The Lunar Observer

A Publication of the Lunar Section of ALPO

David Teske, editor
Coordinator, Lunar Topographic Studies Section Program

June 2024

In This Issue

Online readers, click on images for hyperlinks

Lunar Reflections

A warm greeting to all readers. Hoping that this issue of The Lunar Observer is one that you find interesting. In this issue, Paul Walker leads us on two lunar forays with great details. Rik Hill studies the mysterious mascon Lamont in Mare Tranquillitatis. Jeff Grainger leads us on a study of the features of Mare Nubium. Greg Shanos reports on the reappearance of Antares from a lunar occultation on May 23, 2024. Alberto Anunziato studies the crater Philolaus with a drawing and great information. Alberto also studies how lunar rays were portrayed long ago by Hevelius and how these old drawings compare very favorably to modern lunar images. Plus contributors from across the world have submitted outstanding lunar drawings and images for the Recent Topographic Studies. As always, Tony Cook leads us on interesting studies of Lunar Geologic Change and Buried Basins and Craters. Thanks much to all who contributed!

This past month, cloudynights.com has put the current edition of the ALPO *The Lunar Observer* on its home page! This has generated more views (896 views of the May TLO) of TLO and hopefully more interest in the newsletter and in ALPO.

Please remember to follow the future Focus-On topics and gather observations of these features. Next up is the very interesting Mare Nectaris. Observations are due to Alberto and myself by June 20, 2024.

Clear skies,
-David Teske

Edited by David Teske: david.teske@alpo-astronomy.org
2162 Enon Road, Louisville, Mississippi, USA
Back issues: http://www.alpo-astronomy.org/

Lunar Topographic Studies

Coordinator – David Teske - david.teske@alpo-astronomy.org
Assistant Coordinator– Alberto Anunziato albertoanunziato@yahoo.com.ar
Assistant Coordinator-Wayne Bailey– wayne.bailey@alpo-astronomy.org
Website: http://www.alpo-astronomy.org/

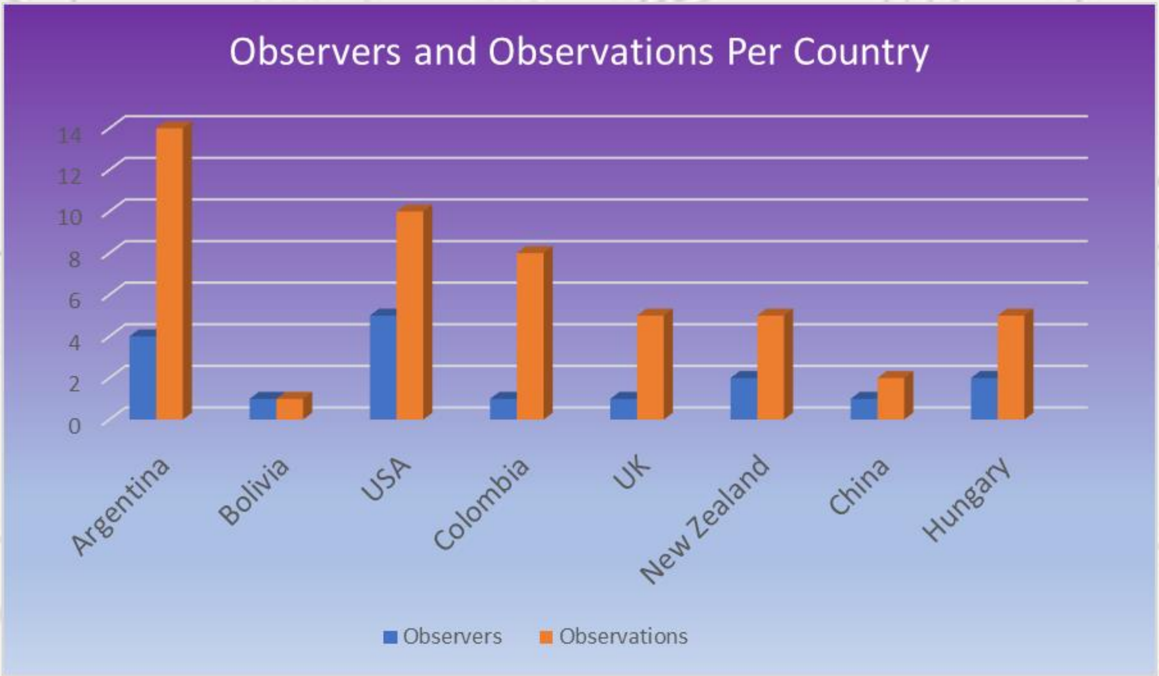
Observations Received

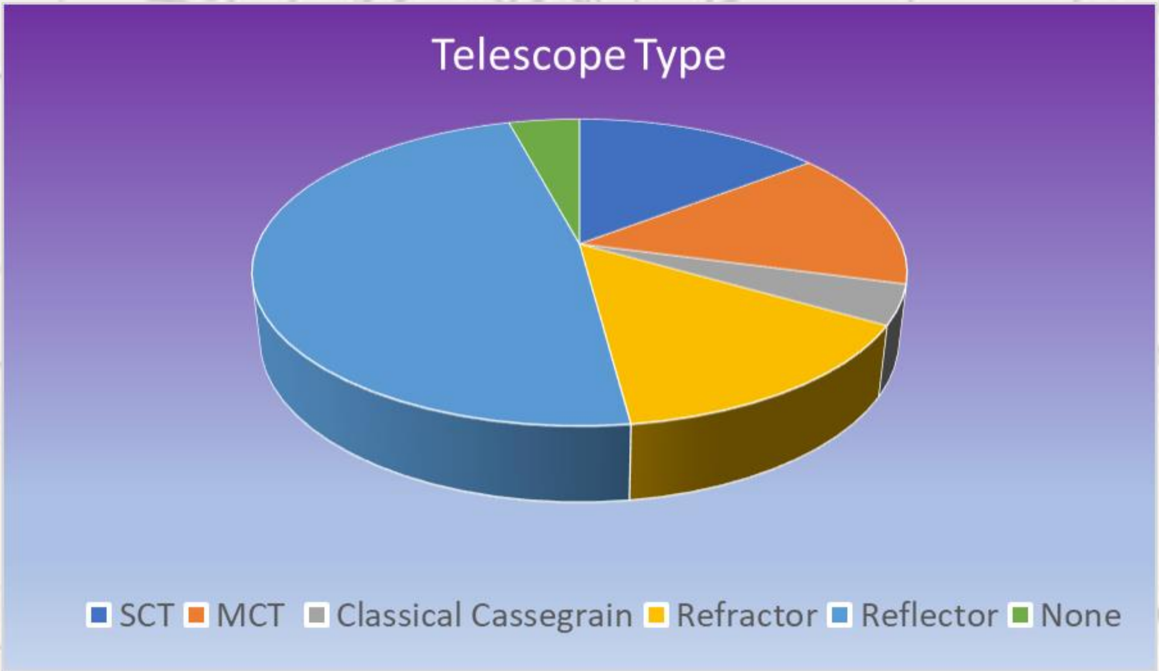
Name	Location and Organization	Image/Article
Alberto Anunziato	Paraná, Argentina	Articles and drawings *A Subjective Vision of Philolaus* and *The Bright Rays on a Map of Hevelius and in a Contemporary Image*.
Jairo Chavez	Popayán, Colombia	Images of Mare Crisium (2), 12% Waxing Crescent Moon, Petavius, 21% Waxing Crescent Moon, Mare Nectaris, Mare Serenitatis and the 62% Waxing Gibbous Moon.
Maurice Collins	Palmerston North, New Zealand	Image of the 8.2 day-old Moon, 11.2 day-old Moon and 15.2 day-old Moon.
Juan Carlos Dovis	Sunchales, Argentina	Image of the Waxing Gibbous Moon.
István Zoltán Földvári	Budapest, Hungary	Drawing of Taruntius.
Jeff Grainger	Cumbria, United Kingdom	Article and images: *A Tour of Southeast Nubium.*
Marcelo Mojica Gundlach	Cochabamba, Bolivia	Image of Janssen.
Richard Hill	Loudon Observatory, Tucson, Arizona, USA	Article and image *Lamont: The Crater that Isn't*
Attila Ete Molnar	Budapest, Hungary	Images of Rima Hyginus, Messier, Mare Nectaris and Bessel.
KC Pau	Hong Kong, China	Images of Messier (2).
Gregory T. Shanos	Sarasota, Florida, USA	Article and images, *Lunar Occultation of Antares on May 23, 2024.*
Michael E. Sweetman	Sky Crest Observatory, Tucson, Arizona, USA	Images of Clavius and Mons Rümker.
David Teske	Louisville, Mississippi, USA	Images of Sabine, Theophilus and Mare Crisium.
Larry Todd	Dunedin, New Zealand	Images of Theophilus (2).
Alan Trumper	Oro Verde, Entre Ríos, Argentina	Image of the Waxing Crescent Moon.
Gonzalo Vega	Oro Verde, Entre Ríos, Argentina	Images of Hercules, Tycho, Metius, Theophilus, the Waxing Gibbous Moon, Mare Crisium, Langrenus, Petavius (2) and the Waning Gibbous Moon.
Paul Walker	Middlebury, Vermont, USA	Articles and images *Exploring Northern Oceanus Procellarum* and *A Small Piece of the South-Southwest Edge of the Moon.*

Many thanks for all these observations, images, and drawings.

June 2024 *The Lunar Observer*
By the Numbers

This month there were 50 observations by 17 contributors in 8 countries.





ALPO 2024 Conference: Call for Papers

Tim Robertson & Ken Poshedly,
ALPO Conference coordinators

Overview

Due to the success of attracting more and more viewers and participants to our online conferences, the 2024 Conference of the ALPO will once more be held online, this time on Friday and Saturday, July 26 and 27.
The ALPO conference times will be:

- Friday from 1 p.m. to 5 p.m. Eastern Time (10 a.m. to 2 p.m. Pacific Time)
- Saturday from 1 p.m. to 6 p.m. Eastern Time (10 a.m. to 3 p.m. Pacific Time).
- The ALPO Conference is free and open to all via two different streaming methods:
- The free online conferencing software application, Zoom.
- On the ALPO YouTube channel at *https://www.youtube.com/channel/UCEmixiL-d5k2Fx27Ijfk41A*

Those who plan to present papers or presentations must (1) be members of the ALPO, (2) use Zoom, and (3) have it already installed on their computer prior to the conference dates. Zoom is free and available at *https://zoom.us/*
Those who have not yet joined the ALPO may do so online. Digital ALPO memberships start at only $22 a year. To join online, go to *http://www.astroleague.org/store/index.phpmain_page=product_info&cPath=10&products_id=39*, then scroll to the bottom of that page, select your membership type, click on "Add to Cart" and proceed from there.
There will be different Zoom meeting hyperlinks to access the conference each of the two days of the conference. Both links will be posted on social media and e-mailed to those who wish to receive it that way on Thursday, July 27.
The Zoom virtual (online) "meeting room" will open 15 minutes prior to the beginning of each day's activities.
Those individuals wishing to attend via Zoom should contact Tim Robertson at *cometman@cometman.net* as soon as possible.

Conference Agenda

The conference will consist of initial welcoming remarks and general announcements at the beginning each day, followed by papers and research findings on astronomy-related topics presented by ALPO members.
Following a break after the last astronomy talk on Saturday will be presentation of the Walter Haas Observing Award. A Peggy Haas Service Award may also be awarded.
A keynote speaker will then follow the awards presentations on Saturday. The selection of a keynote speaker is in progress and the final decision will be announced in the summer issue of this Journal (JALPO66-3).

Presentation Guidelines

All presentations should be no more than 15 minutes in length; the preferred method is 12 minutes for the presentation itself plus 3 minutes for follow-up questions. The preferred format is Microsoft PowerPoint.
Send all PowerPoint files of the presentations to Tim Robertson at *cometman@cometman.net* .

Suggested Topics

Participants are encouraged to present research papers and experience reports concerning various aspects of Earth-based observational astronomy including the following.

- New or ongoing observing programs and studies, specifically, how those programs were designed, implemented and continue to function.
- Results of personal or group studies of solar system or extra-solar system bodies.
- New or ongoing activities involving astronomical instrumentation, construction or improvement.
- Challenges faced by Earth-based observers such as changing interest levels, deteriorating observing conditions brought about by possible global warming, etc.

Information about paper presentations, the keynote speaker and other conference data will be published in this Journal and online as details are learned.

Lunar X Predictions for 2024

40°N-75°W, Eastern Time Zone

Date, 2024	358° Colongitude	Altitude/Azimuth	Cloudy Nights
January 18	5:15 am	–37° / 345°	4:05 am
February 16	7:40 pm	+66° / 236°	6:49 pm
March 17	10:22 am	–11° / 38°	10:10 am
April 15	11:08 pm	+43° / 268°	11:41 pm
May 15	11:01 am	–16° / 53°	12:13 pm
June 13	10:15 pm	+34° / 244°	11:49 pm
July 13	9:11 am	–43° / 58°	10:48 am
August 11	8:15 pm	+24° / 212°	9:31 pm
September 10	7:49 am	–65° / 65°	8:29 am
October 9	8:12 pm	+16° / 206°	8:09 pm
November 8	8:33 am	–49° / 79°	7:49 am
December 7	10:43 pm	+4° / 253°	9:36 pm

Note: The Lunar X is not an instantaneous phenomenon; rather, it appears and evolves over several hours, so the times above are fundamentally approximate and serve only as a guide. The ardent observer should look a little early to catch the initial visible illumination. A less-dramatic Lunar X against a fully illuminated background can still be seen at least several days later. Because of the Moon's nominal 29.5-day synodic period (phase-to-phase), favorable dates for a given location tend to occur on alternate months (unfavorable dates for 40°N-75°W are shaded gray in this table). The 358° colongitude value for the terminator reaching the Lunar X and making it visible (see this RASC paper) and the corresponding lunar altitude/azimuth for 40°N-75°W were determined with WinJUPOS, which is freeware linked from the WinJUPOS download page.

The Cloudy Nights comparative data, derived by a different method, was presented in this post.

Daylight Saving Time for 2024 begins on March 10 and ends on November 3. The listed times are EST/EDT as appropriate for the date.

Submitted by Greg Shanos.

Exploring Northern Oceanus Procellarum

Paul Walker

As the caption indicates this image covers a piece of the northwestern part of the Moon, the northern parts of Oceanus Procellarum from just below the Vallis Schröteri Plateau to almost up to Sinus Roris.

The Vallis Schröteri Plateau is in the lower left. It looks diamond shaped here. It is has surprisingly straight sides and squared off corners. Montes Agricola nicely paralleling its upper left edge helps to accentuate this shape. The banded crater Aristarchus is on the right-hand corner of the plateau. It looks like the corner of the Vallis Schröteri Plateau would still be squared off even if Aristarchus were not there. Part of a second banded crater, Brayley, is on the right edge of the image. Many bumps can be seen on the plateau. I gather from Robert Garfinkle's comments in his "Lunar Cognita" book that though most of these are considered to be of volcanic origin, very few have been studied in sufficient detail to make a determination. On the VMA (Virtual Moon Atlas) only 1 dome here is named, Herodotus 1. This dome does appear to be visible in this image. If you look inside the curve of Vallis Schröteri (the big valley in lower center of the plateau) and magnify the image you can see what looks like a moderately large dome with a crater on its top. That's not marked as a dome. Look just above that. There are 2 small bumps, one to the left, one to the right. As best as I can tell based on the marker location on the VMA, the small bump to the right is Herodotus 1. However, based on the stated size in the VMA of 7.00x10.00 km (4.30x6.10 mi) and counting pixels on the original image (this version is down sampled 67%) the "moderately large dome with the crater on top" may be Herodotus 1. But when I use the measurement tool, I don't find much evidence of an obvious bump with the crater near the middle. Drawing a 40 km line from SW to NE across the crater on the "moderately large dome" there is an indication of a drop on either side of the crater and of a much larger "dome" across about half of those 40 kilometers. Two 40 km lines going from the NW to SE, one through the crater, one north of it show a rising slope over that distance and again an indication of a "dome" over about half of that distance. There is one named mountain on the plateau, Mons Herodotus. It is the first bright peak to the upper left of Vallis Schröteri.

A number of small rilles can be seen on the upper right of the plateau. To the right is the flooded and tilted crater Prinz (the smooth floor is tilted +100 m S-N), above that are a few smaller rilles.

Above Aristarchus (just over 1 crater diameter away) there is a feature that has different names for its south and north ends (Rupes Toscanelli and Rimae Aristarchus respectively). These appear to be parts of the same feature. To my eye and using the measurement tool in the LROC QuickMap (https://quickmap.lroc.asu.edu/) it seems they could be the east side of what was a wide lava channel that emptied into the north portion of Oceanus Procellarum. If it is, it appears to have existed prior to the full formation of the Vallis Schröteri Plat eau. But can't really tell just by running a few cords across it and along the length.

Moving on. In the upper left corner is Mons Rümker. About half of it is visible here. The relatively flat northeastern quadrant of the interior is visible with mountains on the near and far sides of it. In the upper right is a triplet of obvious mountains forming a long right triangle with the apex to the south. Though prominent and isolated the southern mountain appears to be unnamed. The one at the right-angle corner (upper right) is Mount Gruithuisen Delta. The one to the upper left with the divot in the center is Mount Gruithuisen Gamma. It is listed on the VMA as a volcanic dome. The summit crater is 2.6 km (1.6 mi) across and will require good seeing to spot. There are some other volcanic features labeled in the area on the VMA as well, such as Gruithuisen Gamma 1 just to the upper left of Gamma. The smooth area bounded on the right and top by these mountains and the left by low mountains is Sinus Viscositatis. This must be a relatively new name as it shows up on the LROC QuickMap but not the VMA.

