

IPACO expert report

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<i>Type</i> IFO	<i>Class</i> A	<i>Explanation</i> Moon	<i>Complement</i> Camera movement before the shutter is closed
<i>Document</i> Photo	<i>Imaging location</i> Tlamacas, Mexico	<i>Imaging date</i> December 19, 2000, 06:10:00 local hour	



Original photography

I. Shoot circumstances

The photographer and journalist, Antonio Reyes, was mandated at the end of the year 2000 by the press agency NOTIMEX to photograph the Popocatepetl volcano as it was about to erupt.

II. Camera settings

The camera model that was used was a 24x36 silver film Nikon F5. Its main characteristics can be seen [here](#).



III. Data examination and hypothesis

Hypothesis

The working hypothesis is that of the Moon leaving a trace on the silver film, which was then combined with camera shake during the exposure to give the apparent movement in the image .

Preamble

A first analysis of Andres Duarte was carried out according to which the red light (with the yellow light to his left) of the antennas constitutes a clear proof that the whole picture was moved at the last second (slow movement which then goes upward) .

What had to happen was that, because of a poor balance on the ground, either the camera tilted backwards or Reyes lifted it just before the shutter closed at the end of the 20 seconds of exposure.

The fact that the two traces of the antenna lights (red and yellow) appear slightly inclined to the right and to the bottom (see the original photo on the previous page) and do not coincide with the upper part of the trace of the Moon, simply means that the first part of the trace of the Moon is actually outside the field, above the upper frame of the image. In fact, if we could see this first part of the trace of the Moon, we could verify that its orientation was exactly the same as that of the first part of the trace of the two lights of the antenna. In the same way, if these two lights of the antenna had been higher in the field, the lower part of their vertical trace would appear in conformity with the inclination of the upper part of the trace of the Moon.

But since these considerations are very subjective and can always lend themselves to different interpretations (the fact of not having the first part of the trace of the Moon makes that what has been said before appears as a mere hypothesis), it was decided to check it with "hard" data, more difficult to refute.

In this case, knowing the astronomical data relating to the angular size of the Moon, a little more than a half degree, more precisely $31'38''$ or about 0.527° , the strategy of measuring the angular width of the trace of the supposed "UFO" to see if it coincided with this astronomical data was adopted. In case of confirmation of such a coincidence, the Moon would no longer appear as "suspicious", but as the main cause of the luminous trace.

Principle

On the basis of the hypothesis that the trace of a movement can never be wider than its source (at most it could be narrower) it was decided to measure the angular size of the trace of the Moon in at least two of its widest parts, at the beginning (upper edge of the field) and in the broad part of the curve to the left (center of the photo).

Methodology

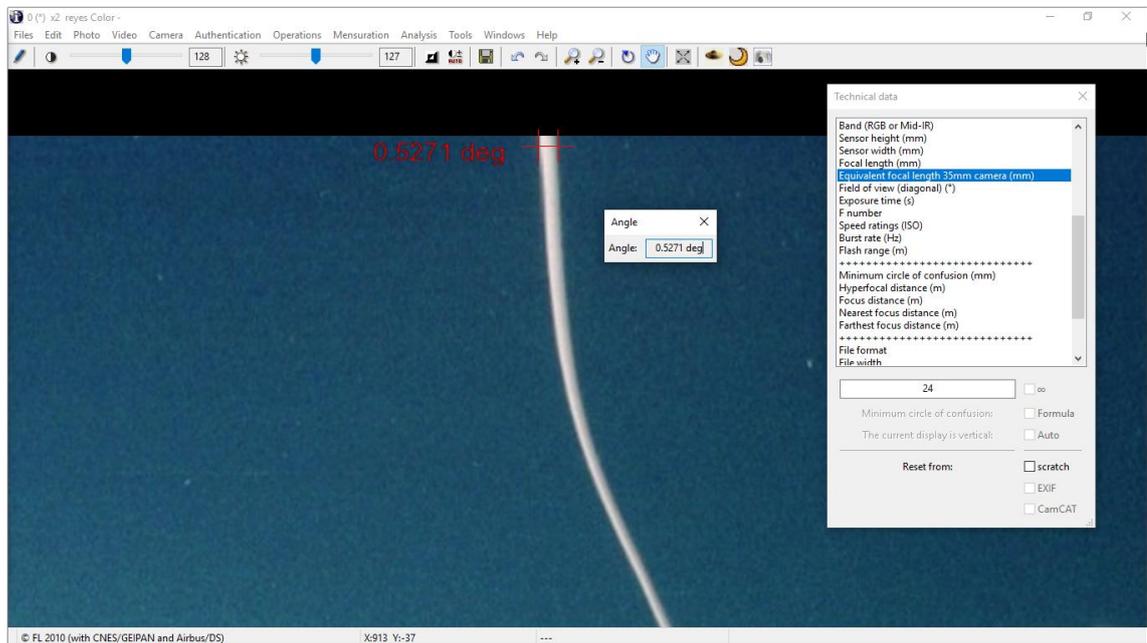
Since this is not a digital picture, and therefore EXIF metadata are not available, the useful technical data provided by the photographer has been transmitted. This is a 35mm silver film camera, which for this photo used a 24mm lens, with an $F/4$ aperture and an exposure time of 20 seconds.

