nature of the temple structure can be further unraveled. To do so it is necessary to accept that there are no longer any constraints or limitations to the methods that need to be used. This is no longer the analysis of a series of historic monuments and their interconnecting geometry but involves real time information that is directly linked to those ancient structures.

Looking back at the logical system that leads to the top right corner of the courtyard structure, this has to be the starting place for the analysis for the temple structures. The detailed image of the courtyard in diagram M17 shows that the east and west walls are not straight, and it is by analysing the bends in these walls that the advanced moon model that has been built can start to be understood.

If you consider how a computer system draws circles, they are constructed using polygons where the number of divisions in the polygon is selected so that the human eye cannot distinguish between the polygon and the circle that it is simulating. On programmes such as "Google Earth" the number of sides that this polygon has is 72 which has presumably been selected because it is the lowest sided polygon that deceives the human eye into correcting the straight sides into a curve. Diagram M22 shows the moon drawing from the earlier analysis with its polygon node points iterated.

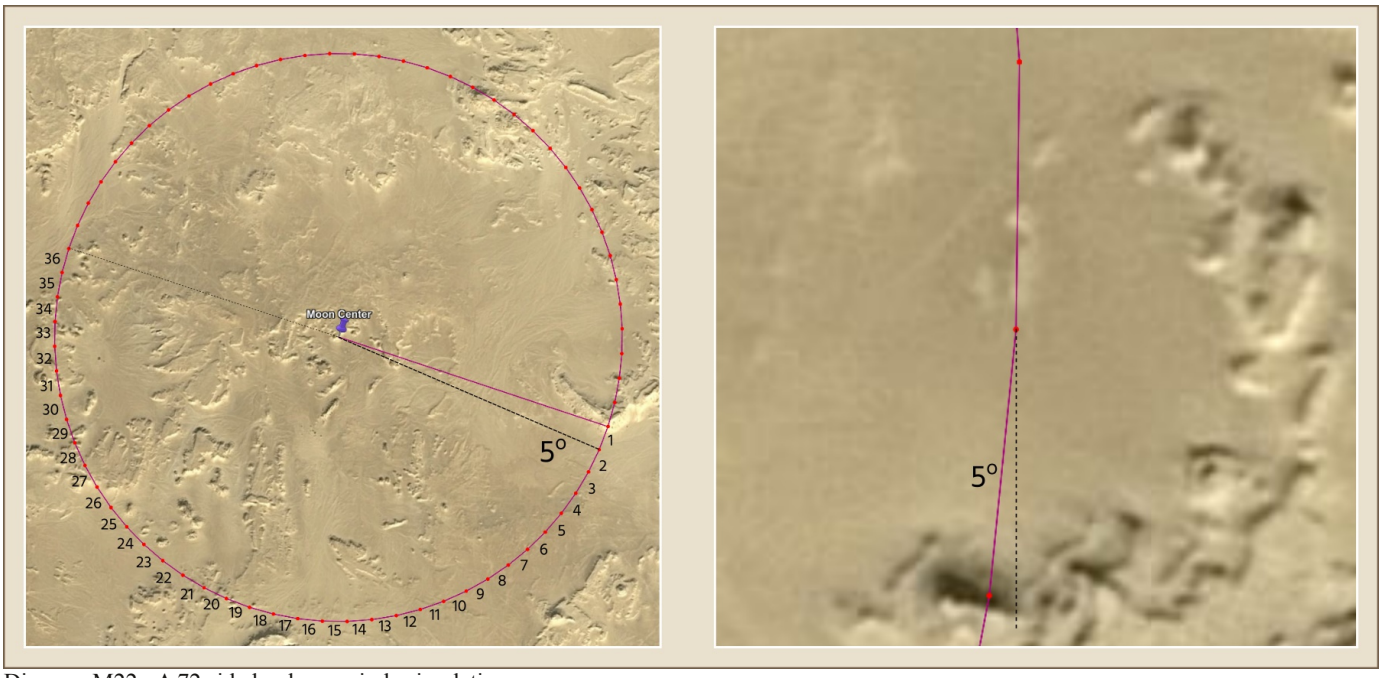


Diagram M22 - A 72 sided polygon circle simulation.

Shown on the left, each of the polygon's side segments subtends a 5 degree angle at the center of the polygon, and the exterior angle between subsequent sides of the polygon is also 5 degrees, shown on the right. When the walls of the courtyard structure are analysed it can be seen that this polygon construction system has been employed in their creation as shown in diagram M23 where the polygon sides have been drawn offset to the side of the walls only so that the walls are still visible. The purple lines are the polygon's sides and the black dots are the line nodes.

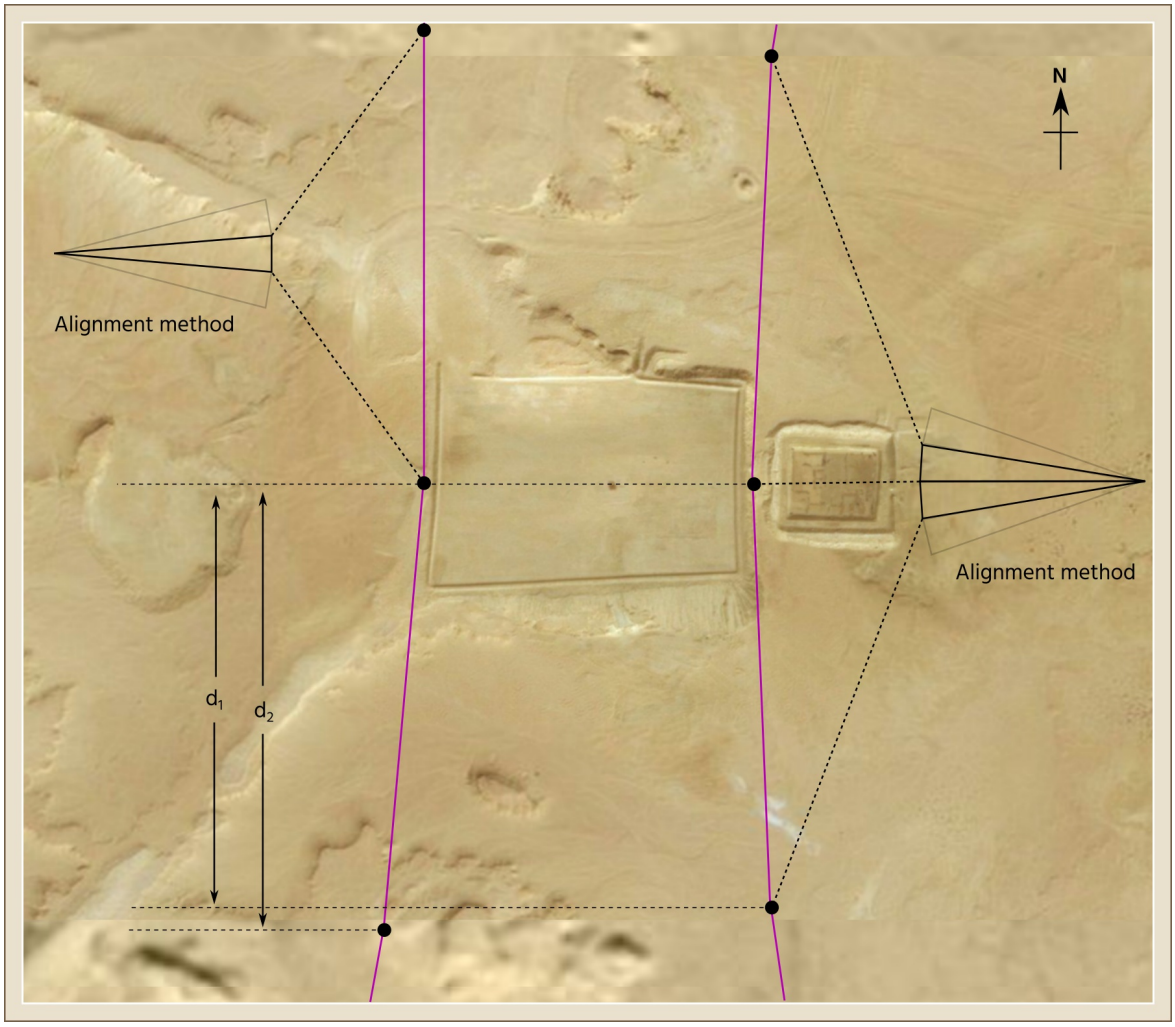


Diagram M23 - The courtyard walls and their 72 sided polygon construction.

Both the east and the west walls contain a bend at their middle point. The east wall is aligned with the segments of a polygon so that the northern and southern sections of the wall are angled at 2.5 degree to north, and the west wall is aligned so that the northern section of the wall is aligned to north and the southern section is angled at 5 degrees west of south. The reason for the different construction systems is that there are two more models of the moon of which these polygon sections are part of, and those moon models are constructed using opposite methods and are also of different sizes, as can be seen by the different lengths, d_1 and d_2 between the polygon's line nodes on the east and west sides of the drawing.

The geometric method of construction of the courtyard is precise and allows geodesic bearing calculations to be performed from the Giza survey point all the way through the temple wall points. Diagram M24 shows the courtyard area with the geodesic points marked on it using the 'push pins' from the mapping application.

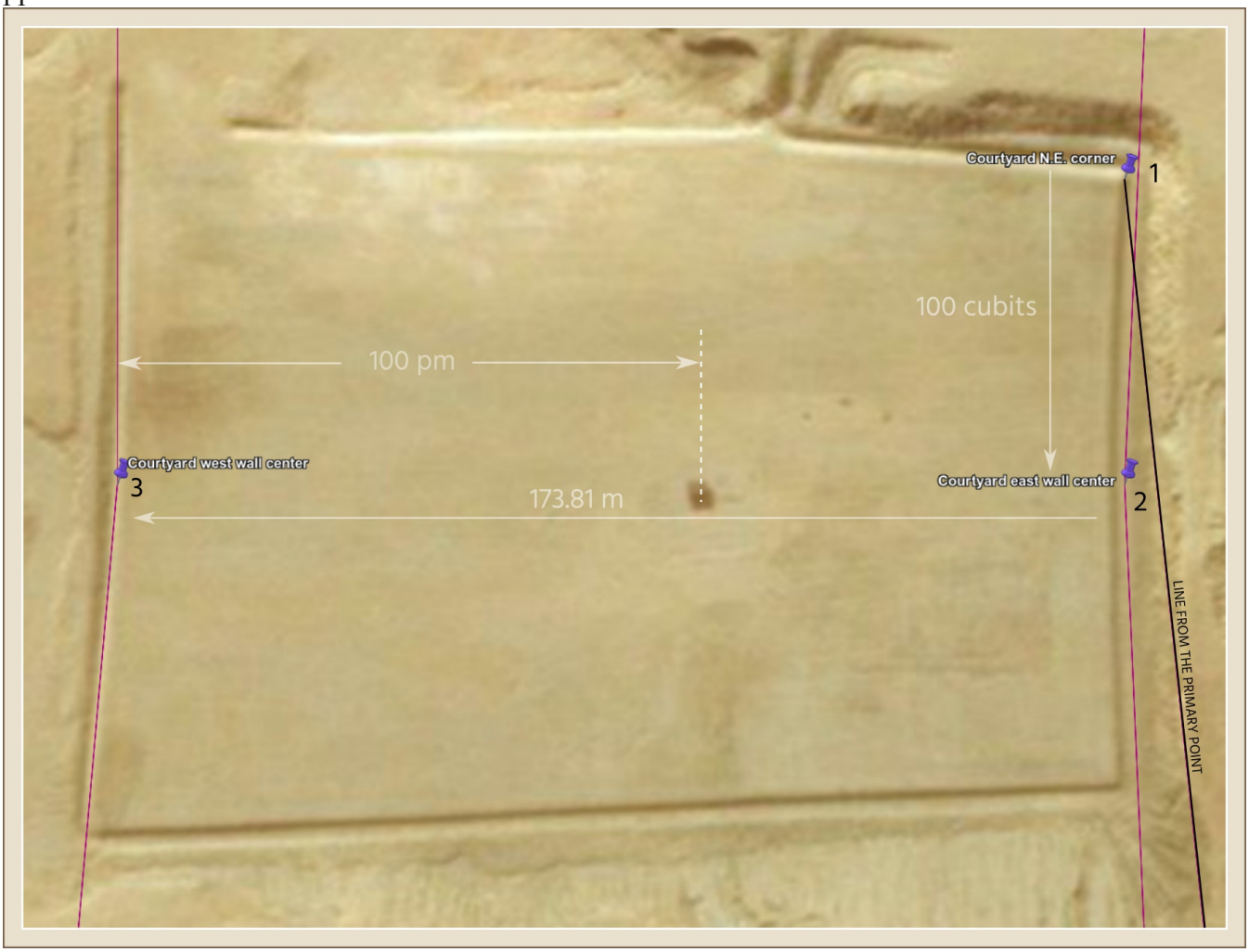


Diagram M24 - The geometric constriction of the courtyard's primary points.

The black line on the right of the diagram is the lines that emanates from the down arrow moon point and terminates at the north east corner of the courtyard first shown in diagram M19. The center of the east wall is exactly 100 cubits to the south of this point, and the courtyard is 1/10000 of the moons equatorial radius in width. The distinct marker point in the courtyard center area is 100 perfect meters from the west wall. These three numerical values deliberately add confirmation to the fact that the structure is built and designed by the same architect's as Giza, because the architecture uses the cubit unit of measure of the Great Pyramid, the courtyard width shows that it conforms to the moon model already discovered, and the central marker point is positioned using perfect meters.

From point number 2 on the diagram it is possible to locate the center of the east side moon model's center point and similarly from point number 3 it is possible to locate the center of the west side moon model if the radii of those models is known. Through analysis of the ground features and subtle clues that are

concealed throughout this area of the desert floor it is possible to determine how these moon models are constructed and how they relate to the geometric line that leads to the north east corner.

There are three 1:500 scale models of the moon incorporated into the system. The red line in diagram M19 represents the radius of the first moon model and is 1/500th of the moon's equatorial radius in length. This should be considered as a model of the moon at perigee (the point on its elliptical orbit around the Earth at which it is the closest to the Earth). The moon model on the east side of the temple is a model of the moon at apogee (its furthest distance from the Earth during its orbit) and the moon model on the west of the temple is of the moon at its average distance from the Earth. The document used to obtain the apparent magnitudes of the moon at these three orbital locations was the 2015 paper "Micro moon versus macro moon: Brightness and size"[3] which lists the unitless relative sizes as 0.00975, 0.00911 and 0.00857 respectively. These are transferred onto the ground drawings by normalising the perigee value to the moon's equatorial radius at 1:500 scale, a value of 3476.2 m and then calculating the radii of the other two models from the apparent magnitude data giving 3265.8453 m for the average radius and 3055.4907 m for the apogee value. The three resulting moon cross section drawings are shown in diagram M25.

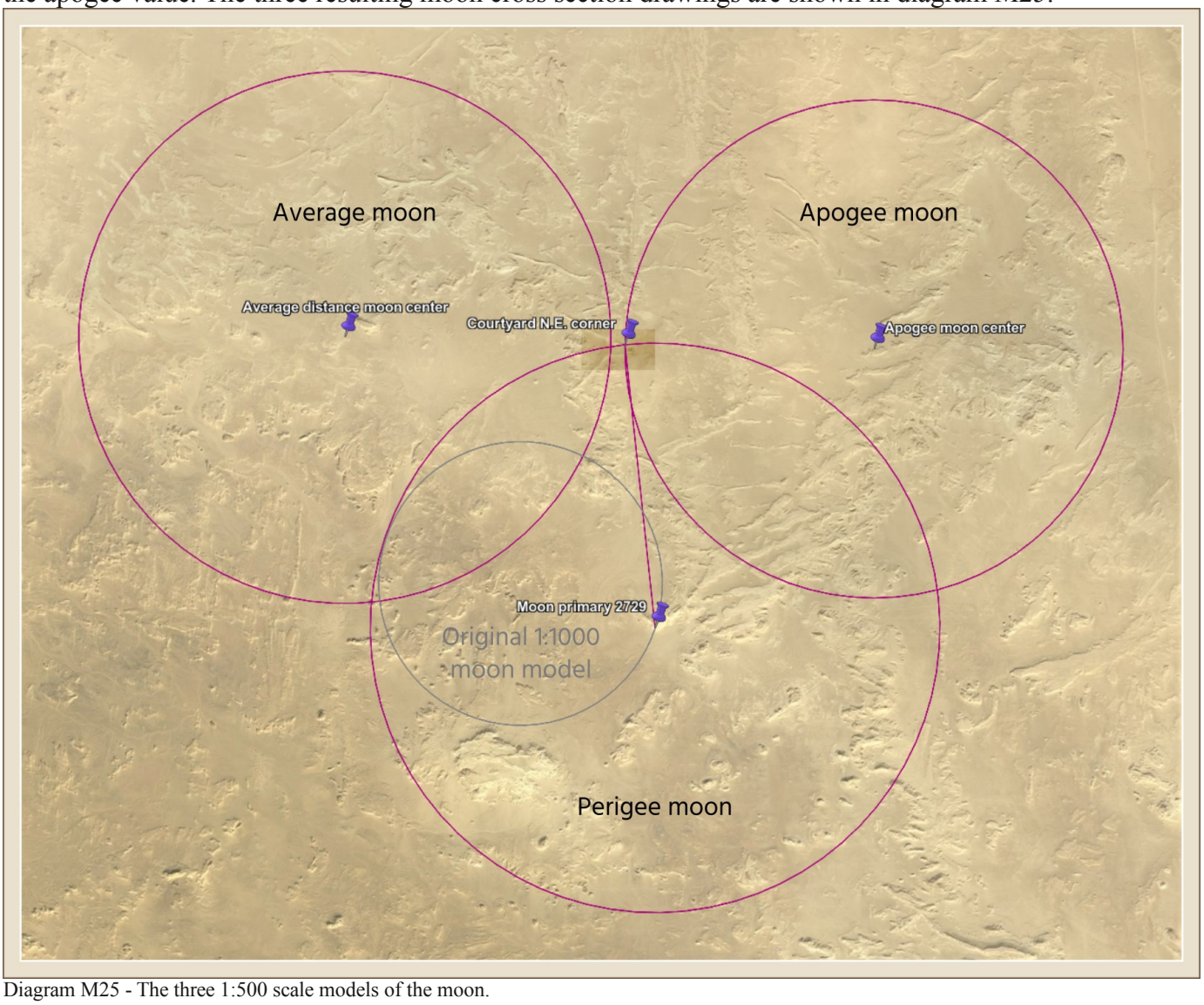


Diagram M25 - The three 1:500 scale models of the moon.

The drawing of the three moons also contains the 1:1000 model of the moon, shown in grey, that was discovered first. This is not a superfluous detail. It is the explanation of what to do next with the construction system. The 1:500 perigee moon and the 1:1000 moon model share a common point on their circumferences because of the manner in which the geometry is designed, and the very same concept now needs to be applied to the three moons whereby an outer moon structure is created that touches all three of the moon models and encloses them into a final 'super moon'. Diagram M26 shows this geometric arrangement.

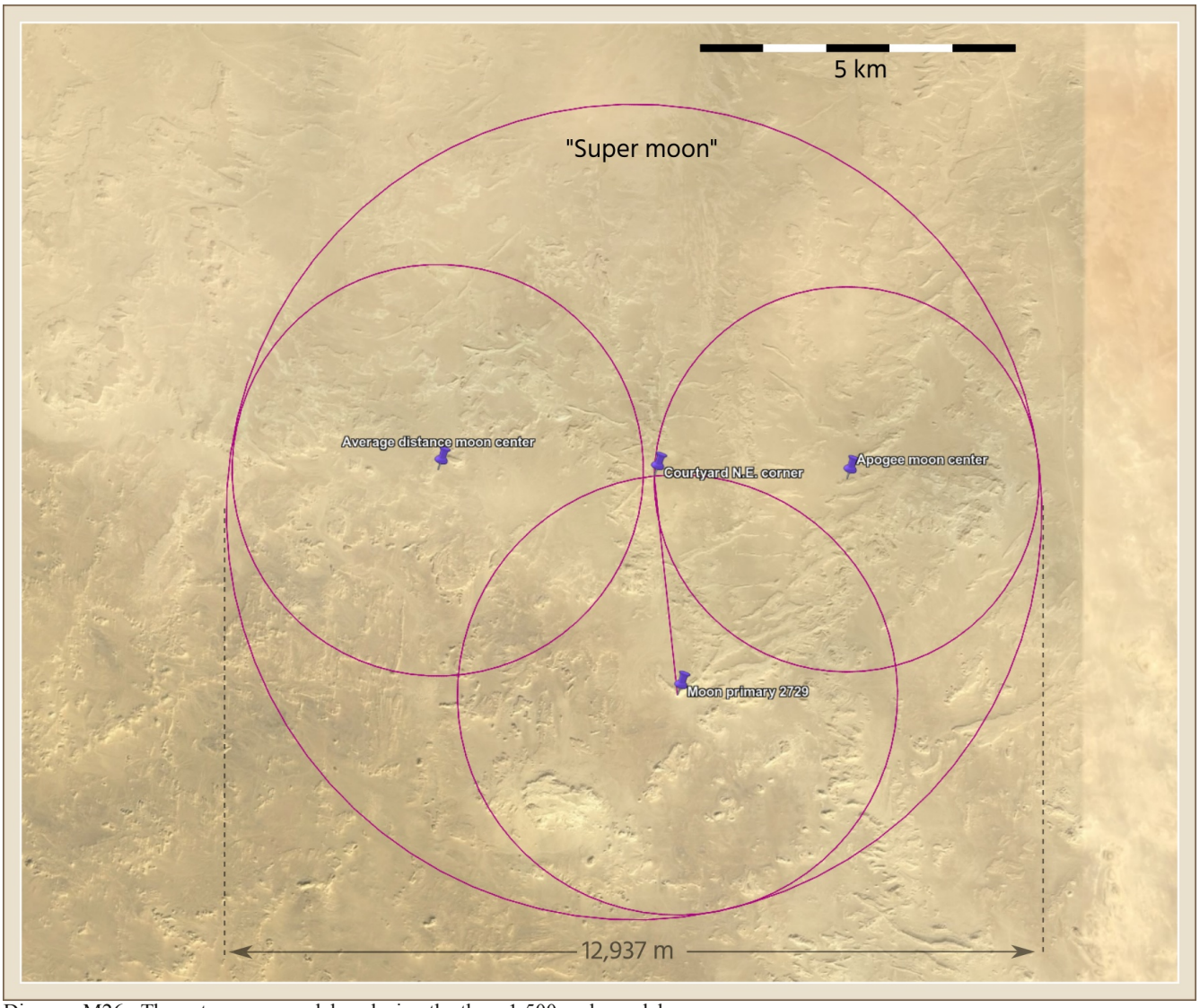


Diagram M26 - The outer moon model enclosing the three 1:500 scale models.

Because at this stage in the analysis the mapping application's inherent circle plotting routine was being used to display the geometric shapes, there is no precision within this drawing. That is to say that the circumference of the super moon model will be out of position by a few meters in any given direction at any point on it's circumference, and therefore the radius of the model only accurate to within a few meters. This does not affect the ability to begin the analysis of the next and final part of the architect's system.

The size of the super moon model is such that the ground features in the desert could well be representative of the ground features on the moon, allowing further confirmation that this is indeed a model of the moon. Investigation of that possibility lead to the creation of a 3D model of the moon using the CGI modeling data supplied by NASA, which contains very high resolution imagery of the moon's surface. The 3D model of the moon was created and then rendered as an orthographic projection, following on from the original orthographic projection[4] of the Earth that is used in the architecture of the Great Pyramid. However, after the resulting image of the moon's surface was overlaid onto the ground model only a very approximate correlations could be found with a small percentage of the ground features, which also involved rotating the image by about 180 degrees so that the north pole of the moon's surface image was at the south part of the ground model and it was concluded that the ground features and the moon's features did not match up.

However, because it is certain that the temple structure was built in late 2006 or 2007, then the construction of this geometric model of the moon post-dates the lunar landings of the Apollo missions of the USA that were carried out in the 1960s and 70s. It was therefore decided to look for the the landing sites on the moon model to see if they have been included in the design.

At the time of the Apollo landings the latitudes and longitudes of the landing sites were recorded using reference points on the moon that were part of the NASA database, but have since been adjusted because we now have significantly more data about the moon which has allowed a prime meridian to be established on the moon's surface. The coordinates of the lunar landing sites of the Apollo missions are published by NASA[5] in both their original and standardised coordinate frames, and these standardised values were used to plot out the sites on the 3D model and then the orthographic projection of the moon was once again taken. The resulting image was overlaid on the ground map in the desert and diagram M27 shows the final moon image superimposed onto the desert floor with the north pole at the south of the image, following on from the first part of the attempted alignment.

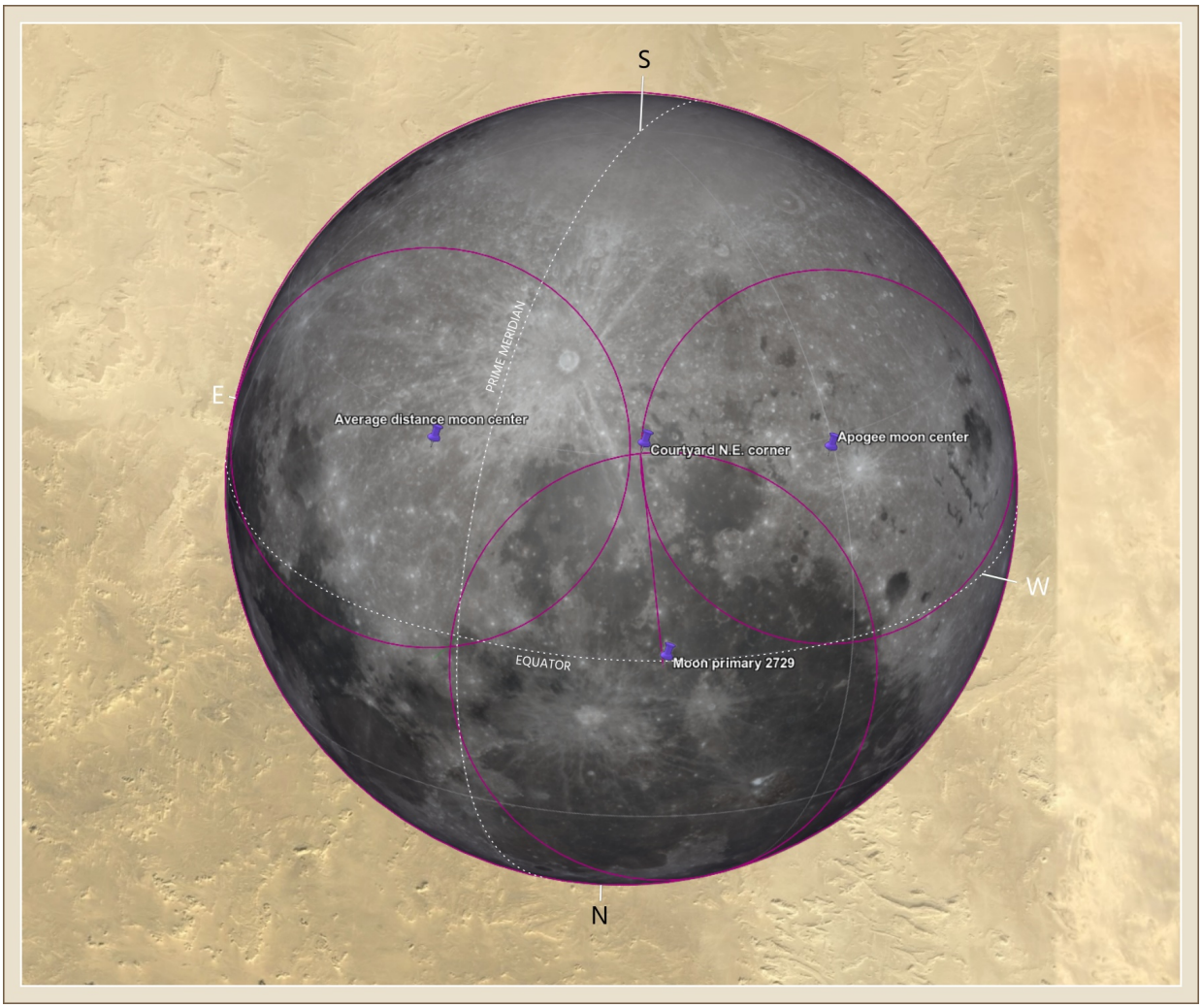


Diagram M27 - The moon's surface superimposed onto the desert floor.

Whilst looking for the Apollo landing sites the model required some adjustments during the initial analysis phase, the major one being that rather than taking an orthographic projection of the moon, a perspective image of the moon as seen from the Earth's surface was used. The model required rotating on its three axis in order to correctly align the moon's surface features with features on the desert floor, and diagram M27 shows the final alignments after all of the analysis, which is about to be described, was completed. The rotation angles are not arbitrary. The east-west line through the center of the moon is the X axis and the model has a rotation of 10 degrees around this axis, the axis running through the prime meridian is the Y axis and the model has a rotation of -30 degrees around it and the line through the poles is the Z axis and the rotation around this axis is 16 degrees. The first angle represents decimal, the third angle represents 16 bit binary format and the second angle shows angular rotation as an integer proportion of a full circle. The final rendered image is rotated by 157.54 degrees in an anti-clockwise direction.

The method of alignment was to inspect the image from the high resolution CGI image at the point of interest and then add a mapping application push pin in the GIS software to the point on the ground

corresponding to the point on the moon's surface. This was repeated for all of the Apollo landing sites, the corresponding ground features identified, and then the adjustments to the 3D perspective render made by changing the rotation angles of the moon model so that the fit of all the points was better. The render was then re-taken and the resulting image placed back onto the mapping application as an overlay and the process repeated until all of the landing sites matched the identified ground features. This was not as time consuming as may be imagined because the final rotation angles of the moon used in the model are integers, and are also rational values that correspond to the logic of the overall system. Diagram M28 shows the close up of the Apollo 11 landing site taken from the high definition rendering of the moon's surface, which was taken from a very high polygon count 3D model so as to eliminate as much distortion as possible, within the limitations of the computer being used.



Diagram M28 - The rendered image quality at the Apollo 11 landing site.

The scale on the image corresponds to the desert floor onto which the image is overlaid and it can be seen that the landing site was identified to within a few meters of precision in the initial analysis.

The Apollo 11 landing site

The location of the Apollo 11 landing site is shown in diagram K-29. The left image shows the raw satellite photo and the right image shows the enhanced ground markings, with the green mark showing the size and location of the mapped landing site from the 3D render.

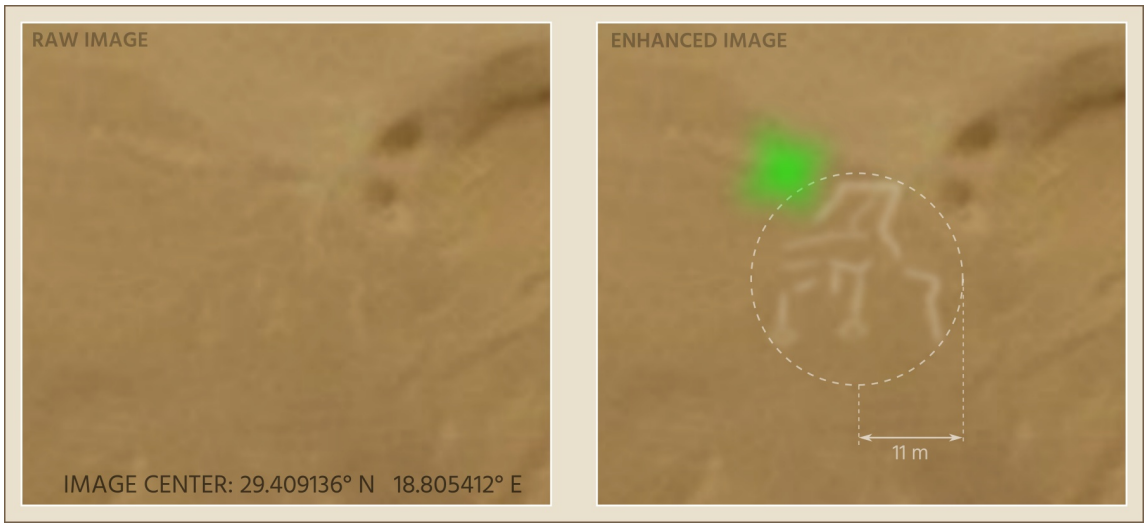


Diagram M29 - The Apollo 11 landing site on the desert floor.

The marking are a rough etching of the lunar lander and they can be enclosed in an 11 perfect meter radius circle as shown in the right image. The latitude and longitude of the location of the center of this circle are shown in the left image, which are taken from the Google Earth application's inherent controls.

If you look at a wider view of the area there is a second etching very close by, as shown in diagram M30.

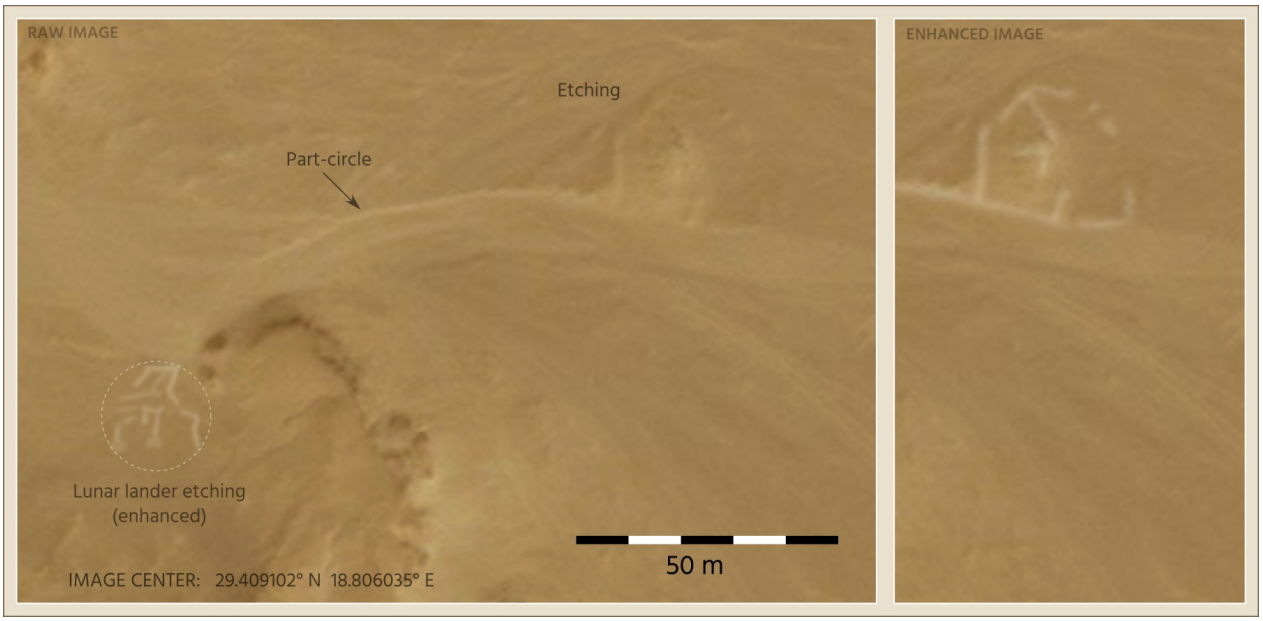


Diagram M30 - The Apollo 11 landing site second etching.