Lunar Topographic Studies
Exploring Northern Oceanus Procellarum

Northern Oceanus Procellarum, Vallis Schröteri Plateau, Aristarchus, Mons Rümker, Paul Walker, Middlebury, VT, USA, (44°01’55”N, 73°09’20”W), February 22, 2024 03:38UT, Lunation: 12.19, Colongitude: 60.2 deg, Sub-solar Lat: -1.1 deg, 10” f/5.6 Newt, 2x Barlow (3.39x), efl=4765mm, no filter, 0.155”/px org. image, Canon T7i (DSLR), HD video @ 3x “digital” zoom, 1/640 sec @ ISO 1600, paulwaav@together.net

Lamont: The Crater That Isn't

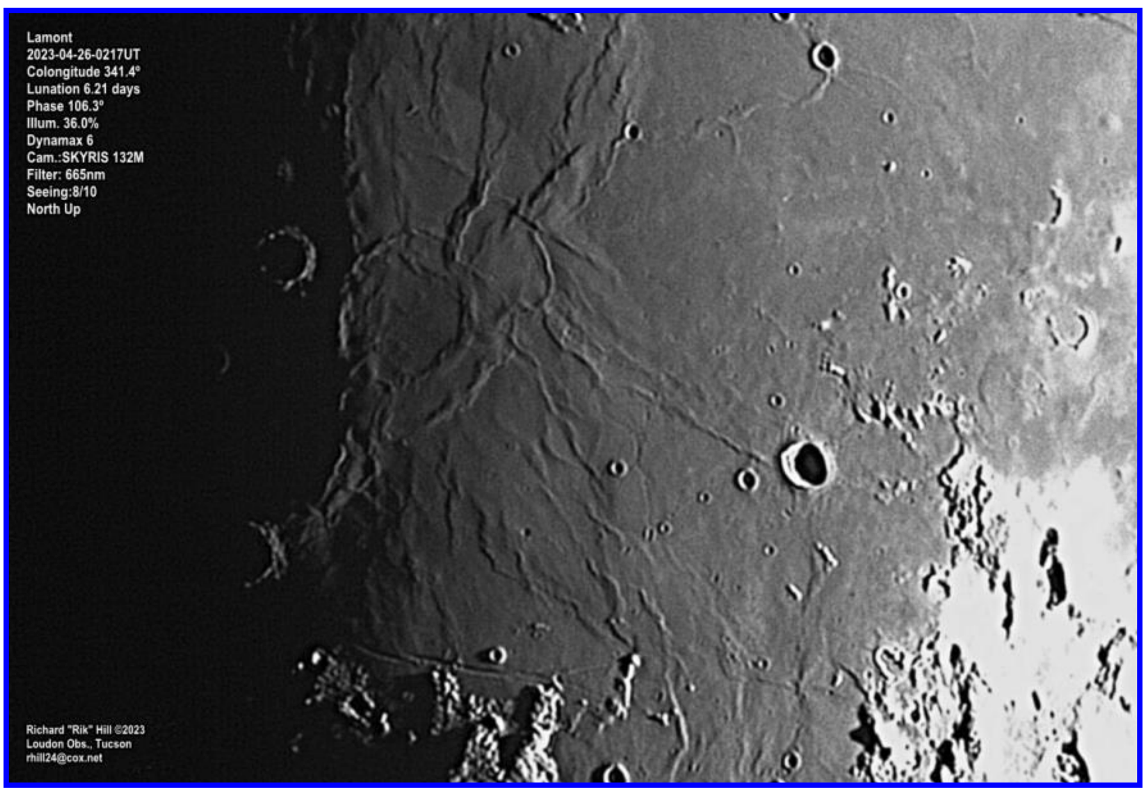
Rik Hill

There are some features on the moon that we are drawn to and will go to great lengths to get a good look at them. The "crater" Lamont is one of these. I put the word "crater" in quotes because it is not a crater in the sense that we normally think of them. This was a crater of some 70-80 km diameter, before the flooding of Tranquillitatis and can be seen just left of center in this image. Note the wonderful radial ridges stretching across the mare especially to north and south. These ridges are not very high, possibly only a hundred feet or so, thus they can best be seen at low sun angles like this image. Three similar sized craters that frame Lamont. On the terminator above Lamont is Arago (27 km dia.) and below that is Sabine (31 km). Then right of center is Maskelyne (26 km). Below Arago is a smaller crater, Manners (15 km). Roughly halfway between Maskelyne and Manners is the impact site for Ranger 8, the second successful Ranger probe in the series, sent to get close up images of possible manned lunar landing sites. It impacted on Feb. 20, 1965. The unsuccessful Ranger 6 impacted almost directly in-between Arago and Sabine almost exactly a year earlier. A little over two years after the Ranger 8 mission, on Sept. 11, 1967 Surveyor 5 landed south of that area about one third of the way from Sabine to Maskelyne. Just under two more years later Apollo 11 landed just south of the Surveyor site, on July 20, 1969. Here that spot is located in the flat area between ridges just north of the small crater Moltke (6 km) on the north side of the graben-like Rimae Hypatia at the bottom.

Getting back to Lamont, this shadow or ghost crater has an outer ring that can be seen in this image about 135 km across. Beneath this is a mascon (mass concentration) about this same size discovered by a Lunar Orbiter spacecraft. This mascon is thought to be evidence that Lamont is a buried impact basin that was covered by the Tranquillitatis lavas, a situation similar to Grimaldi.

Notice that Lamont sits in a brighter area of the Tranquillitatis floor. This is most obvious north and east of the crater. The boundary of this region runs right over the wrinkle ridges as if they were not there! This is thought to be caused from a high density of tiny craters with bright rims and indeed you can see this in the LROC QuickMap images.

One last item, in the upper right corner of this image you can see a small dome. I can find no identification for it but on the LROC images it shows a pit very near the summit. I'm sure a thorough examination of this image would turn up more such domes.



***Lamont**, Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2024 April 26 02:17 UT, colongitude 341.4o. Dynamix 6 inch Schmidt -Cassegrain telescope, 665 nm filter, SKYRIS 132M camera. Seeing 8/10.*

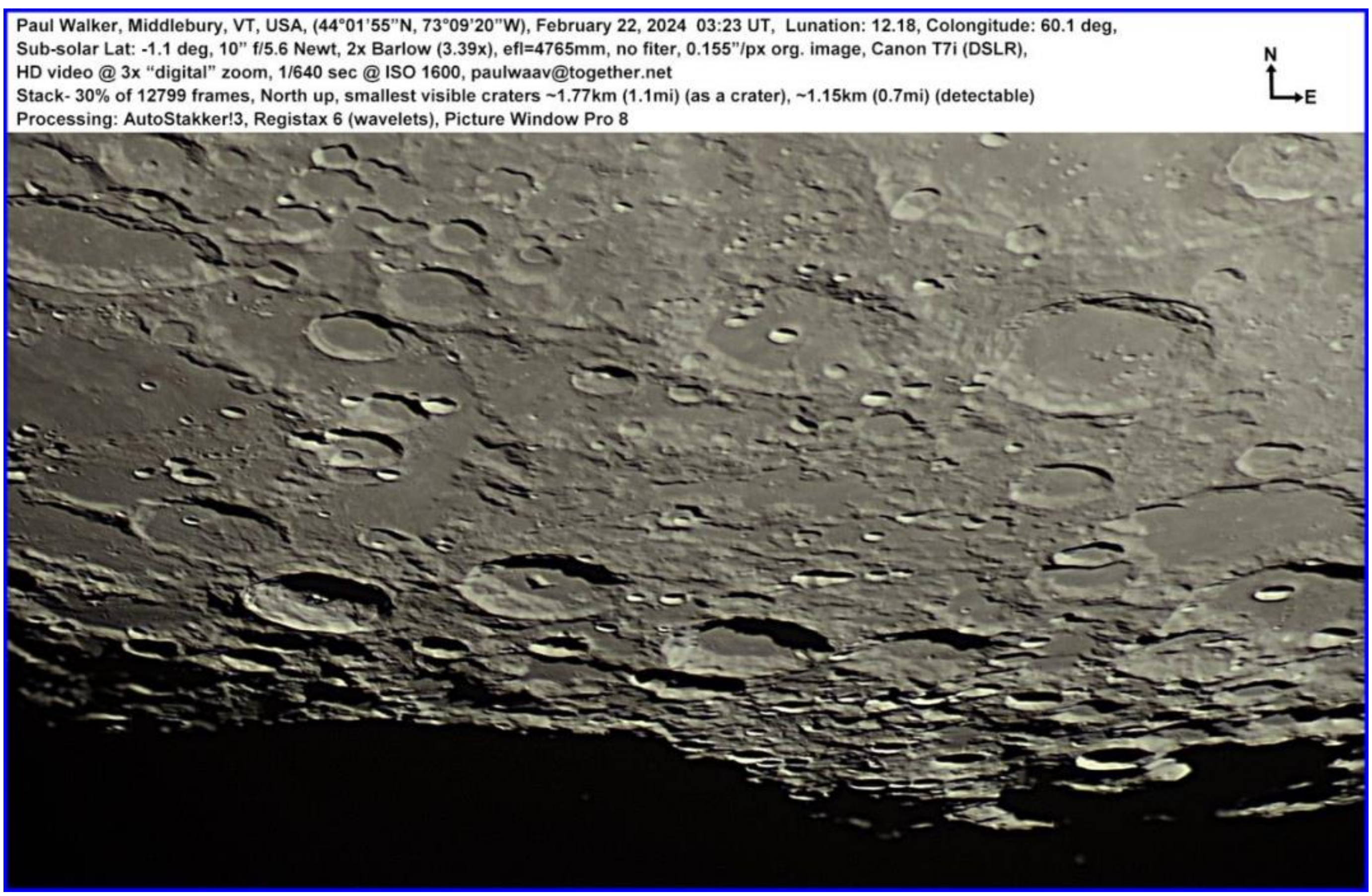
A Small Piece of the South-Southwest Edge of the Moon

Paul Walker

To the upper left (west) with its western end cut off, is the floor-flooded crater, Schiller, 179.00x71.00 km / 108.00x43.00 mi. Just above that and slightly to the right, with a small crater on its floor, is Bayer, 48 km / 29 mi. The small crater is Bayer G, 7 km / 4 mi. Below Schiller is an unnamed ghost crater, ~140x170 km / 87x106 mi. One of an overlapping group of 3 or more unnamed ghost craters (the others are off the edge of the image.

Near the bottom starting left of center to center are 3 similar sized prominent craters. From left to right, Zucchius, Bettinus and Kircher, 65 km / 39 mi, 71 km / 43 mi and 73 km / 44 mi respectively. Interesting comparing of the floors of these craters. Zucchius is the least filled in, looks to be the youngest and has multiple central peaks. Bettinus has an intermediate amount of flooding/in-fill, looks more eroded and has 1 good sized central peak. Kircher appears to have the most flooding, may be the oldest and though the largest of the three has no central peak. Below these, one can see a concave section of the Moon's limb. This is the north rim of the very large crater, Bailey, 303 km / 183 mi. Looking above the center of the image we see the highly eroded 111 km / 67 mi Scheiner with an unnamed 12.4 km / 7.7 mi crater near its middle. To its right (east) is the fresher, terrace walled Blancanus, 106 km / 64 mi.

Above Blancanus is the southern edge of Clavius (225 km / 136 mi) with 55 km / 33 mi Rutherfurd to the far right. Below Blancanus we have Klaproth (119 km / 72 mi) and Casatus (111 km / 67 mi). Casatus has 17 km / 10 mi Casatus C on its floor and 22 km / 13 mi Casatus J on its southern rim.



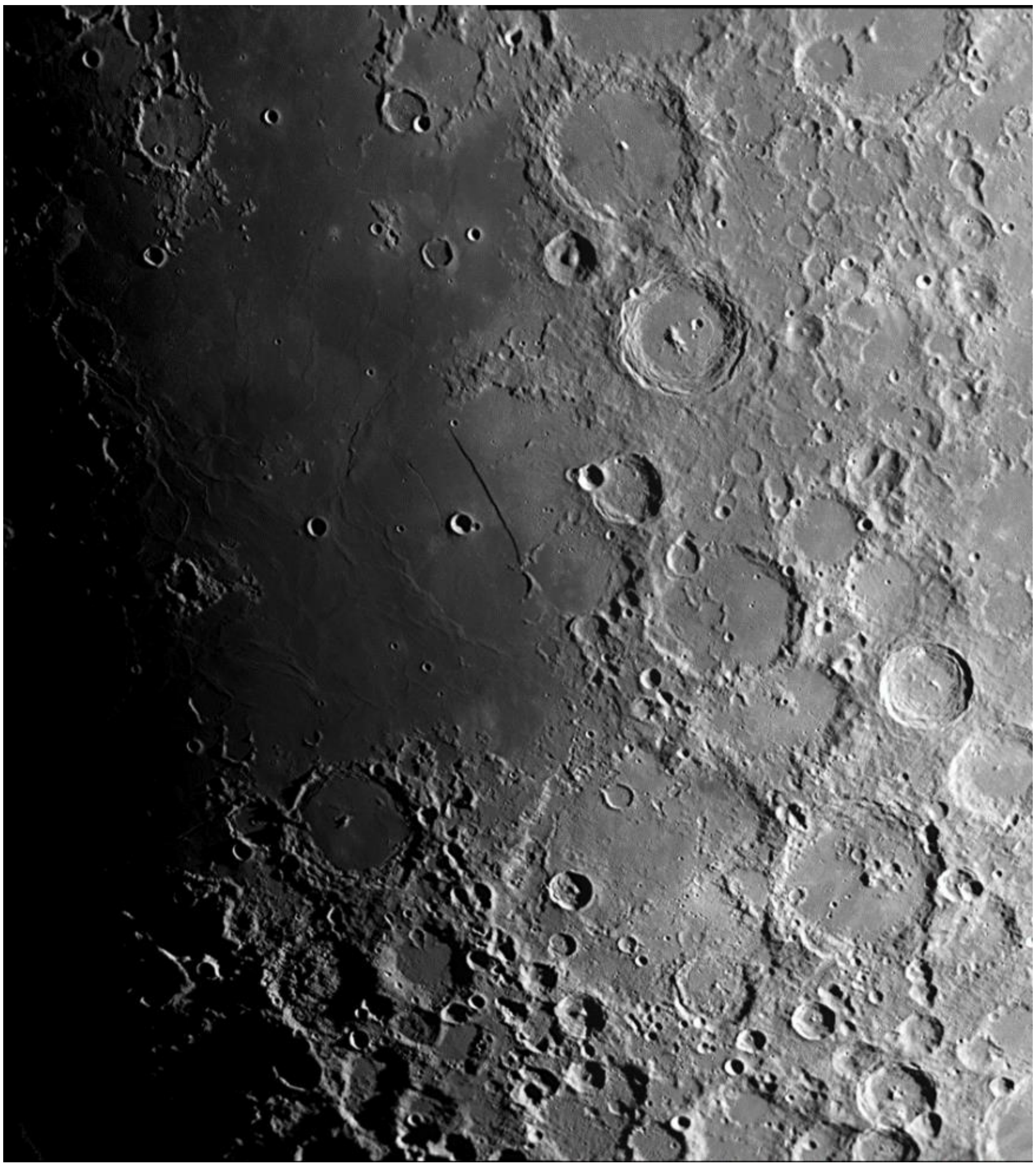
Lunar Topographic Studies
A Small Piece of the South-Southwest Edge of the Moon

A Tour of Southeast Nubium

Jeff Grainer

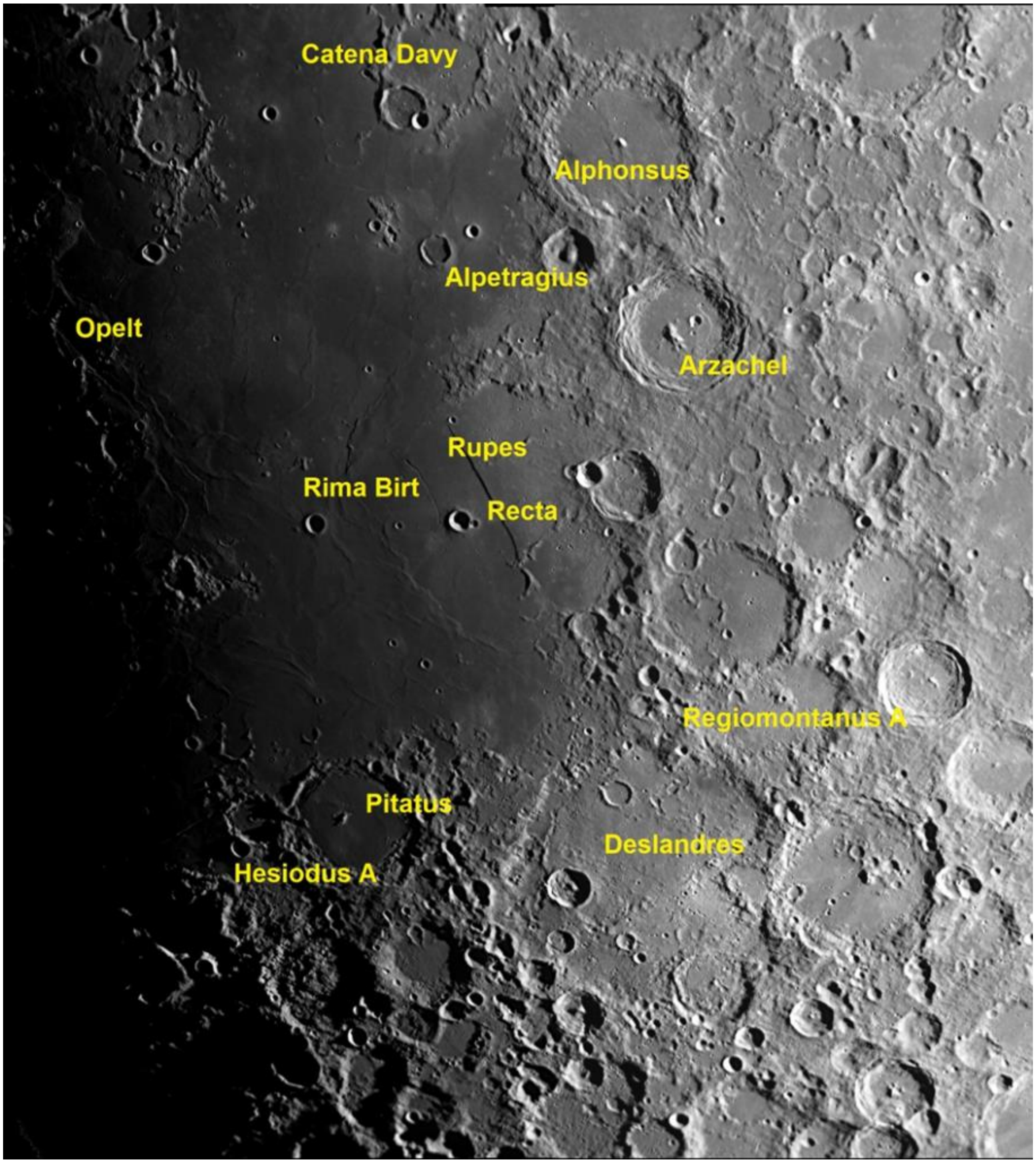
Some imaging work in April 2024 resulted in a 2-pane mosaic of the Alphonsus/SE Nubium/Deslandres region, shown below. It occurred to me that it might be "fun" to select some of its many attractions and outline details of a few of them…

The equivalent image on the next page labels the features selected for the "tour".



Ptolemaeus_to_Deslandres_2024-04-17-2146-JGr

Lunar Topographic Studies
A Tour of Southeast Nubium



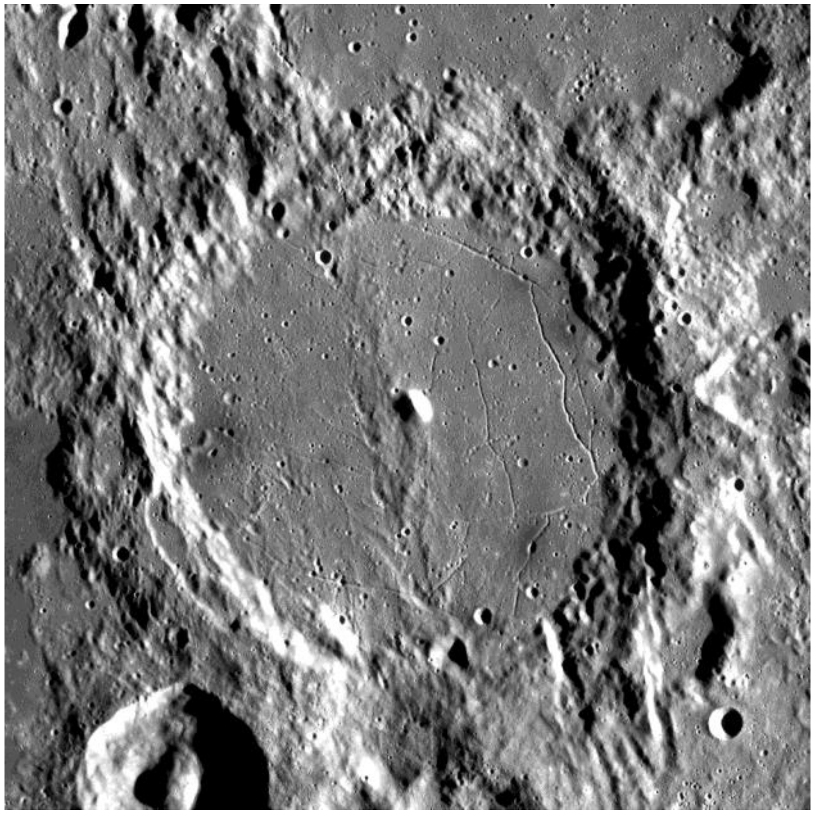
Alphonsus

Nectarian Era (3.92 – 3.85 bn y) complex crater. Diameter: 110 km [Moore, COMNS 33]

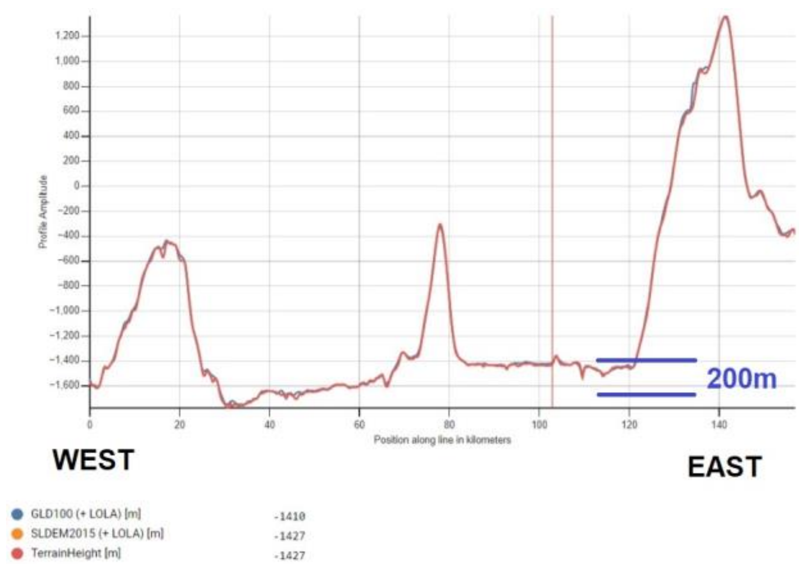
Principal Features:

- Floor-fractured crater (especially the eastern half) with a (~ 1500 m) central peak.
- The interior of the crater has a distinct central ridge, likely a result of Imbrium ejecta.
- The density of cratering is higher to the west, indicating an older surface. The western floor is also significantly lower than the east (~ 200+younger surface. m, see profile), tilted towards Nubium. Lava infill to the east, partly contained by the central ridge, may account for its more elevated, smoother, younger surface.