To analyze these difficult cases of scanned silver film photos that do not have any EXIF metadata, the IPACO software can work with data manually completed. Taking advantage of this possibility of the software, Reyes photo was loaded with these only three data transmitted.

IPACO was then able to calculate a diagonal field of view of 84.1° , and for both measurements appeared an "angular width" of the trace of 0.527 degrees, coinciding perfectly with the apparent diameter of our natural satellite.

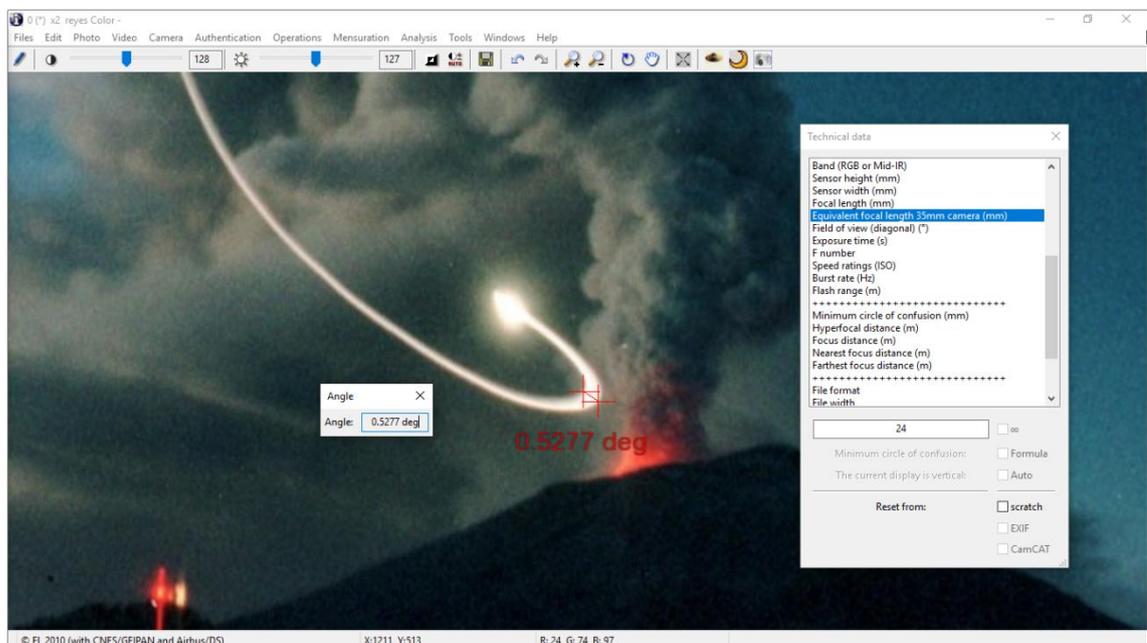
Here is the first capture, taken within the widest part of the trace at its beginning (upper part of the field).

We observe the perfect coincidence with the apparent diameter of the Moon (0.527 °).