There is a part circle cut into the desert floor on which the second etching is inscribed which shows a building with a sloping roof, an opening of some sort at the front, and is shown in perspective. This is the instruction that allows you to convert the initial orthographic projection of the moon into a perspective image which is essential in aligning all of the lunar landing sites correctly. If the etching shows a building placed on the curved surface of Earth then there must be a small model of the moon somewhere nearby for the etching to be complete, and that is the case as shown in the wider view of the area in diagram M31 in which a distinct 11 m diameter moon can be seen on the right side of the image at 29.410259° N 18.808006° E. This moon construction is located 173.8 m away from the opening at the front of the building, confirming that this is indeed a model of the moon by using the moon's radius at 1:10000 as the distance between the two objects.

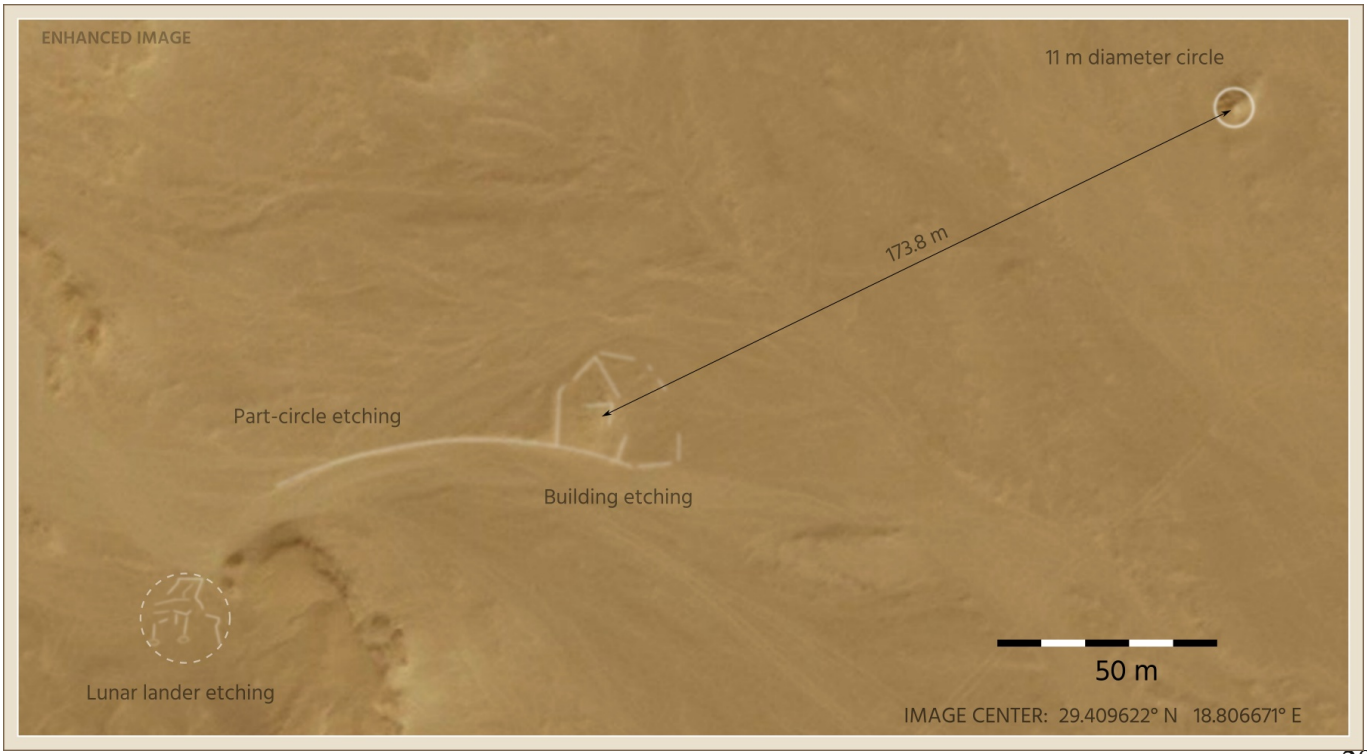


Diagram M31 - The Apollo 11 landing site third construction.

To understand why this series of ground etchings has been constructed it is necessary to look further at the surrounding area where there are a significant number of other non-natural looking constructions on the desert floor which align with the features just shown. Diagram M32 shows these features.

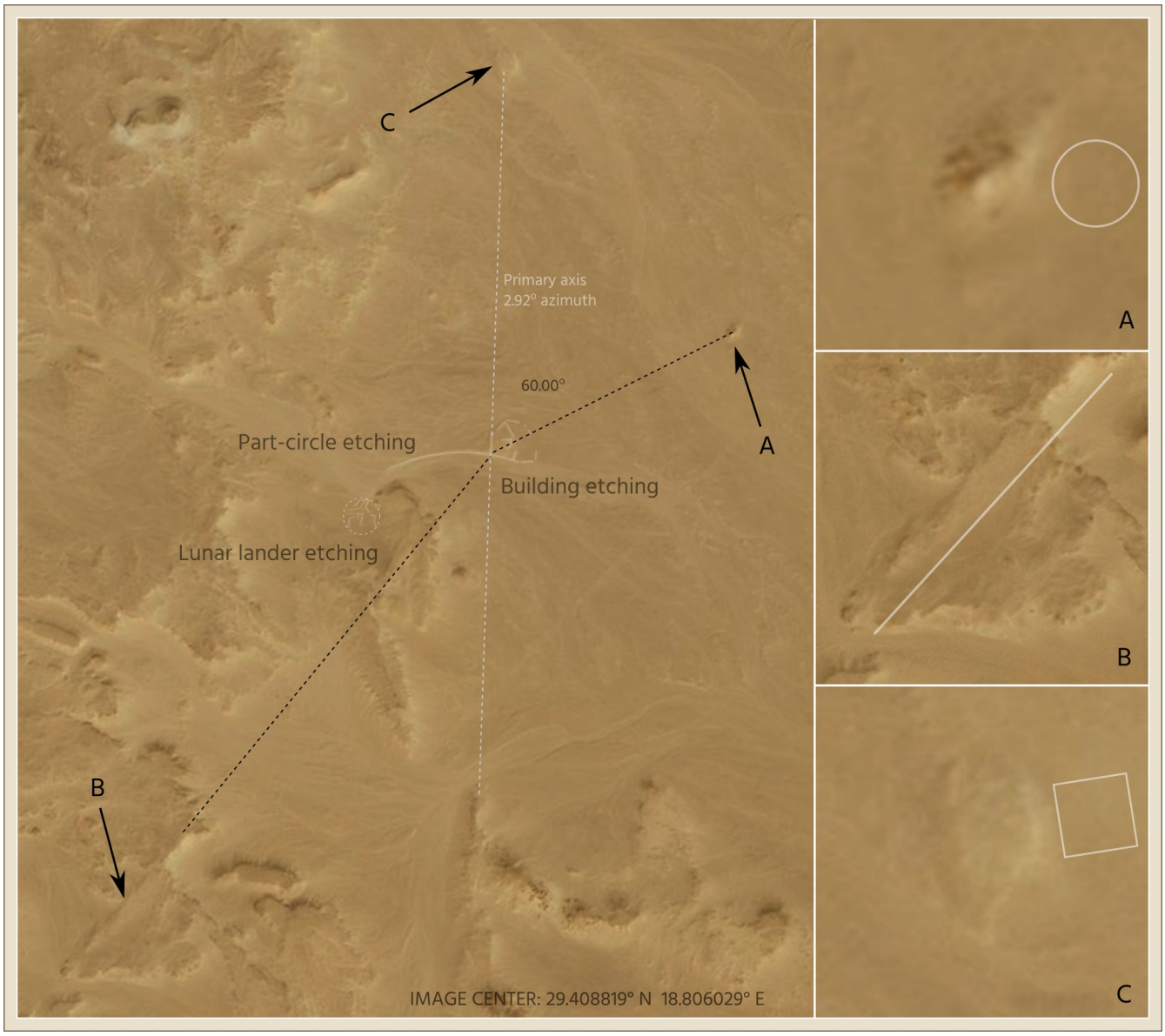


Diagram M32 - The Apollo 11 landing site first set of outer features.

The inset drawings on the right of the diagram have their geometric structures placed at the side of the ground feature so as not to obscure the satellite image. Point A is the moon circle identified above and which is known to connect back to the building etching. Construction B is an unnatural straight rock formation which aligns with south west corner of the building etching and point C is in line with the same corner of the building etching and the second unnatural rock formation at the south of the image. Point C is connected to the rock line by a white dotted line that also passes through the south west corner of the building etching, and this line is parallel to the line of the super moon's Z axis that was shown previously in diagram M27. It is the principal axis line of the drawing and point A is set at exactly 60^{o} to this axis.

Before explaining what this geometric structure represents it is necessary to look at the second series of ground formations that are present in the surrounding area, because the two systems are linked together. Diagram M33 shows the second set of features around the model of the Apollo 11 landing site with the geometric features illustrated on the diagram slightly to the east of their ground locations so as not to obscure the satellite image. There are four ground features on the diagram with feature A being the small moon model from the previous analysis, feature B being a 'Z' shaped structure with its upper bar lining up with the lunar lander location, C being the upper point of an 11 degree circle arc, and feature D being an arrow aligning with the primary axis line of the moon's north and south poles.

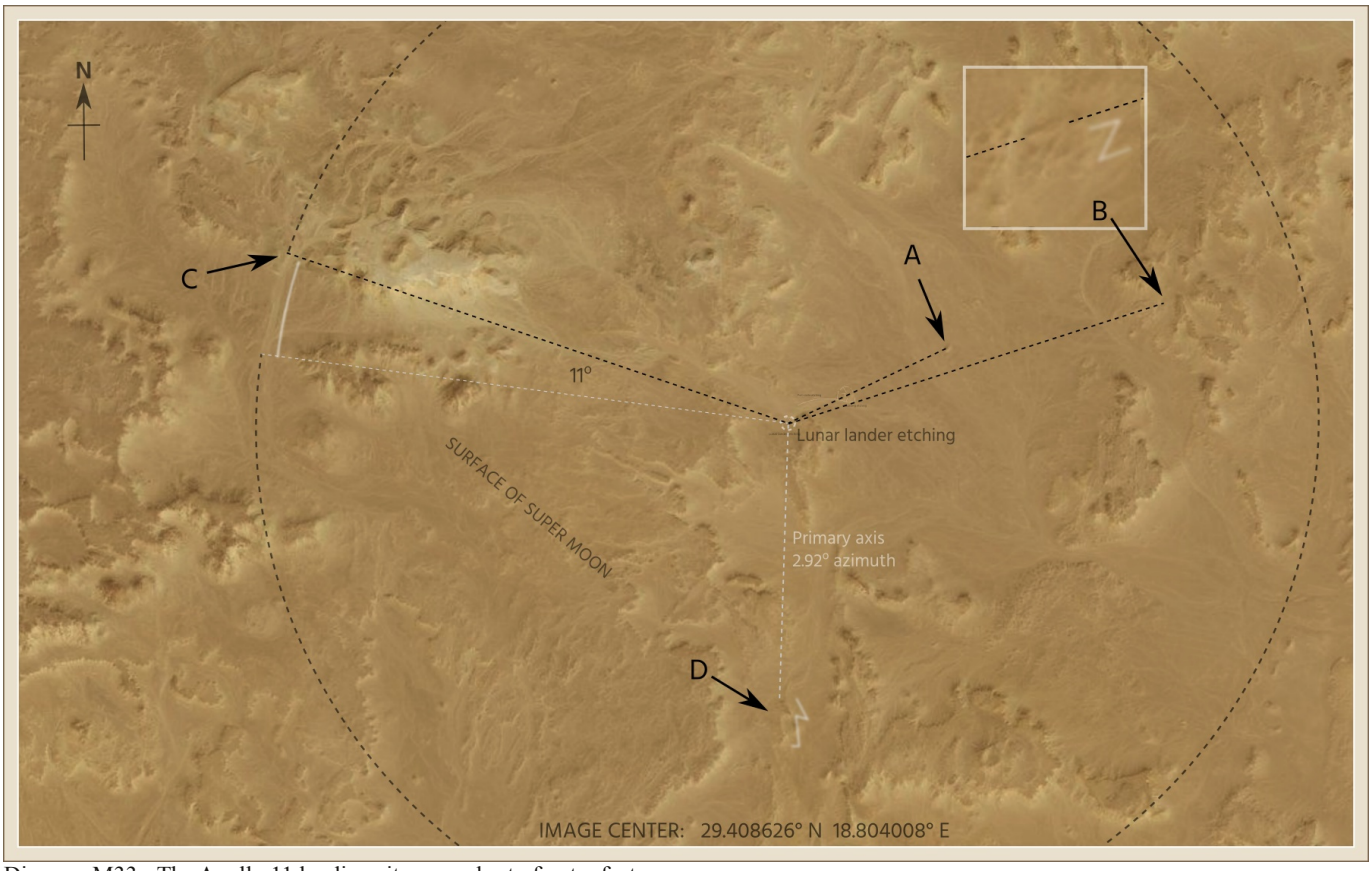


Diagram M33 - The Apollo 11 landing site second set of outer features.

The two diagrams M32 and M33 are both clocks that are upside down with the '12' located at the bottom of the primary axis line on both illustrations. If the two diagrams are rotated so that this '12' position is located at the top of the diagram and the axis line then parallel to the diagram's sides it is easy to see the time that is indicated on the clocks. Diagram M34 shows the clock face from the previous diagram with the axis line running to the top of the diagram and parallel to the page sides.

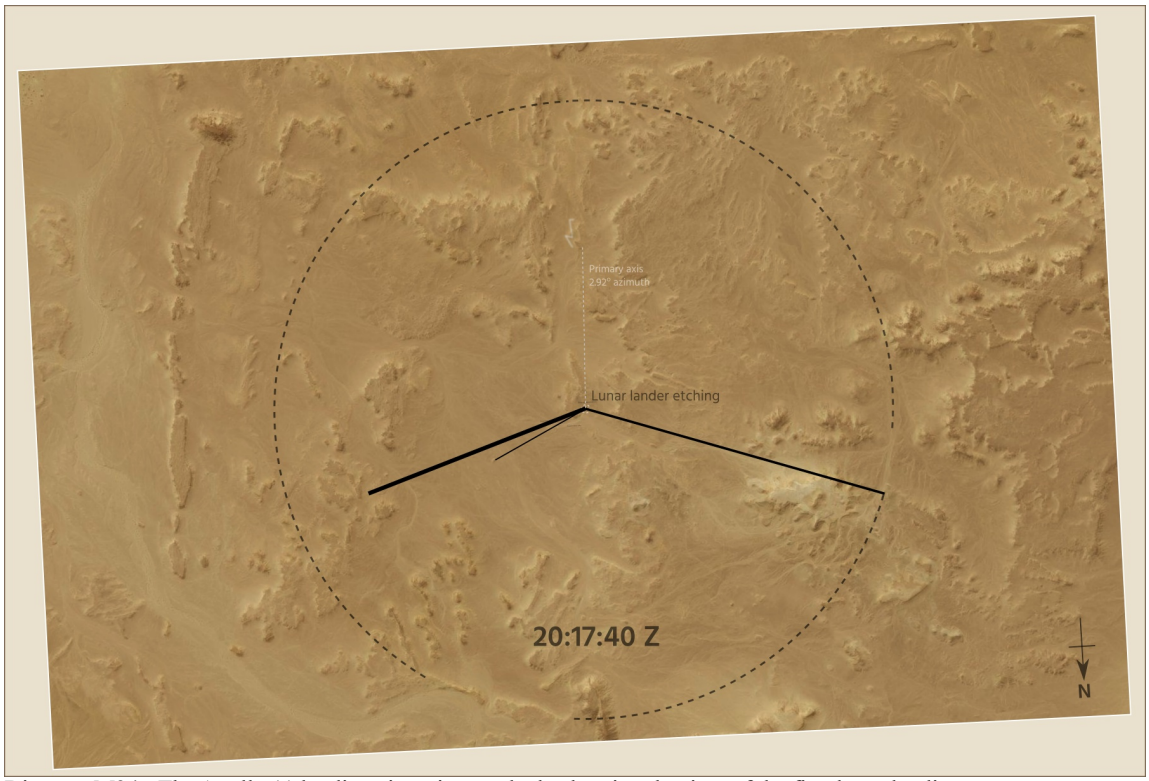


Diagram M34 - The Apollo 11 landing site primary clock, showing the time of the first lunar landing.

The time shown on the clock is 20:17:40 Z, with the 'Z' letter being taken from the ground etching that marks out the minute hand and being a modern standard called "zulu" for expressing times that are given in UTC, or what used to be known at the time of the Apollo 11 landing as Greenwich Mean Time. 20:17:40 Z is the time that the Apollo 11 lunar lander touched down on the moon's surface from the records from NASA, correct to the second.

The angle of the hands on the clock are calculated as composite values so that the hour hand, for example, is at 248.833 degrees from North, that being made up of 240 degrees from the hour (8), 8.5 degrees from the minutes (17) and 0.333 degrees from the seconds (40). The minute hand is therefore at an angle of 106^{o} and the seconds hand at 240^{o}. The alignment with the ground features is precise when calculated using a geodesic bearing calculator over the reference ellipsoid.

What is unusual about this clock time on the desert floor (other than the fact that it exists in the first place) is that the overall geometric system that is being looked at starts at Giza, with the system's prime meridian running through the Sphinx's paws at a GPS longitude of 31.137946 degrees east[6], which when measured to the 1969 prime meridian through Greenwich would be 31.136478 degrees east. The time on the clock for the lunar landing based on the Giza prime meridian time should therefore logically show 2^{h} 4^{m} 32.75^{s} later or 22:22:13 hrs.

If you refer back to diagrams M31 and M32 you can see that the first etchings are not of a clock but describe the prime meridian reference system to which the landing clock has been set. The dotted white line shows the prime axis of the clock system and this runs through and forms the west wall of the building etching, and the small moon circle is connected to the building. The building is a representation of an observatory at the prime meridian used in the clock time. If a geodesic line is taken from the building's south west corner at GPS coordinates 29.409514° N 18.806310° E up to the Greenwich observatory meridian line at coordinates of 51.477976° N -0.001466° E the forward azimuth of the line is 332.782886°. Diagram M35 shows the overlaid moon image from the 3D rendering, the location of the south west corner of the etched building and the geodesic line to Greenwich.

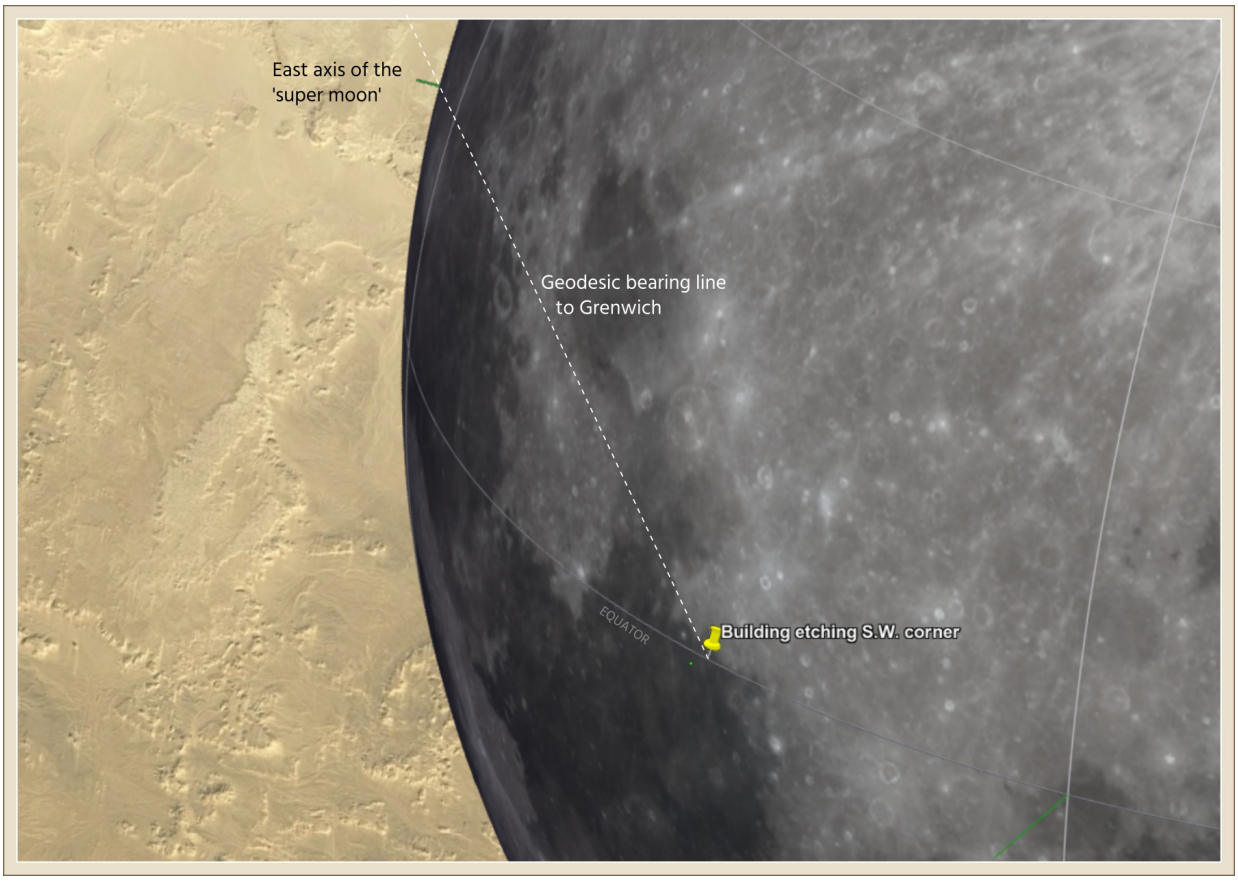


Diagram M35 - The prime meridian geodesic line from the Apollo 11 landing site buidling etching.

The building's south west corner lies exactly on the moon model's equator and the geodesic bearing line from this point to Greenwich runs through the axis line that emerges behind the rendering of the moon (remembering that this axis line has undergone rotations on all three Cartesian axis and the rendered image is taken in perspective).

The next step in the process of analysis would be to move away from the 3D rendering of the Moon, which has served its purpose in allowing the preliminary identification of the Apollo 11 landing site, and to calculate the locations of all of the Apollo landing sites mathematically. The latitudes and longitudes are published, but what is not known is the precise rotation of the perspective image of the moon that is projected onto the desert floor. From the analysis with the 3D model and its alignment to the ground features the rotation angle has been determined as being 157.54 degrees but this is inadequate in accuracy to be used in geodesic computations. The precise value of this rotation angle can eventually be obtained by pursuing the logic of the system back in the direction of Giza, knowing that within the system this angle must re-appear somewhere and that it must be of primary importance in the system. Because of the resulting length of that investigation the mathematical plotting of the rest of the Apollo landing sites is deferred to future paper which will deal exclusively with the ground features of the Moon model.

The moon model's center point

The Moon's center point approximate latitude and longitude can be determined from the center of the Apollo 11 landing circle, which at this stage is the only reference point available to use, and there must be a corresponding point on the desert floor where the center point is explicitly shown. Diagram M36 shows this area of the desert with the initial calculated center point marked on the diagram.

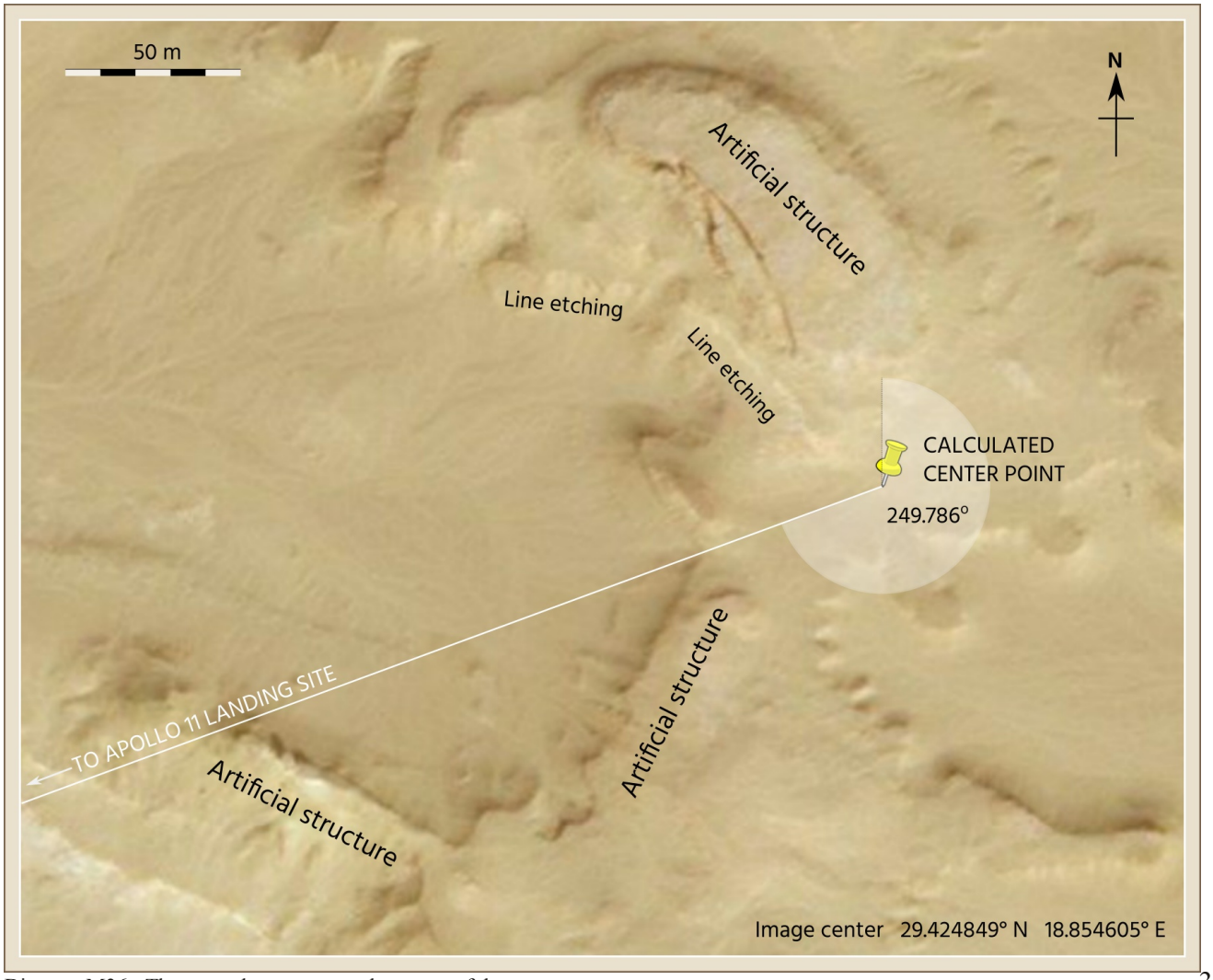


Diagram M36 - The ground structures at the center of the super moon.

To the west of this center point are five quite distinct artificial structures on the ground. There are two structures to the south which form two perpendicular lines and which are delimeted by the geodesic line that runs back to the Apollo 11 landing site. There is a curved structure to the north and then there are two line etchings below the curved structure which are distinctly marked out on the ground.

At the Apollo 11 landing site it has been established that there is a clock construction showing the landing time of the lunar module and it does not take much investigation of the super moon center point to realise that the two line etchings are set at an angle to each other that matches the hour and minute hand angle difference of the previously seen clock. This alignment of the hands places the seconds hand of the clock running exactly to the west from the center point, and because the angle of the seconds hand on the clock is known to be 240° relative to the 12 o'clock position, this allows the precise angles of all the structures to be understood. The geometry at this location can be further explained by realising that the curved artificial structure at the north of the image forms the clock's circular perimeter because the intersection of the line etchings is located at the focal point of the curve that defines the upper part of that structure.

Diagram M37 shows the partially resolved geometry of the super moon's center point area.

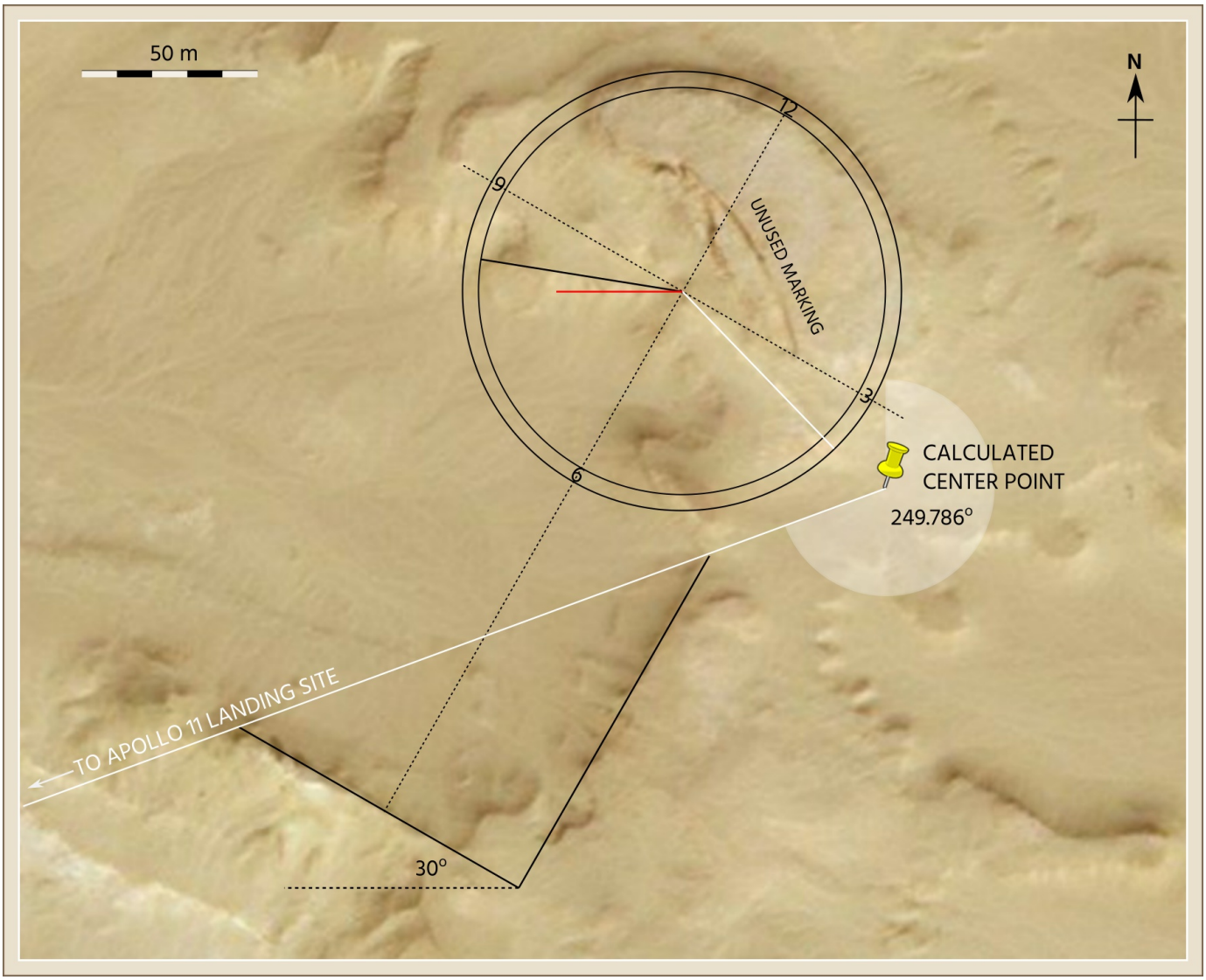


Diagram M37 - The Apollo 11 landing time clock at the center of the super moon.

The seconds hand of the clock is marked in red and is deliberately implicit in the construction. The whole of the clock structure is angled at 30° to north when referenced to the implicit seconds hand. There is a section of unused desert floor marking in the center of the clock which is also shown on the diagram.

Rather than solving where the center of the super moon is located the clock structure makes it clear that the originally calculated super moon center point is not correct and that there must be a further level of

geometry involved in the system. At this stage in the analysis there is only one set of principal geometry that exists, that being the line that starts at the Wall of the Crow in Giza, which then marks out the down arrow head structure explained earlier and then goes on to mark out the north east corner of the newly built temple structure. It therefore must be possible to rationally continue this geometry from the temple courtyard N.E. corner point to the moon center point with that rational continuation involving the radius of the moon and the thirty degree angle that has just be displayed in the center point structures.

After analysing the composition of such a system it is possible to resolve to some degree the geometry of the super moon center point. From the N.E. corner of the temple courtyard a geodesic line needs to taken at a bearing of 210^{o} , or 30^{o} west of south, for a distance of 608.335 m. On first analysis the distance is that of the moon's equatorial radius of 1738.1 km, taken directly from the basic NASA fact sheet, scaled down at a ratio of 20,000:1 and then multiplied up by 7, a value that is completely removed later in the analysis.

This line was added to the geodesic system that starts in Giza and the western end of the geodesic system involving the down arrow head, the temple courtyard and the super moon center point is shown in diagram M38. The resulting marker point for the moon center is shown in diagram M39.

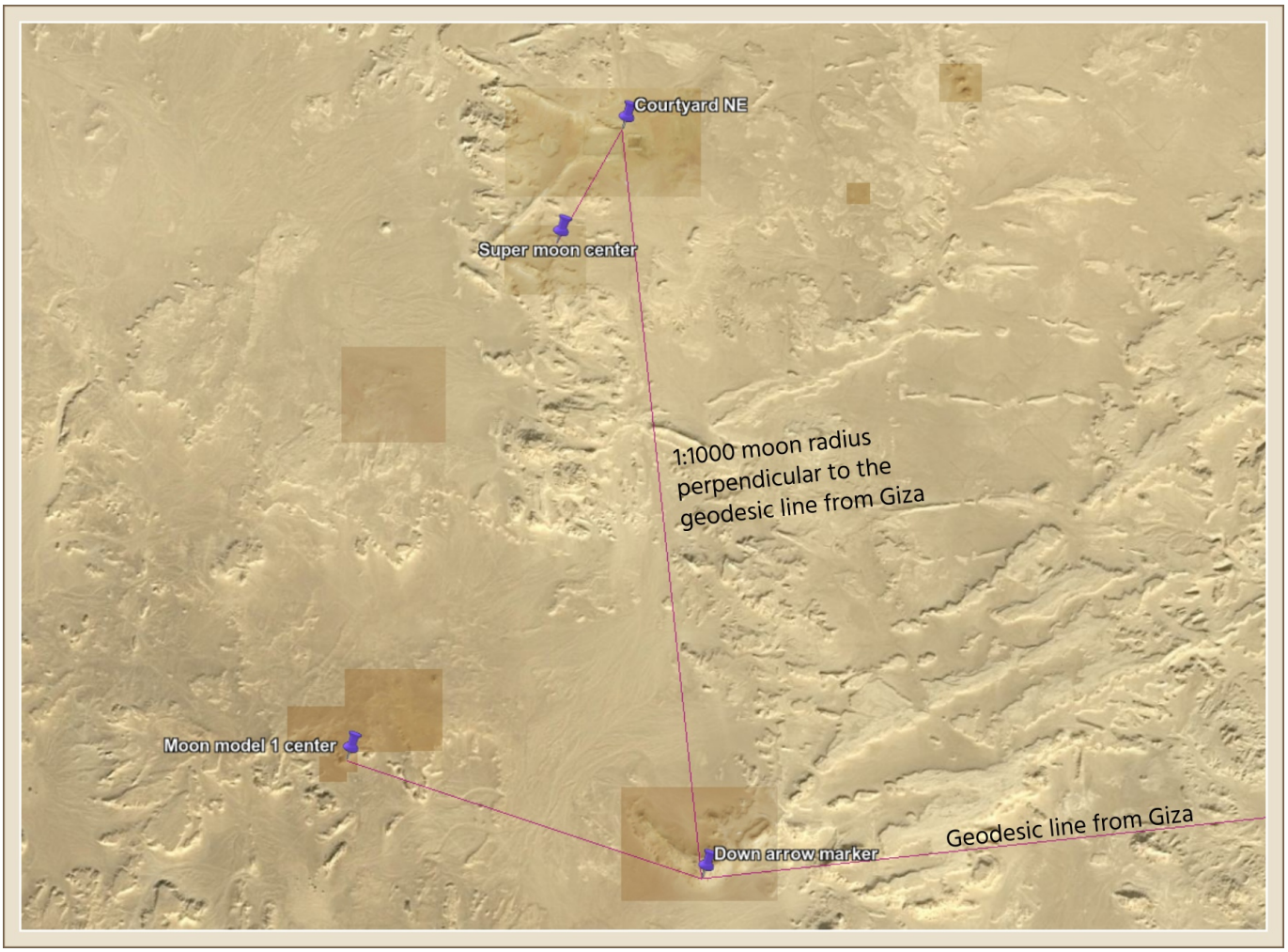


Diagram M38 - The western end of the geodesic system from Giza.