Lunar Topographic Studies
A Tour of Southeast Nubium

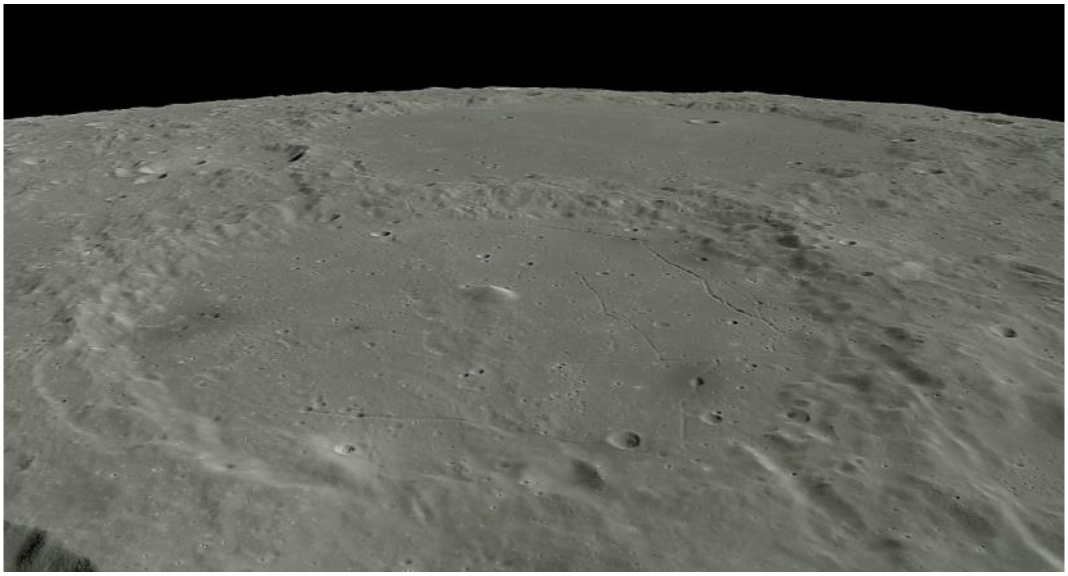


LRO Image

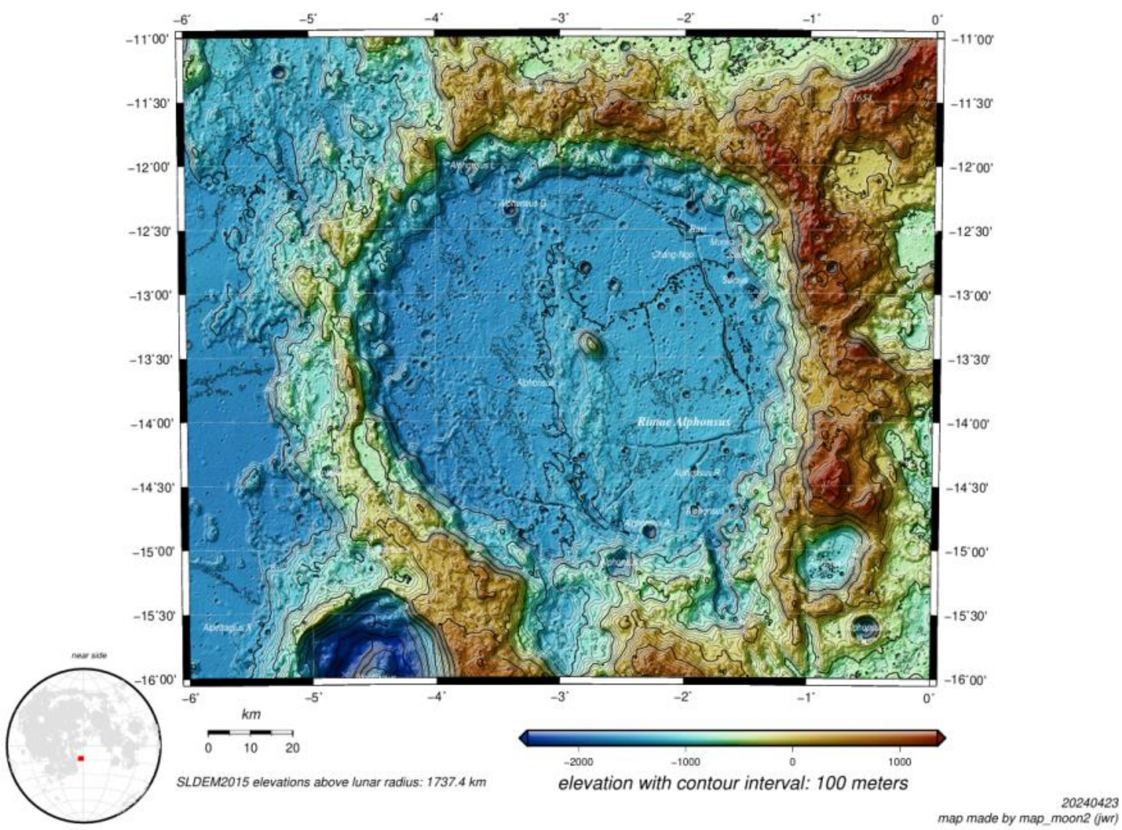


Credit: LROC ACT-QuickMap

- The LRO image clearly shows Dark Halo craters (DHC)/Dark Mantle deposits (potentially from small volcanic vents) at the (roughly) 2, 4 and 9 o'clock positions, adjacent to the crater walls. These are also apparent on the oblique view from the Kaguya satellite (looking north):



- The DHC/vents seem to be inter-connected by the network of rimae.
- The NW and SE corners are striated/cut through by linear troughs, produced by debris from the Imbrium Basin event. These sections form parts of G.K.Gilbert's so-called "Imbrium Sculpture".
- A chart of the area, provided by John Robbins, is extremely useful, with depth information giving a clear "feel" for elevations of the crater features:

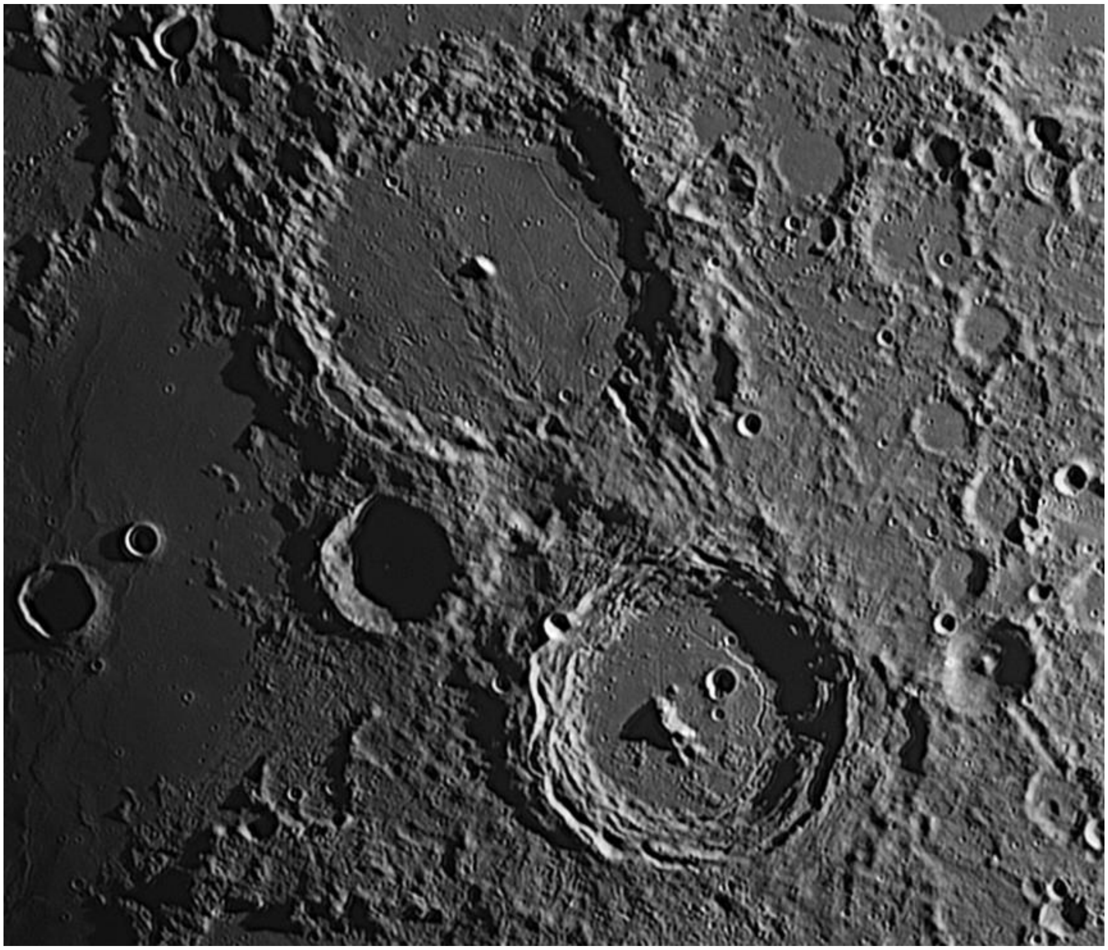


Credit: John W Robbins SLDEM2015 Atlas

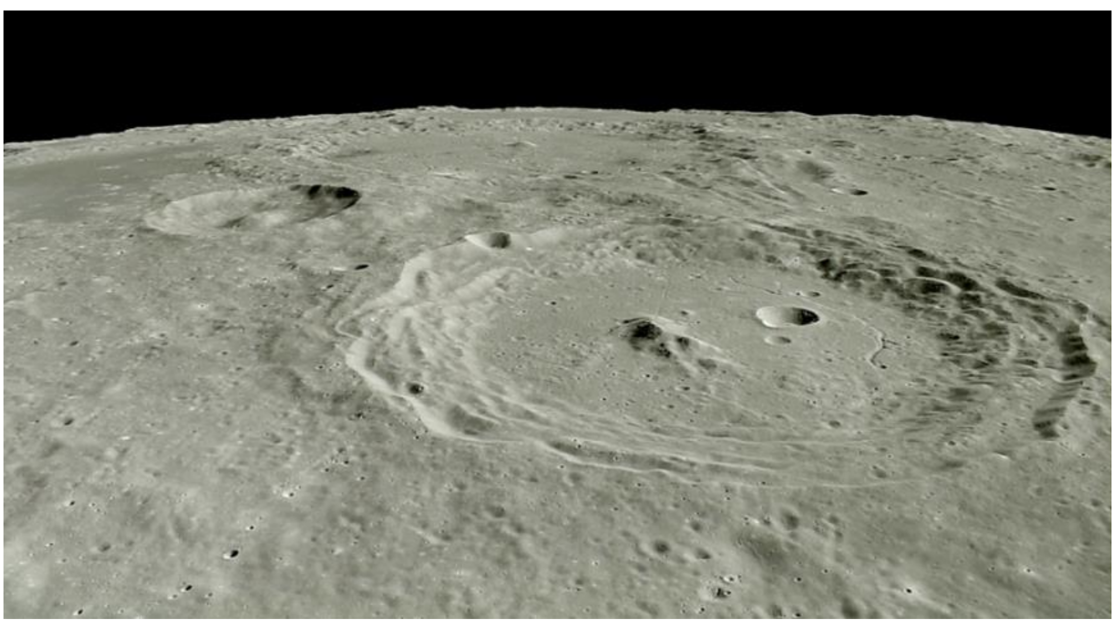
Lunar Topographic Studies
A Tour of Southeast Nubium

Arzachel

Lower Imbrian Era (3.85 – 3.75 bn y) Diameter: 97km [Moore, COMNS 51]



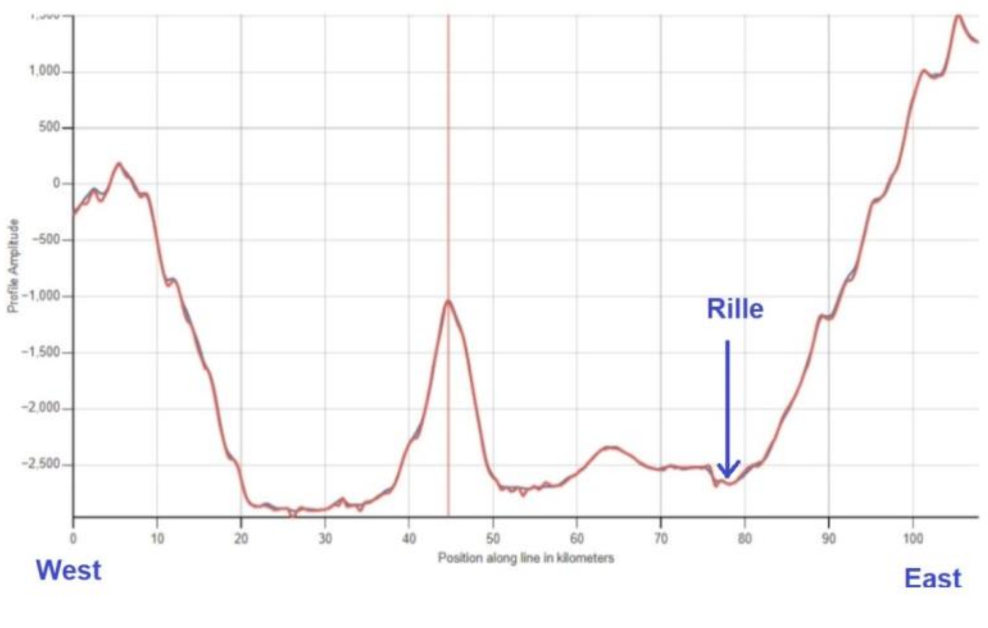
Alphonsus_Alpetraggius_and_Arzachel_2024-04-17-2146-JGr (C11, above, Kaguya, below)



Lunar Topographic Studies
A Tour of Southeast Nubium

Principal Features:

- A conspicuous member of the “Ptolemaeus trio” of craters, complex in form with an asymmetrically located (displaced to the west) central peak (height ~ 2km), terraced walls of typical depth 3-4km. West-East profile [LRO data]:



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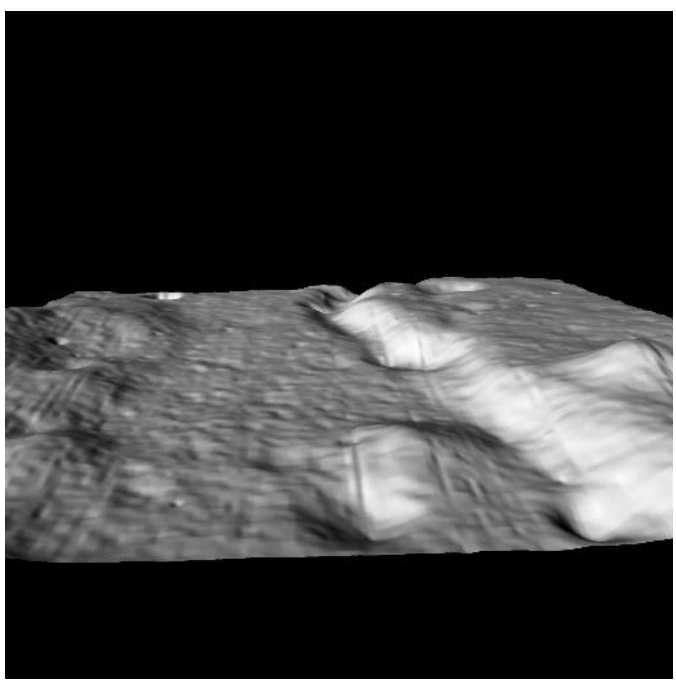
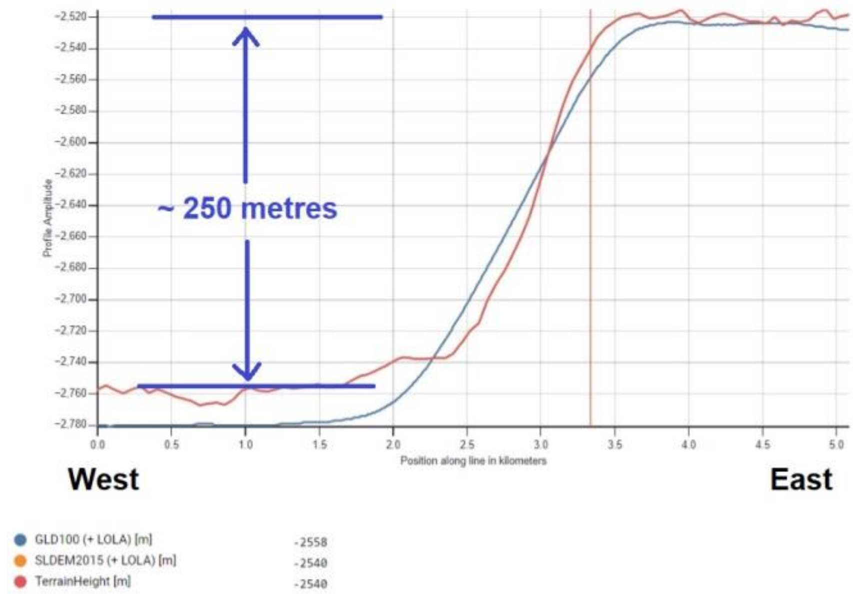
- Credit: LROC ACT-QuickMap