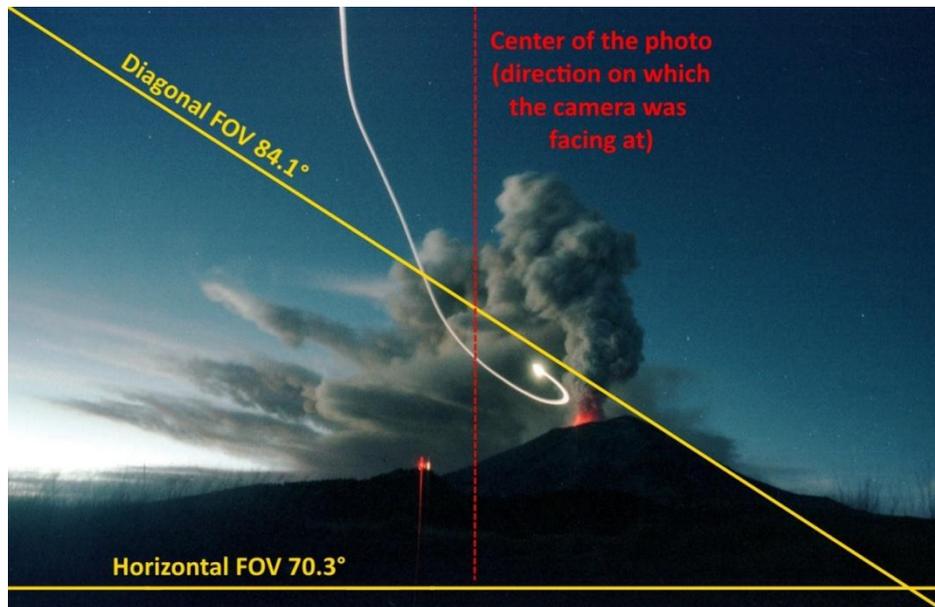


Then here is the angular measurement obtained in the broad part of the "left turn".

In this case, an angular width of 0.527 ° is also verified.

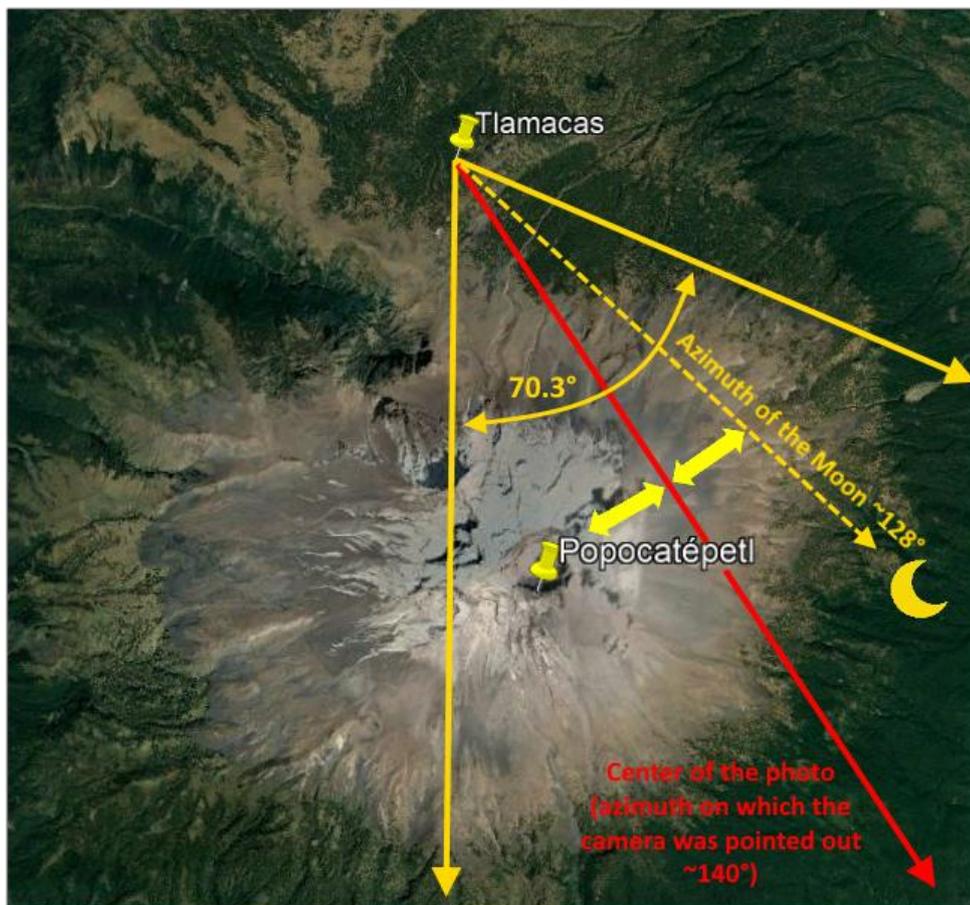


Below is a composition analysis based on a diagonal field of view of 84.1 ° (for a 24 mm equivalent focal length 35 mm of the camera) which by trigonometric calculation (the angle is obtained beforehand with the help of a protractor to obtain the arc-cosine) gives us a horizontal field of view of 70.3 °.