In diagram M39 the end of the geodesic line from the temple courtyard terminates on the previously unused part of the ground structures that was marked on diagram M37. A line taken back to the Apollo 11 landing site at the azimuth of 249.79^{o} from this termination point passes through the clock center and the diagram has been adjusted to show this alignment.

On the unused structure there is a small marker hole, probably about 1 m in diameter, to which the geodesic line has been drawn. This involved adjusting the line length from Giza to the down arrow marker to be 1189.52136 km so that the geodesic line from the courtyard terminates in the correct place,

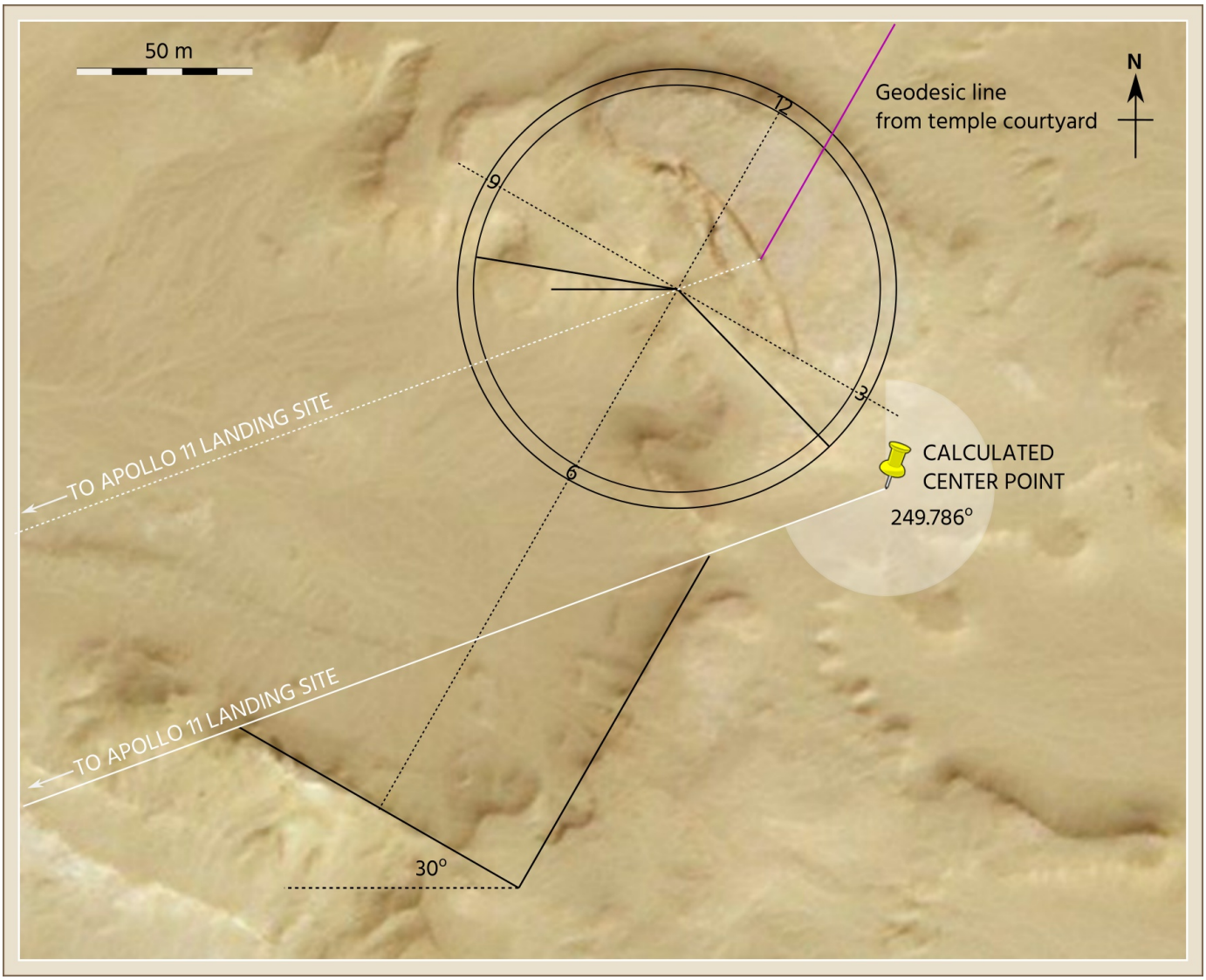


Diagram M39 - The super moon center point area of the desert floor.

and this calibration then gives the reverse azimuth of the Giza line as being 83.90176167 degrees and therefore the astronomical value of the moon's maximum tilt to the ecliptic as 6.09823833 degrees.

This value, as was explained previously, is the addition of the moon's inclination to its orbit plus the angle of the moon's orbital plane to that of the ecliptic and is a precise value which does not include any data from our modern ephemeris tables. What is required is to split this value into its component parts, which are known to be approximately 4.555^{o} and 1.545^{o} respectively in 2729 BCE.

There is one more piece of information that is currently being used that is from modern data sources and that is the equatorial radius of the moon which is being used in the geodesic line construction from the down turned arrow marker to the temple courtyard and then from that point to the super moon center. It is necessary to resolve this value in addition to splitting the angular measure so that the whole system can be fully resolved independently of modern astronomy data.

The process of resolving these values involved investigating how the super moon model has been placed relative to Giza, how the system tied in with the last resolved point on the Giza plateau, and searching for a marker point that will define the moons radius with precision. As will be seen, all of these values can be determined accurately and the quest to determine them will also eventually lead to resolving the rotation angle of the perspective image of the moon that is projected on the desert floor.

The bulk parameters of the Moon

The full size dimensions of the moon are included in the geometry of the model by way of specifying the polar flattening of the Moon and its mean polar radius.

If you calculate the focal points of a reference ellipsoid of the Moon taking the data from the modern values on the NASA moon fact sheet[7] where the equatorial radius is 1738.1 km and the polar radius is 1736.0 km then the focal length of the moon polar cross section ellipse will be 85.4 km. If the two focal points of the ellipse are plotted on the 3D model of the moon and then included in the projection on the ground, then the resulting polar coordinates of the two focal points are not equal and opposite because the projection is not orthographic. The easterly focal point on the ground model is located at a bearing of 282.7 degrees from the center of the moon at a distance of 298.257 m.

This distance is instantly recognisable as the numerical value of the reciprocal polar flattening of the Earth which is a value that was given within the Great Pyramid's internal architecture. The size of the model of the Moon in Libya and the three rotation angles around the three axes of the 3D model and the resulting method of projection are specifically chosen so that the eastern focal point of the model is located at a distance, in perfect meters, from the moon center that is equal to the RPF of the Earth.

A mathematical model of the Moon and its projection on the ground was developed at this stage in a spreadsheet with the Apollo landing site locations included and the full size focal length of the moon was calibrated so that the distance to the eastern focal point on the ground projection perfectly matched the value of the Earth's RPF to eight decimal places of accuracy. This then gave the full size focal length of the moon as specified in the architecture as being 85.31506464 km and is independent of any modern values.

Once this focal distance has been established all that is then required in order to be able to resolve the two radii of the Moon's reference ellipsoid that is used in the architecture is for any one of the dimensions of the Moon to be given somewhere in the architecture, whether that be the equatorial radius or the polar radius. Because this value is required with absolute precision the architects have constructed the marker point at the full sized polar radius of the Moon distance from the super moon center point which can therefore be found 1736 km due south of the center of the moon model in the country of Chad, central Africa, as shown in diagram M40.

On diagram M40 the provisional longitude of the center point of the moon model in Libya of 18.8549^{o} is used as the reference longitude and is drawn as a white line on the right side of the drawing upon which the marker point distances of the Moon's polar radius are shown, taken from the academic paper "Topography of the Moon from Clementine Lidar"[8] which was used as a reference document so that the most precise modern measurement values were being used along with their published error margins. Considerable time was spent looking at the ground markings in the area and although several reasonably distinct wall edge markings could be seen in the surrounding area of the polar distance markers, nothing definitive could be determined and the research work was put to one side for a number of months whilst other parts of the system were being analysed.

On returning to this area a number of months later I was immediately struck by the aircraft image that is located on the left of the satellite photograph which quite certainly was not on any of the satellite images that I had previously looked at.

The satellite photo with the aircraft image in diagram M40 is reproduced from the Google Earth image, dated 04/2022 on their timeline.

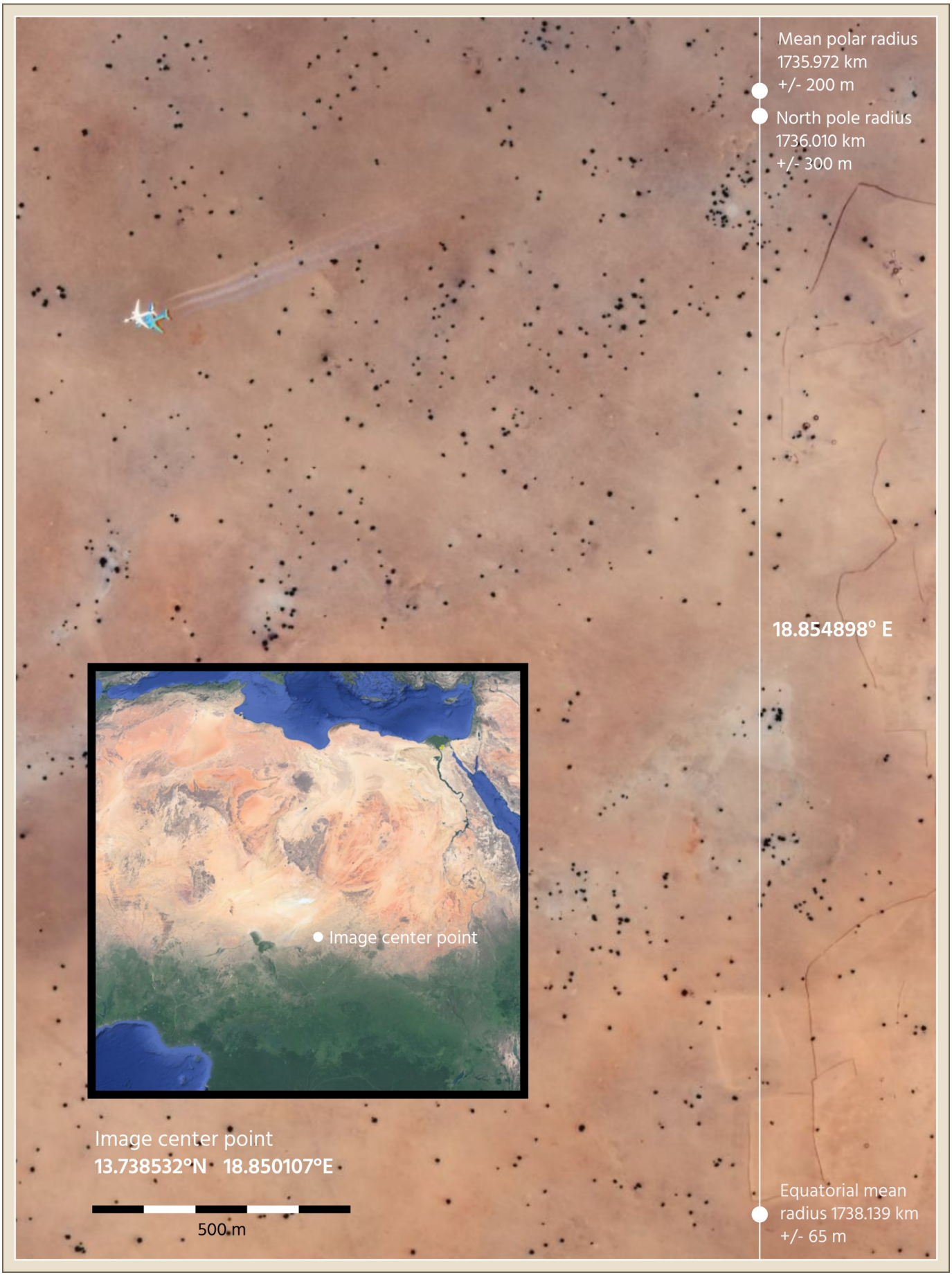


Diagram M40 - The full sized moon radius marker to the south of the moon model.

A close up of the top section of diagram M40 was constructed and the bearing line from the moon model center to the Apollo 11 landing site on the ground projection in Libya, taken from the NASA coordinate data of the landing site shown on diagram M39, were added to the image as shown in diagram M41.

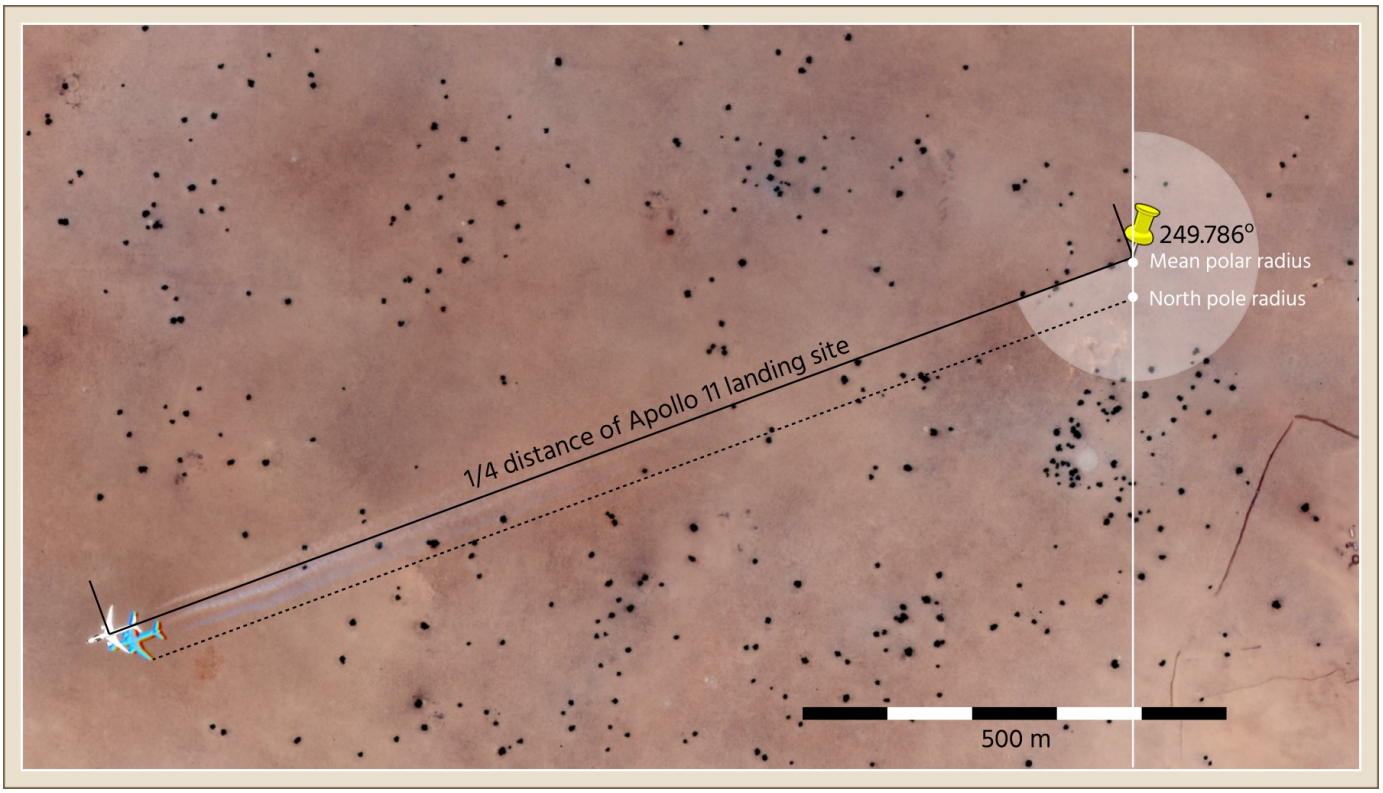


Diagram M41 - The digitally edited satellite image at the moon south marker point.

With the line angle graphic located with its center within a few meters of the mean polar radius point, not only is the aircraft image positioned perfectly on the Apollo 11 landing site line bearing but also its center of gravity is positioned at a distance of 1282.433 m from that center point, a value which is exactly 1/4 of the Apollo landing site line length on the moon model. The southern wing tip of the aircraft in the RGB image aligns at the same angle to the north pole marker point.

It is statistically impossible for an aircraft 1) in an area with few commercial flights to have 2) flown directly over the mean polar marker point at 3) the precise angle of the Apollo 11 geometric line and then for 4) the satellite image to have been taken at the moment the aircraft's center of gravity was positioned at a simple fraction of the expected distance from that point and 5) the southern wing tip to align with the second marker point at the same angle. Without doubt the satellite image has been digitally edited and the aircraft image has been added at some juncture to the original image. This is the first of a number of digitally edited satellite images that appear in subsequent papers in this series.

It is therefore appears possible to accurately determine the polar radius of the moon by using the mathematically calculated line bearing of the Apollo 11 landing site on the moon in a geodesic calculator and using the aircraft image as the calculation point location.

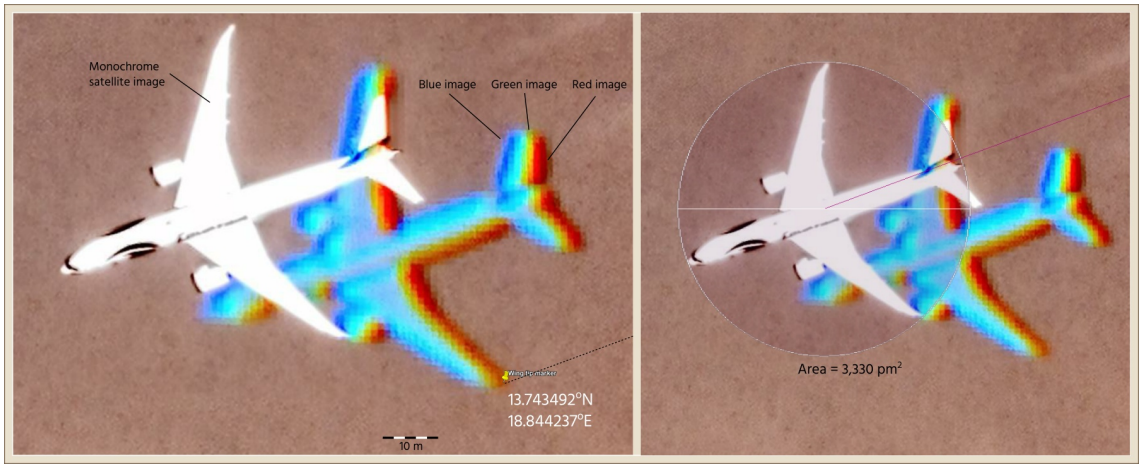


Diagram M42 - A close up of the digitally edited aircraft image and containing circle.

Diagram M42 shows a close up of the aircraft image, the left part of the diagram showing the four colour images that are present and which simulate what an aircraft would be expected to look like on a standard satellite image in the visible spectrum, and the right side showing the containing circle into which the monochrome aircraft image fits.

The purpose of this aircraft image having been digitally added to the satellite image is not to show where the Moon's polar radius is located on the longitude line the comes down from the super moon center point as would be expected, *it is to define the longitude line* with the aircraft image having been positioned on the satellite image specifically as a geo-referencing point. The aircraft image is a high precision technical drawing which needs analysing further to determine the correct latitude and longitude of its reference point and the manner in which the line needs taking to the longitude reference line that runs up to the super moon center.

Diagram M43 shows the architect's grid system from the previous paper[1] at the aircraft's location.

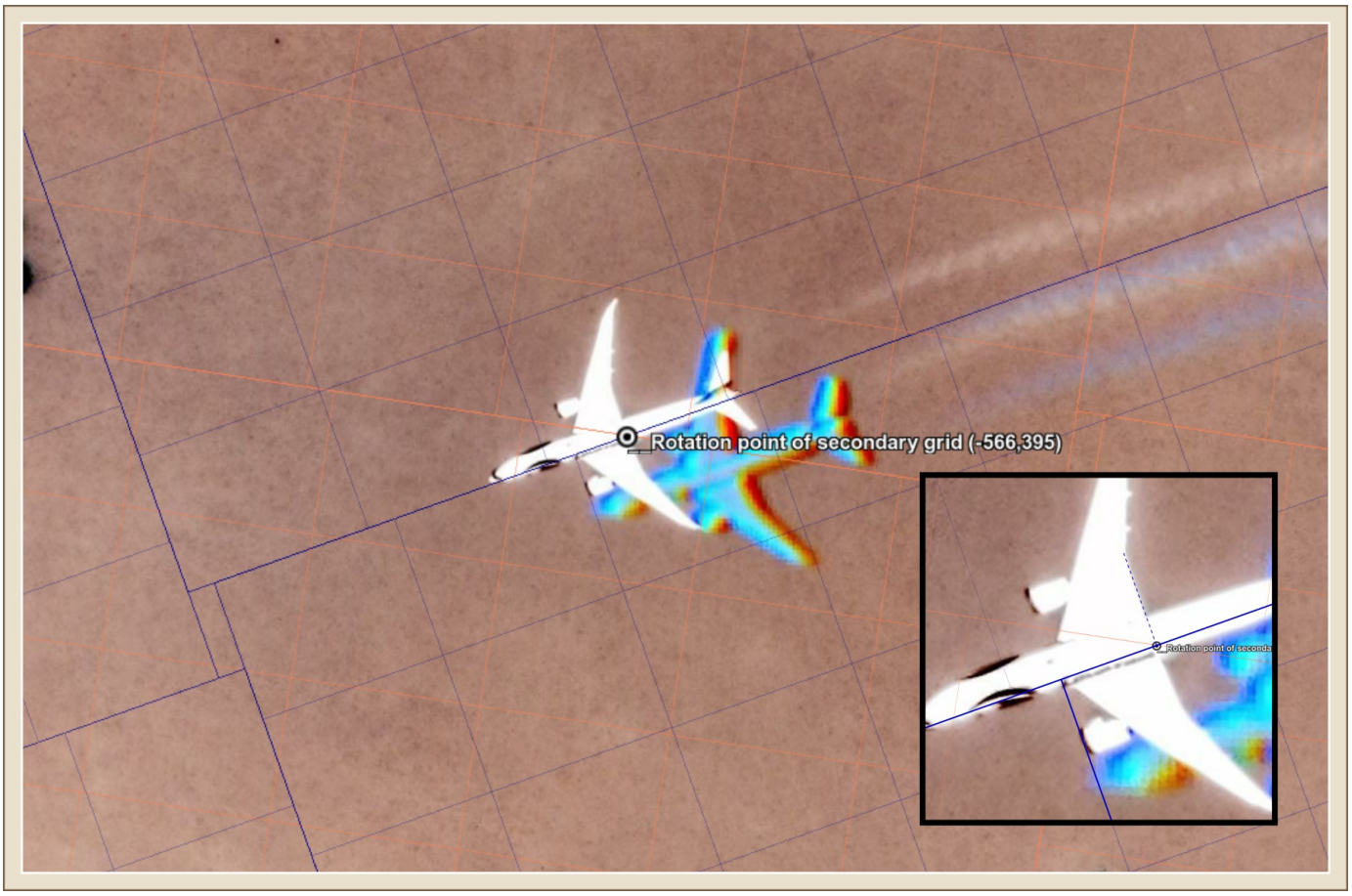


Diagram M43 - The grid system alignment of the aircraft image.

The orange grid is the primary grid and the blue grid is the rotated secondary grid, the angle of which is dictated by the location of the rotation point which is found in the center of the aircraft image. The aircraft image is aligned to the grid and the inset image shows how the starboard wing of the image also aligns perfectly to the grid. This alignment with the wing allows the correct grid rotation point to be selected because as the rotation point is moved during the analysis from one micro grid node to the next the change in rotation angle of the blue grid is much less than one degree and the wing allows for the differentiation of the various angles.

The aircraft image is constructed from the angular values of the Earth's axial tilt and the Moon's orbital tilt, in other words it is composed of all of the angles that are used in the geometry of the Moon system that is being analysed. Diagram M44 shows these angles superimposed upon the aircraft image with each angle being shown by a different coloured line.

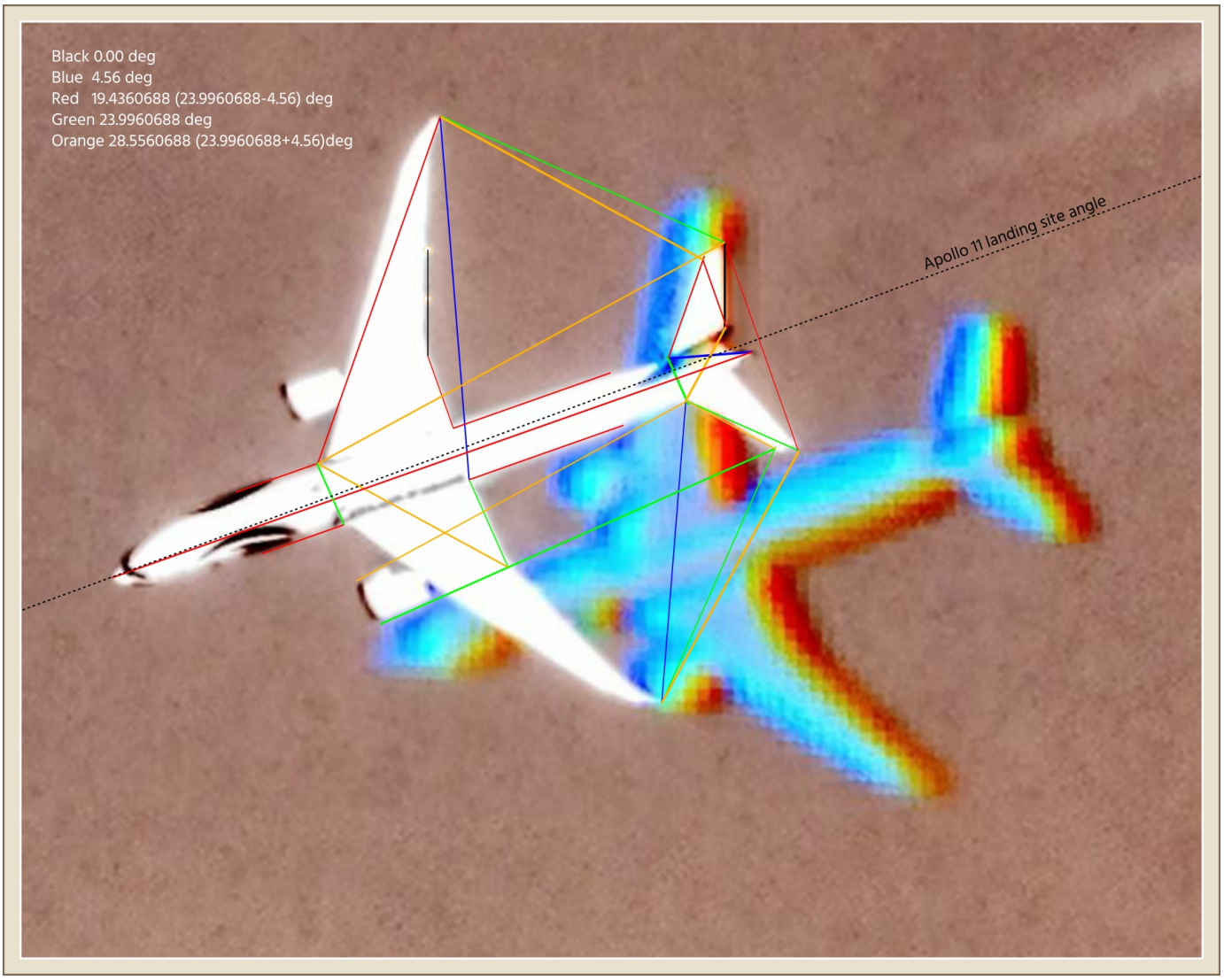


Diagram M44 - The grid system alignment of the aircraft image.

The angles used in the drawing are listed in the top left corner and are composed in a very specific manner. The axial tilt of the Earth, shown as 23.9960688 degrees, is the precise angle of the 2729 BCE winter solstice axial tilt taken from the Great Pyramid's lower northern shaft that is known and used to 14 decimal places of accuracy. The orbital tilt of the Moon's orbit in 2729 BCE is shown as 4.56 degrees and is truncated to two decimal places, with this truncation playing a vital role in the analysis.

Because the overriding purpose of the analysis is to determine, among other things, the precise angle of the Moon's orbit to the ecliptic and because we currently have a value for this in the DE441 ephemeris and the architects have another very similar value in their data tables, then there is a problem. If the geometric constructions are done with our value then there will be an inherent error, and we do not yet have the architect's value to use. The logical solution to this that has been used in the whole geometric system's calibration is to use the rounded value of the Moon's orbit angle, a quantity that will be the same in both our ephemeris tables and in theirs. This is a correct analysis of the logic and was determined by processing the system through to completion and finding that all errors could be removed by using the value rounded to two decimal places. It is confirmed in numerous places in the system, for example in the clock structure at the super moon center, which has deliberately not had the seconds hand etched into the desert floor to illustrate that values are rounded.

Returning to the aircraft image it can be seen that the direction of travel of the aircraft is along the red line that runs down the center of the aircraft from nose to tail and therefore the angle that needs to be used when determining the longitude line back to the super moon center is the 19.436 degree angle of the Earth's axial tilt less the Moon's orbital tilt, with just the latter being rounded to two decimal places.

Using the geodesic path calculator a point was determined so that, using 2729 BCE coordinates, a line emanating from that point at an angle of 250.56393 degrees and with a distance of 1282.4336 m terminated on the aircraft image's grid rotation point. The point that was determined has a longitude in 2018 coordinates of 18.8550707 degrees and from this point a line was added to the path creation software running due north up to the area of the super moon center.

Returning to the super moon center area, the center of the clock must also have precise coordinates which are linked into the Giza grid system and so an analysis was undertaken to determine how this had been accomplished. Diagram M45 shows the primary grid the covers the super moon center area with the alignment mechanism shown and a detail of the moon center area contained within the inset image.

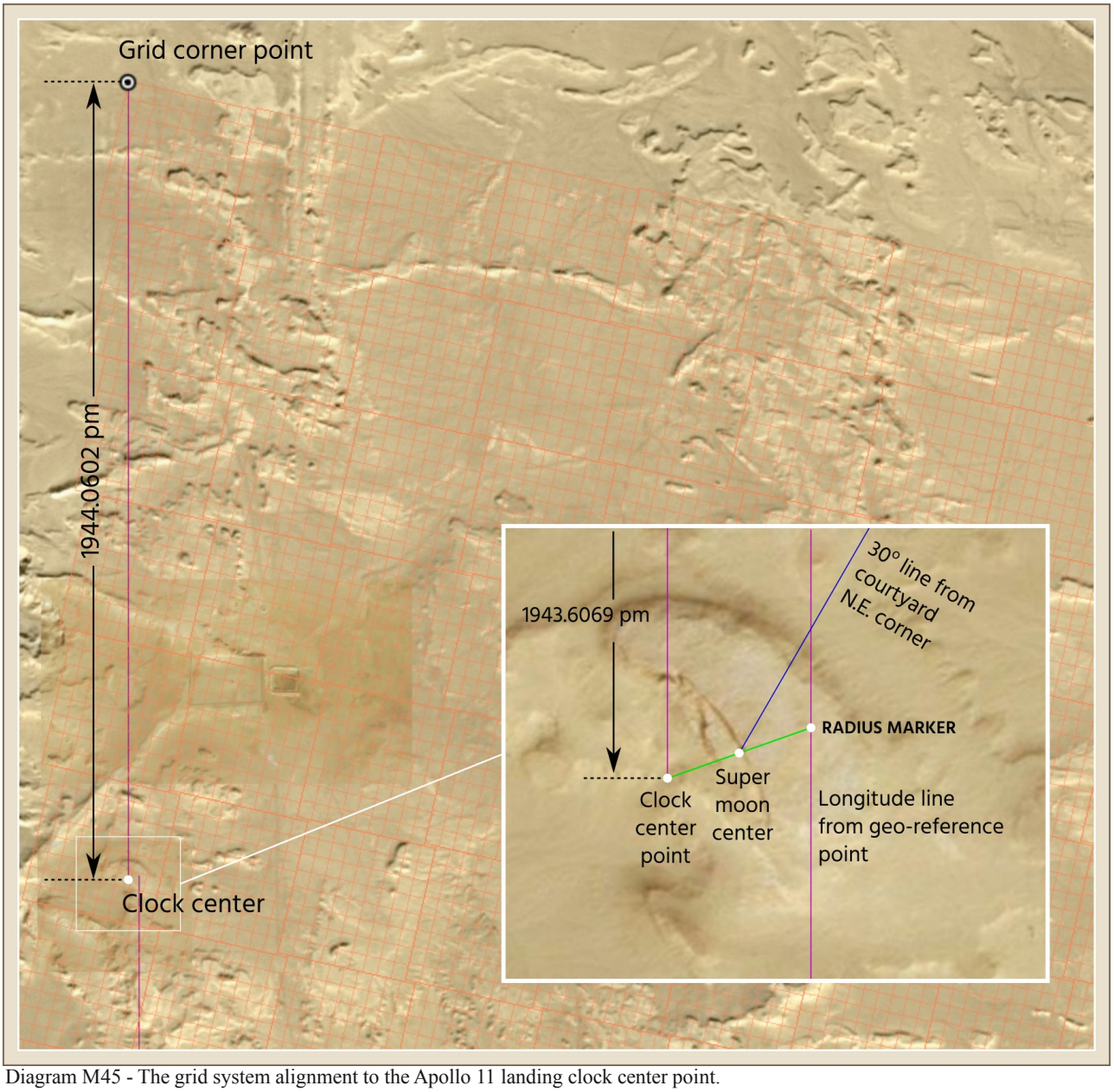


Diagram M45 - The grid system alignment to the Apollo 11 landing clock center point.