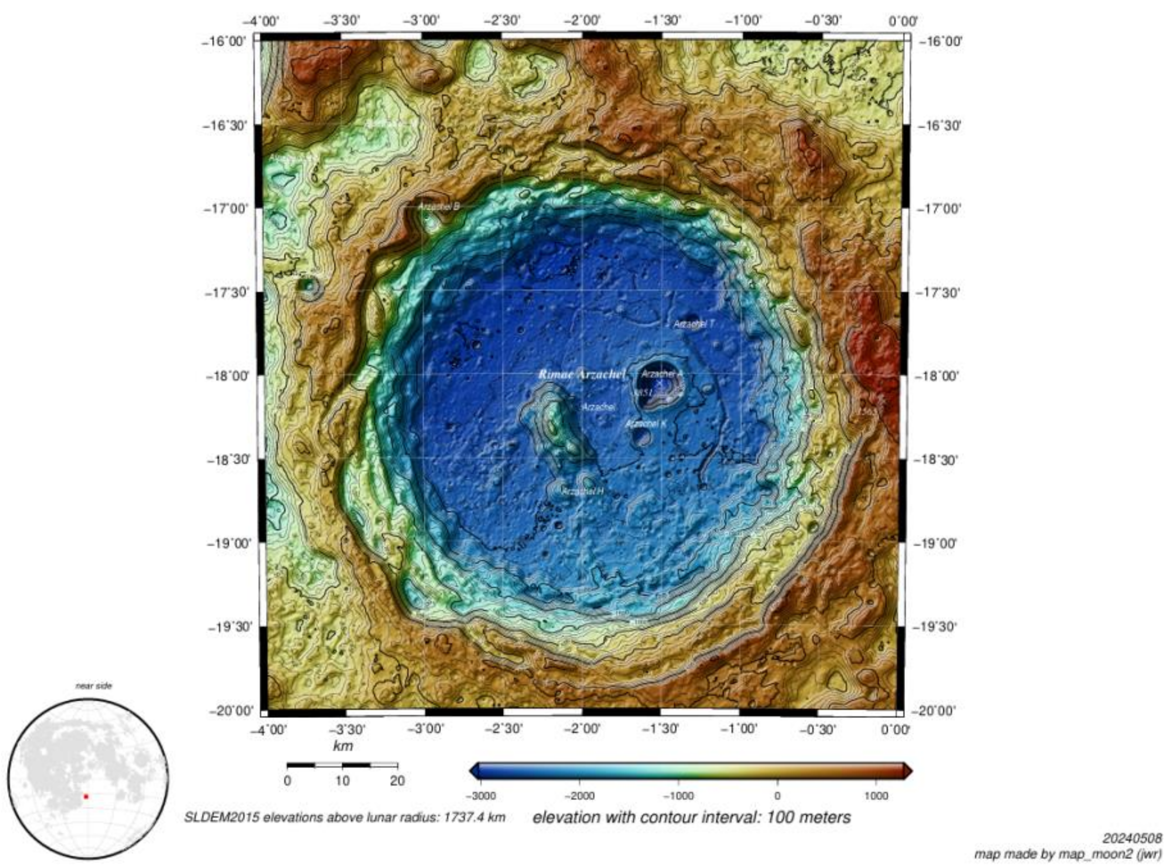
- The Rima(e) Arzachel extends from the northern wall to the SE and towards its southern end it has the unusual trait of transitioning from a depressed rille form to an escarpment rising to the east. This render from LRO data, and the accompanying profile show this (looking north):



Lunar Topographic Studies
A Tour of Southeast Nubium



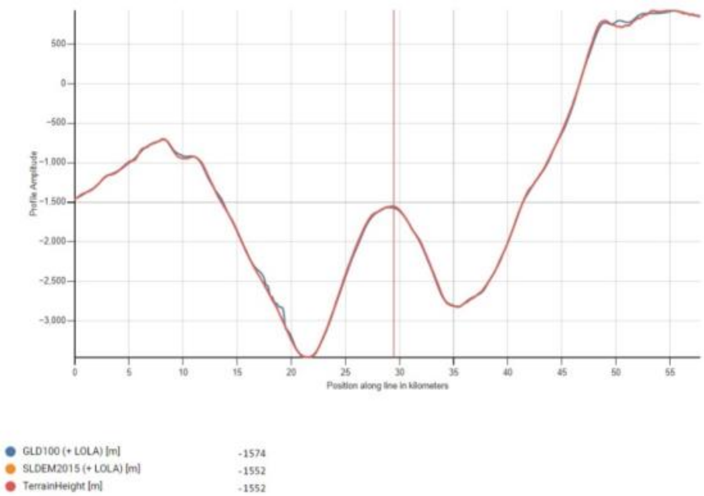
Credit: LROC ACT-QuickMap



Credit: John W Robbins SLDEM2015 Atlas

Alpetragius

- A very peculiar impact crater, 40 km in diameter, depth ~ 4 km, but with its interior nearly filled by a large, domed, “central peak”.
- The great planetary astronomer Gerard Kuiper described the interior of Alpetragius as looking like an “egg in a nest”.
- The crater is adjacent to Alphonsus and Arzachel and is shown at an oblique angle in the Kaguya image (previous section). LRO imaging data and the crater profile:

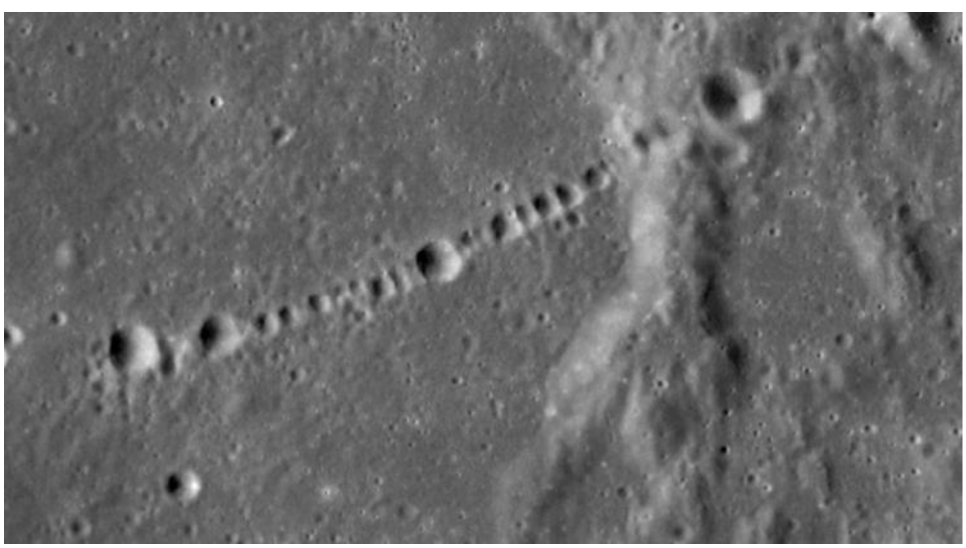


Credits: LROC ACT-QuickMap

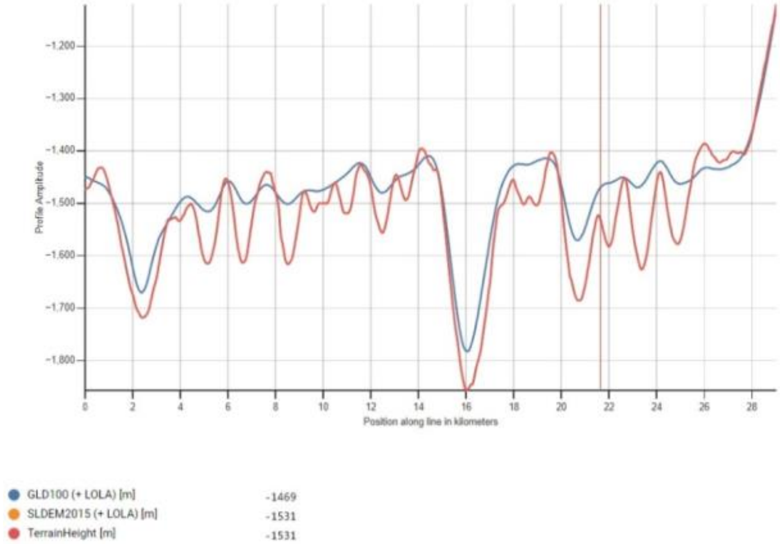
- It is surmised that the dome may have a volcanic origin, though this supposition is controversial. It does look impressive when part-filled with shadow (see images in previous sections)!

Catena_Davy_2022-08-19-0332-JGr

- The catena extends in a virtual straight line for 52 km to the west of Ptolemaeus.
- The crater chain consists of craterlets of 1 to 2 km in diameter.
- Similar features on the Moon include Catena Abulfeda and the "Rheita Valley" – basically a series of gouges from multiple large-body impacts.



Lunar Topographic Studies
A Tour of Southeast Nubium

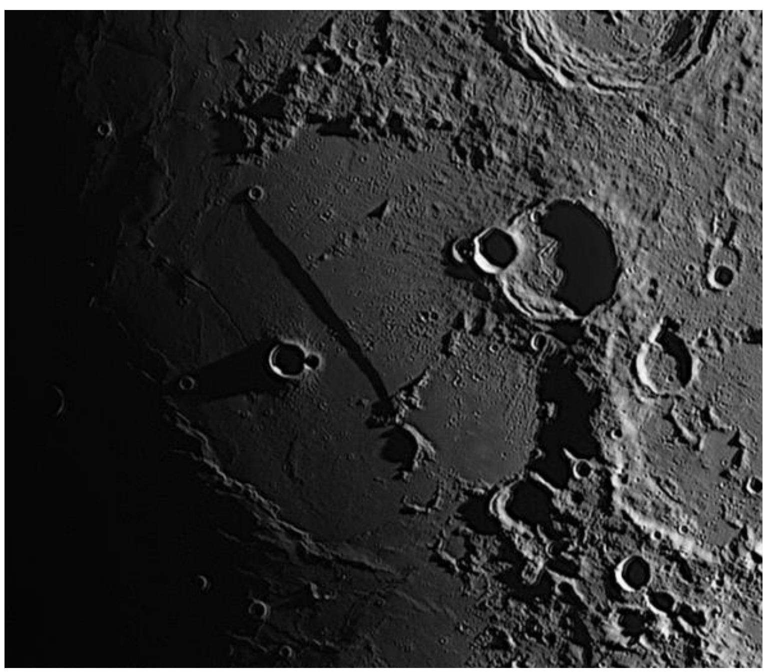


Credits: LROC ACT-QuickMap

- Individual crater depths along the chain are around 200m on average. The suggested mechanism for such events appears to be the break-up of an incoming loosely-bound impactor, such as a comet. Of course, gravitational break-up leading to multiple impacts was well-observed in 1994 with Comet Shoemaker-Levy 9 on Jupiter.

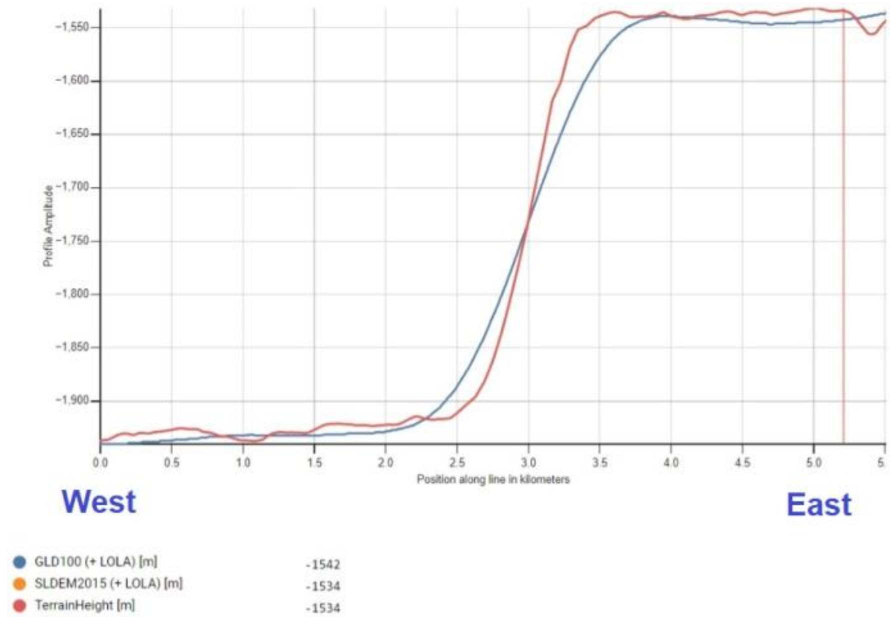
Rupes Recta

- Along with the Rupes Altai (adjacent to Nectaris), probably the best-known "scarp", or fault-induced escarpment on the near side of the Moon.

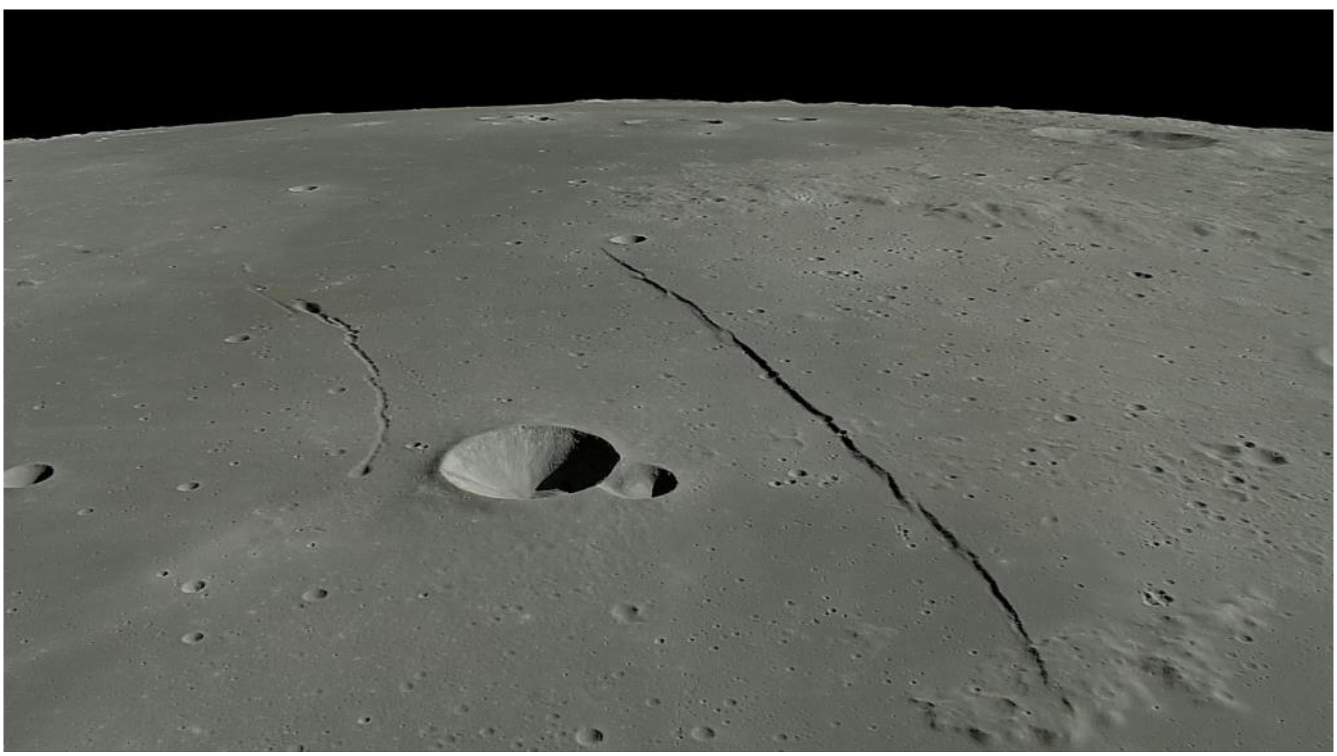


Rupes_Recta_2023-04-28-1942-JGr

- 116 km, but, despite its prominence at certain lunar phases, only 400 metres high along most of its length, the eastern side being higher.
- The LRO profile (below) suggests a typical scarp rising 400m over a distance of ~ 1000 m giving a typical slope angle of ~ 20°



Credit: LROC ACT-QuickMap



A spectacular image of the Rupes Recta (and Rima Birt) from Kaguya [Credit: JAXA]

Rima Birt

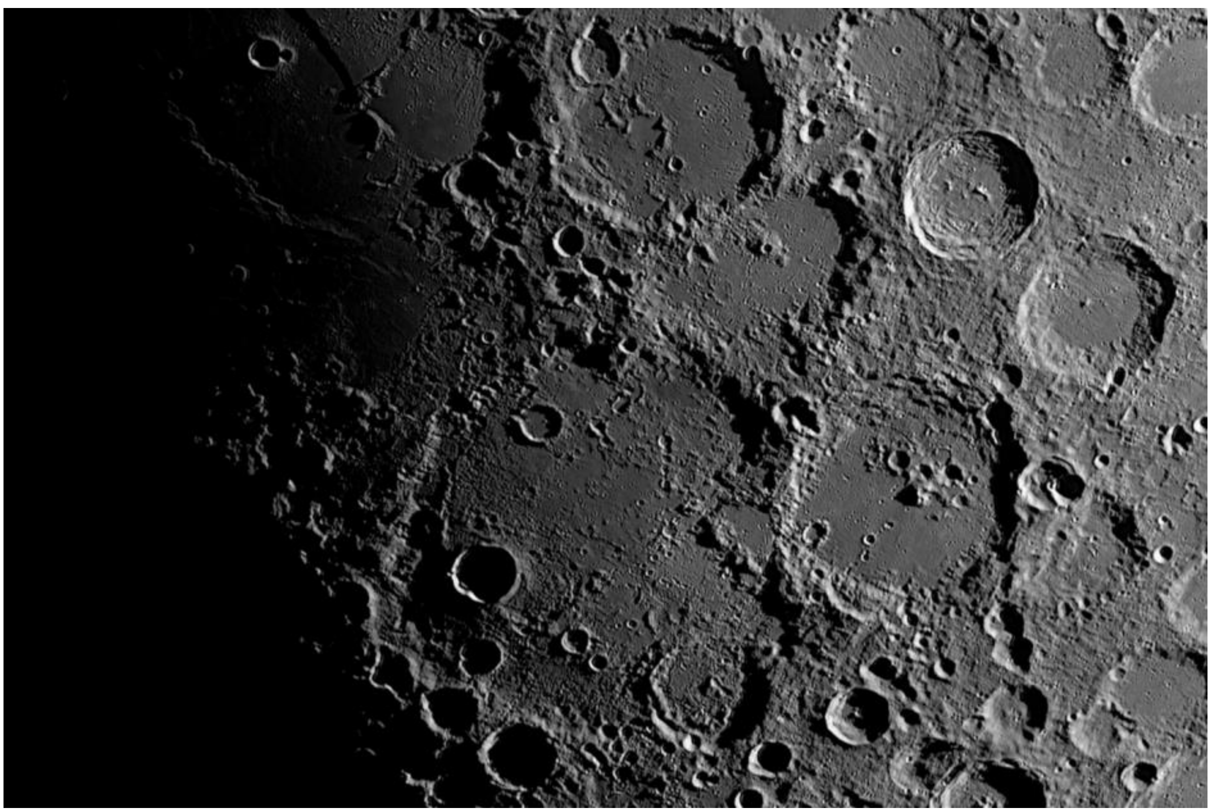
Just to the west of the Rupes Recta, visible on the opening mosaic of the article, and on the Kaguya image, is the Rima Birt.

A narrow rille, unusual for having 2 "heads" – with a small craterlet/depression at each end, the northern one housing a dome.