It is observed that the distances between the Moon (vertical trace in upper limit) and the crater of the volcano are almost equidistant from the central vertical line of the photo.

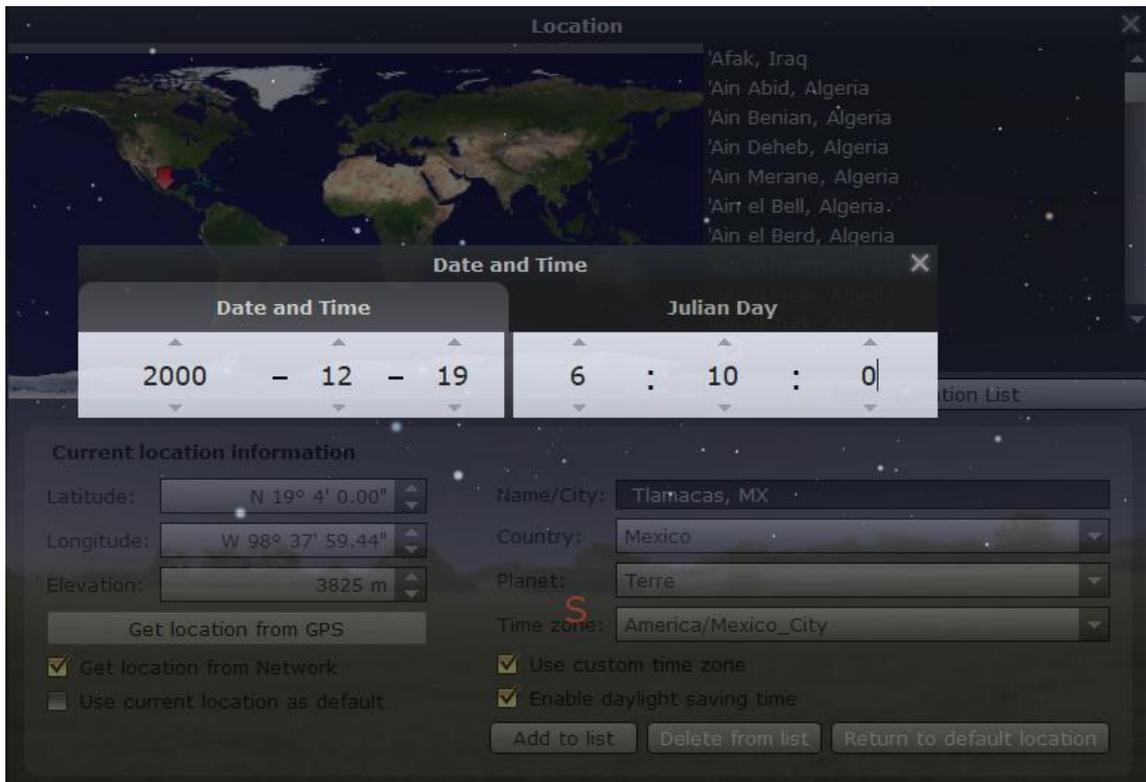
This would locate the azimuth of the Moon at approximately 128° , plotted approximately below:



What was still needed to be done finally was to show the astronomical configuration of that night, as seen from the exact point where the photo was taken. For this, the position of Tlamacas was manually loaded in Stellarium:



As well as the date and the hour of the sighting:



Which provides the following result from the photographer's point of view:



In this Stellarium simulation we can observe, in yellow, the azimuth where the Moon was in relation to the eye of the observer ($127^{\circ} 31'$) and especially the angular size of the Moon of $0^{\circ} 31'37.75''$, which corresponds in decimal system to 0.527° , value identical to that obtained by IPACO for the width of the trace of the so-called "UFO", at two different points of the same picture.

In red appear the location and date / time data.

IV. Conclusion

With these consolidated data we can conclude, with a certainty margin sufficiently important, that the probability of a "ship" having same angular size as the Moon seems infinitely lower than that of the Moon itself, which was close to the scene before entering at the last second of the exposure time.

V. Acknowledgements

Thank you to Rubén Lianza of the CIAE for this analysis, Andres Duarte for the preliminary assessment and Salim Sigales, of the IAE-DEFECO.

Credits goes to Antonio Reyes for the original photo.