The center point detail will be addressed shortly but for now, for this system to calibrate correctly the grid's primary corner point needs to be identified exactly and because the secondary grid's pivot point slightly adjusts the rotation of the primary grid, and therefore the location of this corner point, it is imperative to identify the pivot point of the secondary grid.

During the analysis work it was noted that the temple structure to the east of the courtyard had the same size as the sub grid in one of its dimensions and investigation into finding the appropriate pivot point to align to this temple structure resulted in the pivot point and secondary grid that is shown in diagram M46.

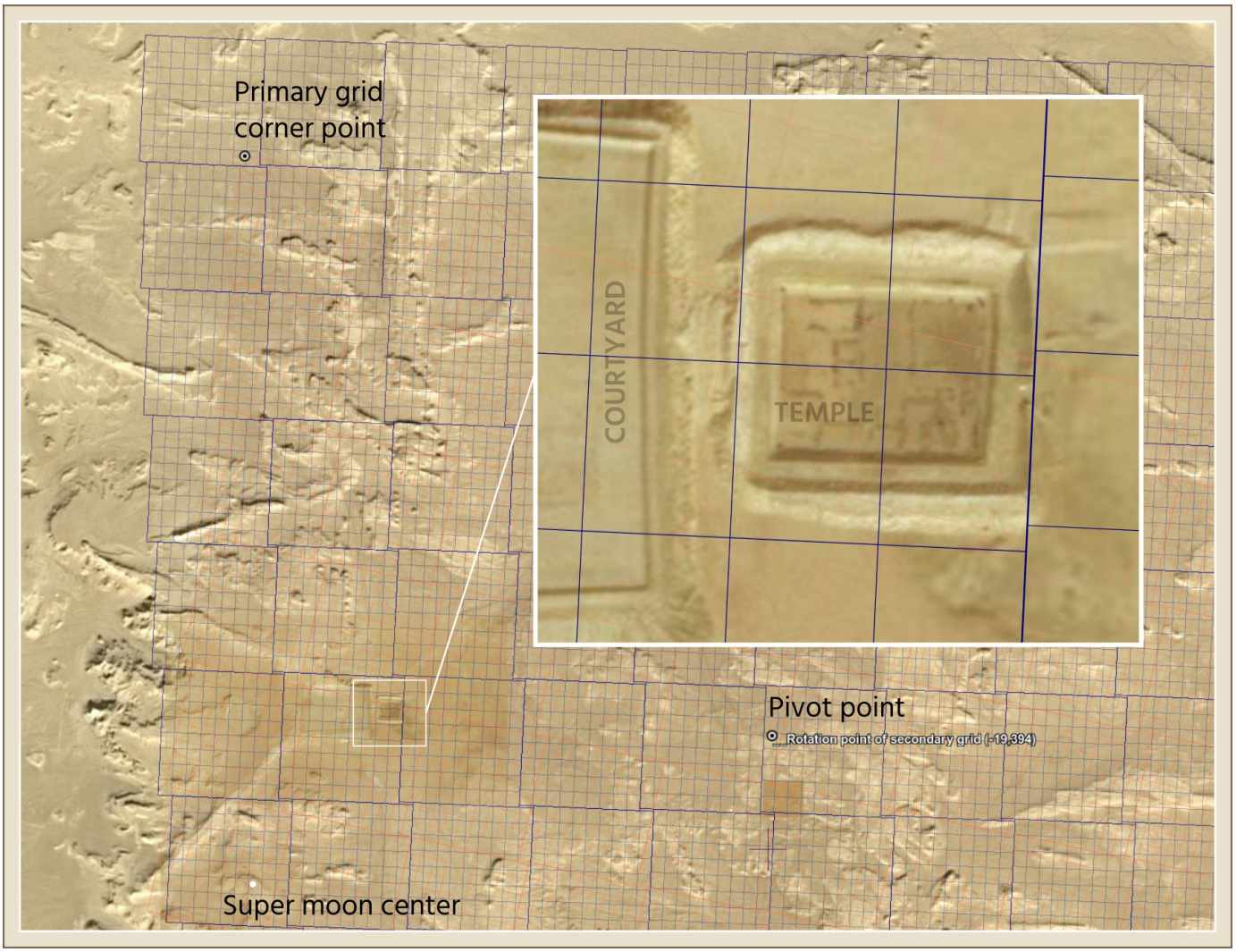


Diagram M46 - The secondary grid system, its pivot point and alignment to the temple.

As can be seen in the diagram and the inset image, the secondary grid aligns to the temple's east and west outer walls and the temple is also bisected in both directions by the grid's lines. The pivot point is located at 29.428263037°N 18.868321170°E and therefore the exact distance between the super moon center and the pivot point can be calculated in a geodesic calculator, giving a distance of 1432.792698 m +/- 0.1.

Investigation into this value was performed and it was found to be the full size distance between the geometric center of the moon and the center of Mass of the moon. In the reference document[8] the X,Y,Z coordinates of the center of the moon are given in kilometers as (-1.74,-0.75,0.27). This point was added to the spreadsheet which was being used to calculate the projected positions of points on the moon and the resulting distance between the moon center and the Moon's center of mass was computed as being 1413.04 km. The small discrepancy between this value and the geodesic value strongly suggests that the pivot point is the 3D center of mass point, and since this point is used to also define the temple layout the individual values of the X,Y and Z components of the center of mass of the Moon are most likely contained within the temple's wall layout. Unfortunately there is insufficient detail in the satellite image to be able to investigate this any further.

Returning to diagram M45 and the center of the super moon, from the primary grid corner point a line is taken to the south for a distance of 1943.6069 pm that distance being the one seen in the previous section and determined from the minimum value of the tilt of the Moon's orbit to the Earth's equator in 2729 BCE in degrees, 23.99607° - 4.56° or 19.436069°, and then converted into perfect meters and multiplied by one hundred.

In the inset image this line and its end point are shown, the end point marking out the clock's center point, and the the longitude line derived from the geo-correct aircraft image is shown on the right of the inset image. The green line that emanates from the clock center point is angled at $23.99607^{o} + 4.56^{o}$ or 28.556069^{o} and it terminates on the longitude line from the aircraft derived southern marker point and defines the polar radius length of the moon. The oblique blue line running at 30 degrees west of south which emanates from the courtyard's N.E. corner point is also shown on the diagram and this line's length was adjusted so that the end of the line falls on the green connecting line and by doing so the line length from the courtyard becomes irrelevant - the rather cumbersome length estimation from earlier is removed from the system. The intersection of this 30^{o} line and the green connecting line is the super moon's center point and falls on the small ground marker hole identified earlier.

If you consider the diagram's composition there are three independent geodesic systems being used all of which are perfectly geo located to the Giza grid system. The first is the path line from Giza which is the blue line, the second is the longitude reference line from the aircraft image in Chad and the third is the clock center latitude and longitude.

Because the the purple and green lines are all fixed to the grid and contain no errors then the radius of the Moon can be read out of the geodesic path system as being 1735.9816889628 km , the number of decimal places being those given by the geodesic calculations and only containing the error associated with the computer on which the calculations were performed. The value is truncated to 14 significant digits to show this fact.

With this Moon radius established then the length of the geodesic path line to the temple courtyard from the down arrow marker must now be known with precision as it is derived from the Moon's radius and so this was adjusted in the software and the system recalculated to give the results shown previously in diagram M45.

The architect's dimensions of the full sized Moon can now be found by knowing that on the projected image of the moon, shown earlier in diagram M27, the equatorial diameter is defined as being 13 km and the projected focal length from the eastern focal point is numerically equal to the reciprocal polar flattening of the Earth at 298.257566 pm. The architect's moon size, independent of modern data is therefore:

Moon mean polar radius	1735.9816889628	km
Moon reciprocal polar flattening	829.60020393565	
Moon mean equatorial radius	1738.0767665174	km

Referring to the published article regarding the Moon's topography[8] the mean polar radius given in that paper is 1735.972 km +/- 0.2 and it is from the proximity of this value to that shown in the architecture above that it was deduced that the value being given was the mean polar radius of the Moon, hence the labeling of the values above.

If you consider the geometric structure of the super moon center point there is only one unknown quantity that is being used in the whole geodesic path from the Wall of the Crow through to the super moon center point definition and that quantity is the sidereal orbit period of the Moon at the 2729 BCE winter equinox, explained on page 9 , which is now the only modern day value left in the system. It was by completing the whole system in the forthcoming sections that the architect's value of this quantity was found, and the whole of the system was then be re-calibrated through iterative adjustment. For now, the alignment of the blue line in the inset image of diagram M45 to the ground markings is sufficiently accurate for the system to be continued onto the next stage of the analysis which was to determine the orbital parameters of the Moon.

The long term orbital parameters of the Moon

For the orbital parameters of the moon to be accurately displayed in the architecture there must be a method for *directly* connecting the previous work in Giza to the super moon center point, rather than taking the composite geometric path that has led so far to the moon center via the temple courtyard.

The distance of the super moon center to various locations on the Giza plateau was measured using a geodesic calculator and it became apparent that the distance to the entrance of the Sphinx temple was a significant value. Diagram M47 shows the direct geodesic distance from the super moon center to the entrance of the Sphinx temple, at coordinates 29.974917° N 31.138520° E.



Diagram M47 - The distance from the super moon center to the Sphinx temple entrance.

The distance between the two points is 1189.7405 km if the 2018 coordinates of the points are used and if the points are placed into their 2729 BCE locations by applying the tectonic plate movement that has occurred over the 4747 years since 2018 the distance is 1189.7475 km. This value does not immediately jump out of the page as being significant but is in fact a 1:300 scale model of the moon's distance from the surface of Earth.

This value was recognised during the analysis because when forming the projection of the moon for diagram M27 it was necessary to use a projection taken from the surface of the Earth and so the value had already been heavily used in a previous calculation.

Because the architectural puzzle has always been linear up to this point and at the end of the previous paper[2] the final point that was determined on the Giza plateau was the corner of the temple situated a few meters to the north east of the Sphinx it was decided to investigate how the formation of a line from the super moon model center to this temple corner point could relate to the current geometry.

Diagram M48 shows the results of this investigation on which a line from the super moon center passes directly through the northern corner of the Sphinx's N.E. temple (shown in the inset drawing) and then continues onward until it terminates at a distance of 363,000 km scaled down by a ratio of 300:1, that

distance being the average perigee distance of the moon, taken from the NASA Moon fact sheet. At the eastern point of this line a 1:300 scale model of the Earth has been drawn with the equatorial and polar radii distances of the Earth taken from the values inside the Great Pyramid in an earlier paper[4] and which are all but identical to those of the WGS84 reference ellipsoid .

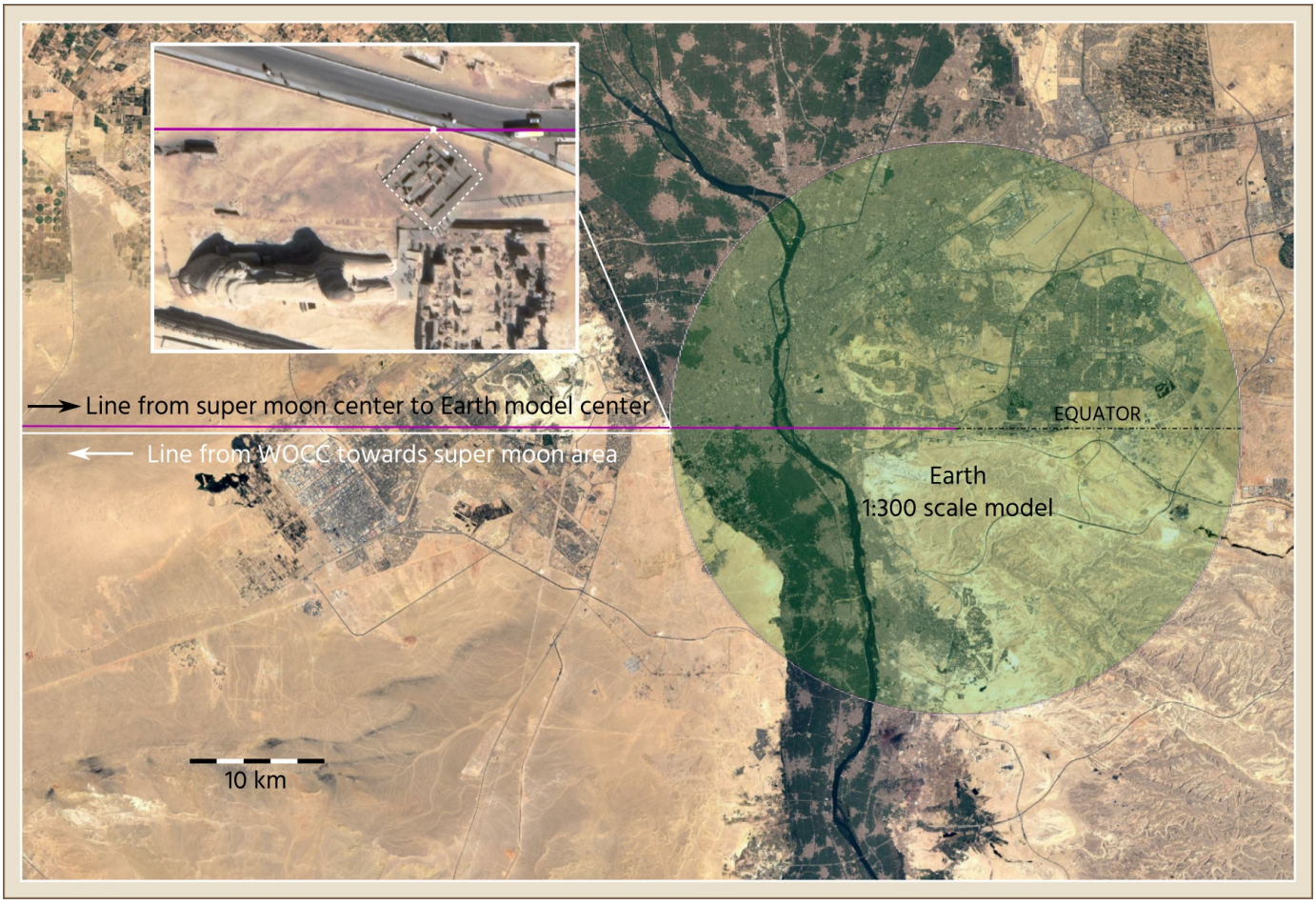


Diagram M48 - The eastern end of the 1:300 scaled perigee line from the super moon.

The Earth model has no axial tilt applied and therefore the equator point on the west side marks out a line on or around the eastern Sphinx temple wall structure at Giza as shown on diagram M49.

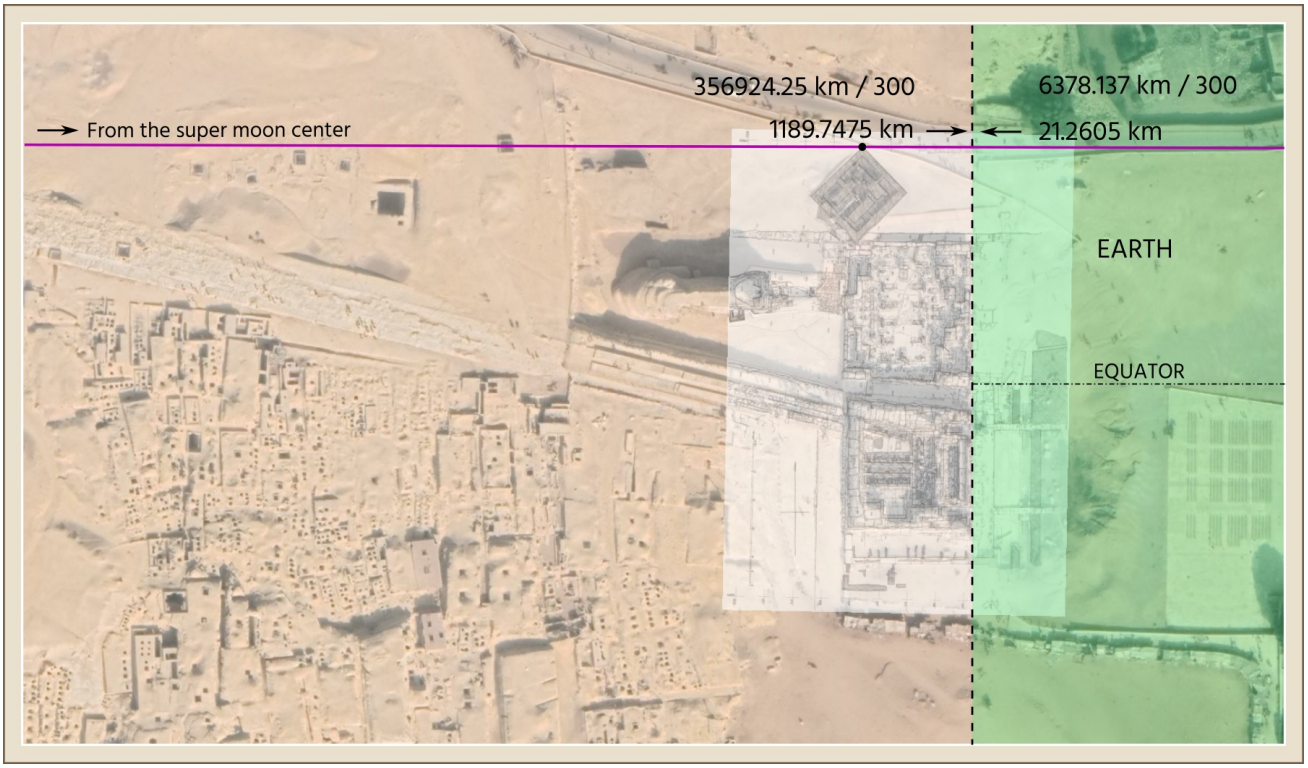


Diagram M49 - The layout of the moon model, the Earth model and the Sphinx temple.

On the right of diagram M49 the Earth is shown in green with the surface curvature removed from the illustration for clarity and with the equatorial radius of the planet running approximately east-west as there is no rotation applied to the Earth but the line does contain a small geodesic bend. The equator of the Earth aligns directly with passage that splits the north and south Sphinx temple structures.

The system is not fully resolved because the eastern wall of the Sphinx temple is not explicitly marked out as being the surface of the Earth, it is only implicitly being shown as such because the astronomical distances taken from modern data, when scaled down, show that the surface should fall on or around this point.

If you look at diagram M48 and imagine adding rotation to the Earth model whilst keeping its center point fixed then as that rotation is applied, at Giza the surface line will move to the East because the polar radius of the Earth is less that that of the equatorial. It is therefore possible to graph out the surface position of the Earth at different axial tilts and superimpose the data onto the floor in front of the Sphinx temple as shown in diagram M50.

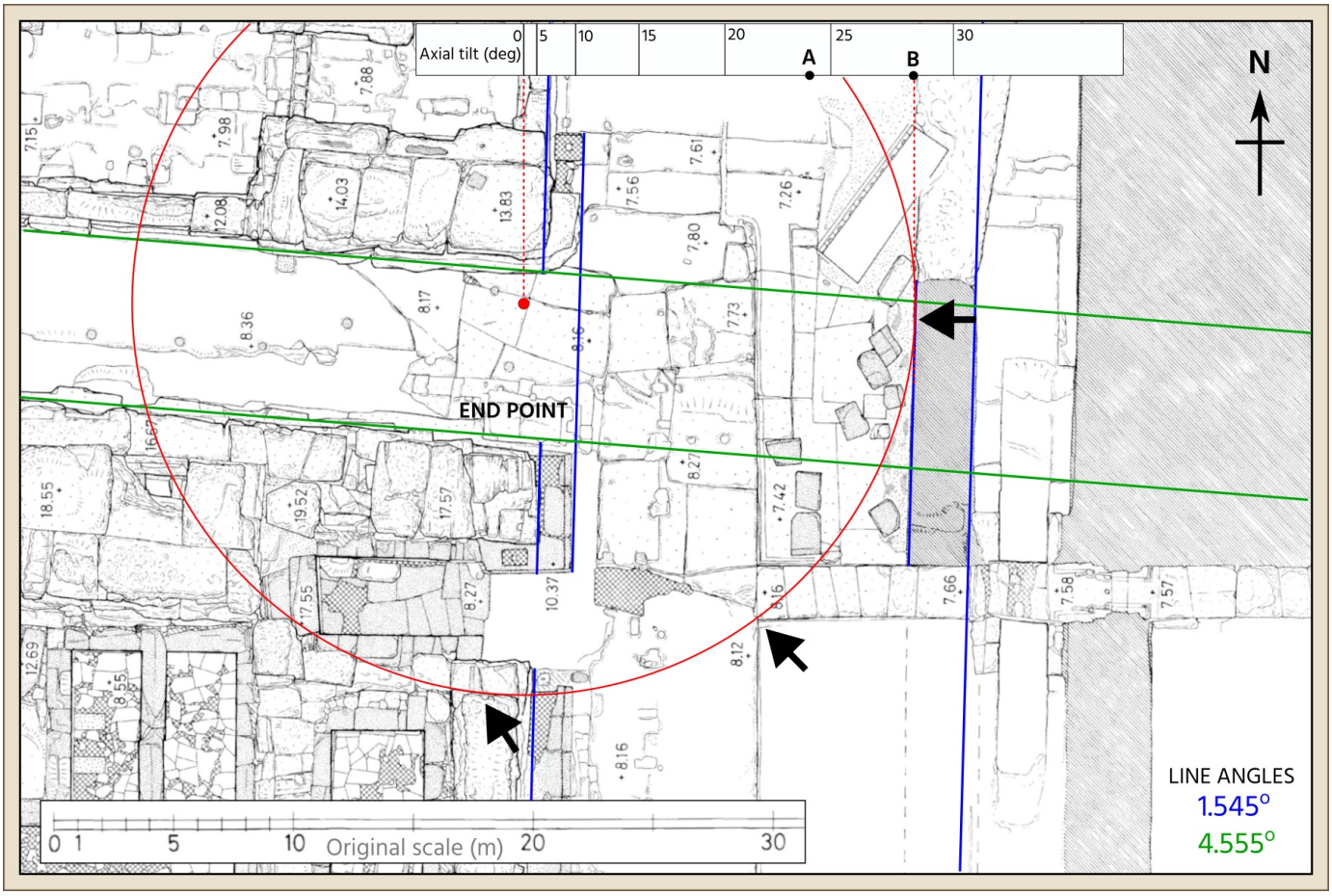


Diagram M50 - The axial tilt radii marked out in front of the Sphinx temple.

It was discovered that the underlying architecture at the east side of the Sphinx temple is based upon the angular tilt of the moon and in diagram M50 the blue lines are set an angle equal to that of the moon's tilt to the ecliptic in 2729 BCE and the green lines are set at the angle of the moon's orbital plane to the ecliptic, these being the two angles already encountered in the geometry in Libya.

The scale at the top of the diagram shows the position of the 1:300 Earth model's surface with a series of axial tilts applied to the Earth. The zero position of the scale is in line with the red dot on the diagram which marks out the currently resolved surface location of the equator end point when no axial tilt has been applied to the Earth model. The two labeled points on the axial tilt scale, A and B, are the average and maximum values of the angle of the Moon's orbit to the equator in 2729 BCE, being

$$A=23.99607^{o} \quad B=23.99607+4.56=28.55^{o}$$

The bold black arrows show the three distinct alignments of the architecture to the angular tilt and it is by resolving these alignments, and therefore the position of the end point, that the logic used on the line between the super moon and the earth center was established. It is already known that the distance is the long term average perigee of the moon from comparison with the DE441 ephemeris data, and this value needs to be presented in the original units of the architecture, perfect meters, and then rounded so that it can be used as a fixed reference distance in future calculations. By looking carefully at the architecture of the front of the Sphinx temple it was established that the full size distance of the perigee needs to be 363,230,000 pm making the 1:300 scale model line from the super moon center in Libya to the Earth model center 1210766.66 pm. The full size distance of the Moon's long term average perigee in metric measurement from the architecture is therefore 363,301.40154 km.

The 1:300 Earth surface movement lengths at the Sphinx temple may well be of use in further research of the archaeological remains, and so are provided in table M3.

Axial tilt (deg)	Movement of surface, east of start point (m)
23.99 - 6.100	6.673
23.99 - 4.555	7.932
23.99 - 1.545	10.441
23.99	11.839
23.99 + 1.545	13.306
23.99 + 4.555	16.346
23.99 + 6.100	17.990

Table M3 - The Earth model surface movement at various axial tilts.

The architect's value of the long term average perigee was then placed back into the geodesic calculation software and the system recomputed resulting in the alignment of the end point shown in diagram M51.

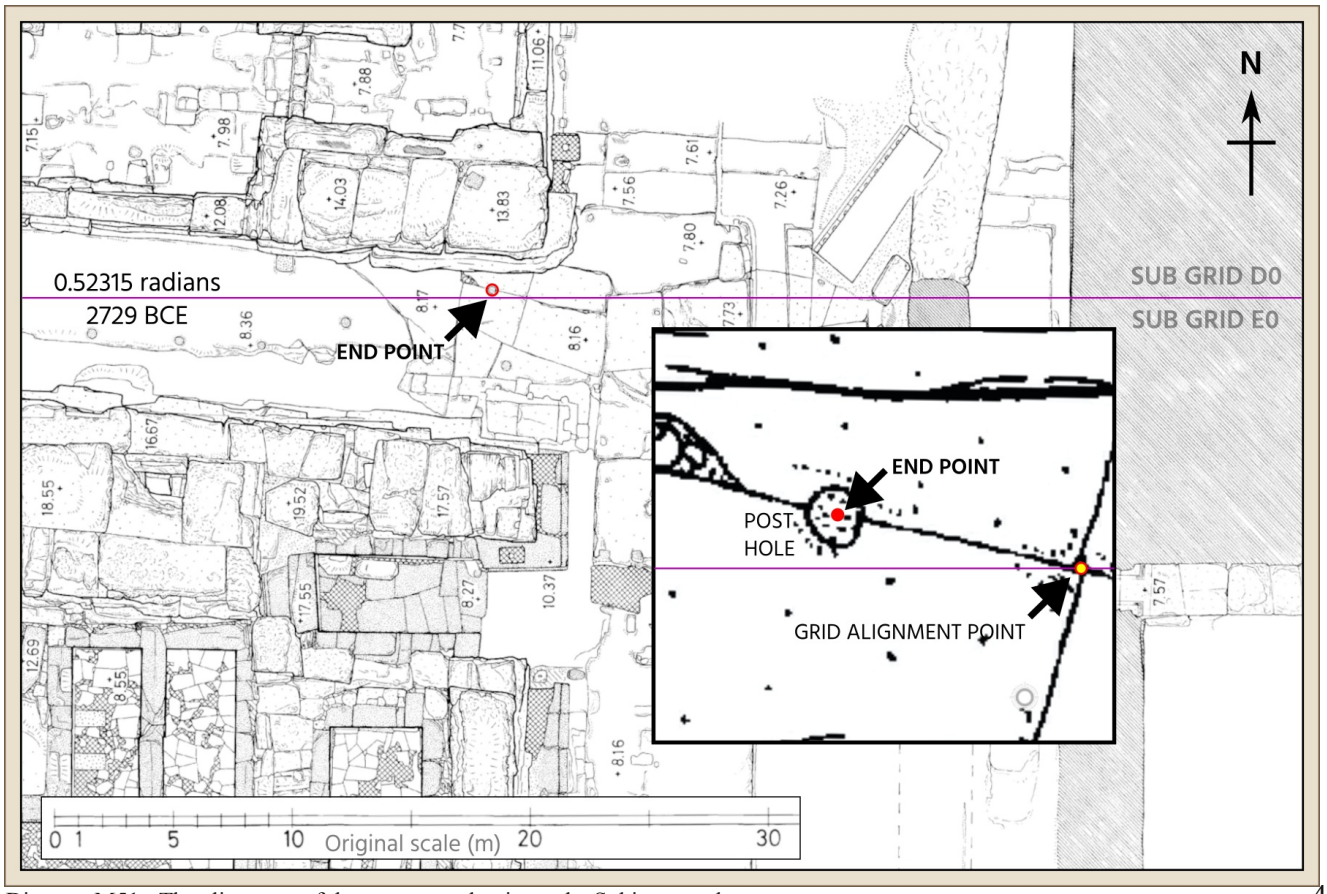


Diagram M51 - The alignment of the equator end point at the Sphinx temple entrance.

By placing the architect's correct scaled value for the long term average of the Moon perigee into the geodesic path calculator as the distance from the super moon center point to the Earth model then the end point of the system on the western equator of the Earth falls perfectly into the post hole shown in the inset image of diagram M51. The longitude of this point is determined directly from the values shown in the description up to this point and the latitude was perfected by adjusting the location of the vague corner point of the temple to the north east of the Sphinx until the final line end point matched the post hole.

The latitude correction to align the post hole and the end point could be carried out successfully because there is also a grid alignment marker point included in the stonework of the entrance area floor, as shown in the inset image, which allows the archaeological drawing to be correctly geolocated. The latitude and longitude of the points shown in diagram M51 are exact, however because the system still requires the sidereal orbit period of the Moon to be fed back into the calculations at the end of the process there is no need at this stage to list out those values as they change slightly during the final calibration.

From the foregoing geodesic calculations of the path between Giza and the Libyan Moon location the center of the Moon model has provisionally been determined as:

2018 Moon model center point	29.425208273^{o} N	18.854889407^{o} E
2729 BCE Moon model center point	29.424592232^{o} N	18.854147499^{o} E

The instantaneous orbital parameters of the Moon

In astronomy the motion of a body in space at any given instant is defined by specifying the properties of the elliptical orbit that the body would describe in space if its motion at that particular moment in time were to continue uniformly. The 'periapsis distance' that can be found in the NASA ephemeris tables is specifying one of these quantities and so far in the analysis of the moon models on the desert floor and in Cairo all of the values used have been the long term averages. For the model of the moon to be of any use as an independent ephemeris entry the instantaneous values of the Moon's distance from the Earth and some of it's orbital characteristics need to be specified with absolute precision on a ground model.

The clue to understanding how this has been achieved in the architecture is by looking at the corner point of the N.E. Sphinx temple which was used as the reference location for the line coming from the super moon center point and which is rounded off. It is rounded off for two reasons. The first is that the system about to be used to determine the exact orbital parameters of the Moon at the moment of the 2729 BCE winter solstice uses a rounded value of the Moon's orbital angle being rounded to two decimal places, as explained earlier. The second reason is that if the precise value of the distance to the Moon is now being sought then the line coming from the super moon center towards Cairo needs to pass through a precisely defined point on the Giza plateau, and the rounded off corner of the N.E. Sphinx temple quite clearly is not a precision point. There is only one point that would fit this requirement, that being the start point of the geodesic path system at the Wall of the Crow, the point 'WOCC'.

The geodesic path system of the solution for the long term average perigee of the Moon was copied in the software and then recreated with the line from the super moon to the Earth model center point passing through the point 'WOCC' using the same system as previously of putting the super moon center and the point 'WOCC' into a geodesic bearing calculator, which gave the forward azimuth from the super moon center as being 84.0402602096 degrees. Because the point 'WOCC' is about 320 m south of the Sphinx temple point this resulted in the 1:300 model of the Earth being located the same distance south relative to the model for the long term average and from this new model an investigation was commenced to look for any marker points in the ancient structures around Cairo that would align the system. Diagram M52 shows the first alignment point within the pyramid complex of Abusir, 11 km to the south south-east of Giza.



Diagram M52 - The Earth model alignment in Abusir.

The image in diagram M52 is taken from the work of the Czech Institute of Egyptology[9] which has published the GIS data of their excavations in Abusir allowing for accurate geodesic geometry analysis of this area to be undertaken. The image shows two ancient buildings labeled AC13 and AC28 which are connected by a causeway that contains a number of bends. The section of the causeway to the east is angled at 4.56 degrees from an east-west line and shows the angle of the Moon's orbit in 2729 BCE relative to the ecliptic. On the west side, the causeway is initially aligned at 22.1 degrees, that being the long term minimum angle of the Moon's orbital tilt to the ecliptic, and then is angled at 26.66 degrees, which is the addition of the two previous angles and shows therefore the long term minimum angle of the Moon's orbit to the Earth's equator. This section of causeway has been designed so that by connecting the northern end points the angle between them is 24.5 degrees, that being the long term maximum angle of the Moon's orbit to the ecliptic. The layout could not be more explicit. The building to the west represents the Earth and the building to the east represents the Moon. This leaves the arrow head feature that attaches to the moon building which has no discernible geometric alignment and which requires solving. Diagram M53 shows how the arrow head has been formed geometrically.



Diagram M53 - The arrow head construction in Abusir.

The construction line that is set at an angle of 28.55 degrees south of west is the 2729 BCE angular value of the axial tilt of the Earth taken from the lower northern shaft of the Great Pyramid[10] added to which is the angle of the Moon's orbit to the ecliptic at the moment of the winter solstice of that year, rounded to two decimal places. From this construction line the angle of 19.43 degrees is subtracted in the manner shown in the diagram where the angle is now composed of the axial tilt minus the Moon orbit angle.

It is from the clues within the whole system shown in diagram M52 that the location and full alignment of the 1:300 Earth model can be determined because the model must be using the same angular constructions that are contained with the Abusir complex and must also align in some manner to the Abusir arrow head marker. It is therefore possible to make adjustments to the position of the center of the 1:300 Earth model by increasing the distance from the super moon center and checking alignments to Abusir. When this is done it becomes apparent that the *center point* of the Earth's cross sectional ellipse will not align in any manner with Abusir but that when the focal points of the Earth's ellipse are added to the geometry and plotted using the geodesic path software the system can be solved, as shown in diagram M54.