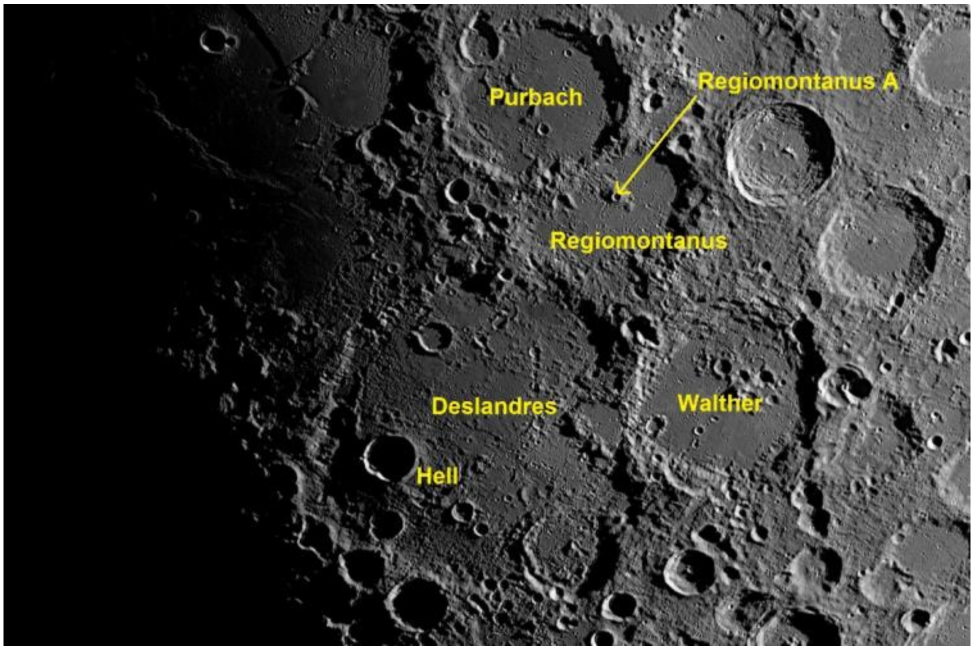
Regiomontanus A

Continuing south from Arzachel, crossing Purbach, we arrive at the wrecked crater Regiomontanus. This is a Pre Nectarian (> ~ 4 bn y) structure, massively degraded by subsequent impacts on all sides. Nominal diameter ~ 130 km.

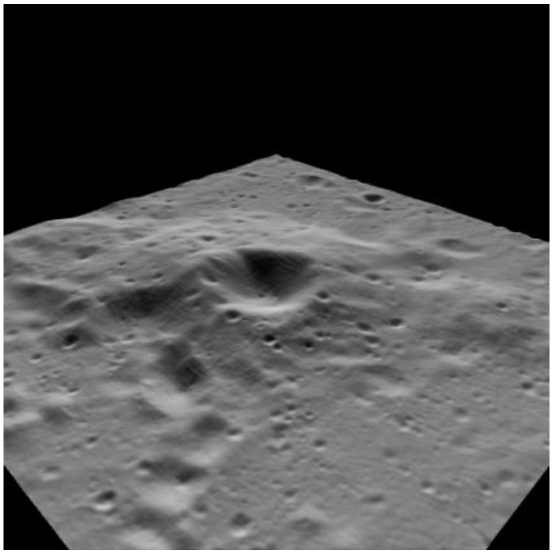
Here's a C11 image of the region from April 2023, with a key on the next page. Deslandres will be considered next, but the feature to focus on here is Regiomontanus A.



Deslandres_Purbach_Regiomontanus_2023-04-28-2003-JGr



- Regiomontanus A is a small crater (diameter ~ 5 km) at the top of the (offset) “central peak” of its parent crater.
- As with a number of summit craterlets, Reg A was used as evidence for the volcanic origin of lunar craters.
- Reg A is now known to be a small impact crater, not the caldera of a shield volcano or volcanic vent.
- The “central peak” it sits upon may not even be a true central peak at all. It is possible the crater base is ejecta from the nearby Purbach crater, especially as the extreme age of Regiomontanus itself has led to the destruction of most original features – as the heavily cratered floor shows.
- Reg A is an interesting target to observe…. This LROC render gives an impression of the appearance of the crater, looking NE.



Credit: LROC ACT-QuickMap

A Kaguya view of the Purbach, Regiomontanus, Walther chain, looking south (Deslandres to the upper right):

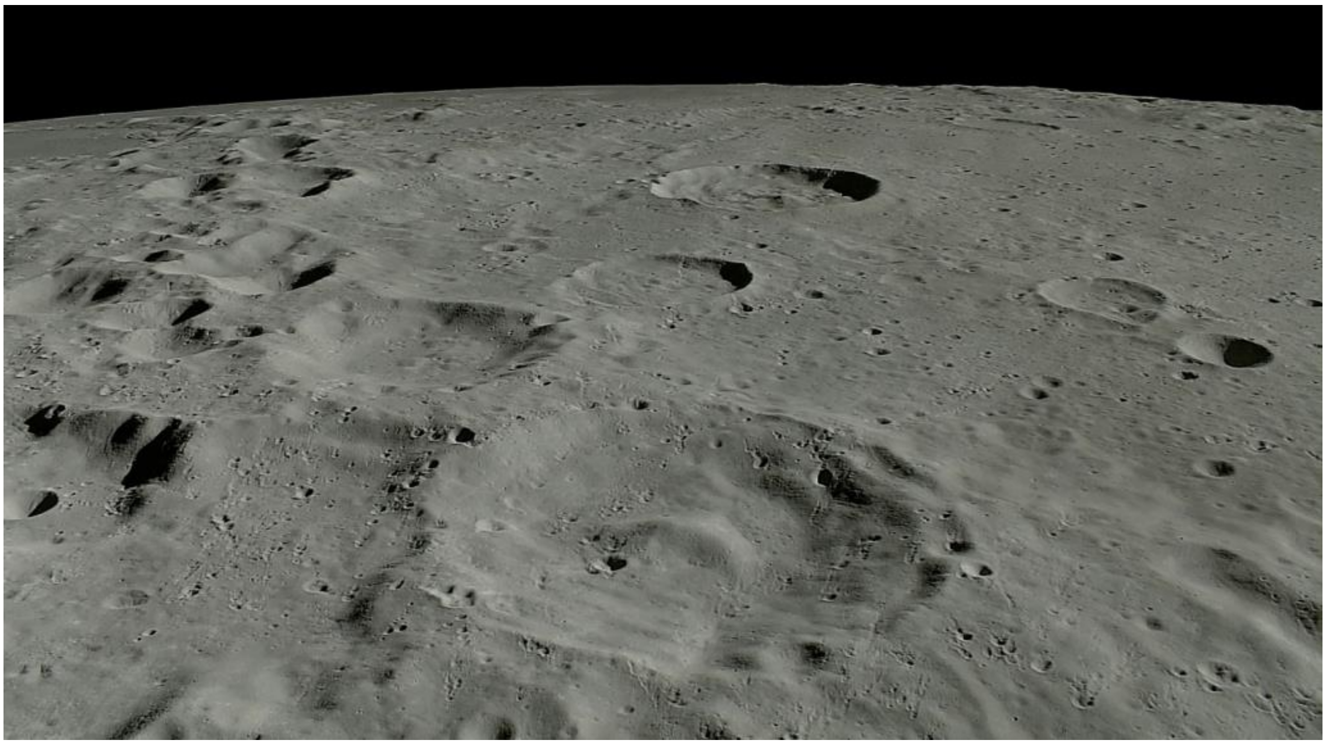
Credit: JAXA/Kaguya

Deslandres

The composite image from Lunar Orbiter 4, shown below, summarises the state of this 227 km diameter "walled plain": a heavily degraded jumble of the original Pre Nectarian crater and a myriad of later impact events….

Credit: NASA Lunar Orbiter IV 4107 h3 and 4112 h3

- Deslandres is of interest as, despite the degradation, the overall form of the original feature is clearly visible, indeed prominent, at the southern Nubium boundary.
- Deslandres as a recognised crater-entity only dates to the mid-20th century, but as such is of comparable size to Clavius and Schickard on the near side.
- The wonderfully named 33 km diameter crater Hell is probably the most pristine inclusion.
- Deslandres was pointed out on the Kaguya Regiomontanus video snap looking south. Here's a view looking NE, taken by Kaguya when adjacent to the SW corner of Deslandres: Hell is at upper middle, Ball (41km, rounded central peak) is in the middle foreground.



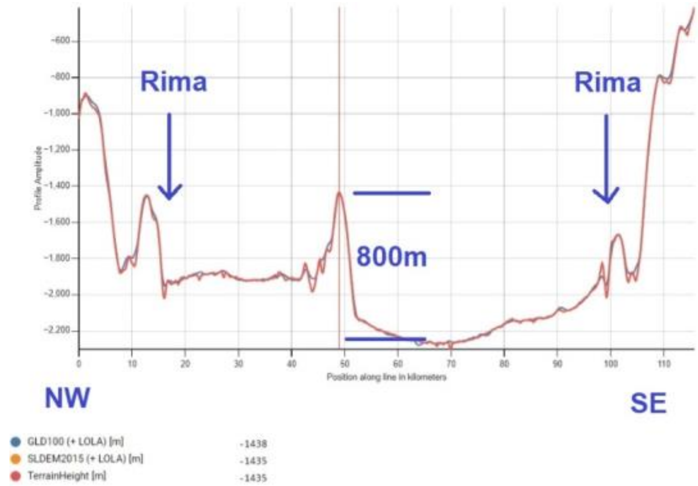
Credit: JAXA/Kaguya

Pitatus

Principal Features:

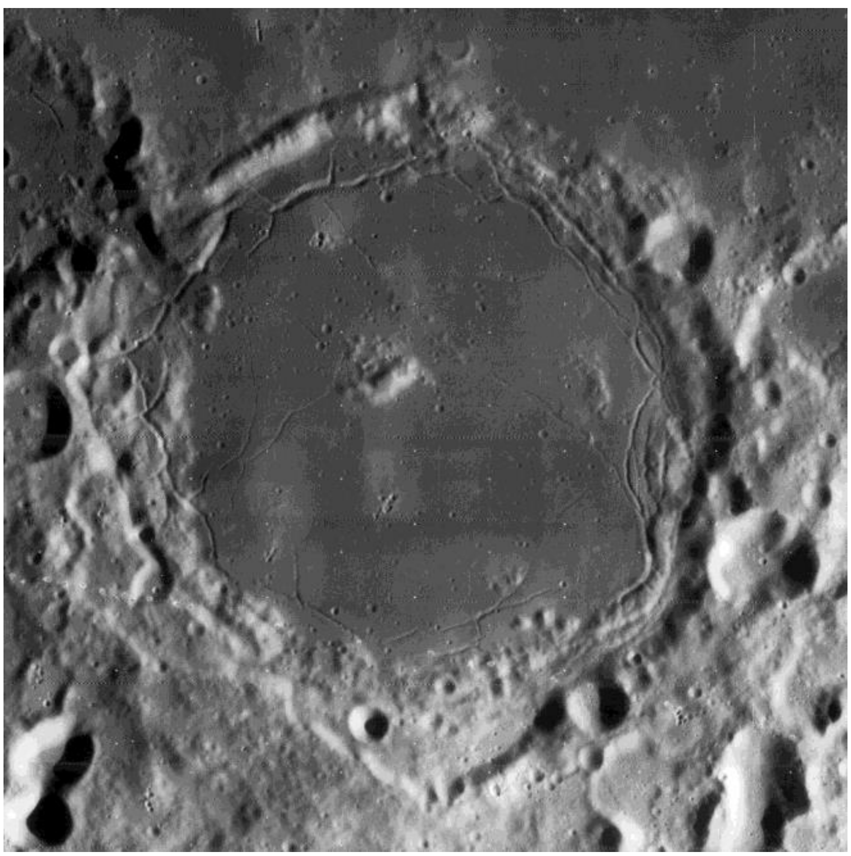
- Nectarian Era (3.92 – 3.85 bn y) crater, diameter ~ 100 km.
- The crater walls are severely eroded, noticeably so on the northern boundary with Nubium, allowing lava ingress from mare to crater.
- Pitatus is a Floor Fractured Crater (FFC) in a similar category to Taruntius, Gassendi and Posidonius. Magma intrusion has taken place through cracks in the crust inside the crater, raising the level of the interior floor.

- The central peak rises to less than 1000 m above the crater floor – see the LRO profile, taken in an approximately NW to SE direction:



- Credit: LROC ACT-QuickMap

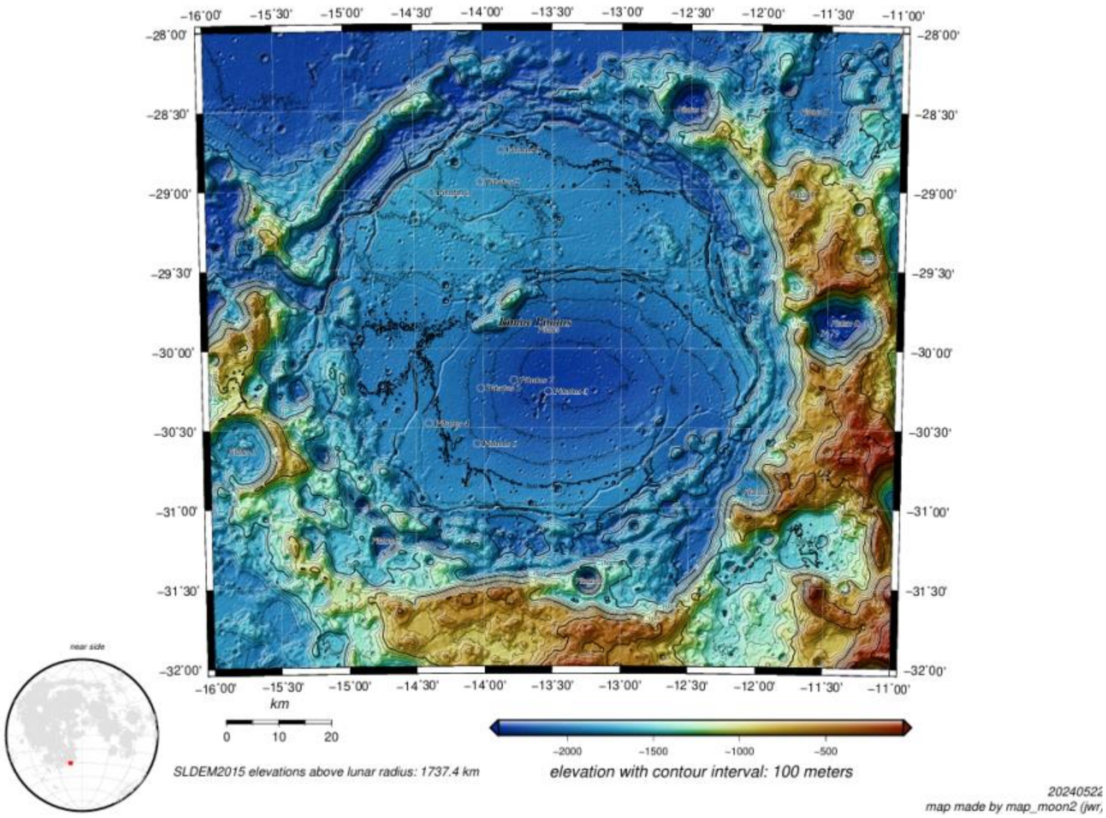
- Relate the profile to the overhead Lunar Orbiter IV view of the area, showing the network of rim-hugging rilles named Rima Pitatus:



Credit: NASA/Lunar Orbiter IV 4119 h3

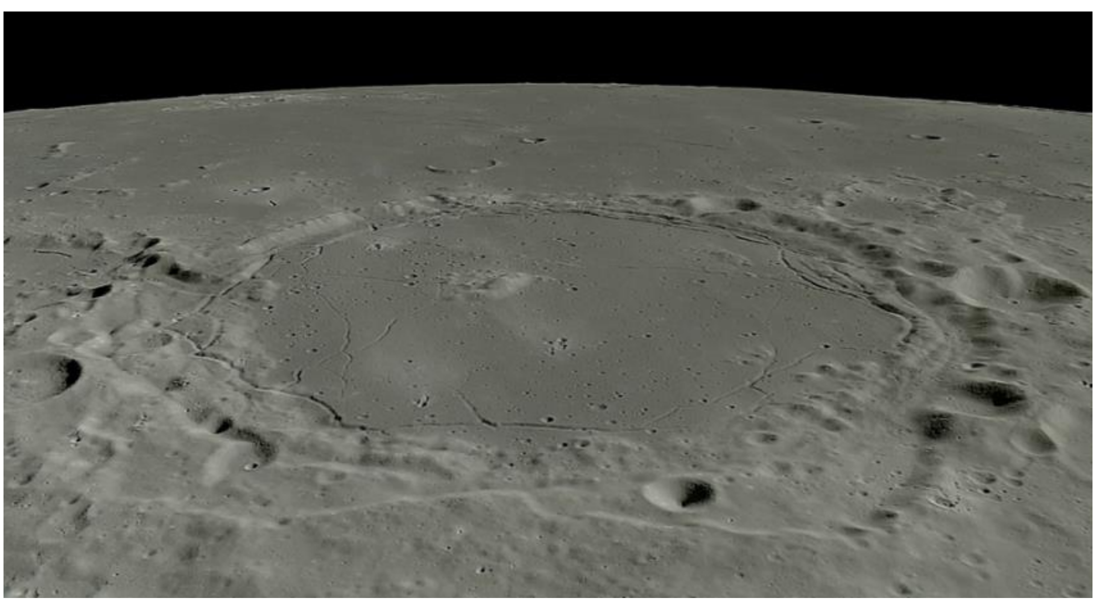
Lunar Topographic Studies
A Tour of Southeast Nubium

- A topographical chart, identifying features with contour data is shown below:



Credit: John W Robbins SLDEM2015 Atlas

This oblique Kaguya view, looking north, gives a beautiful impression of the crater with the Mare Nubium disappearing into the distance…

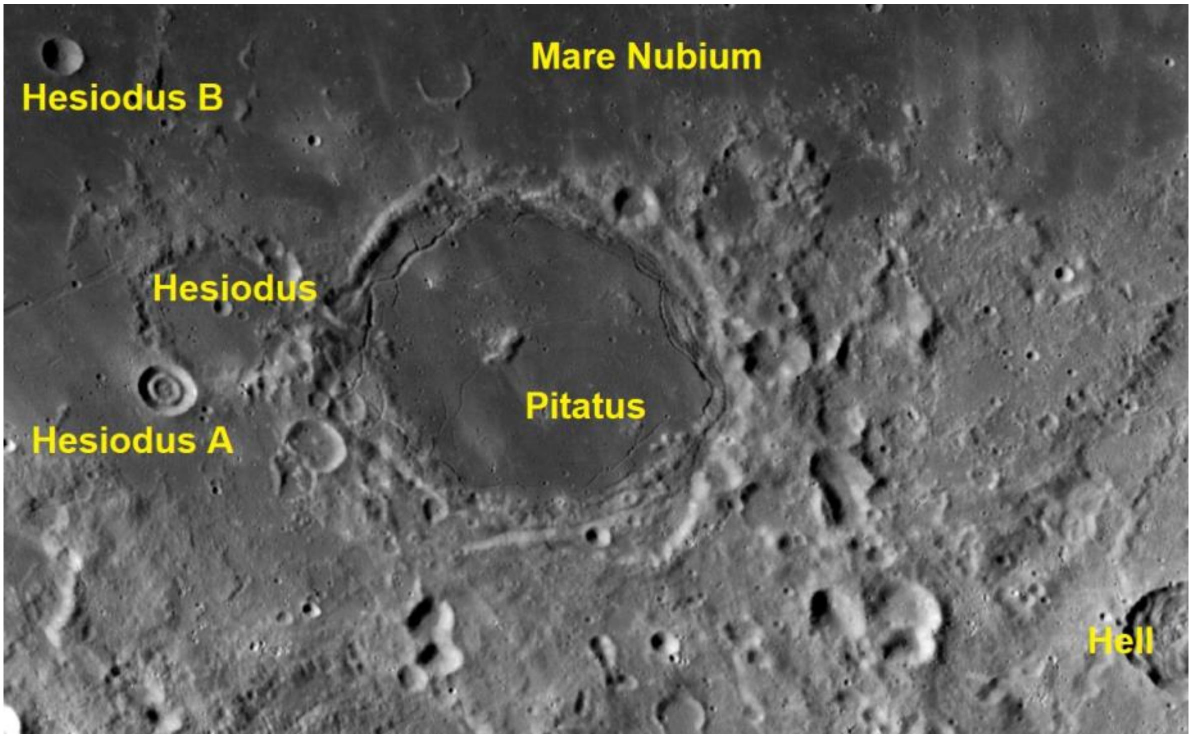


Credit: JAXA/Kaguya

Lunar Topographic Studies
A Tour of Southeast Nubium

Hesiodus A

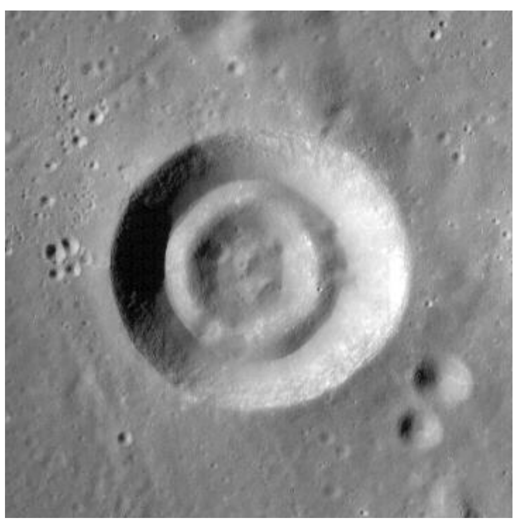
The LRO-based image, below, shows the location of Hesiodus A in the context of Nubium and Pitatus:



Credit: LROC ACT-QuickMap

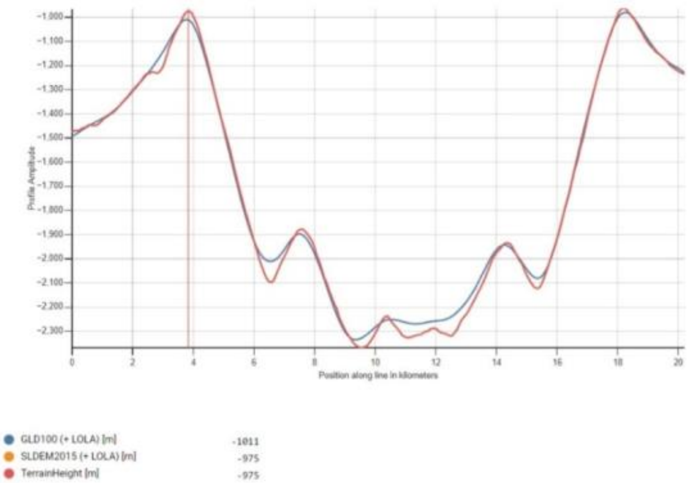
Principal features:

- "Simple" (non-complex), Concentric crater, diameter ~ 15 km:



- Credit: LROC-WAC

- Depth from outer rim to centre (see profile) ~ 1500 m



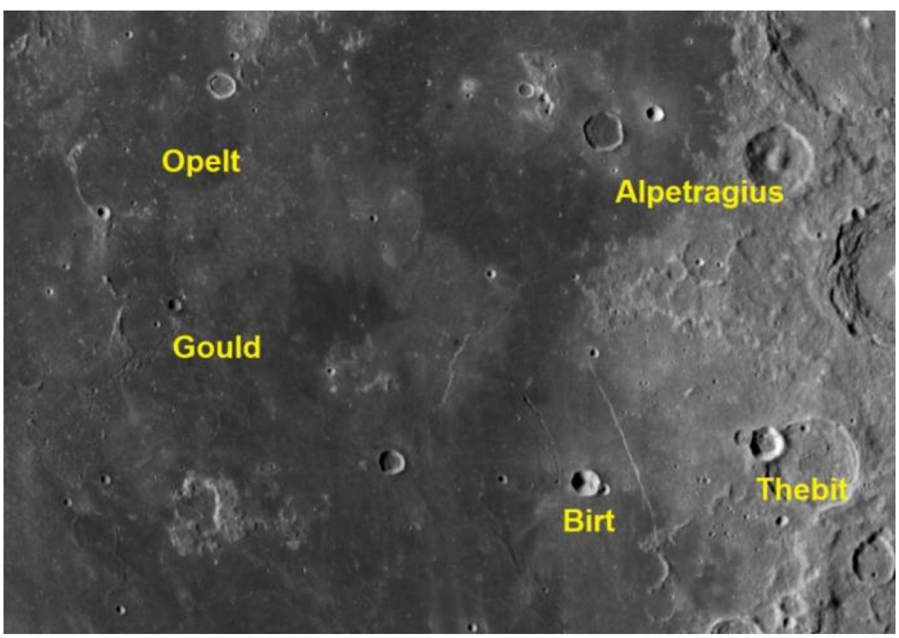
Credit: LROC ACT-QuickMap

- One of a small group of concentrics – only ~ 100 documented on the Moon, with typical diameters of 15mm or less.
- Suggested origin is due to igneous extrusion. Magma uplift in larger craters – such as adjacent Pitatus – leads to floor cracking. In the smaller, basic "simple" bowl craters it may produce an inner ring structure. There certainly seems to be a correlation between lava-rich mare areas and the location of most concentrics – along mare margins.

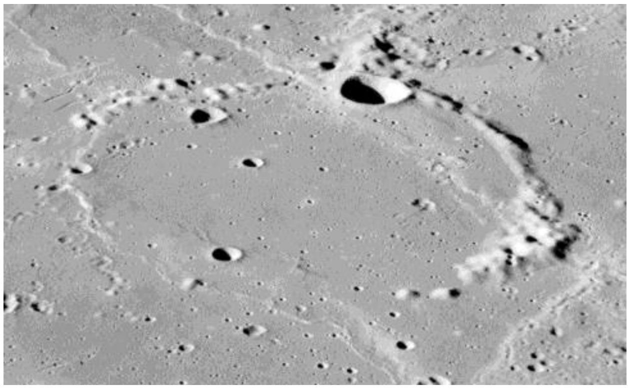
A Miscellany

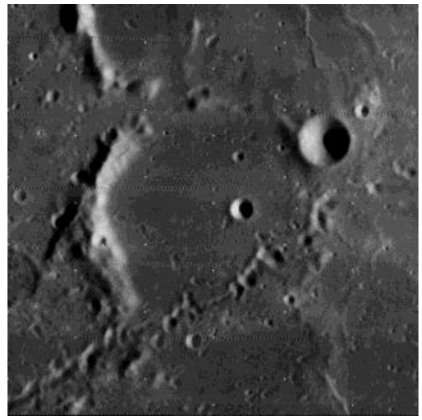
To finish off the tour of the southern regions of Mare Nubium, here are a couple of "curiosities" that would normally be completely overlooked by the telescopic observer.

The chart indicates the craters Opelt and Gould, to the upper left (NW) of our tour area:



- Opelt and Gould verge on falling into the “ghost” category – where only the partial remnants of an original crater (usually sections of the rim) remain visible (the rest of the crater may have been inundated by lava or buried under a later impact event).
- Images below…

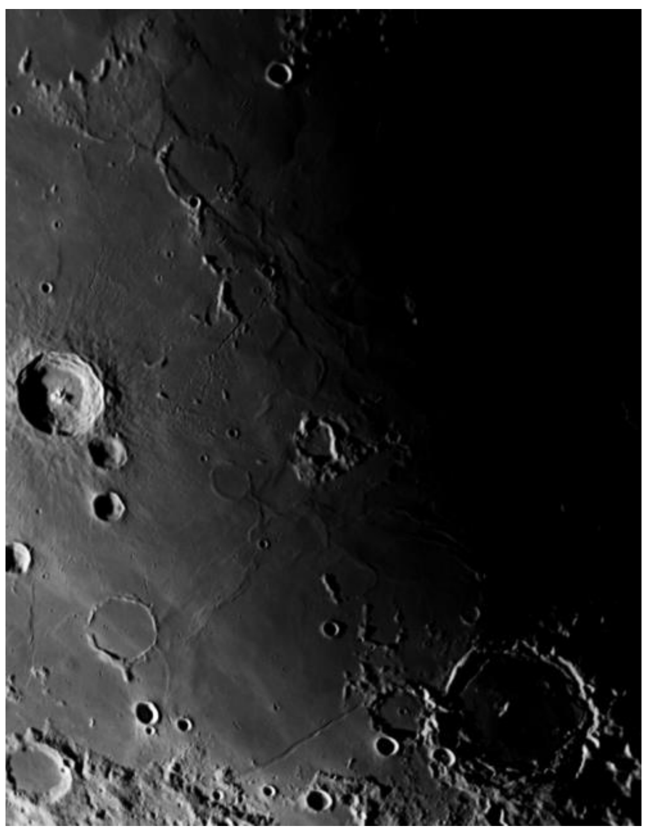




Opelt: 48km Apollo 16 AS-16-M-2489 Gould: 34km Lunar Orbiter IV

Looking south Enlarge to see small catena inside crater

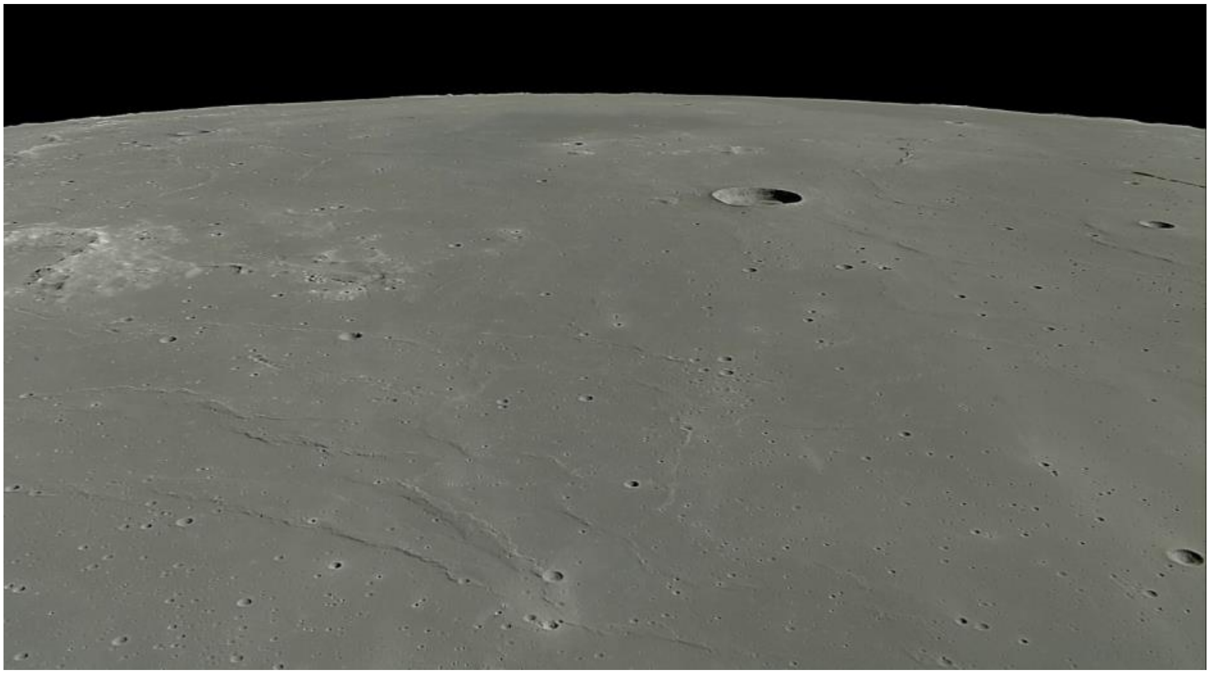
- Both these craters suffered “death by basaltic lava flooding”, with only rims remaining
Here’s an image I took of the area as the sun set… Bullialdus to the left, Pitatus at the bottom.



Pitatus_Bullialdus_2023-12-06-0437-JGr

Lunar Topographic Studies
A Tour of Southeast Nubium

Finally, to complete the tour, here's a Kaguya view looking north over the Mare Nubium.



Credit: JAXA/Kaguya

- The crater Nicollet is at upper centre, with the top end of Rima Birt just visible to the right.
- The craft was just at the northern rim of Pitatus for the shot. Low wrinkle ridges (dorsa) move away into the distance with Gould at upper left.

Acknowledgements

I'd like to thank Scott Smith for his input throughout this tour, notably with information relating to Alphonsus and Arzachel.

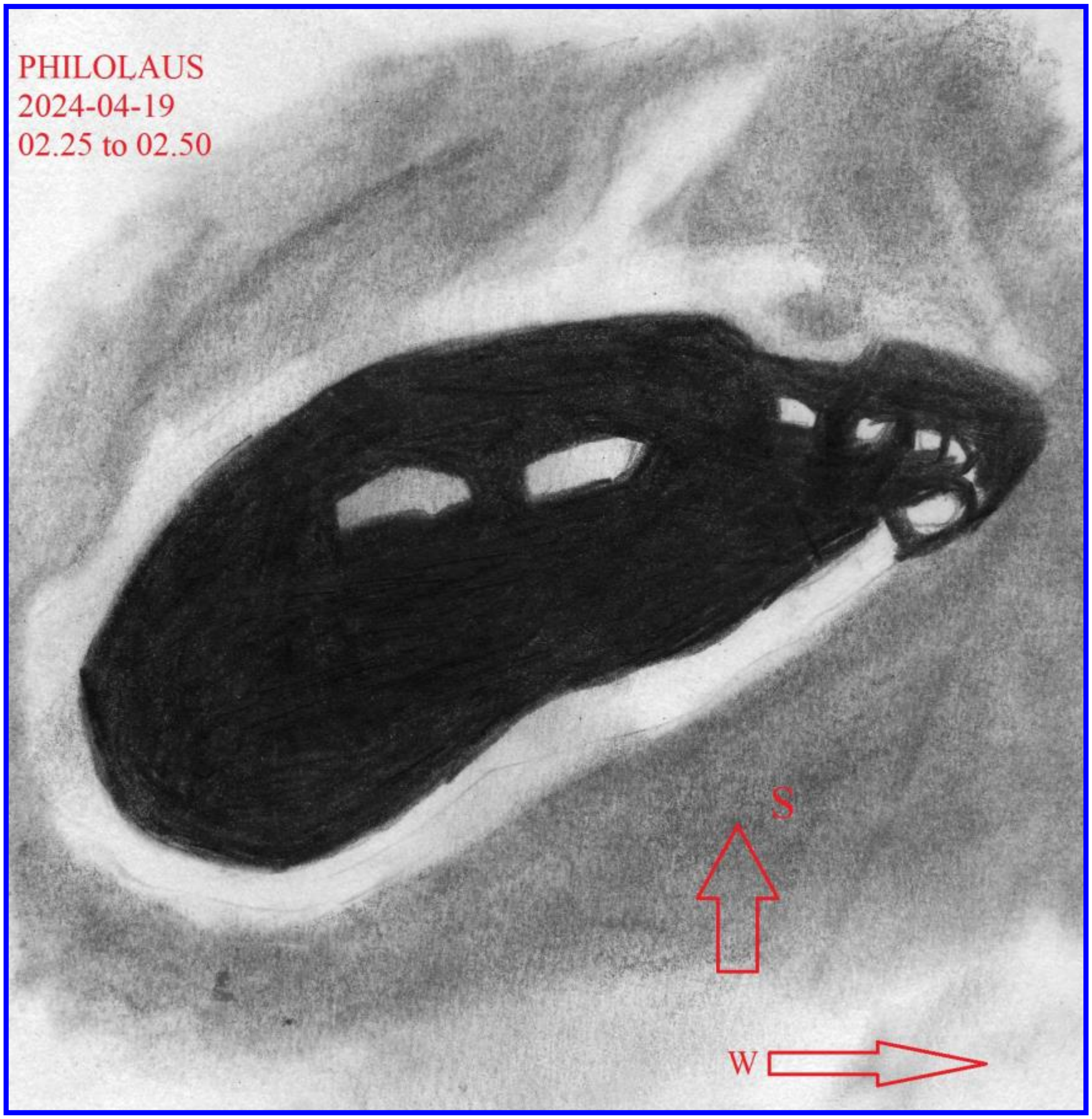
I'd also like to express thanks to John Robbins for providing me with "to order" maps of Alphonsus, Arzachel and Pitatus. This document doesn't do them justice!

Images credited to JGr were taken by the author using a C11 Edge and ASI 290 camera at f10.

A Subjective Vision of Philolaus

Alberto Anunziato

The craters near the North Pole are not easy to observe, less to distinguish, with small telescopes, but on the night of the observation that illustrates IMAGE 1, with better conditions of libration, one can see clearly what should be the Philolaus crater (71 kms in diameter). There really isn't much that can be added with my observation to the knowledge of Philolaus, but I can't resist the delicious configuration of brights and shadows that was presented when the crater was in the terminator, at 28.2 colongitude. Due to the peculiar arrangement of the central peaks, much more close to the south wall, it was possible to identify Philolaus, because it appears like an elongated crater, while we know that its shape is circular (surelly because it is relatively close to the limb, at 72 degrees of latitude, not so far from the pole). What is obvious is that it is a deep crater, what we can deduce by the the shadows (which cover completely its interior) and by the intense shine of its walls in its entirety (especially the north wall). This north wall, however, seems to diminish in altitude by the west, because its brightness is interrupted by the shadows. There is a series of bright dots on the left wall, which will occupy what could be the last terracing zone of this wall.



Philolaus, *Alberto Anunziato, 2024 April 19 02:25-)2:50 UT. Meade EX105 Maksutov-Cassegrain telescope, 154 x.*

Lunar Topographic Studies
A Subjective Vision of Philolaus

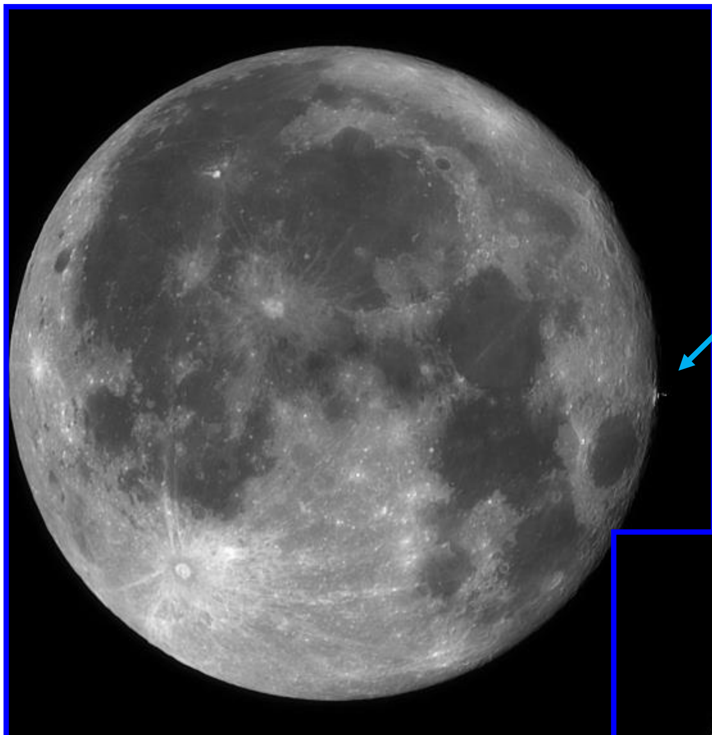
Philolaus is a supremely interesting crater, that will probably be the target of space missions in the not very far future (perhpas when the fashion of the Southern Pole abates), and which combines two interesting aspects. They have been discovered in Philolaus, with images of the Lunar Reconnaissance Orbiter probe, 3 possible images of potential lava tubes entrances on the floor. Because of the latitude in which Philolaus is located and the geometry of these potential lava tubes skylights, it is very likely that in these caves there are Permanently Shadowed Regions (PSR) in which there are deposits of water ice. These circumstances have motivated the design of a fascinating future mission in this Copernican crater: LEASP (Lunar Expedition to Ascertain the Philolaus Skylights), which "is designed to deliver a lander and a set of "micro-rovers" on the lunar surface, specifically tasked to explore the skylight interiors and surroundings through light sensing mapping and in situ science. These micro-rovers have the undeniable advantage of being lightweight and capable of traversing long distances on the lunar terrain at high speeds. LEAPS objectives stem from the scientific interest behind the presence of caverns in polar regions of the Moon, and the prospective use of local resources within them". As we could read in the official website (https://espace.epfl.ch/2021/10/11/leaps/). See you at Philolaus in a few years?