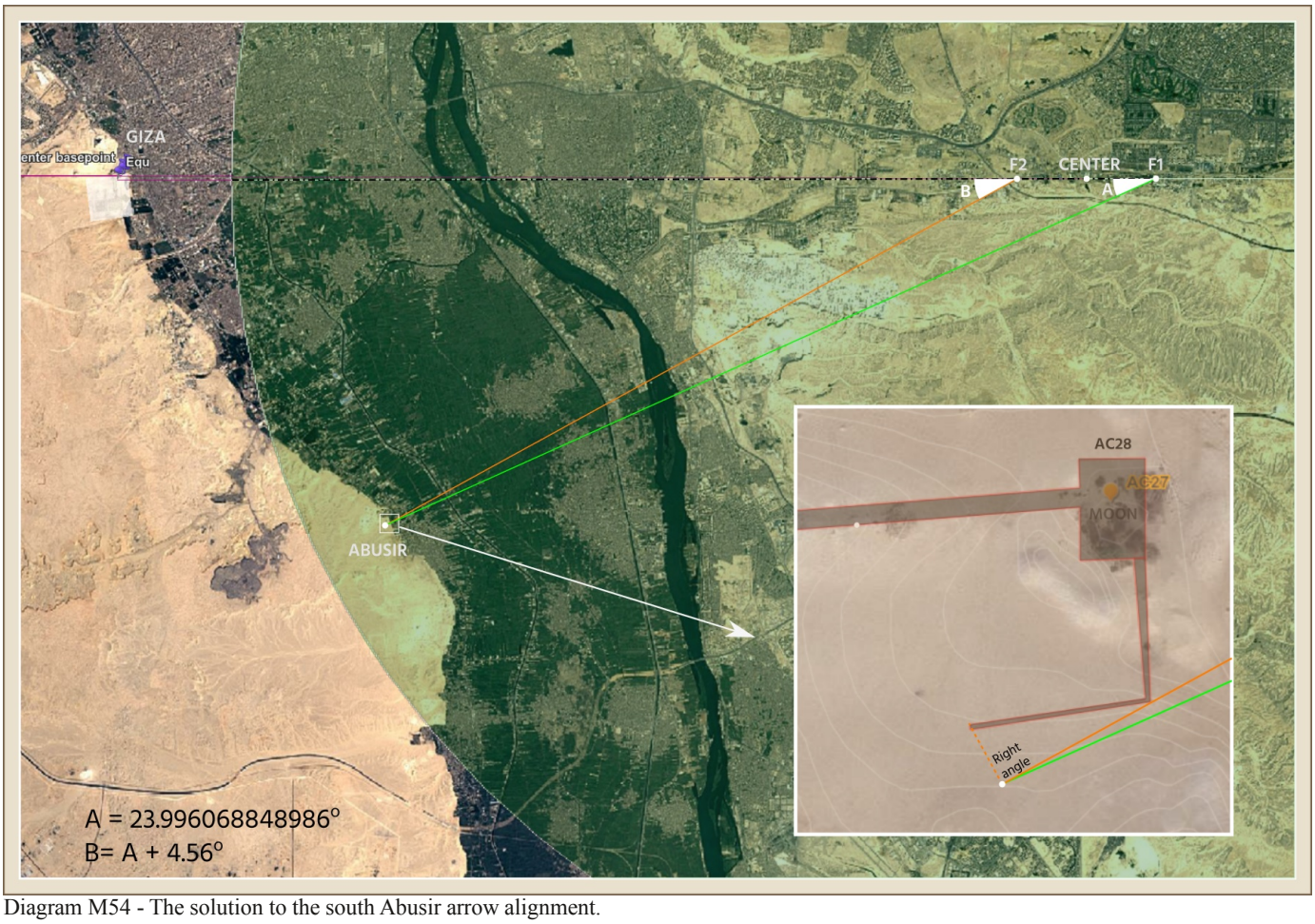


Diagram M54 - The solution to the south Abusir arrow alignment.

In diagram M54, which shows a 30 km wide view of Cairo, the green shaded area is a portion of the Earth's polar cross section ellipse and in the top right of the diagram the center of the Earth and the Earth's two focal points F1 and F2 are shown. The position of the focal points is derived mathematically from the equatorial and polar radii of the Earth and when scaled onto the 1:300 model the focal length is 1739.512362 m. The angles at which the geodesic lines emerge from these points is shown as angles A and B which are enumerated in the bottom left side of the diagram. The reason for the number of decimal places is that angle A comes from the resolved geometry inside the Great Pyramid and is known to this precision and angle B is composed of angle A plus the orbital angle of the Moon rounded to two decimal places. When related to the geometry of Abusir the pinpointing of the intersection point of the two lines is precise and, as the inset diagram shows, the intersection point completes a right angled triangle with the architecture.

The alignment however is far from reliable because the physical ancient structure to which it aligns is nowadays a rough trench with a few remaining stones in it, and so using the corner point of this construction cannot be considered a definitive alignment, nor was it ever intended to be. What this system does is positions the Earth model very close indeed to its correct location and a small amount of further investigation is required, using the logic of the Abusir alignment, to correctly locate the next alignment location.

In the greater Cairo area there is just one standing obelisk, and that is located in the area known as Heliopolis in the north of the city but which was originally named by the hieroglyphic symbols that spell out a word pronounced as 'Lunu', a word which I will use to refer to this area. The obelisk is reported to still be standing in its original position and is known as the 'Al-Masalla obelisk' weighing some 120 tonnes and is reportedly the oldest known standing obelisk in the world. Diagram M55 shows the alignment to this obelisk from the center of the scale model of the Earth, the diagram also including the previous alignment to Abusir so that the combined system of the two alignment points can be seen.

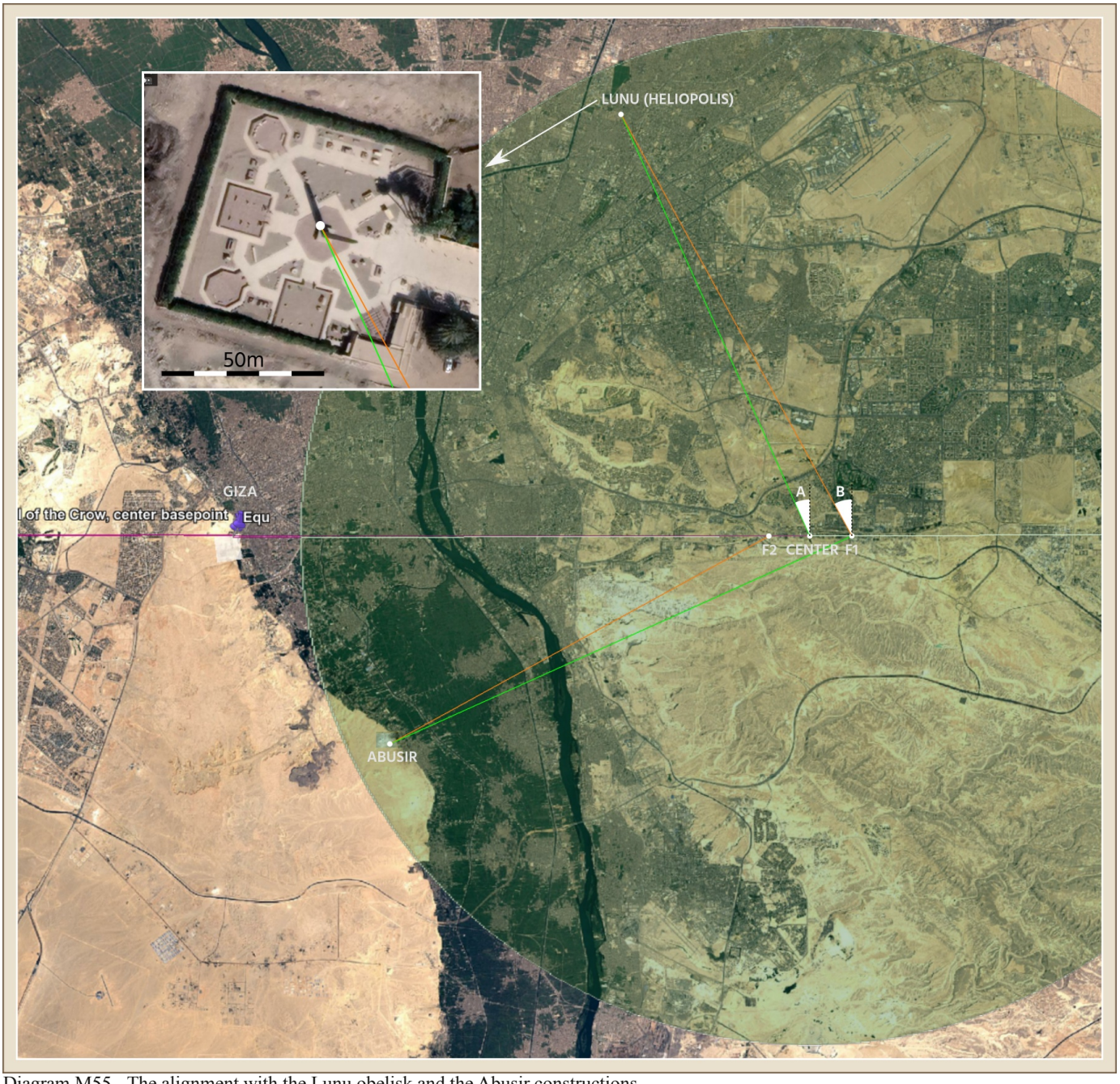


Diagram M55 - The alignment with the Lunu obelisk and the Abusir constructions.

The two angles in diagram M55, A and B, are the same angles as those in diagram M54 but whereas for the Abusir alignment they emanate from the two focal points of the Earth model ellipse for the northern alignment the western line emanates from the ellipse's center point and the eastern line from the eastern focal point. The precision with which these mathematically constructed lines meet up with the Lunu obelisk is shown in the inset satellite image.

The obelisk is the primary alignment point of the system and therefore it is essential that it is lined up correctly to the original 2729 BCE geometry. This alignment could be performed by taking high precision GPS measurements around the monument's base area to determine the current location but this approach would inevitably lead to a small amount of error from within the GPS system. The highest accuracy GPS method uses a system known as 'post-processed carrier phase differential' which results in a maximum error of 30cm and standard surveying GPS system have an error of up to 5m.

The correct and only valid method of determining the latitude and longitude of the obelisk is to use the architect's grid system that was fully resolved in the previous paper[1] in this series.

In summary, the grid system is a mathematical construct in which there are two grids at any given location. The first grid's position and angle is determined primarily by its latitude and longitude and the second grid is then attached to the first grid at a pivot point, the location of the pivot point determining the rotation of the second grid. The orientation of the second grid is therefore predetermined once the pivot point has been assigned to it and diagram M56 shows the Lunu obelisk area in the Heliopolis suburb of Cairo with the pivot point of the grid located at the base center of the obelisk.



Diagram M56 - The architectural grid system and pivot point at the Lunu obelisk.

As is self evident in the diagram, by correctly selecting the pivot point the blue grid aligns to both the south and the north walls of the compound in which the obelisk is situated and the orange alignment line from the focal point of the Earth model runs up the central axis of the pathway in the compound. The location of the grid's pivot point, which also the location of the obelisk center, is part of the output display of the software that produces the grid system when it generates the KML files and its location is given as:

Lunu obelisk center	Latitude	30.12933128738
2018	Longitude	31.30746553036

Diagram M57 shows a plan view of the obelisk on which the incoming geometry lines are shown in a similar manner to that of the previous diagrams. The obelisk has a width at its base of 1.9436 pm which is a linear representation of the angle of the axial tilt of the Earth minus the angle of the Moon's orbit to the ecliptic (23.99^{o}-4.56^{o}). The base which surrounds the obelisk has a length of 4.56 pm which is a linear representation of the Moon's orbit angle, although it should be noted that this base appears to be a modern restoration which has presumably been designed according to the archaeological remnants of the original base. The same is true of the compound as a whole which appears to have be restored on top of archaeological remains, deduced from the close fit of the compound's walls to the grid lines. If this is not the case then the compound has still been set at the same angle as the obelisk, which is known to be in its original position and orientation, and therefore the grid alignment holds true.

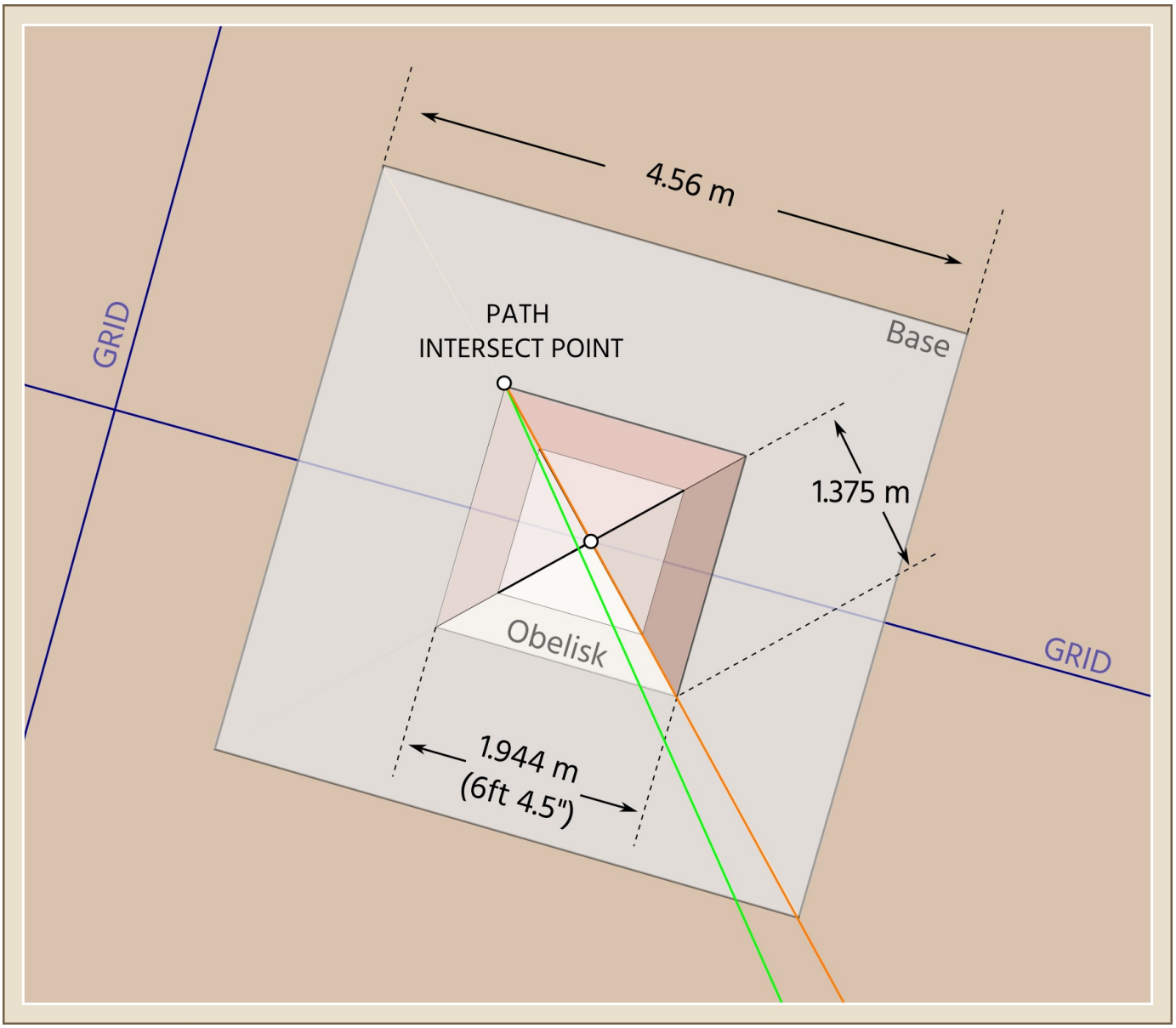


Diagram M57 - The details of the Lunu obelisk.

The half diagonal length of the obelisk, through trigonometry, is 1.3743 m. With the geodesic line length from the super moon center point adjusted so that the orange line in diagram M53 runs along the diagonal of the obelisk, the distance between the obelisk center point and the path intersect point measured using a geodesic calculator is 1.394 m giving a discrepancy between the path location and the obelisk corner point of +19 mm.

The intersection point of the geometric lines falls in the north west corner of the obelisk and the resulting 2018 latitude and longitude of the north west corner point of the obelisk from the software is

Lunu obelisk N.W. corner	Latitude	30.1293422376
2018	Longitude	31.3074629748
Lunu obelisk N.W. corner	Latitude	30.1287262614
2729 BCE	Longitude	31.3067158578

The error of 19 mm can be split into its longitude and latitude component parts, which gives the error in longitude as being 8.47 mm and therefore the line from the super moon to the Earth model center must have been resolved to this margin. Because this line is a 1:300 model of the Moon's distance to the Earth at the 2729 BCE winter solstice the real world astronomical distance must have been resolved to 2.5m.

Having resolved the alignment it is now possible to analyse the distance between the center of the super moon and the Earth models to determine how the Earth model has been positioned. If the Moon range is extracted from the DE441 ephemeris at JD 724669.978940065, the moment of the DE441 winter solstice, its value is 394129.397 km. Compared to the mean perigee value of 363301.40154 km determined earlier the difference is 30828 km which when scaled down by 300:1 should place the winter solstice Earth model some 102.76 km to the east of the mean range Earth model in Cairo and just to the west of the town of Suez. Because this would result in a whole new area of construction needing to be built away from the principal architectural locations around Giza, the difference between the instantaneous and long term average range values has had a very rational 30,000 perfect kilometers removed from it before it has been modeled in the architecture. On the 1:300 scale model this removed distance is 100 pkm and by understanding this it is therefore possible to compute the architect's winter solstice range value of the Moon in the following manner.

1) Using the geodesic path calculator, convert the distance between the super moon center point and the Earth center point into perfect kilometers, giving the distance
   Result: 1213.62567876818 pkm.
2) Scale this value up by 300:1 to its real world size
   Result: 364087.703630453 pkm
3) Add on the 30,000 pkm removed portion
   result: 394087.703630453 pkm
4) Convert this back to metric measure to get the

Moon range at 2729 BCE winter solstice 394165.1710 +/- 0.0025 (km)

Diagram M58 shows the arrangement of the long term average (LTA) Moon perigee Earth location and that of the 2729 BCE winter solstice location with the discontinuous 100 pkm shown by the short wavy black line.

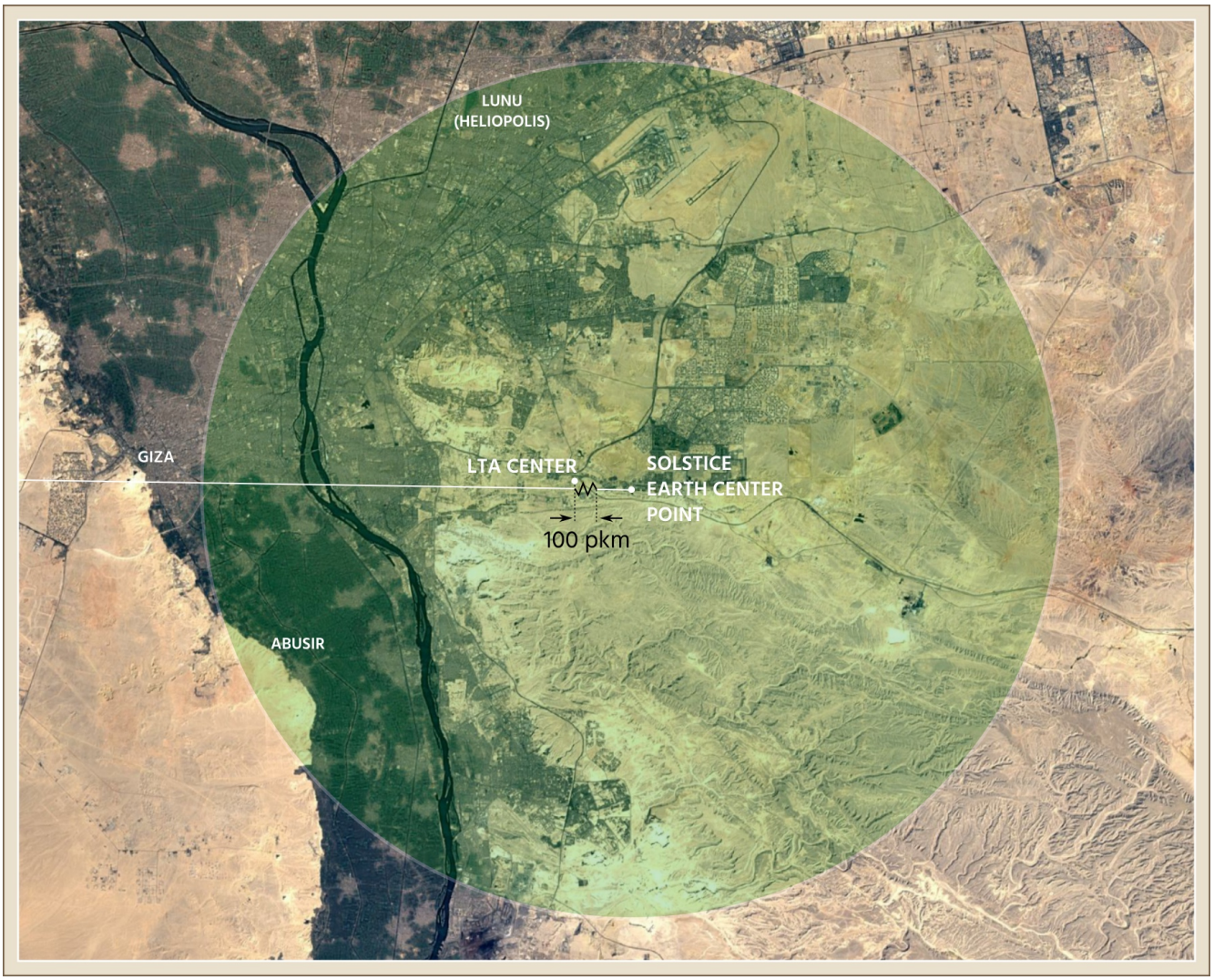


Diagram M58 - The long term average Moon perigee and winter solstice 2729 BCE Earth locations.

With the latitude and longitude of the 2729 BCE winter solstice Earth model firmly established the system was further investigated to find the accurate value of the Moon's orbit angle to the ecliptic, which is the value of 4.56 degrees that has been rounded to two decimal places in the preceding steps. Because the accuracy of this value needs to be of the highest level, and because in Libya the polar radius of the moon has been given at full size (which has established the fact that the architecture already includes geodesic constructions of thousands of kilometers) searches were made at both short and long distance. Additionally, the location of the center of gravity of the Earth-Moon system was investigated as this would be expected to have been included in the geometric construction by anyone working to the levels of detail seen so far.

If the joint center of mass of the Earth and Moon is considered, known as the Earth Moon barycenter with the well used acronym 'EMB', and also the true anomaly of the moon at the time of the 2729 BCE winter solstice then the first marker points for the Moon's orbital angle to the ecliptic can be discovered. The system uses a fundamental understanding of the motion of the Moon around the Earth as its primary feature.

Diagram M59 shows the Earth-Moon barycenter rotated into its correct location relative to the Earth's gravitational center point using the value of the true anomaly (TA) of the EMB relative to the Moon taken from the DE441 ephemeris and then projected onto the Earth's equatorial radius. The inset image shows a schematic of the rotation of the barycenter around the Earth's center point and the projection of the point onto the equatorial axis. Two additional points have been placed on the diagram, the projection of the EMB if it were to be rotated by the mean anomaly (MA) angle, and a reference point which is the projection of the EMB when rotated by the true anomaly angle plus the difference between the mean and true anomalies. All of the values used in the diagram are taken from the DE441 ephemeris.

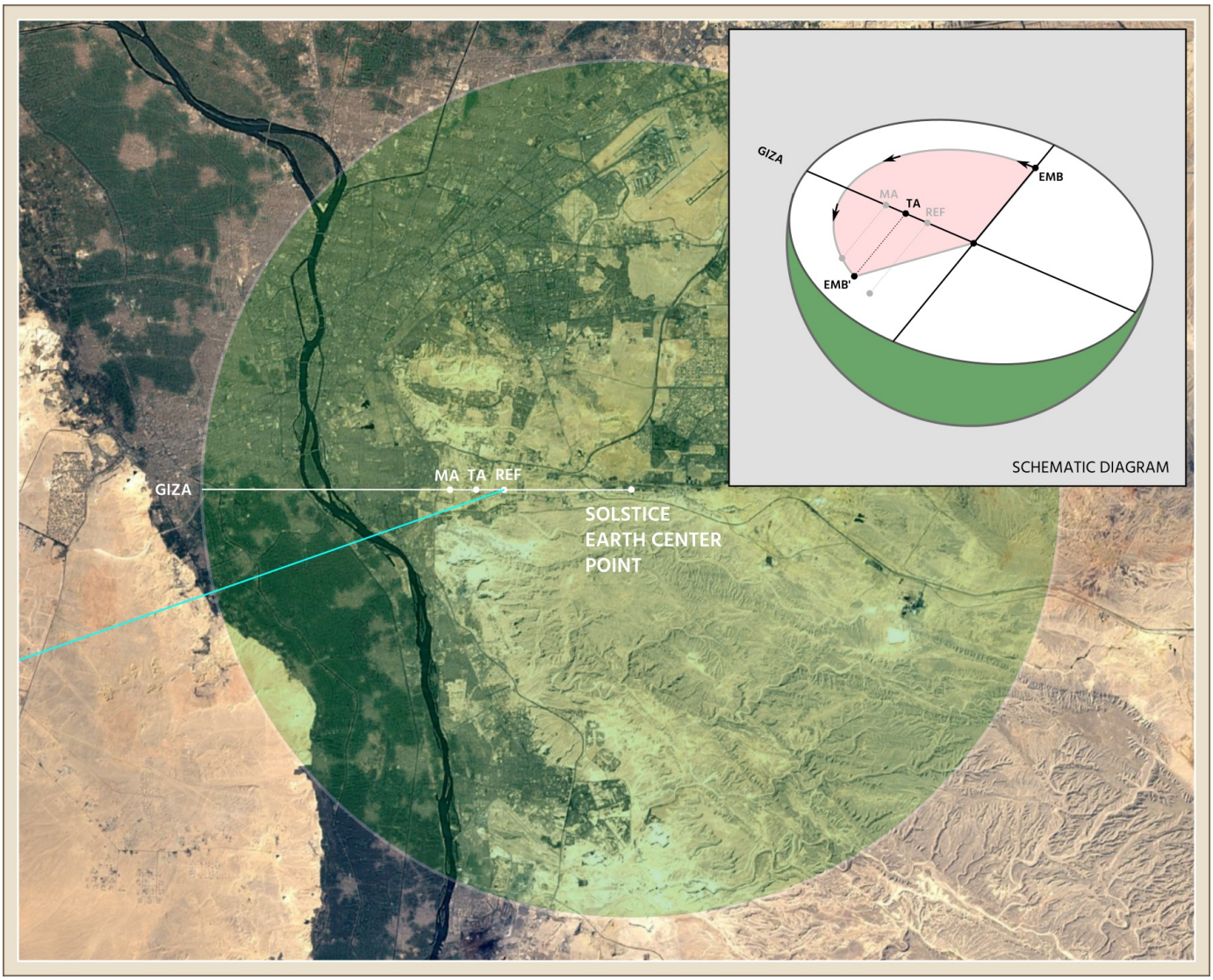


Diagram M59 - The EMB barycenter projected onto the 1:300 Earth model.

The values used in the calculations for the diagram are

DE441 2729 BCE winter solstice			
Date	724669.97867086	(JD)	
Barycenter Range from geocenter	4788.88866053924	(km)	
True anomaly of the Moon	151.011279526543	(deg)	A
Mean anomaly of the Moon	145.490783097721	(deg)	B
Reference point angle	156.531775955365	(deg)	2A-B

If the system was being reproduced in an astronomically correct manner the center of the Earth would rotate around the barycenter point, but in order to keep the Earth model located at the correct ground location the Earth is held static as the reference frame and the barycenter is revolved around the Earth center. This makes no difference to the geometry of the system. In addition to the true anomaly angle projection, the mean anomaly has also be included as a *geometric* feature with the EMB rotated around the center of the Earth by the mean anomaly angle, which is a geometrically valid operation but an astronomically invalid one. The third point that been added to the system is a reference point that is determined by computing the difference between the true and mean anomaly angles and then adding this value on to the true anomaly angle. This results in the three points being distributed regularly in rotation angle around the Earth center but the projected lengths being slightly different between the true anomaly projected point and the mean anomaly projected point compared to the true anomaly projected point and the additional reference point.

The need for these three points was identified during the analysis of the forthcoming geometric alignments, in other words the system needs to be fully analysed and resolved in order to determine that these three points exists in the first place. The points are not arbitrarily chosen and form the precision resolution of the moon's orbital angular location relative to the Earth and constitute the primary definition of the Winter Solstice for the Earth in 2729 BCE. The distance along the equatorial radius of the projection of each of the three points from the center of the 1:300 model of the Earth is as follows

Mean anomaly point	MA	9043.6374	(m)
True anomaly point	TA	7736.2489	(m)
Reference point	REF	6357.0966	(m)

The reference point's distance immediately jumps out of the calculations as being numerically very close indeed to the polar radius of the Earth's reference ellipsoid that is being used as the basis of all of the geodesic calculations of the system and a value which was given within the Great Pyramid as being 6356.7523275 km. It is by recognising that the reference point's distance to the Earth center point on the 1:300 model of the Earth is intended to be this value that the astronomical system can be resolved.

The ancient ephemeris date of the 2729 BCE winter solstice

The culmination of all of the work up to this stage is contained in the following remarkable system.

The winter solstice of 2729 BCE has been selected as the overall system's astronomical reference event specifically because at that moment in time the position of the Earth can be defined from the position of the Moon using the geometry explained in the previous section. The reason that this needs to be done is that of all the ephemeris data that we currently have, that of the Moon is by far the most accurate because it is a satellite of the Earth and our observation data of the Moon is highly refined. Relative to our observation data of the planets and indeed of the Earth itself relative to the Sun, the Moon data is around 25 times more accurate (from reading several sources of commentary). Defining the Earth's winter solstice from the true anomaly angle of the Moon is a massively important definition.

The manner to perform the calculations is as follows:

1) Use the Moon range that was specified earlier accurate to 2.5m using the alignment to the Lunu obelisk to determine the distance of the EMB barycenter from the center of the Earth.

2) Extract a series of values of the Moon's true and mean anomalies from the DE441 ephemeris data over a time span either side of the DE441 winter solstice time and place them in a spreadsheet

3) Use the geometric system from the previous section to calculate the distance of the reference point (REF) from the center of the Earth model by computing the barycenter distance projection at the mean and true anomalies.

4) Determine the exact date at which the reference point's distance from the Earth model center is numerically equal to the polar radius of the Earth's reference ellipsoid.

To perform the calculation in step 1 the relative mass of the Earth and Moon is required, and that is why in the Great Pyramid's roof chambers[11] this value was specified in the architecture as being 0.01230003 using the stonework step sizes within one of the roof voids. The barycenter distance can therefore be determined completely independently of modern data.

When this analysis is carried out the following data emerges from the system

Ancient ephemeris winter solstice		
Geocentric moon range	394165.1710	(km)
Moon Earth mass ratio	0.01230003	
Barycenter Range from geocenter	4789.262816	(km)
True anomaly of the Moon	151.015145550817	(deg)
Mean anomaly of the Moon	145.495224735482	(deg)
Reference point angle	156.53506636615	(deg)
Date	724669.979295079	(JD)

These values have been resolved to the maximum accuracy of the DE441 ephemeris time specification of nine decimal places in the Julian date which results in a resolution of the location of the reference point to one tenth of a millimeter on the full size polar radius of the Earth. The winter solstice of 2729 BCE therefore occurred at January 15th 2729 BCE 11:30:11.0949 at Julian Date JD 724669.979295079, a value which will become further refined once the system is fully complete and the Moon's sidereal orbit period is resolved and fed back into the start of the system.

As well as giving the all important date of the winter solstice, this calculation also provides the rotation angle of the projected moon image which was estimated on page 26 as being 157.54 degrees. The correct value for the moon image rotation is the reference point angle from the above resolved astronomy plus one degree, or 157.535066, a value which is particularly well concealed bearing in mind the amount of computation and puzzle resolution required to uncover it.

With the three reference point's locations relative to the Earth model's center point now known precisely the investigation into the geometry could then proceed, because if the Lunu obelisk and the Abusir temple were aligned with the Earth model center and focal points, then it stands to reason that the three barycenter points will also align with other geometric structures.

The starting point of the geometric alignment of the three points has to be the true anomaly point because this is the only one of the three points that is astronomically correct. The quantity being looked for is the tilt of the moon to the ecliptic, which is the value that was specified to two decimal places in the preceding calculations as being 4.56 degrees but which must have a precise value somewhere within the geodesic geometry. By using previous construction systems as a guide as to how to proceed, it was found that a line drawn from the projection of the barycenter on the Earth model equator line, the point TA, at an azimuth of 270-23.99+4.56 degrees with a distance of 4,560 perfect kilometers terminated at a location which clearly looked like a marker point.

The resulting point is in the country of Mali very close to its southern border with the countries of Guinae and the Ivory Coast. Diagram M60 shows the north of Africa with the geodesic line plotted running from Cairo to the marker point and the inset image shows a 3D representation of the area with a quite distinct hill construction very close to the line's end point. The hill is located in a completely flat geographic plane and draws attention to itself by its presence. The details on the hill were studied using the highest resolution satellite image available across all platforms, and although some minor details could be seen that could be reference points it was obvious that there was no specific marker point built on the top of the hill, other than the hill itself.

It was concluded that the latitude and longitude of the end point in Mali must therefore be determined through a triangulation system that uses the two other barycenter points on the Earth model. The geodesic line on diagram M60 was studied in more detail and it was discovered that it passes through a very distinct and well known geographic feature in southern Libya called Waw an Namus.

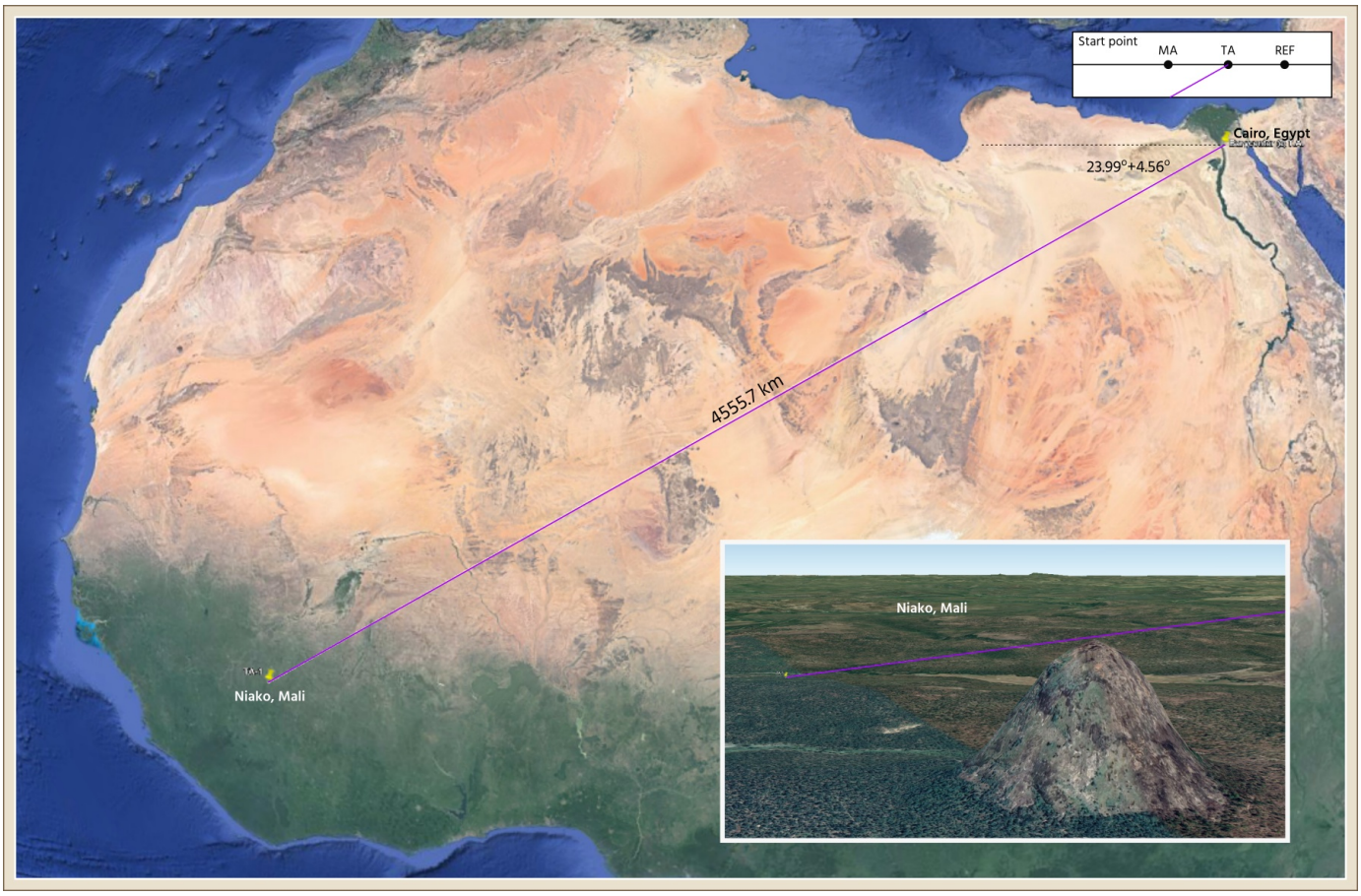


Diagram M60 - The moon tilt-to-the-ecliptic geometry line from Cairo to southern Mali.