Lunar Topographic Studies
A Subjective Vision of Philolaus

Lunar Occultation of Antares on May 23, 2024

Gregory T. Shanos

On the evening of May 23, 2024, the Full Moon was in conjunction with the red supergiant star Antares in the constellation of Scorpius for most of the United States. However, the southern states were treated to an occultation. The setting was less than ideal since the disappearance occurred at approximately 9:18 pm local time when Antares was only 5 degrees above the horizon according to Stellarium. I could barely see the moon behind a break in the trees therefore, I was unable to witness and image the disappearance. The reappearance occurred approximately an hour later when the moon was 15 degrees above the horizon. Fortunately, Sarasota had perfectly clear skies right down to the horizon which made imaging much easier. I was successfully able to image the reappearance of Antares from behind the full moon. Once I could see the star scintillating in the video, the reappearance had occurred. See the two images below. Overall, the occultation was a success!



Reappearance of Antares after lunar occultation, *Greg Shanos, Sarasota, Florida, USA. 2024 May 24. To the right, the reappearance of Antares just north of Mare Crisium at 02:17 UT, below just two minutes later at 02:19 UT.*

The Bright Rays on a Map of Hevelius and in a Contemporary Image

Alberto Anunziato

When we show someone the Moon through a telescope and they ask us about "those bright filaments," the explanation for the bright rays is not so simple: sometimes they are seen, sometimes they are not, and furthermore: what are they? The astonishment increases when we say that they are a spectacle reserved exclusively for the inhabitants of the Earth, that they cannot be seen on the surface of the Moon, that they are so evanescent that they have the consistency of dreams... sorry, sometimes we get carried away and topographical precision is forgotten. They were an observational problem for many centuries: how to represent them? What selenographic accident were they? The first selenographers were almost exclusively dedicated to the representation of the visible side of the Moon as a planisphere as precise as possible, so the detailed recording of selenographic features in particular will have to wait for the selenographers of the 18th century such as Schröter or Gruithuisen. Therefore, the first maps of the Moon were maps of the full Moon or maps that showed the features in a conventional way, without indication of brightness. Still, many of these maps show bright rays. Probably the first selenographer interested in recording craters with bright rays accurately, or at least noticing that they were different from other craters (although neither the word nor the concept of "crater" itself was known in the 17th century) was the Italian Francesco Fontana in 1646. Says Manasek, in his fundamental "A Treatise on Moon Maps" (page 105): "Fontana clearly was interested in the lunar ray system and his effort to portray even minor ray craters help us identify other features since these rayed craters can be identified more easily than other features, and used as signposts to orient the map to modern images". Furthermore, Fontana attempted a primitive distinction of brightness between the craters we now know as bright-ray craters and which he called "fontanae" ("fountains" in Latin), perhaps as a (very baroque) means of boasting (Manasek, page 103): "Firstly, the lunar disk is not viewed as a uniform whole, but as a diverse body consisting of various regions of differing kinds; for certain parts are brighter than others, and of these some are shining. There is one that is more outstanding than the rest.... I shall call it the Larger Fountain. Amongst the other shining regions there is another exceptional one which also emits double rays, situated on one of the larger dark patches, and so it will be called the outstanding fountain of the larger dark patch. Other shining regions, small Fountains, their rays, streams and rilles will also be named. There are other areas which are not actually shining, but comprise small dots, and smaller dots which are brighter, then there are others which form a fourth class and have differing shapes; these I shall call pearls, little pearls, jewels and little jewels". Clearly, "Larger Fountain" is Tycho, and the simile is really accurate, if we see IMAGE 1 (extracted from page 120 of Manasek's work) in which we see how Tycho is represented in the famous book by Antonius de Rheita "Oculus Enoch et Elia" (1645) as spilling out towards the four cardinal points, a representation that is not wrong at all. Not far in time from these two astronomers we have the most important work on the Moon for many centuries, the "Selenographia" by the Polish Johannes Hevelius (published in 1647). Hevelius was not the first to represent the surface of the Moon according to the phases of illumination, but he was the first to do so systematically in the aforementioned work. In the chapters dedicated to the Moon near the full moon the bright rays are represented less spectacularly than in IMAGE I but in a very conspicuous and more realistic way: "Map P, much like map O, shows the ray system in dramatic fashion.

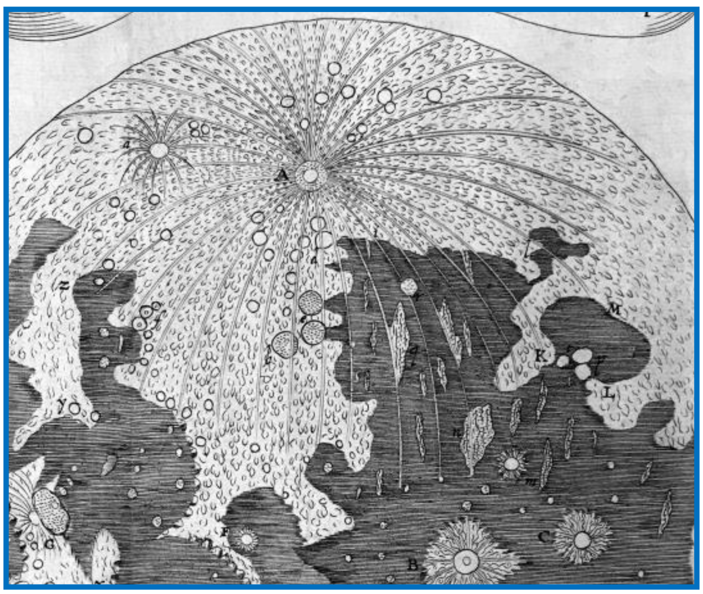


Image 1

The rays (…) are merely shown as light streaks. In this map Hevelius makes no definitive cartographic statement about their form, they are primarily shown as areas of greater albedo. Nonetheless he does suggest associated thickness by means of short lines on the edges of the large rays from Copernicus and by introducing some ray-specific markings in the rays from Tycho" (Manasek, page 127). What were the bright rays to Hevelius? Chains of low mountain elevations, as we see graphically in IMAGE 2, a detail obtained by Manasek (page 132) from Map Q of Selenographia, in which the rays of Copernicus "are represented by columns of mountains and the crater Copernicus is shown as a mountain ring, named by Hevelius Aetna M, (Etna Mons)". Which makes a lot of sense, for many years, attempts have been made to discover relief associated with bright rays. Hevelius's explanation (on pages 357/358 of Selenographia) is also very logical and consistent with what was known about the Moon in the mid-17th century (our translation): "The whitish or luminous rays, which near the full moon appear scattered in the oceans, islands and lunar continents, are nothing other than (as we have already said) lines of rocks, the highest segments of the mountains, which in this phase have an appearance similar to the summits of our highest mountains, covered by eternal snow. The brightest segments of the lunar mountains, mainly the one oriented from Mount Sinai, appear to be covered with snow, which is not credible, since they are never reached by any rain, since the sky is permanently dry (if we can use the expression") and, therefore, it is easy to deduce that it cannot snow on the Moon and that perhaps they appear brighter due to other causes, related to their material, color, roughness and location". It is a very logical explanation because observationally it makes sense. For example, the famous double ray of Tycho, which runs towards the north, is represented by Hevelius, as Manasek refers (page 130), with marks that indicate possible low relief: "The short-engraved lines in the large ray may be indicative of attempt to portray the rays as having elevation.

Image 2 *Treatise On Moon Maps*

Hevelius uses a wide range of line types and thicknesses but they are all used to complement the parallel-line method of showing detail" (IMAGE 3). The explanation of the bright rays as reliefs that shine illuminated by frontal light coexisted with other explanations, bizarre ones such as that they were saline remains of the evaporated waters of ancient seas, or in accordance with the volcanic origin of the craters (dominant hypothesis in the century XIX), like the one narrated on page 208 of "Epic Moon: "Nasmyth and Carpenter saw everywhere on the surface of the Moon evidence of this general process. The crater Copernicus-the "Monarch of the Moon"-was evidently "the result of a vast discharge of molten matter which has been ejected at the focus or center of disruption of an extensively upheaved portion of the lunar crust... Were we to select a comparatively limited portion of the lunar surface abounding in the most unmistakable evidence of volcanic action in every variety that can characterize its several phases, we could not choose one yielding in all respects such instructive examples as Copernicus and its immediate surroundings." Tycho and its system of rays similarly represented "an instance of vast disruptive action which vent the solid crust of the Moon into radiating fissures... subsequently occupied by extruded molten matter." The process that formed it was evidently analogous to the cracking of a water-filled glass globe when heat is applied, where the contents build pressure until the container is ruptured".

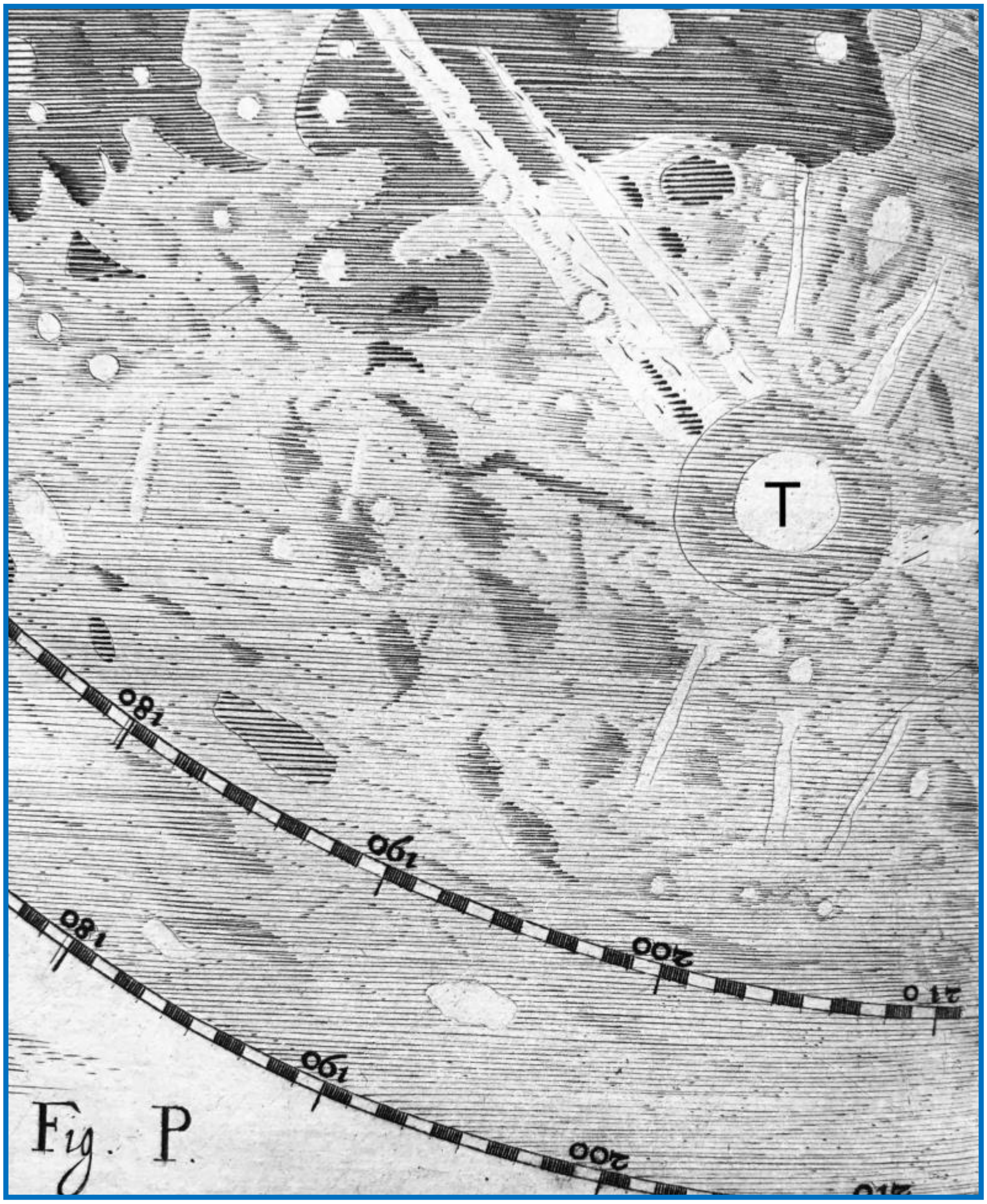


Image 3 *Treatise On Moon Maps*

Lunar Topographic Studies
The Bright Rays on a Map of Hevelius and in a Contemporary Image

Now that we know what bright rays consist of, I thought it would be interesting to compare Hevelius' records of bright full moon areas with a modern image to see how accurate Hevelius was in his records. To do this, we are going to compare IMAGE 4, which is the map (between pages 358 and 359) that illustrates chapter XXVI, referring to the Full Moon, with IMAGE 5, which belongs to one of the observers of our Sociedad Lunar Argentina, frequent contributor to this magazine, Jairo Andrés Chávez. Jairo regularly records the Moon from Popayán, Colombia, with special emphasis on images of the complete visible side, which helps us compare with the visual observation and subsequent drawing of Hevelius almost 4 centuries ago: Let us not forget that the observational drawings and the later engravings are also by the Polish master: "author sculpsit", we read at the bottom of IMAGE 4.

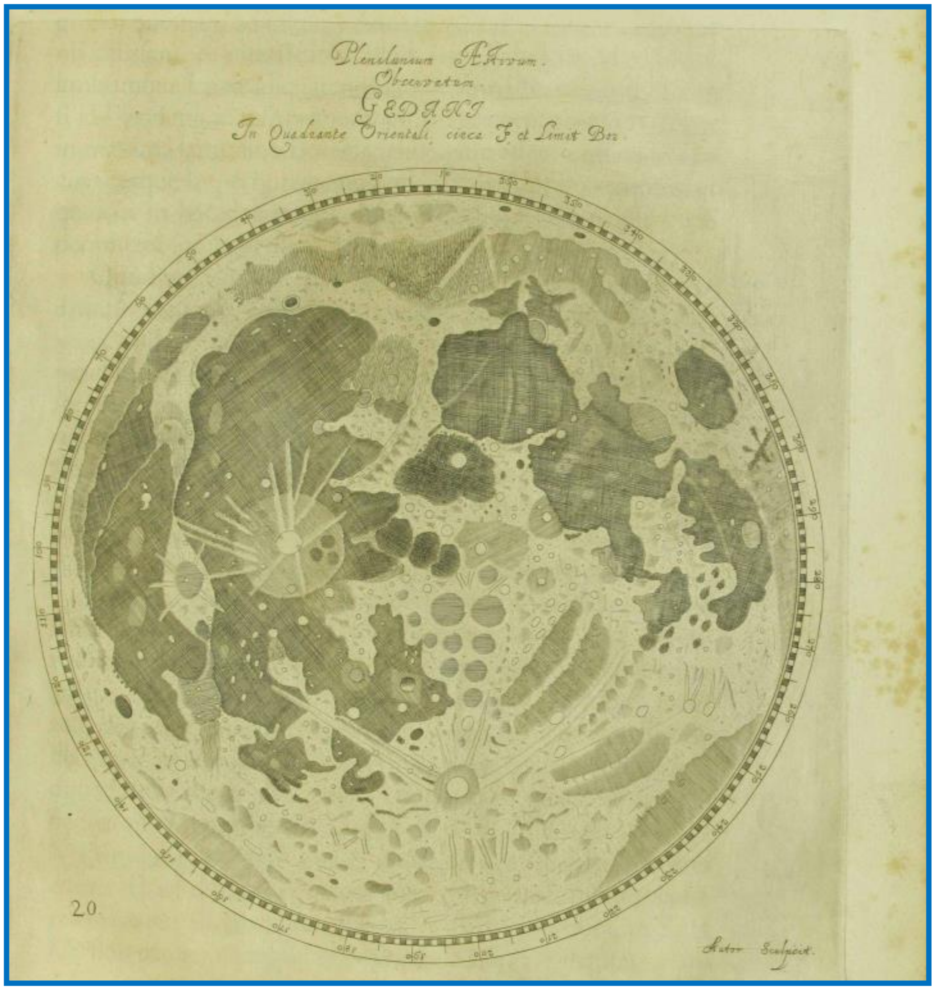


Image 4 *Hevelius Selenographia page 461.*

Image 5 Full Moon, *Jairo Chavez, Popayán, Colombia. 2023 August 02 02:26 UT. 311 mm truss tube Dobsonian reflector telescope, MOTO E5 PLAY camera.*

Let's start the comparison, with IMAGE 6, and it is very positive for dear Hevelius, note the “Bessel ray” perfectly visible (more curved in Hevelius, because visually everything looks more curved on the Moon) and the darker areas on the margins of Mare Serenitatis, in Mare Crisium Hevelius records the intense brightness of Picard but, strangely, it does not record the rays of Proclus. In IMAGE 7 the topographic record of Hevelius is also notable, even the brightest areas in Sinus Iridum, the Anaxagoras rays in Hevelius are much less defined, it appears almost as a bright area (and really the Anaxagoras rays are not easy to notice). IMAGE 8 is the Tycho area, which we have already referred to. The dark ring around Tycho appears clearly in Hevelius, the not so bright areas between the rays appear darker (probably by contrast) and the systems of bright rays around Snellius and Stevinus are more clearly distinguished, simplified with what some have called “rabbit ears”, which in our opinion are not so far-fetched, just look at the images of these craters, for example, in the March 2022 issue of our magazine, Focus On section. IMAGE 9 is a detail of Tycho's double ray, the truth is that Hevelius' record is astonishingly accurate. IMAGE 10 comprises the area of the bright ray systems of Copernicus and Kepler, partly represented in Hevelius as rounded areas.