Diagram M61 shows the geodesic construction line from diagram M60 passing directly through Waw an Namus, which is a bizarre crater structure with a hill in its center and which contains a number of lakes. The surrounding desert floor area is black which makes the structure stand out from the surrounding desert and a most distinct curved side section that rises from the crater floor to the peak of the inner hill is present in the structure. Diagram M61 is a 3D perspective image which has an elevation exaggeration of x3 to highlight the shape of the crater and its hill. The geodesic line passes 200m to the south of the center of the crater at the top of the hill.

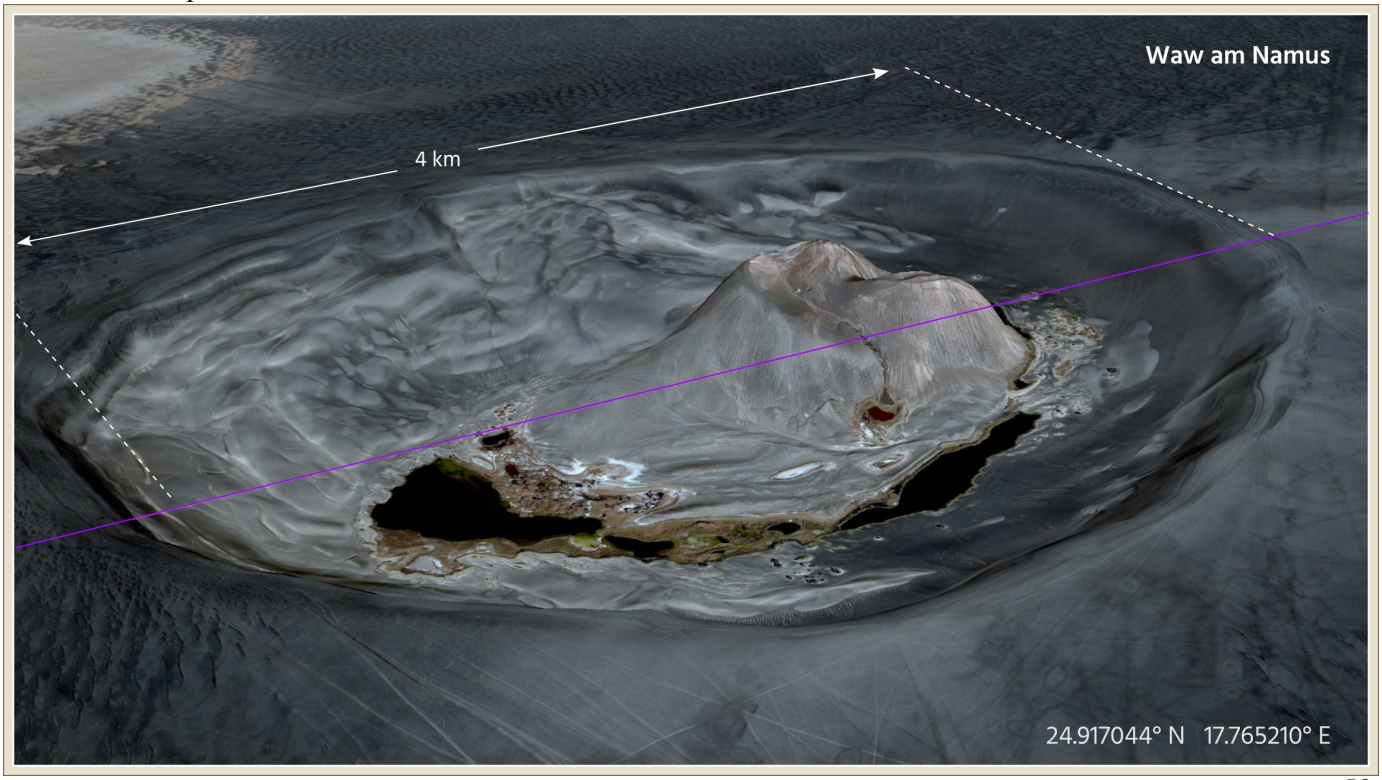


Diagram M61 - The moon tilt-to-the-ecliptic geometry line passing through Wa an Namus

The system can be resolved further by now drawing a geodesic bearing line at the same angle but coming from the reference point (REF) on the Earth model equatorial radius line and with its length equal to that of the first geodesic line divided by pi, specifically 4.558/pi=1451 pkm. This geodesic line is shown in diagram M62 with the inset image showing how the line terminates at the center of the crater and at the center of the enclosed hill structure.

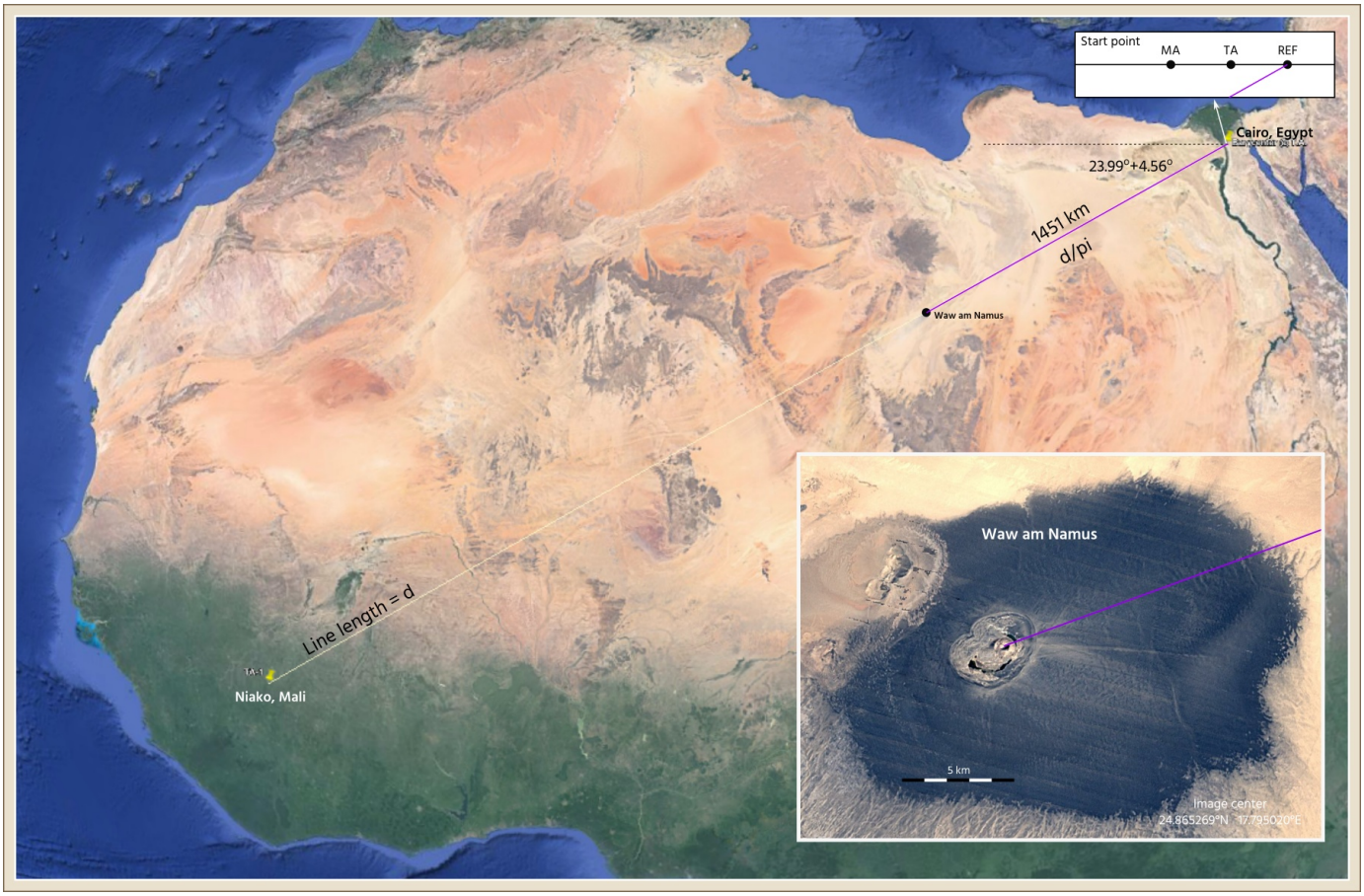


Diagram M62 - The second geometric line from Cairo to Waw an Namus

The final part of this construction involves taking the same geodesic bearing from the final one of the three points on the Earth model's equator line, that being the mean anomaly point (MA) . The construction is logical and uses the length of the line from the reference point just explained of 1451.0 pkm plus an additional 30 pkm, which is working in the same logic manner as the line from the super moon to the Earth center which has 100 pkm removed from it. From the end point of this geometric line, a line is drawn due south until it reached the equator and from the point on the equator a line is drawn at 23.99 degrees north of East in the direction of the first geodesic line end point.

This triangulation covers the whole of north Africa and is shown in diagram M63. The system for resolving the triangulation is iterative because the angle at which the lines emanate from the start points is the angle that is trying to be determined and so an initial estimate needs to be used, the triangulation resolved, and then the length of the principal line from the true anomaly point down to the point in Mali read out as a result and then plugged back in as the start angle.

This iterative solution was run until the numerical values stabilised at a few decimal places which gave the length of the principal lines as being 4555.74746 pkm and therefore the angle of the moon's orbit to the ecliptic as 4.55574746 degrees which, without knowing what comes next in the overall system, is a fully resolved angle and independent of any modern data.

The three starting points on the Earth model's equatorial radius have also been used in a second piece of alignment geometry in which they align to monuments and obelisks in Egypt and which, when resolved, show how the whole system, going back to the Great Pyramid, can be resolved with absolute precision.

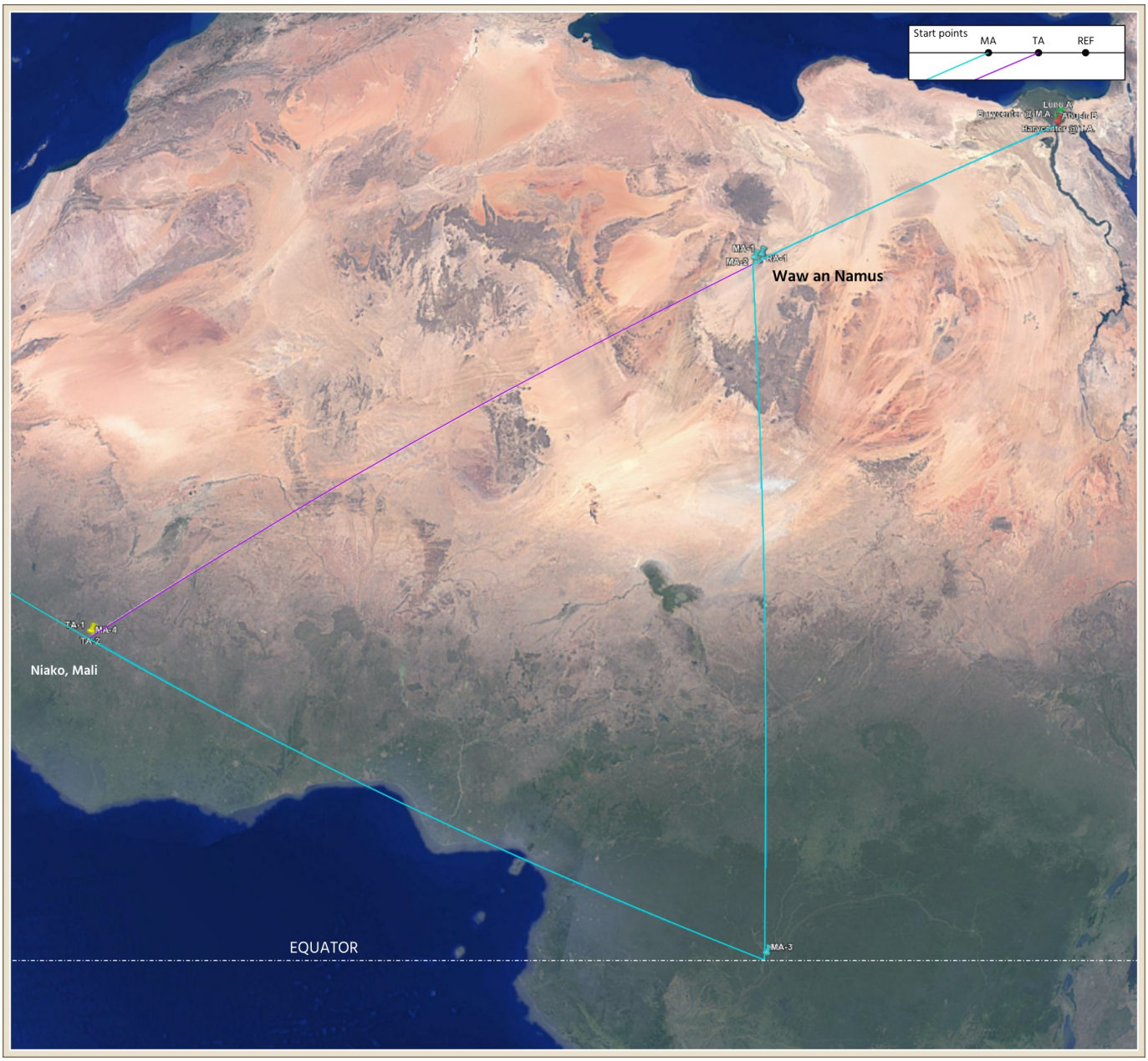


Diagram M63 - The triangulation of the geodesic lines from Cairo, Egypt to Niako, Mali.

The final alignments of the Earth model

Diagram M64 shows the alignments from the true anomaly and mean anomaly projection points of the Earth-Moon barycenter down to the northern temples in Abusir which are situated a few hundred meters to the north of the temples that were used for the initial alignment in diagrams M52,53 and 54. On diagram M64 the large green part ellipse is the polar cross section of the Earth at the scale of 1:300, the purple line coming in from the west is the line from the super moon center point in Libya and the white line just below that is the equatorial radius of the Earth model. The three points that are marked on this are the three barycenter projection points and the lines running off to the west south-west are the triangulation lines explained in the previous section that run into Mali and Libya. The temples of Abusir north are marked and the two geometric lines from the MA and TA points are shown in cyan and yellow.

The angle of the yellow line is 233.15 degrees and is the instantaneous sidereal orbit period of the moon at the 2729 BCE winter solstice 2,331,508 seconds divided by 10,000 and converted it into degrees. The cyan line which starts at the mean anomaly point runs down to the center of the main Abusir temple where archaeologists have deduced that a large obelisk once stood. The location of this position is at a fixed node on the master alignment grid and can therefore be determined to the precision required to resolve the triangulation of the cyan and yellow lines.

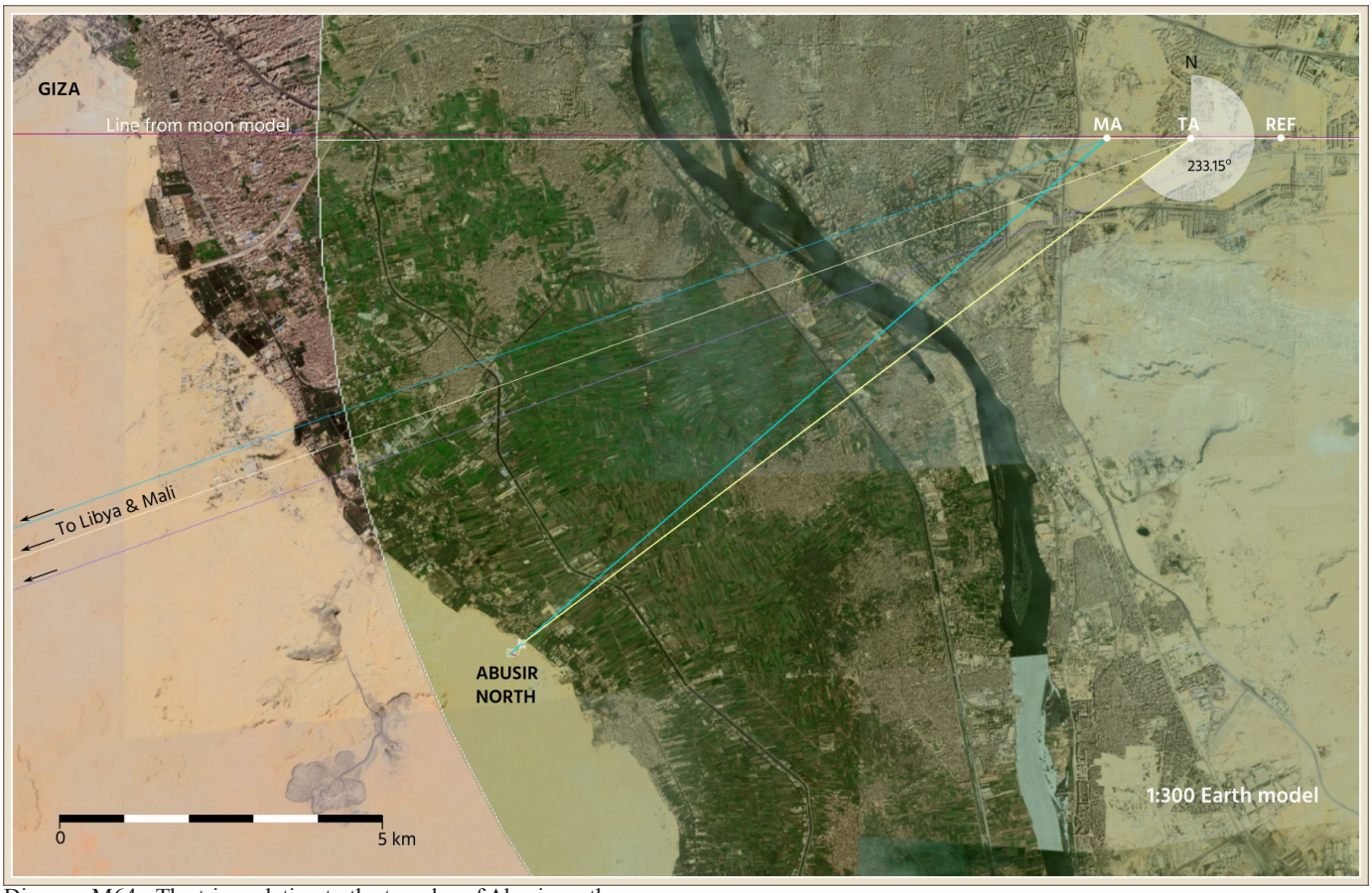


Diagram M64 - The triangulation to the temples of Abusir north.

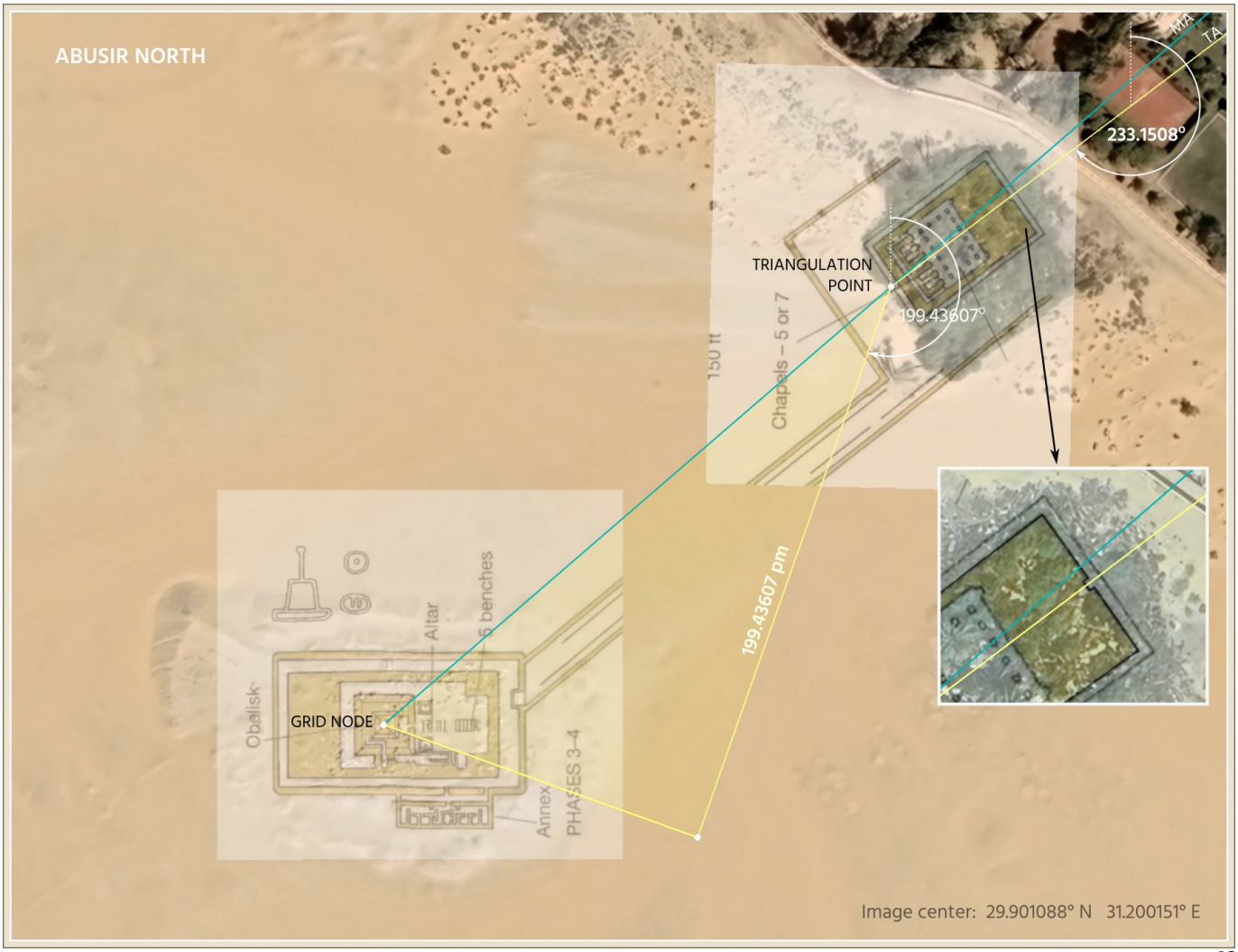


Diagram M65 - The geometric resolution of the Abusir north temples.

The details of the termination of the triangulation in Abusir is shown in diagram M65. The cyan and yellow lines come in at the north east corner of the image and are marked with the letter code of the point from which they emanate, either MA or TA. The grid node is at the center of the construction of the lower of the two temples and is situated on a grid node at which the cyan line terminates. The background image is a satellite photograph and the temple structures overlay images are taken from the work of Mark Lehner and his original image has been split into two in order to correctly geo-align the two temple structures with the satellite image. The triangulation point is the location where the yellow line intersects with the cyan line and which falls on the center point of the outer wall of the northern temple.

Once this structure of these two temples has been analysed to sufficient depth it becomes apparent that there is a deliberate right angled triangle built into the architecture and which is shown in the diagram in pale yellow. The side length that is marked is 199.44 perfect meters in length and is set at an azimuth of 199.44 degrees, showing that it is a quite deliberate construction. The purpose of this triangle becomes apparent at the very end of the full puzzle analysis but it is worth showing a second hidden right angled triangle at this stage which is formed in an identical manner as this first triangle but has its northern corner at the rear of the northern temple, the wall of which has a notch cut out of it at its center point as shown in the inset image of diagram M65.

Diagram M66 shows the second, main triangle of the Abusir north complex which is identical in formation to the first with the marked triangle side being of numerically equal angle and length of 199.44 units. On this triangle side it is possible to mark of the width of the temple, which is just over 30 meters, along the line and the marked points delimit the locations of the temple's outer wall and the causeway's inner wall as shown by the white dots on the line.

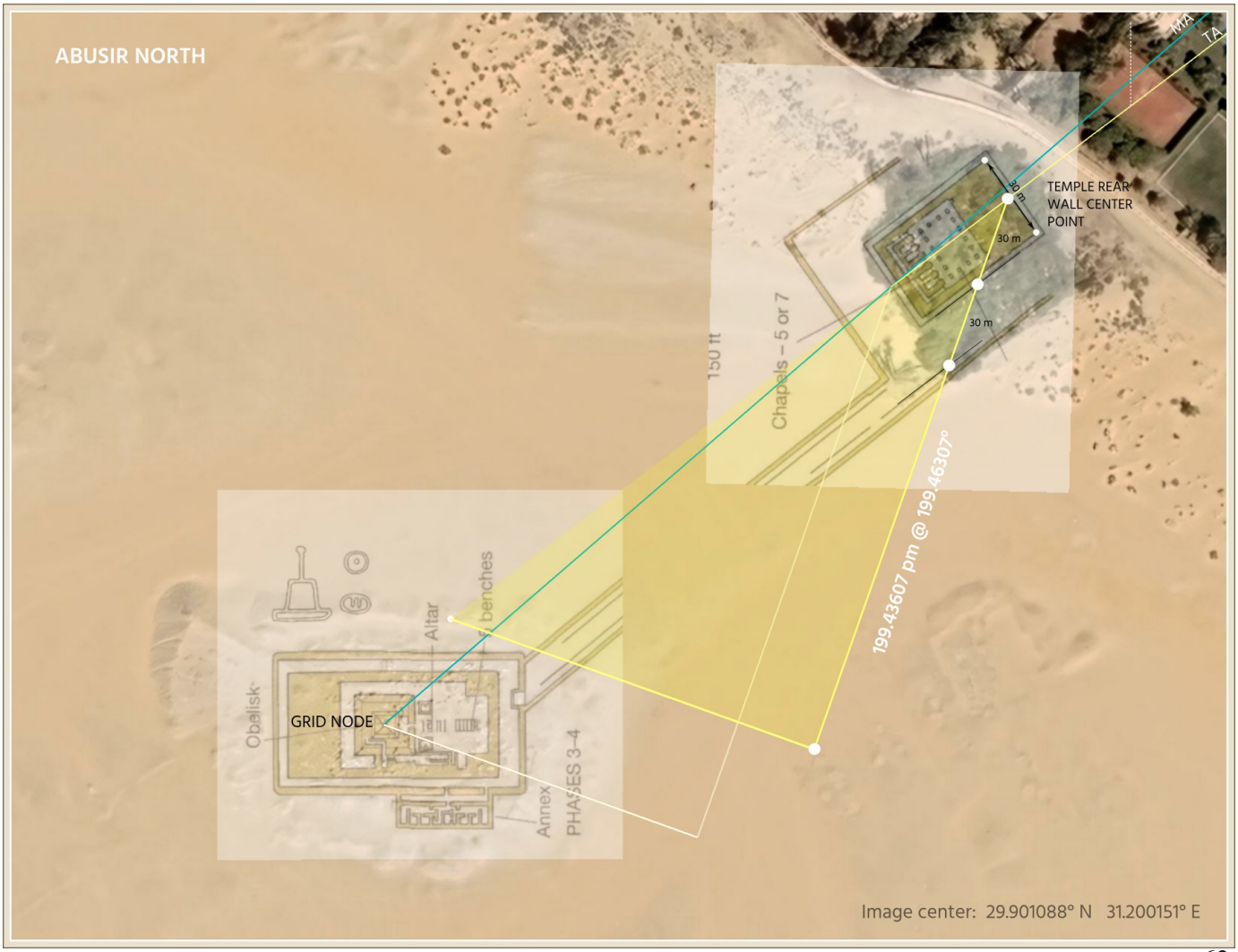


Diagram M66 - The main triangle of the of the Abusir north temples.

These three points are reminiscent of the three marked points on the Earth model from which the geometry lines start, and indeed that turns out to be the case and to understand how it is necessary to return for a final time to the Earth model and determine the last of the geometric constructions that locks the Earth model into place.

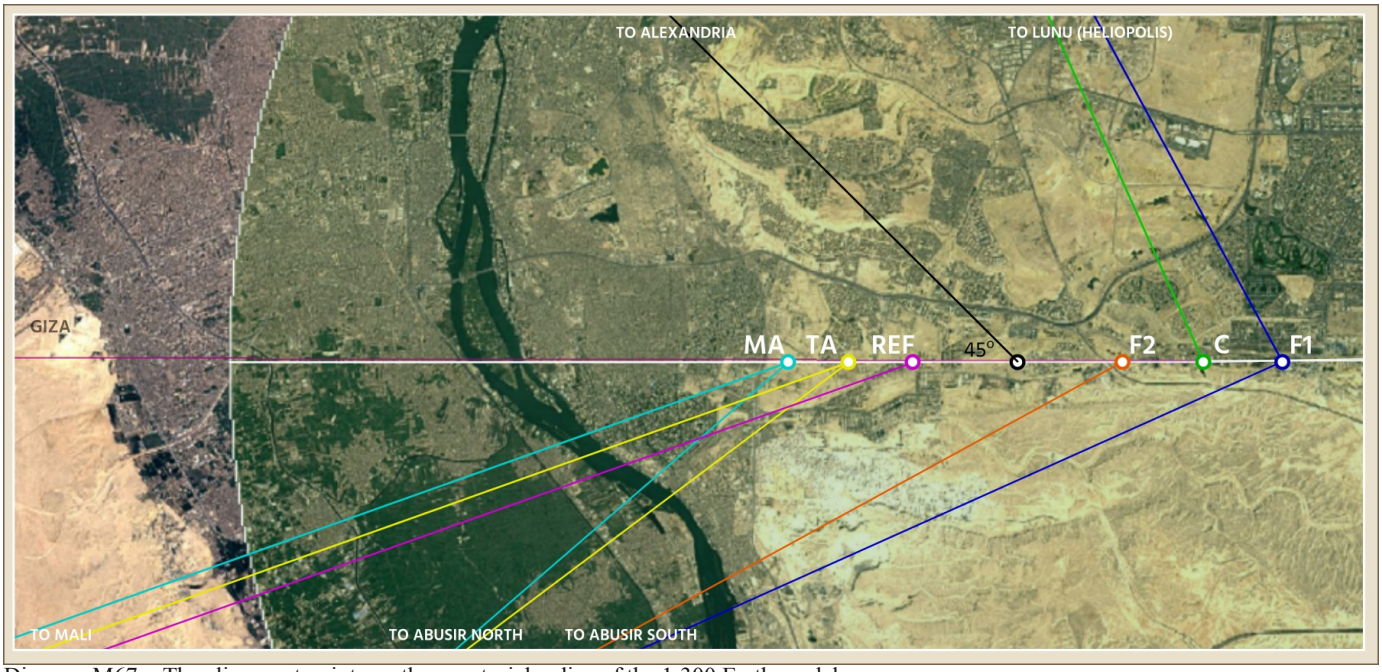


Diagram M67 - The alignment points on the equatorial radius of the 1:300 Earth model.

Diagram M67 shows all of the points that are used on the equatorial radius of the Earth model from which the geometric lines lock the model into place. The three points on the right (F2,C and F1) ar the two focal points of the Earth polar cross section ellipse and the three points on the left (MA,TA and REF) are the projections of the Earth-Moon barycenter onto the equatorial radius.

An additional point has been placed on the diagram which is located at the center of the two sets of points, in other words half way between the points REF and F2. This is the final alignment point of the Earth model and when a geodesic line is taken from this point at a bearing of 45° west of north for a distance of 194.7295213 perfect meters and the geodesic mapping is performed using spherical coordinates, rather than ellipsoidal, the line terminates at the obelisks in Alexandria known as 'Cleopatra's Needles'. The distance is not arbitrary, the decimal places in the distance are all significant, and the value is the axial tilt of the Earth relative to the ecliptic taken from the lower northern shaft of the Great Pyramid of 23.9960688 degrees minus the angle of the Moon's axial tilt to the ecliptic from the line down to Mali with a value of 4.55574746 in spherical perfect meters giving the distance as 194.4032134 pm. This value is then converted into perfect meters giving the final plotted distance of 194.7295213 pm.

The only problem with this alignment is that the two obelisks in question in Alexandria were removed from their locations and transported to New York and London in the 1870's and there is now a large modern hotel built on the original location of these points. It was therefore necessary to investigate the historical records of where these monuments used to be in order to determine accurate latitude and longitude points to which the final geodesic alignment could be compared.

Diagram M68 shows an old map of Alexandria with the obelisks marked and the inset image on that map shows a photograph of the seafront from the 1800s where the single standing obelisk can be seen right next to the sea wall. The lower photograph of diagram M67 shows a photograph taken of the second obelisk, which was laid along the ground rather than being upright, being removed prior to transportation to New York. The inset image is a modern one taken from the work of the Egyptologist Chris Naunton who visited Alexandria with the intention of determining the original location of these obelisks. He succeeded in his endeavors and the inset image shows him holding up the photo from the 1870s in front of the building.

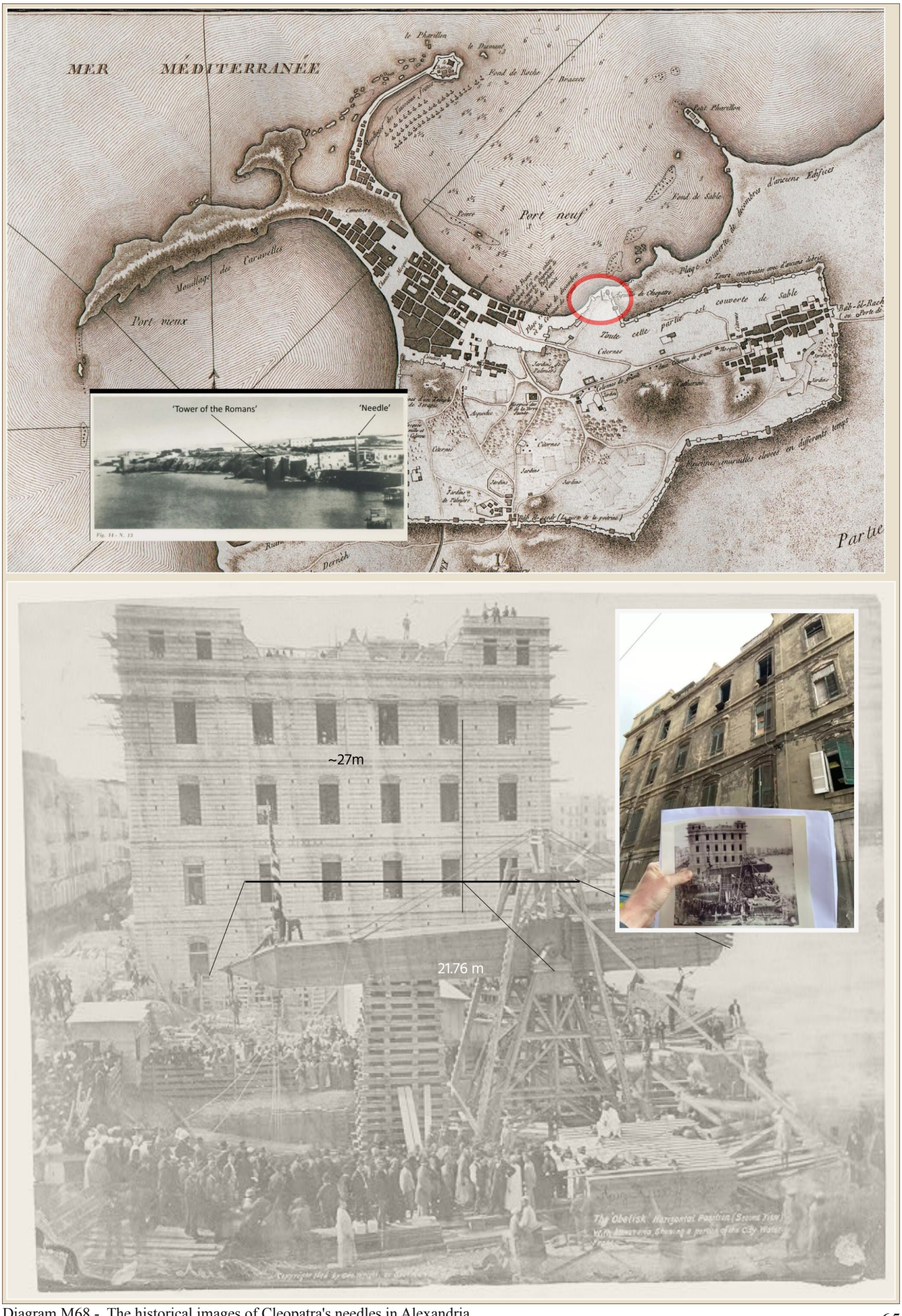


Diagram M68 - The historical images of Cleopatra's needles in Alexandria.

Because the Egyptian government has reclaimed a large amount of land from the sea, the obelisk location is no longer directly on the sea front and by using the 'street view' facility on Google maps it was possible to locate the building in the photo in a side street and then from perspective analysis of the 1870 photograph determine the position of the obelisk's location.

Diagram M69 shows the fully resolved location of the obelisks which was determined from the triangulation from Cairo, the grid system and the photographic analysis above.



Diagram M69 - The precise location of the obelisks in Alexandria.

The point OB2 is the standing vertical obelisk that can be seen in the old photograph of diagram M68 and the point OB1 is the obelisk that was laid horizontal in the ground which is always described historically as having fallen down. It can be seen from studying photography of the obelisks that OB1 was built in the horizontal position because its primary purpose is to point back down the geodesic line to Cairo.

Diagram M70 (upper) shows an etching/painting done in 1802 by Thomas Milton of the two obelisks "called Cleopatra's Needles" and from this print it is possible to roughly determine the angle at which the horizontal obelisk was laid and the distance between the two obelisks which was the starting point from which the preceding analysis of the location of the obelisks was undertaken, prior to referencing them to the grid system.

On diagram M69 the standing obelisk OB2 is located due east of the grid pivot point and exactly 100 pm from it, the grid pivot point being selected because it places the secondary grid in a perfect North-South alignment. The horizontal obelisk OB1 is located 21.25 pm back along the geodesic line from Cairo, this distance being 1/200th of the encrypted moon sidereal orbit period that was seen in the very start of the whole system and is also the length of this obelisk.

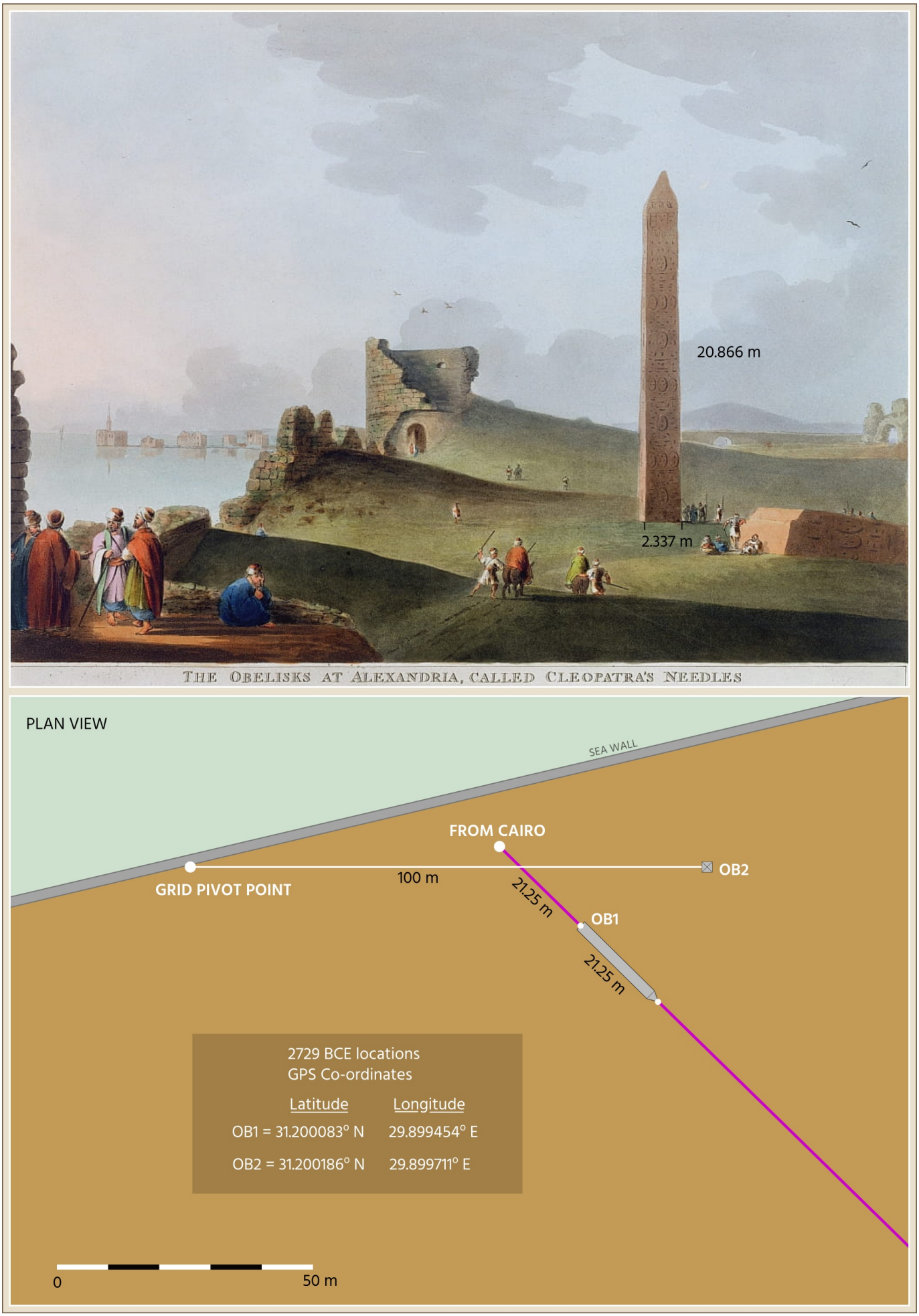


Diagram M70 - The original position and orientation of the obelisks in Alexandria.

In the lower section of diagram M70 the geometric layout of the two obelisks is shown as they would have been prior to the development of Alexandria and as shown in the 1802 painting. The horizontal obelisk, which is the one that was transported to New York, is 21.25 perfect meters in length and its base point is located 21.25 perfect meters from the end of the geodesic alignment line and the obelisk is laid horizontal along this line.

These obelisks in Alexandria are the final location in the geodesic construction that starts in Giza, makes its way into Libya, then back to Cairo and finally to these obelisks. The system is fully diagnosed and understood but there is one more piece to the puzzle which has profound implications not just for the architectural system but for our understanding of science.

If you reverse the latitude and longitude of each of the obelisks in Alexandria, literally just swap the numbers over, then you will end up with two points which are in a completely different location. That location is shown in diagram M71.

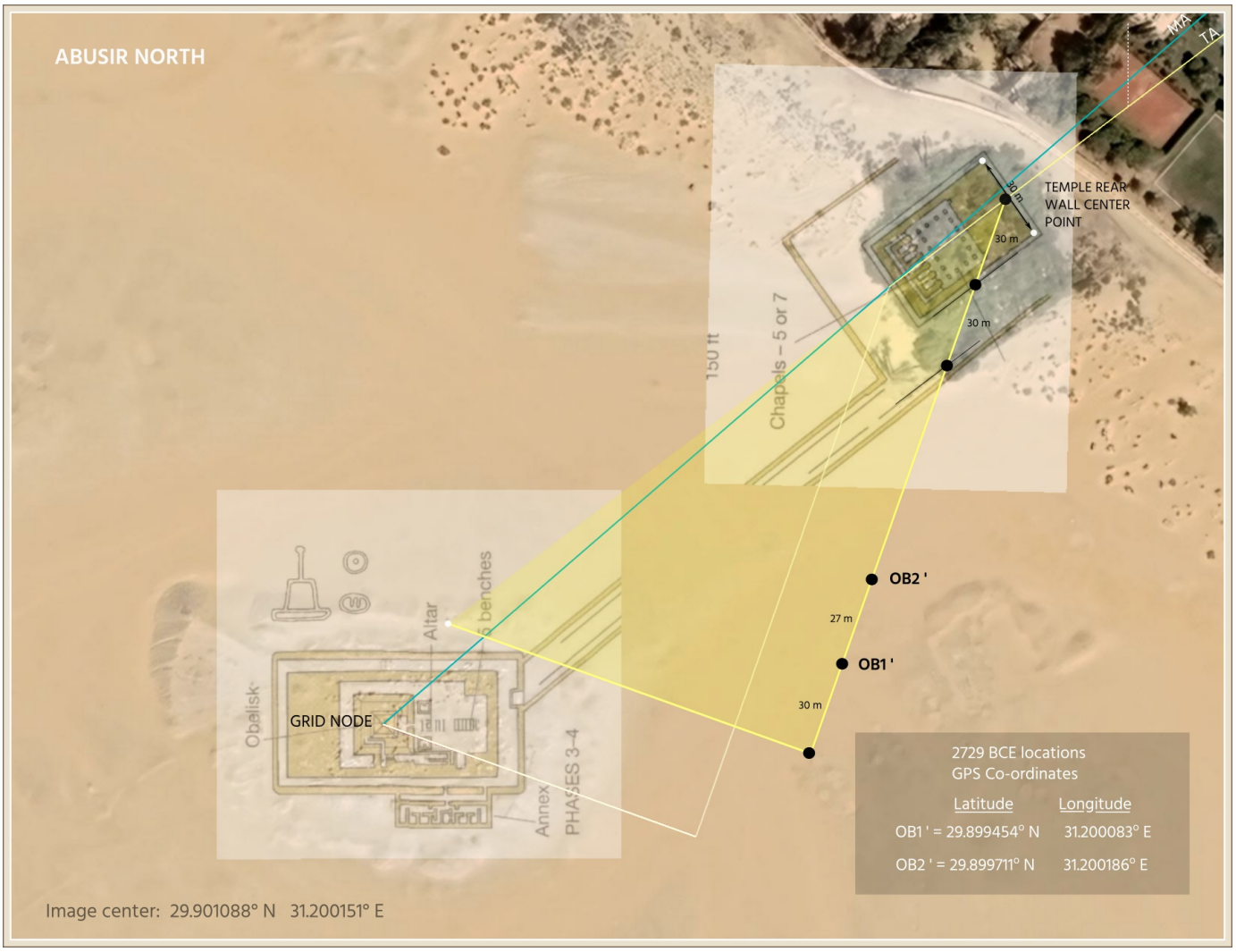


Diagram M71 - The reversed latitude and longitude of the Alexandria obelisks.

The inverse coordinate locations of the two Alexandria obelisks complete the geometric construction at the temples of Abusir North and the primary triangle side line now has three points on either end of it. Those at the top are symmetrically spaced and represent the Earth model's center and focii and the three at the bottom are asymmetrically spaced and represent the Earth-Moon barycenter projection points.

The puzzle solution is complete and this final part with the interchangeable latitude and longitudes provides the whole purpose to everything that has been covered in this and all previous papers in this series and explains why it was all so well hidden.

The only way that the Alexandria obelisk's latitude and longitude can map onto the Abusir temple construction with such precision by simply swapping over the latitude and longitude values is if the original architectural design was geolocated using our GPS coordinate system. This is a simple statement of fact.

This is why in the analysis of the Giza plateau in the earlier paper[12] that the grid system was detected as aligning to the GPS coordinates, but that the analysis was rejected because of its improbability. That analysis was actually correct and the whole of the Giza plateau buildings along with the rest of the overall system are quite definitely aligned to our GPS system.

How the architects were able to access this GPS data 4750 years ago is currently unknown, but one hypothesis that can be considered whilst remaining firmly inside the boundaries of the world that we inhabit is that during the creation of electromagnetic radiation, by which method the GPS signals are broadcast from our satellites, as well as propagating forwards through space the waves have an equal and opposite event occurring and that they are being propagated backwards through time, static at the location in inertial space where they are being generated.

Because our GPS system must have been used in the planning of the ancient constructions then it is logical that the start point for the overall system is located at GPS coordinates (0,0).

The GPS reference frame

This hypothesis was tested by using the geodesic path mapping software and it was discovered that the Giza reference points do indeed originate from the GPS origin at (0,0). Diagram M72 shows the two starting lines of the geodesic connection system between the GPS origin and Giza, shown in purple. The first line, which starts from the origin and runs east along the equator, is of arbitrary length *d* and the the second line runs from the equator due north for a distance of one third of the distance between the north pole and the equator. Because the architect's primary unit of measurement is the perfect meter (pm), which is defined as being 1/10,000,000 of the distance between the north pole and the equator, the second line length is known precisely in both perfect meters and modern metric units.

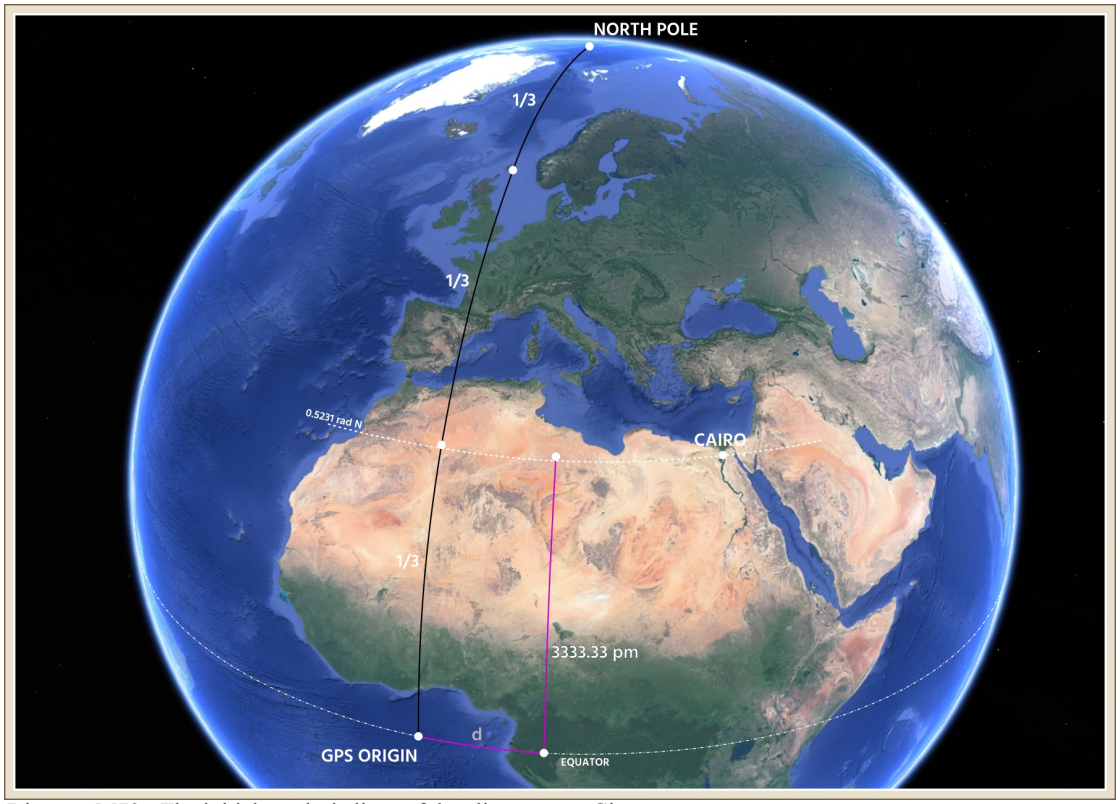


Diagram M72 - The initial geodesic lines of the alignment to Giza.

On the diagram the latitude of the Wall of the Crow's reference point which was determined in earlier work as being exactly 0.5231 radians north is drawn and its position has been moved slightly south on the diagram for illustrative purposes only so that it can be seen that the line that is one third of the distance of the pole-equator length terminates slightly north of this reference latitude. The reference ellipsoid being used for the calculations is the modern WGS84 model because if the GPS system has been used in the construction of the monuments then the architects must have also been using our reference ellipsoid.

The next step in the alignment process is to rotate the second line around its point on the equator in a clockwise direction until its northern end point falls on the 0.5231 radian latitude reference line. This was achieved manually on the geodesic path creation software by adjusting the line's angular rotation until the latitude of the end point was aligned with the reference latitude to 14 decimal places of accuracy, in radians. The resulting required rotation angle is exactly 5.52048409500000 degrees showing that the input angle need only be accurate to 9 decimal places to achieve an output accuracy of 14 decimal places. Whilst taking into account the transposition between degrees and radians, the precision of the input angle in degrees is not accidental because it occurs on the very first calculation in the system an ensures two facts. First, that the reference ellipsoid being used for the geodesic calculation is the same one that was used by them, our WGS84 model, and second to show that the end point is supposed to be positioned on the 0.5231 radian north latitude reference line.

The arbitrary length *d* can now be adjusted until the situation is reached where the length of the line in perfect meters becomes numerically equivalent to the longitude of the second line's end point in Cairo, in degrees. Specifically the a line length *d* of 3127547.0623885127 pm gives the longitude of the end point as 31.275470623885127 degrees with all of the decimal places being significant. This relatively simple geodesic geometric arrangement is shown in diagram M73.



Diagram M73 - The adjusted line length *d* placing the end point in Giza

The three points on the GPS origin line system have been marked as GPS0000, GPS0001 and GPS0002 which is the start of a nomenclature system that is going to be required to keep track of the points in the future where the three letter prefix dictates the system to which the points belong and the numerical suffix being used to index the points.

Returning to the 1:300 model of the Earth that was shown in diagram M67, the GPS origin construction end point can now be plotted onto that diagram and it can be seen that the point is an additional point in the barycenter modeled group of points, as shown in diagram M74 in which the red line is the GPS zero path construction line coming from the equator at an azimuth of 5.52 degrees.

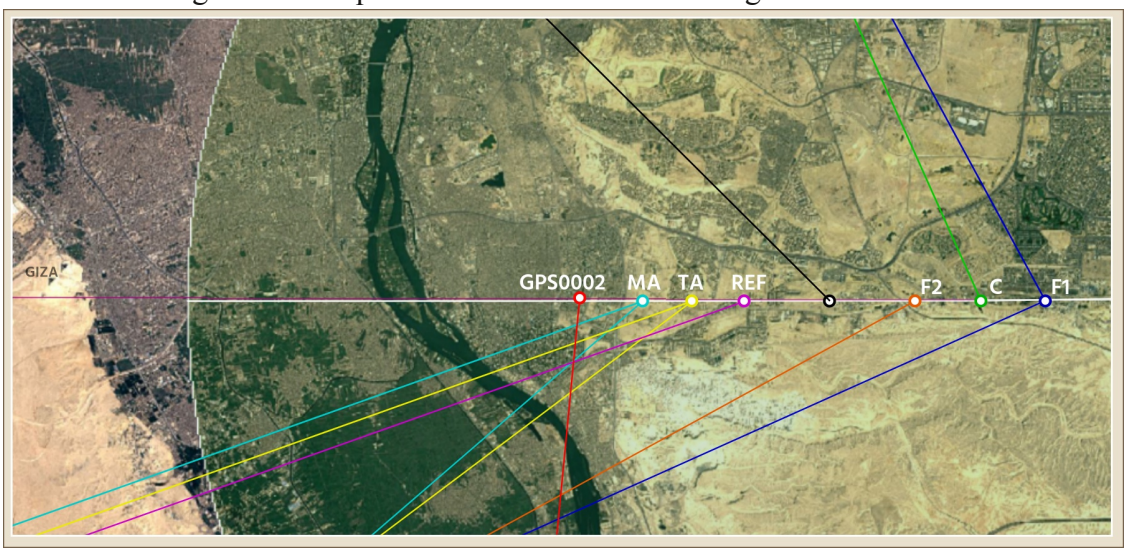


Diagram M74 - The location of the GPS zero end point, GPS0002, in Cairo.

The point GPS0002 is slightly north of the points MA,TA and REF and the reason for this is that when the model of the Earth was constructed the only manner in which the equator line could be formed was by taking a geodesic bearing line to the west from the Earth model center point *C*, and the center point *C* was positioned from the line from the Moon model which passes through the reference point on the Giza plateau at the Wall of the Crow at the latitude 0.5231 radians north. The new point GPS0002 brings with it the definition of how to form the Earth model and *all* of the points shown on diagram M74 should be defined as having a latitude of 0.5231 radians and the equator of the Earth model runs along this latitude.

There is a checking system in place to prove that the point GPS0002 is part of the Earth model system because in Abusir north the points on the Earth model equator were duplicated in the Abusir geometry shown in diagram M71 and therefore the new point GPS0002 can be also mapped onto the Abusir geometry to give the final arrangements shown in diagram M75.

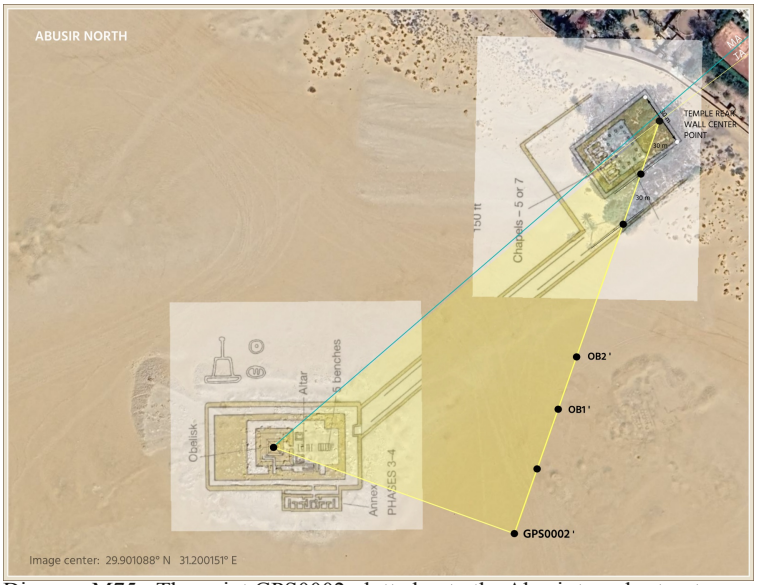


Diagram M75 - The point GPS0002 plotted onto the Abusir temple structures.

The point GPS0002, being part of the group of points that was formed by rotating the EMB barycenter around the center of the Earth model by various angles, must also be a projection of the barycenter and therefore must have an angular rotation around the Earth center point that is associated with its location. If the distance from the point GPS0002 to the Earth center is evaluated by plugging in the latitudes and longitudes into a geodesic bearing reverse calculator the distance between the points can be found to be 10814.404 pm and through trigonometry the required rotation angle of the EMB to produce this distance can be calculated as being 137.3495 deg. Because of the change that is required to the construction of the Earth model system that places the Earth center point exactly at the 0.5231 radian latitude the distance and angle just calculated will contain a slight error but not sufficient for any significant variations that will affect the explanation of the solution. This angular value is completely hidden unless the Earth-Moon system has already been solved, and therefore anyone trying to connect the GPS origin to Giza through curiosity alone would not be able to access this crucial piece of information.

When the angle is transposed into a distance of 13734 .95 perfect meters by multiplying its value by 100 and then a geodesic line is taken at an angle of 3.3333 degrees north of west, that angle coming from the length of the previous line between the points GPS0001 and GPS0002 in the GPS construction, the result is that shown in diagram M76.

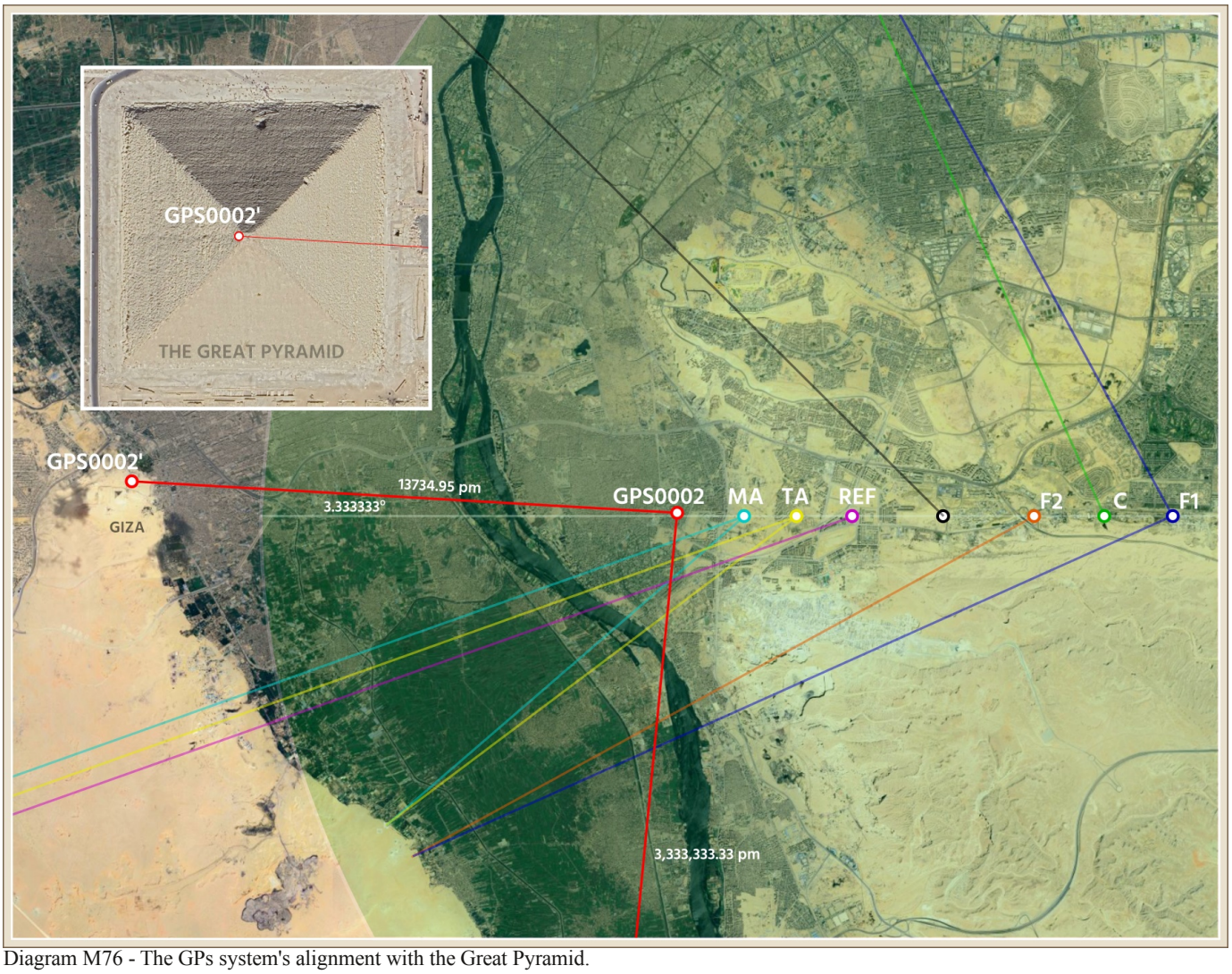


Diagram M76 - The GPs system's alignment with the Great Pyramid.

The line from the point GPS0002 terminates at the center of the Great Pyramid of Giza, which is a highly appropriate place for it to end, at the point GPS0002'. This construction system is ingenious because if the details of the constructed line length can be determined within the architecture then the rotation angle of the point GPS00002 can be determined from which the center point C of the 1:300 Earth model can be specified without error. The termination point of the line at the point GPS0002' is shown within the Great Pyramid's internal architecture in diagram M77.

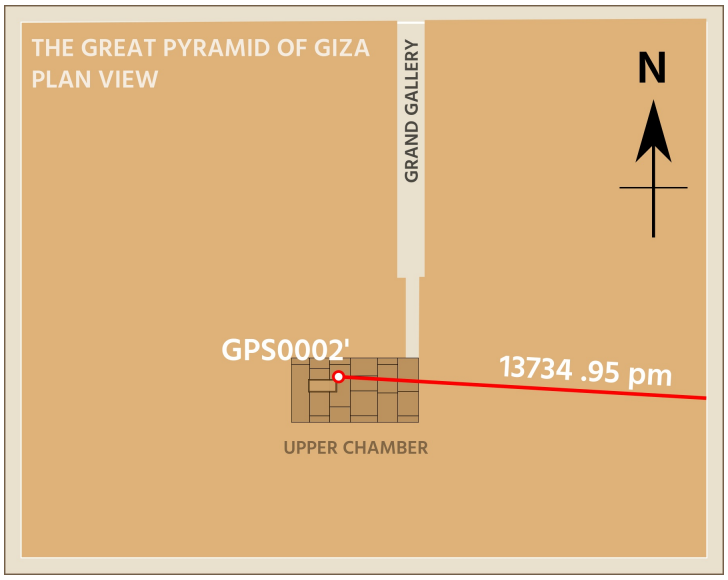


Diagram M77 - The termination point of the GPS line within the Great Pyramid.

As can be seen the point GPS0002' falls inside the upper chamber of the Great Pyramid close to the south east corner of the coffin shaped object that is located within the chamber. The diagram has been composed from a CAD drawing and is mapped to an accuracy of less than 1cm.

For this system to be of any use as a GPS alignment frame the angle of rotation of the barycenter around the Earth model of about 137.349 degrees to form the point GPS0002 needs to have been given explicitly in the architecture and the red construction line in diagram M77 shows that the value must be contained on the floor of the upper chamber of the Great Pyramid.

Looking back at paper H in this series it was determined[13] that the floor stones in the chamber contain an encoding mechanism and that the numerical value that can be decoded from the floor, walls and roof was shown to be 7.292123 x 10^{-5} rad/s which is the angular velocity of the Earth at the instant of the winter solstice in 2729 BCE . This value can of course be converted into the sidereal day length at the moment of the winter solstice, a value of 86164.006108777 seconds and similarly into hours as 23.9344461413271 hours. Diagram M78 shows the floor stone arrangement of the upper chamber of the pyramid with the point GPS0002' marked.

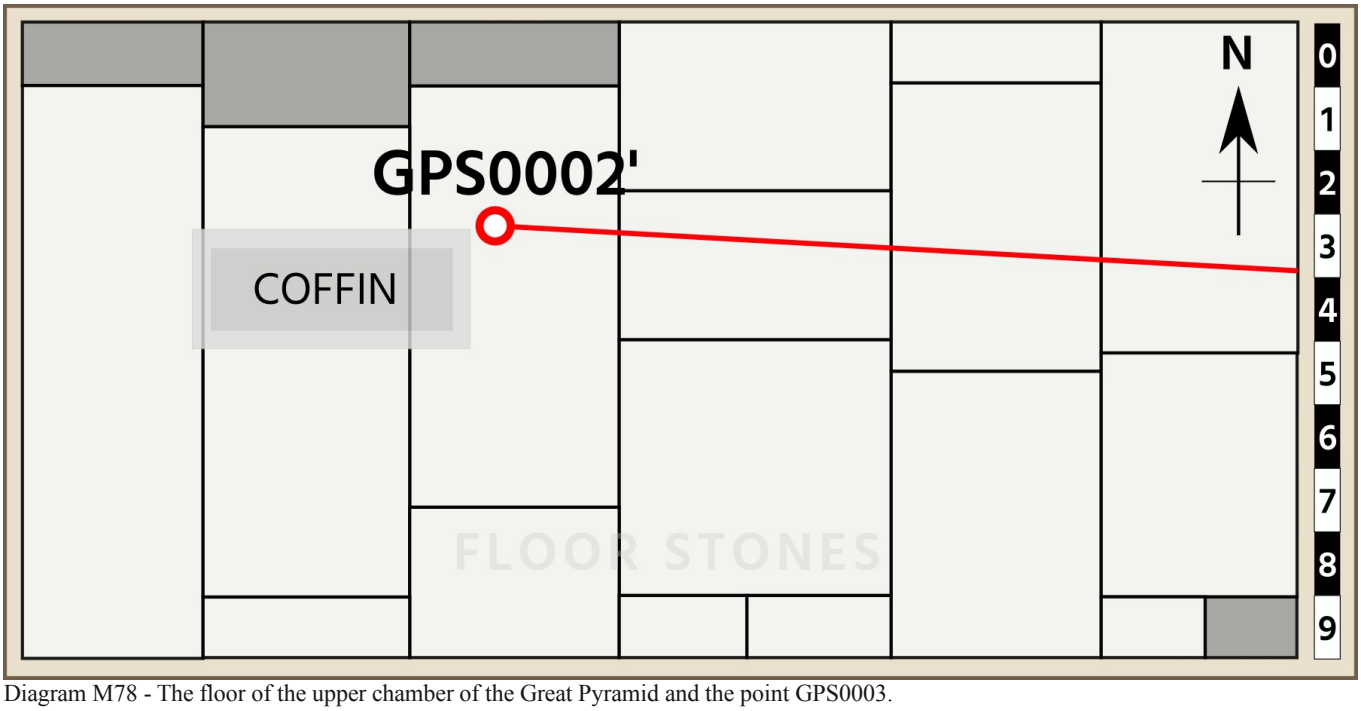


Diagram M78 - The floor of the upper chamber of the Great Pyramid and the point GPS0003.

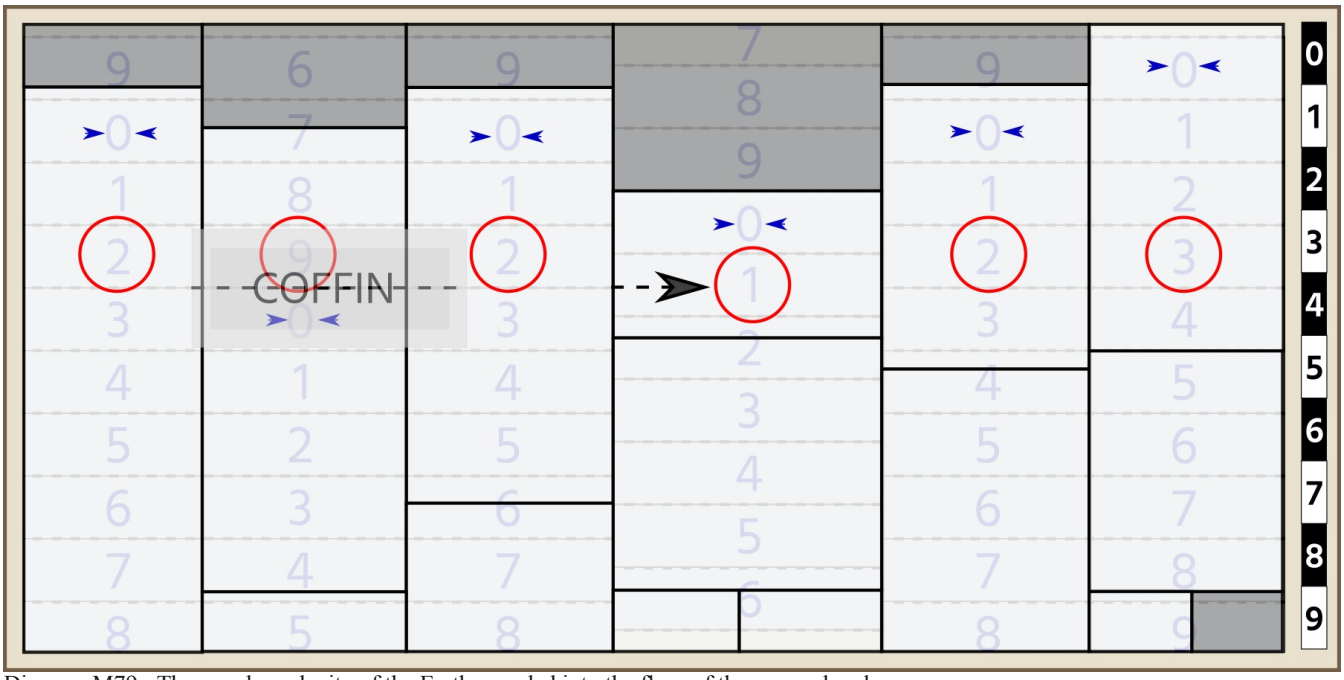


Diagram M79 - The angular velocity of the Earth encoded into the floor of the upper chamber.

Diagram M79 shows how the angular velocity was encoded into the floor stones and is a duplicate diagram from the previous paper. The encoding works by dividing the north-south floor length into 10 sections, numbering them 0-9 and then in each row of floor stones the row numbers are slid in a north-south direction until the zero markers align with the northerly stone joints, and in the case of row two, with the coffin center. The value of .292123 can then be read out of the system. It is also possible to align the zero markers in another manner to the stone joints directly to the south of the ones used in diagram M79 and this arrangement is shown in diagram M80.

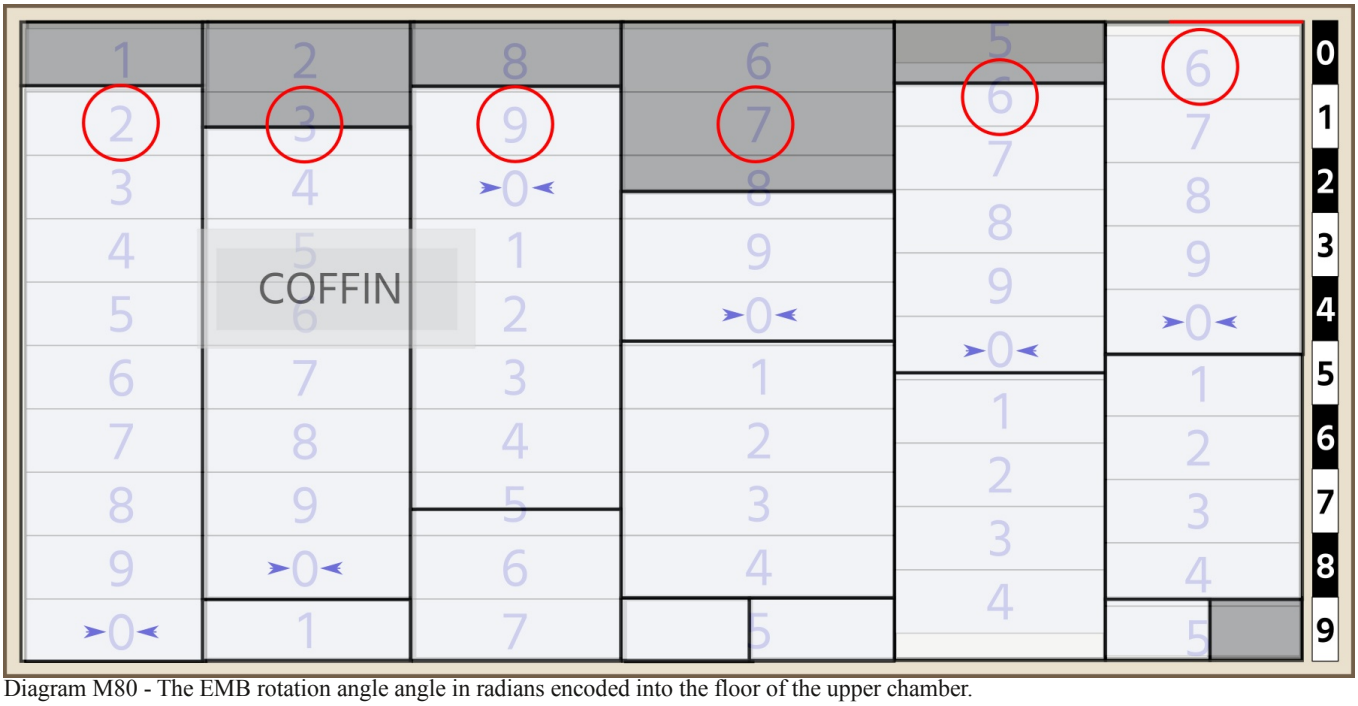


Diagram M80 - The EMB rotation angle angle in radians encoded into the floor of the upper chamber.

The zeros now all align to the lower stone joints apart from the third row from the left which aligns with the GPS0002' line marker point. The value that can be read out of the system is marked with the red circles and is 2.39766 radians, which is the equivalent of 137.3757987 degrees - the value that is required for the EMB rotation on the GPS alignment. This value can only be discovered in the upper chamber of the Great Pyramid if the GPS usage has been correctly deduced in the system and also that the value of EMB rotation is known. In other words you need to know what you are looking for before you can find it encoded into the stones, and which is why in the earlier paper this second value was not identified within the floor stones because it was not known at that point to exist.

There is a very small numerical adjustment that needs to be made to the angle that is given with this floor stone system and it can be discovered by realising that there must be a rational value somewhere in this line construction from the point GPS0002 to the point GPS00002'. The angular rotation of the EMB is of no significant value, that is to say that it does not coincide with any astronomical event in the cycles of the Earth-Moon system and also the angular value is not a rational value in either degrees or radians. The end point GPS0002' however does contain a nearly rational value because the longitude of the end point in GPS coordinates is 31.1333354997330 degrees from which the intended longitude can be deduced as having the target value 31.1333333333 degrees. The confirmation that this is the correct analysis is contained in the floor stones that are used to express the value in radians. Reference to the diligent work of Flinders Petrie[14] is required to show how the adjustment has been represented in the stone architecture.

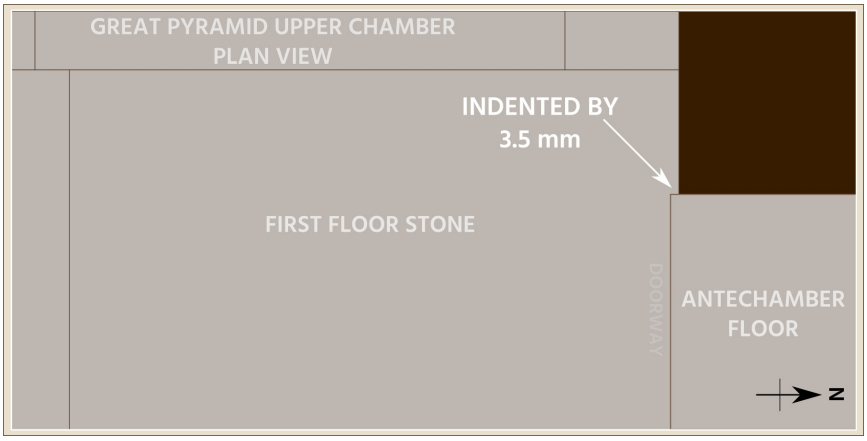


Diagram M81 - A close up of the floor stones near the doorway of the upper chamber of the Great Pyramid.

Diagram M81 shows a plan view of the entrance to the upper chamber in which the antechamber floor is indented into the upper chamber by 3.5 mm (not shown to scale). Therefore the final number '6' shown with the red circle around it in the top right corner of diagram M80 needs to be adjusted. The solution to the adjustment is shown in diagram M82.

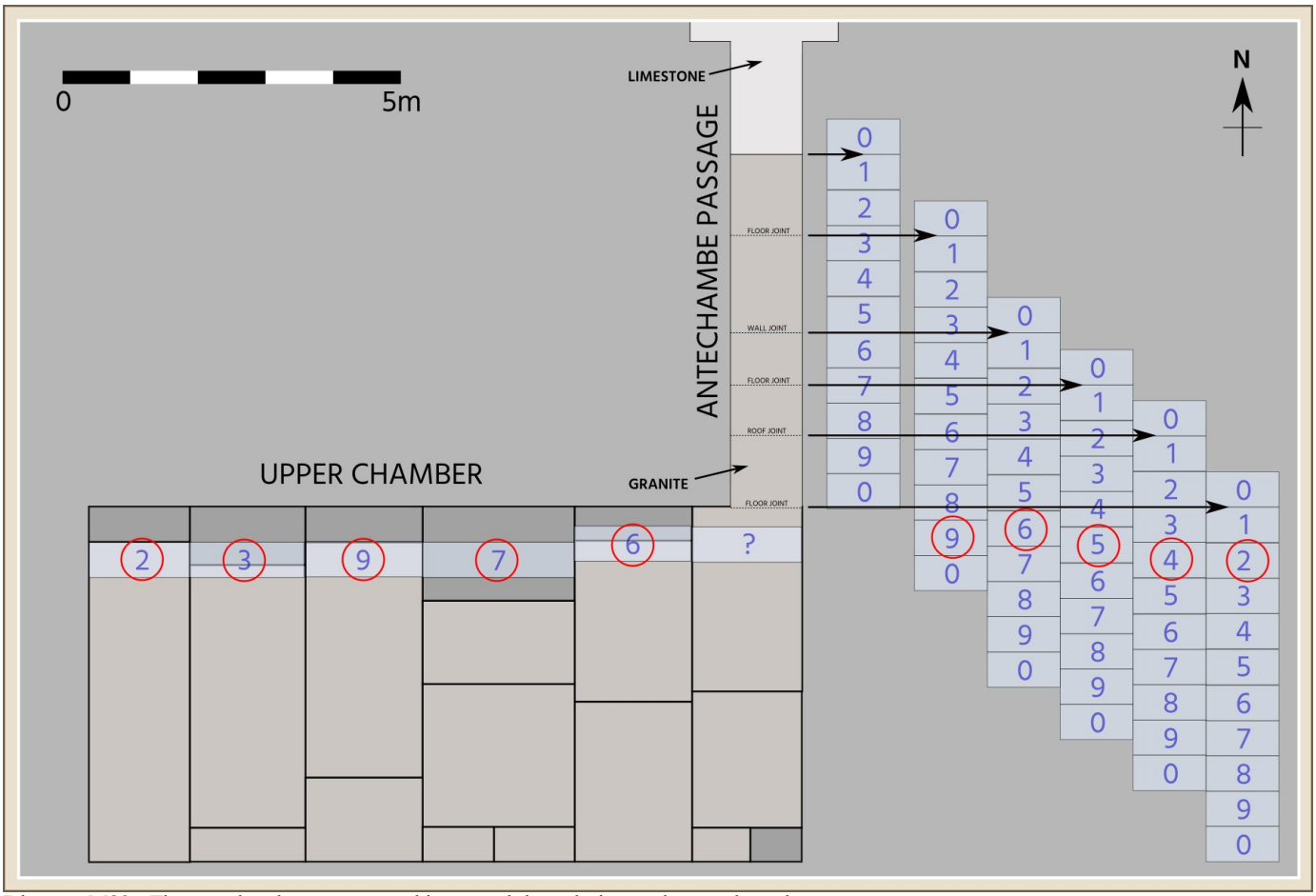


Diagram M82 - The antechamber passage and its stone joint solution to the angular value.

The diagram shows the upper chamber and the antechamber passage of the Great Pyramid. The numbers already identified are shown on the chamber floor. To the right of the antechamber passage is the strip of numbers from 0-9 that was used to work out the chamber floor puzzle, and this strip has its zero aligned to the joint in the antechamber passage where the floor changes from limestone to granite and its other end aligned at the doorway between the antechamber and the upper chamber. The number strip should actually be inside the antechamber passage from where it slides down the passage in the direction of the chamber. When the zero marker aligns with a floor, wall or roof joint the corresponding number can then be read off in the chamber at the location where the question mark is placed. Because this cannot be shown in a static image, the number strip has been placed multiple times on the right of the passage to simulate it being slid southwards along the passage floor and aligned with the respective stone joints.

The number than can be read out of this system is 2.397696542 radians which is equal to 137.377892409712 degrees which when used as a distance of 13737.7892409712 perfect meters from the point GPS0002 gives the end point of the geodesic line within the Great Pyramid GPS0002' at a GPS longitude of 31.133333333333 deg.

The antechamber of the Great Pyramid contains the stonework remnants of a physical locking device which was designed to look like it prohibits access into the upper chamber. It actually contains a numerical locking device designed around the gaps between the stones which prohibits exit from the main chamber, which is the complete opposite. That lock has just been opened.

If the EMB angle value requires the antechamber passage system to obtain the precision in the final digits of the number then the Earth's angular velocity value from the earlier paper needs to be reconsidered. It will have the opposite properties to the system just discovered and so either will not use the sliding number strip or it will use sliding number strip but will align with the walls rather than the floor. Both of these methods produce the same result and diagram M83 shows how the antechamber passage system works.

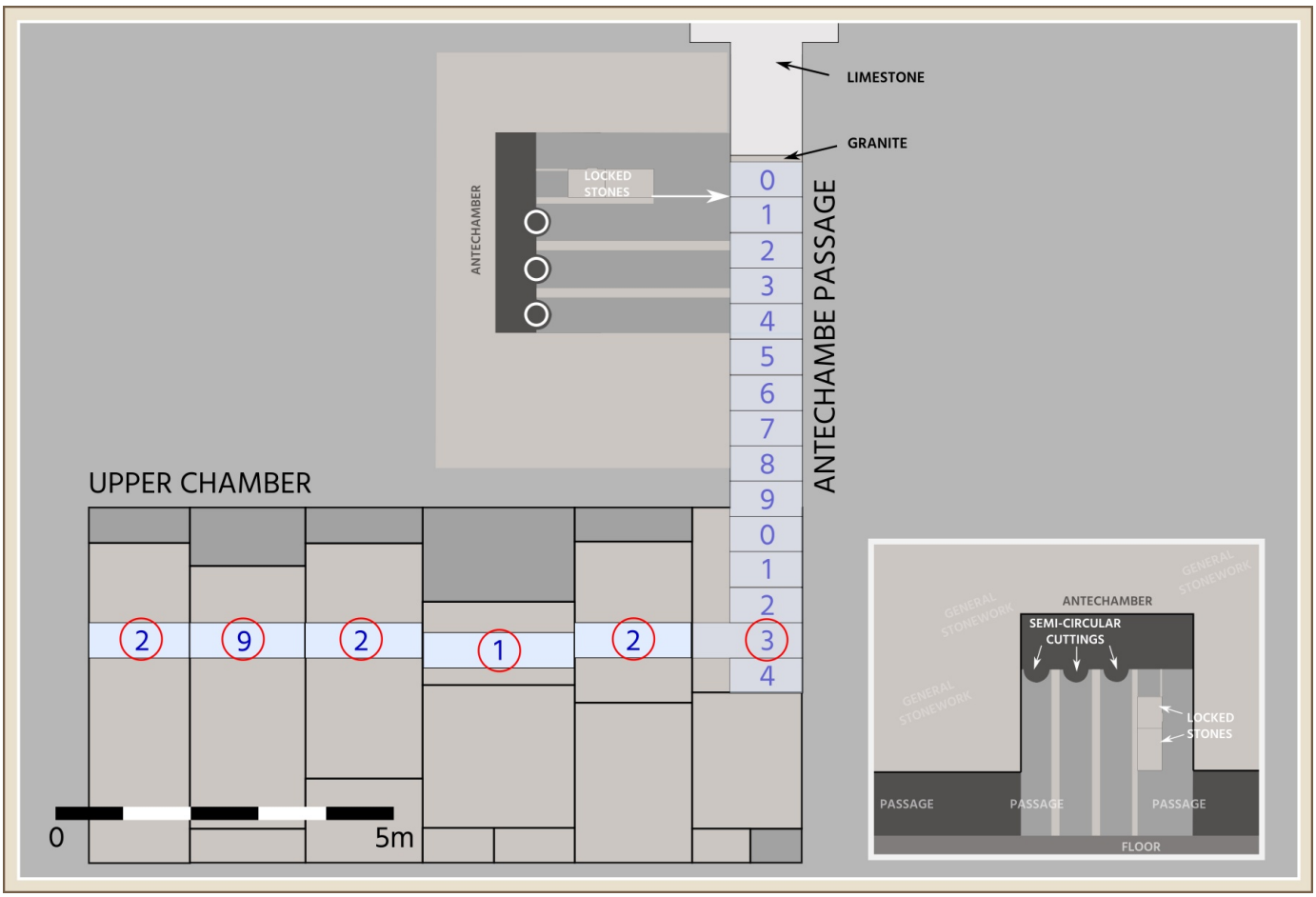


Diagram M83 - The antechamber passage number strip alignment with the walls.

The inset image shows the antechamber which contains a partially recessed wall above which is a fully recessed upper section. The lower section of the wall contains four wide grooves and in the right groove there are two locked stones which would slide up and down in the groove if it were not for the fact that they are cemented into place. The top ledge of the lower wall section has three semi circular cuttings in it which appear above each of the remaining three grooves.

The main section of diagram M83 shows how the number strip system works with these wall features. If the zero on the number strip is aligned with the locked stones then the number '3' correctly aligns with the six digits that were discovered running across the upper chamber floor and which give the decimal portion of the angular velocity. The number strip, like the stones it aligns to, is fixed in place to show that there are no additional numbers to add to the end of the floor number sequence. The strip does not slide. However, all values in the upper chamber have been given to 14 decimal places of accuracy and so, to be technically correct, three zeros need adding to the end of the number. These are the three white circles that have been placed into the semi-circular cuttings in the main part of the diagram. The floor number that was originally found in the previous paper was 7.292123×10^{-5} and so the value with the trailing zeros added is 0.00007292123000 correctly specifying the value to 14 decimal places.

With the precise values from the floor stones now known the GPS alignment system can be continued. Knowing the EMB rotation angle means that the center of the 1:300 Earth model over Cairo can now be precisely located relative to the point GPS0002 in absolute GPS coordinates. The angular rotation of 137.37789 degrees translates into a distance of the EMB from the Earth center point of 10808.5945808599 pm. This distance can be determined as a longitude shift of the point GPS00002 by dividing through the translation distance by circumference of the Earth at 0.5231 radians latitude and expressing it as an angle, giving 0.112204410274232 degrees as the longitude shift to the East. Diagram M84 shows the location of the center of the 1:300 Earth model and the points GPS0002 and GPS0002'.

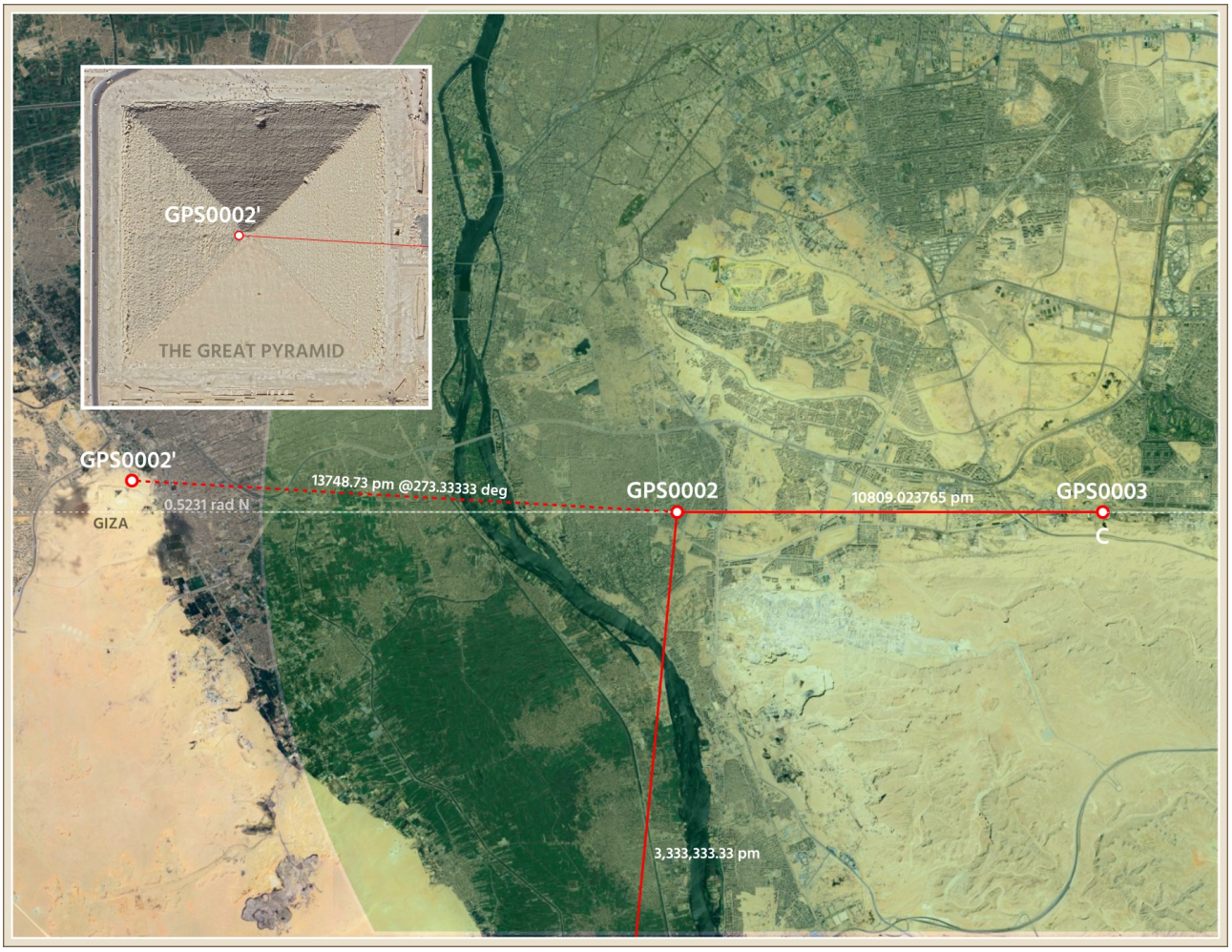


Diagram M84 - The GPS location of the Earth model center.

The reason that the point GPS002 is slightly further north than the previous three points in the barycenter group shown in diagram M76 is because, by changing the specification of the construction of the equator of the 1:300 Earth model so that all points on it fall at the same latitude, implicitly all of the previous geodesic alignments to the obelisks and temples become broken and obsolete, by design, as they are no longer required to align the Earth model which is now mathematically aligned to the GPS origin.

If you now consider the system in its entirety the distance between the points GPS0002 and GPS0003 is dependent upon the rotation angle of the EMB and the distance of the EMB from the Earth's center point. The rotation angle is fixed by the value given by the floor stonework, but the calculation of the EMB range from the Earth center contains one constant and one variable. The constant is the mass ratio between the two bodies, which was given in the roof chambers of the Great Pyramid and therefore also cannot change, but the variable value of the distance between the center of the Moon and the center of the Earth can change and is dependent on the construction of the whole system out into the Libyan desert. And because the system running into the Libyan desert starts at the reference point at the Wall of the Crow in Giza then this primary reference point must also be specified within the GPS alignment system.

The way this is achieved is sublime. The first number that was found in the upper chamber floor stones in the earlier paper was the angular velocity of the Earth in radians per second which is equivalent to exactly 23.9344461413271 hours. The Wall of the Crow reference point, GPS0004, is located 23934.4461413271 perfect meters towards the west of the center point of the Earth model at the same latitude of 0.5231 radians. The location of this point needs to be determined by reference to the Earth's circumference at this latitude of 34679996.4990945 pm as was done in the previous calculation which gives the longitude difference between GPS0003 and GPS0004 as 0.24845448330 west. Diagram M85 shows the placement of the final absolute GPS reference point on the system.

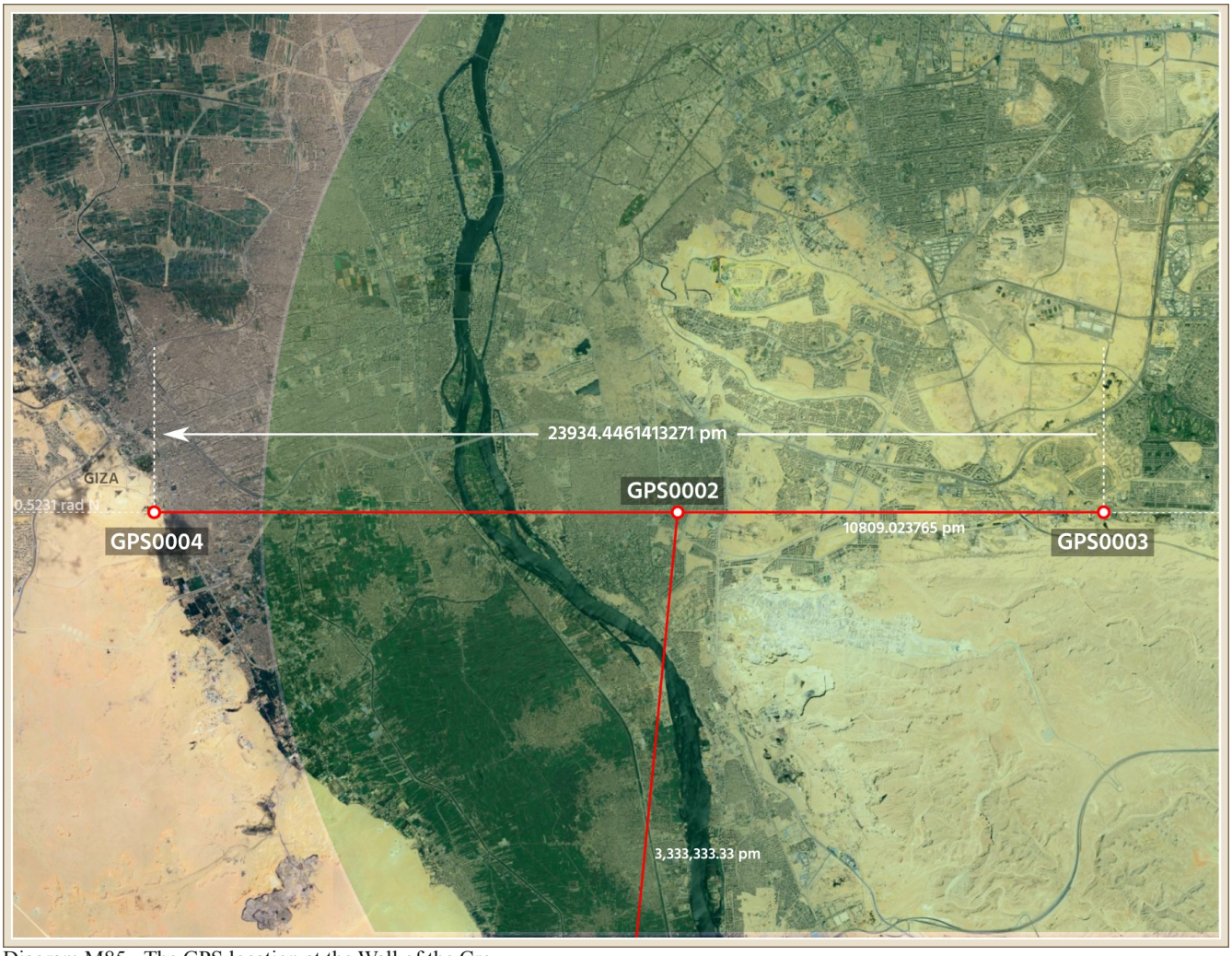


Diagram M85 - The GPS location at the Wall of the Crow.

The point GPS0004 was referred to as the point 'WOCA' in previous papers and it is interesting to note that the two points are 23cm apart, that being the error in the earlier papers resulting from the GPS surveying of the top of the Great Pyramid being the primary reference point of the isolated Giza system.

The five points on the GPS origin alignment system can now be quantified:

The GPS alignment of Giza (provisional)

	2729BCE winter solstice coordinates		2018 coordinates	
	Latitude (deg)	Longitude (deg)	Latitude (deg)	Longitude (deg)
GPS0000	0.00	0.00	0.00	0.00
GPS0001	0.00	28.1007560418276	0.00	28.1007560418276
GPS0002	29.9714222632934	31.2754706238851	29.9720382542585	31.2762165610949
GPS0002'	29.9785528310659	31.1333333333333	29.9791688213630	31.1340793238203
*GPS0003	29.9714222632934	31.3876705788481	29.9720382542585	31.3884165160579
*GPS0004	29.9714222632934	31.1392160957947	29.9720382542585	31.1399620330045

Table M1 - The absolute GPS coordinates of the system's primary reference points.

The values in table M1 are purely mathematical and all of the decimal places shown are significant. The list includes the fully resolved reference point GPS0002' found within the Great Pyramid.

The 2018 coordinate values in the table account for the latitude and longitude shift of the African tectonic plate and therefore there is a geophysical disjoint between the points GPS0001 and GPS0002 in those columns. It is not possible to directly construct the system at 2018 coordinates because of this. The 2729 BCE GPS frame must be constructed first and then the resulting system points in Cairo transposed to their modern locations, which is how table M1's 2018 data from the point GPS0002 onward has been calculated.

Table M2 shows the same values in radians.

The GPS alignment of Giza (provisional)

	2729BCE winter solstice coordinates		2018 coordinates	
	Latitude (rad)	Longitude (rad)	Latitude (rad)	Longitude (rad)
GPS0000	0.00	0.00	0.00	0.00
GPS0001	0.00	0.49045071522958	0.00	0.49045071522958
GPS0002	0.5231	0.54585993749756	0.52311075107050	0.54587295655788
GPS0002'	0.52322445188517	0.54337917378757	0.52323520294401	0.54339219377775
*GPS0003	0.5231	0.54781819613225	0.52311075107050	0.54783121519258
*GPS0004	0.5231	0.54348184736163	0.52311075107050	0.54349486642196

Table M2 - The absolute GPS coordinates of the system's primary reference points in radians.

The reason that the tables are marked as provisional is that the Earth-Moon system, the research of which was described in this paper, needs to be re-calculated starting from the point GPS0004. The geodesic line system then goes out into the Libyan desert where the moon model can be found. The moon model's

center point is aligned to the global grid system and the global grid system also starts at the point GPS0004. When the Moon model is connected back to the Earth model's center point the distance between the two center points will have changed from the previous calculations because the system now uses an equator that runs across a latitude rather than being plotted geodesically. If the distance between the Earth and Moon changes, then the location of the barycenter must also change meaning that the GPS alignment system will place the Earth center point at a different location. This will in turn then change the location of the point GPS0004 which will then require the world grid system to be recalculated, which will move the center of the moon, which will change the distance between the Moon and Earth models.

This system is designed to work like this by the architects and will require a diligent effort to manually adjust the system or a lot of time and effort to programme the software to automatically adjust the calibrate the system. Consequently this analysis will be presented in the next paper in this series and in the table data above the items marked with an asterisk are provisional values.

Appendix

pm	Perfect meter. One 10 millionth of the distance from the North pole to the equator on the reference ellipsoid of Earth. The conversion factor between meters and perfect meters is 1 (pm) = 1.00019657308809 (m)

References

1. Brabin, S.H. *The Great Pyramid's solar system map and the original surveying grid of the Giza plateau* ISBN 978-1-7398691-1-3 http://www.giza-pyramids.com/documents/pdf/GPP_J-TheMapAndTheGrid.pdf

2. Brabin, S.H. *The GPS location of the Great Pyramid* ISBN 978-1-7398691-3-7 http://www.giza-pyramids.com/documents/pdf/GPP_L_WorldSurveyGrid.pdf

3. Agrawal, Dulli Chandra, 2015, Banaras Hindu University *Micro moon versus macro moon: Brightness and size* https://www.researchgate.net/publication/280104912_Micro_moon_versus_macro_moon_Brightness_and_size

4. Brabin, S.H. The Great Pyramid, the Earth and the Cubit ISBN 978-0-9566588-8-3 http://www.giza-pyramids.com/documents/pdf/GPP_G-TheEarthModel.pdf

5. Zimbelman, James R. *Landing Site Coordinates*, Apollo Lunar Surface Journal

https://www.hq.nasa.gov/alsj/alsjcoords.html

6. Brabin, S.H. *The GPS location of the Great Pyramid*
ISBN 978-1-7398691-3-7
http://www.giza-pyramids.com/documents/pdf/GPP_L_WorldSurveyGrid.pdf
diagram L30, page 26

7. Williams, Dr. David R. *Moon Fact Sheet* NASA
https://nssdc.gsfc.nasa.gov/planetary/factsheet/moonfact.html

8. Smith, David E. et al. *Topography of the Moon from the Clementine lidar*
Journal of Geophysical Research, VOL. 102, NO. El, PAGES 1591-1611, JANUARY 25, 1997

9. Brůna,Vladimír – Czech Institute of Egyptology, Faculty of Philosophy UK
Map of the archaelogical objects in Abusir of the concession of the Czech Institude of Egyptology
https://fzp.maps.arcgis.com/apps/webappviewer/index.html?id=2b60e338ea264e028ce8ceae5f0f7037

10. Brabin, S.H. *The architecture of the Great Pyramid's lower northern shaft*
ISBN 978-1-7398691-0-6
http://www.giza-pyramids.com/documents/pdf/GPP_I_ResolvingTheLowerNorthernShaft.pdf

11. Brabin, S.H. *Decoding the upper chamber of the Great Pyramid - part 2*
ISBN 978-0-9566588-9-0
http://www.giza-pyramids.com/documents/pdf/GPP_H-DecodingUpperChamber2.pdf
diagram H20, page 16

12. Brabin, S.H. *The GPS location of the Great Pyramid*
ISBN 978-1-7398691-3-7
http://www.giza-pyramids.com/documents/pdf/GPP_L_WorldSurveyGrid.pdf
pages 27-29

13. Brabin, S.H. *Decoding the upper chamber of the Great Pyramid - part 2*
ISBN 978-0-9566588-9-0
http://www.giza-pyramids.com/documents/pdf/GPP_H-DecodingUpperChamber2.pdf , page 12

14. Petrie, W. M. Flinders. *The Pyramids and Temples of Gizeh*. 1st ed. London: Field and Tuer; New York: Section 47, Page 76