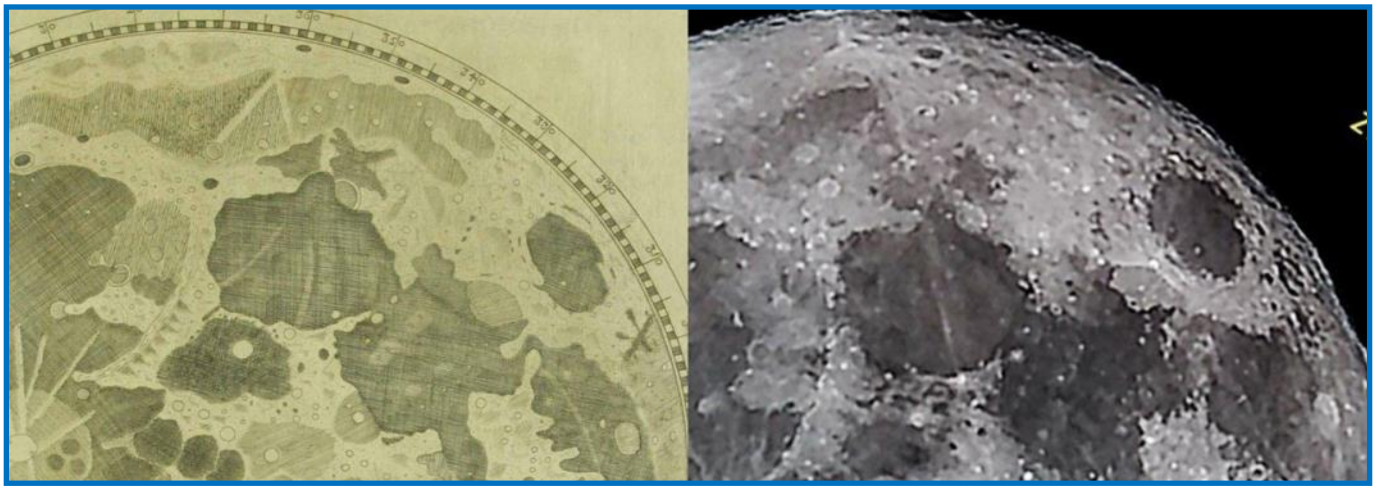


Image 6, *A comparison of Hevelius Selenographia page 461 to Chavez image 5. Note the Bessel Ray.*

Image 7, *A comparison of Hevelius Selenographia page 461 to Chavez image 5. Note the brightness of Sinus Iridum and rays of Anaxagoras in the Hevelius map.*

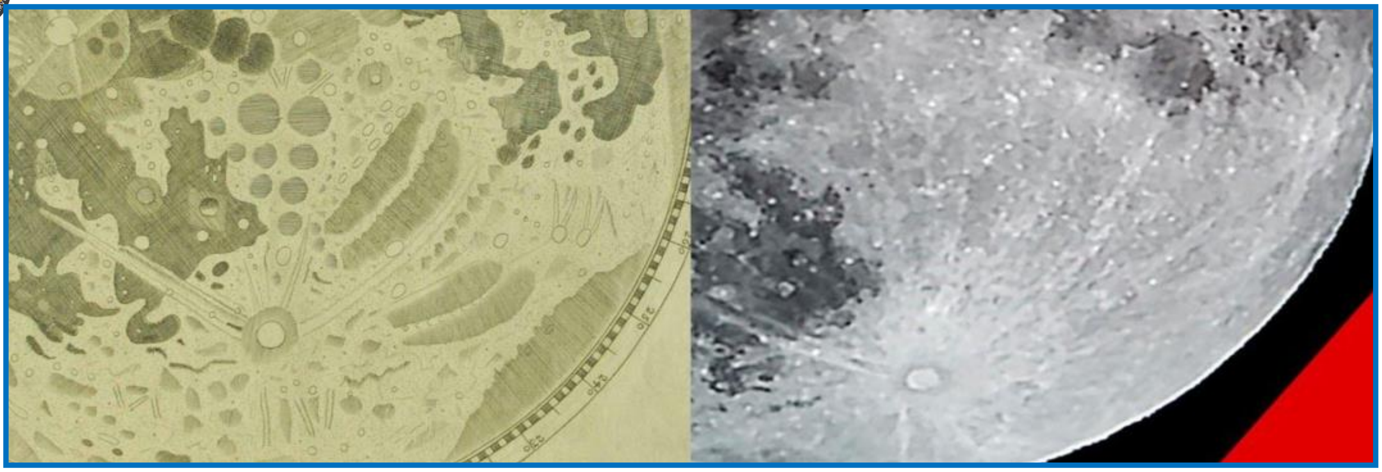


Image 8, *A comparison of Hevelius Selenographia page 461 to Chavez image 5. Note the Tycho rays and dark ring.*

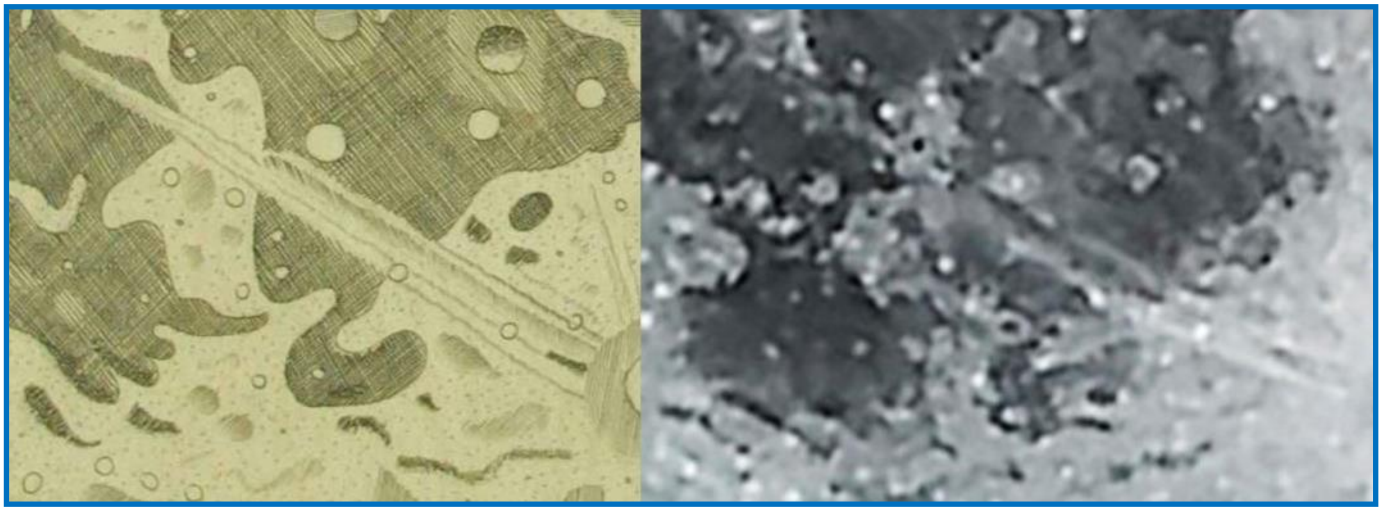


Image 9, *A comparison of Hevelius Selenographia page 461 to Chavez image 5. Note the Tycho's double ray.*

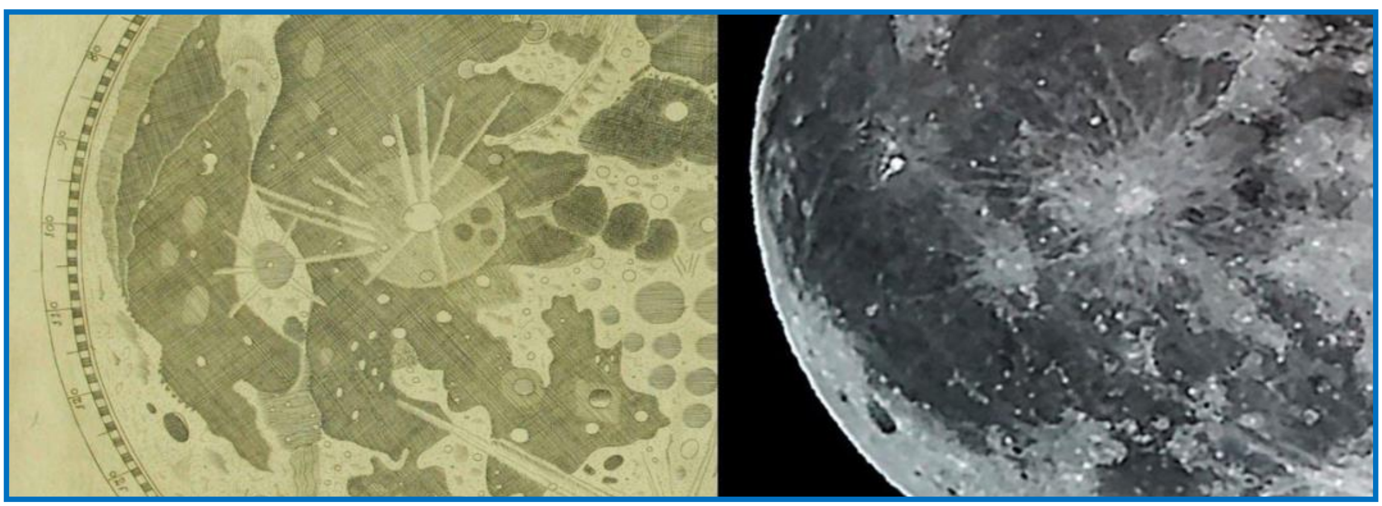


Image 10, *A comparison of Hevelius Selenographia page 461 to Chavez image 5. Note the circular rays around Copernicus and Kepler..*

Let us remember that for Hevelius these bright areas represented lands or rather, islands; he called the ejecta mantle around Copernicus Sicily (and the crater itself Mons Etna) and Kepler's Insula Cercinna. He did not record, however, the ray system of Aristarchus, which he represented quite plausibly, although not so brilliantly. A not-so-known curiosity is that we have a sample of a bright ray on our planet, it was brought back by the astronauts of the Apollo 12 mission, one of whose objectives was to take samples of a bright ray from Copernicus. Apollo 12 was launched to land a few meters from the landing site of a previous (unmanned) mission called Surveyor 3, which had analyzed in situ samples from the area crossed by a bright Copernicus ray. The curious thing is that it does seem that something is visible from the bright rays, a kind of lighter material that arises when the most superficial layer of the regolith is removed, just the movement of the boots in the dust. This is how David Harland tells it in "Exploring the Moon. The Apollo Expeditions" (page 54): "As Bean followed around Head's rim, he noticed that his commander`s boots were breaking through the surficial regolith to expose a lighter material. This provoked howls of delight from the scientists in Mission Control's "Backroom". One of the reasons for selecting Surveyor 3 as the target was that one of the bright rays radiating out from Copernicus crossed the site. Could this subsurface be the ray? Conrad was surprised, because they had not exposed such material in deploying the ALSEP nearby. "Let trench this!" he decided. After taking a surface simple, they scraped out a 15-cm-deep hole and sampled the floor. Reluctant to use formal geological terms, Conrad referred to everything as "stuff". For good measure, he added to that bag a small fragment of rock that he dug out of the trench. Subsequent analysis of the isotopic ratios in the material showed it to be 810 million years old, and although the link is tenuous, this is generally accepted as dating Copernicus. In providing an absolute date for this stratigraphic feature. Apollo 12 achieved one of its objectives".

In closing, Hevelius' maps are not as appreciated as they should be, this comparison increases our admiration for the Polish master who almost four hundred years ago showed a new world in one of the most influential astronomical books in history.

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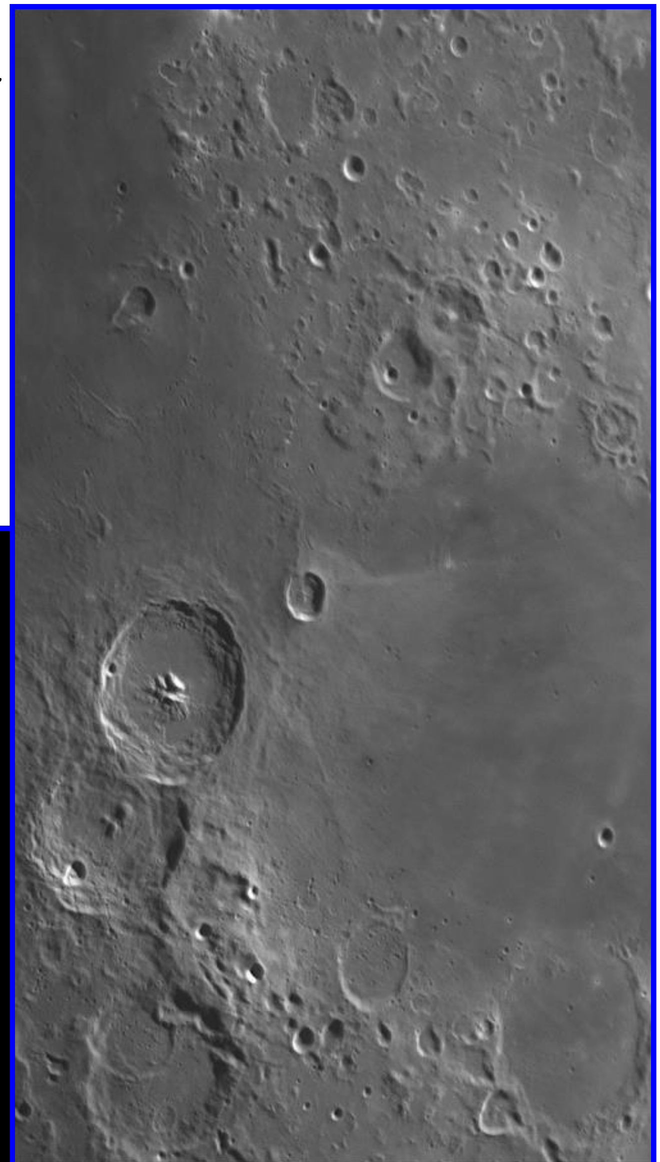
Hevelius. Selenographia. Gdansk (1647), En: www.e-rara.ch/zut/content/titleinfo/160230
Manasek, Francis J, (2022), A Treatise on Moon Maps.
Sheehan W. and Dobbins T., (2001), Epic Moon, Willmann-Bell, Richmond.

Theophilus, *Larry Todd, Dunedin, New Zealand. 2022 October 02 07:09 UT. OMC 200 f/20 Maksutov-Cassegrain telescope, Neptune 2C camera.*



Mare Crisium, *Gonzalo Vega, Paraná, Entre Ríos, Argentina. 2024 May 25 00:00 UT. Celestron 130 mm Newtonian reflector telescope, 650 mm fl, EQGG3 mount, Moto g52 camera.*

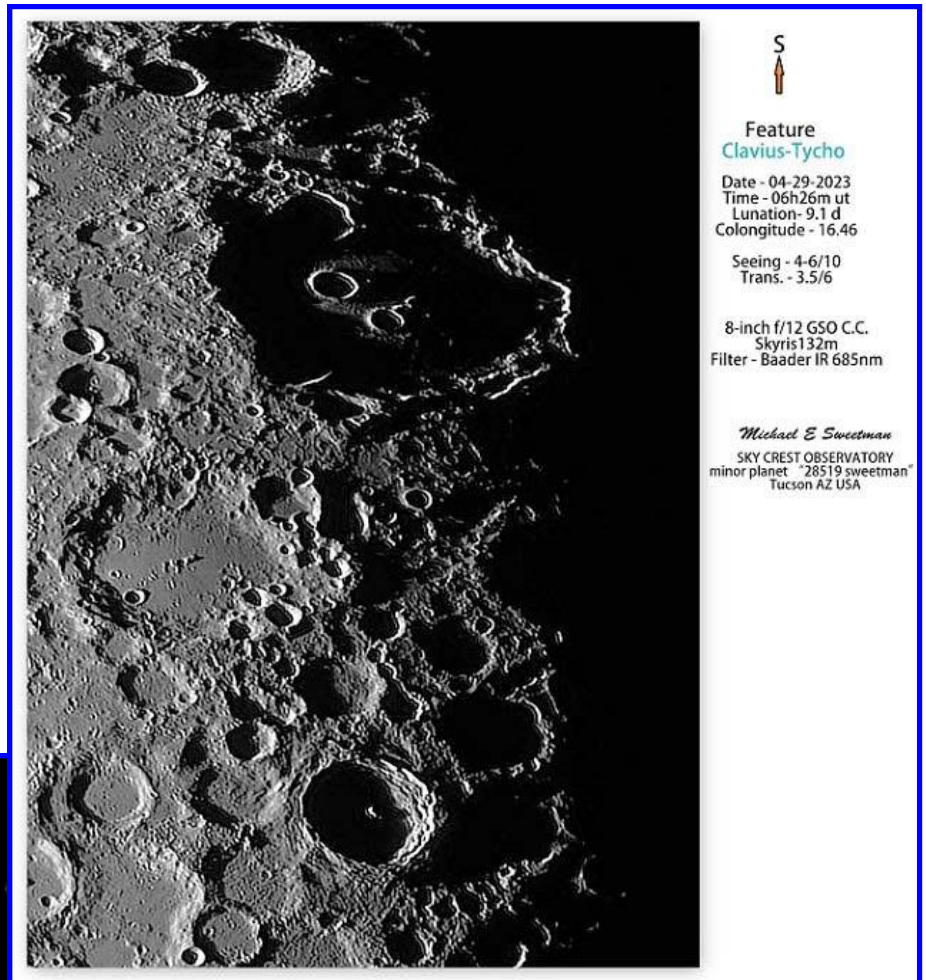
Recent Topographic Studies

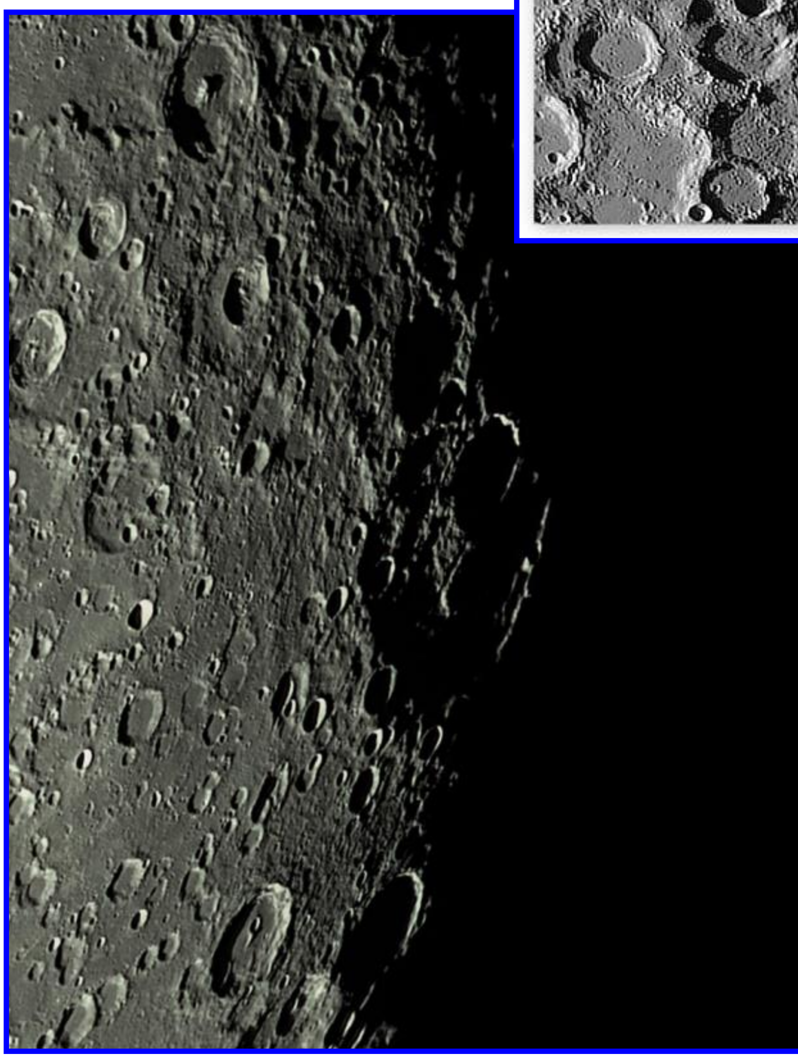
Theophilus, *Larry Todd, Dunedin, New Zealand. 2022 October 31 08:31 UT. OMC 200 f/20 Maksutov-Cassegrain telescope, Neptune 2C camera.*

Taruntius and Cameron, *István Zoltán Földvári, Budapest, Hungary. 2020 September 05 23:22-23:46 UT, colongitude 132.0º. 70 mm refractor telescope, 500 mm focal length, Vixen Lanthanum LV 4mm eyepiece, 125x. Seeing 8-6/10, transparency 5/6.*

Recent Topographic Studies

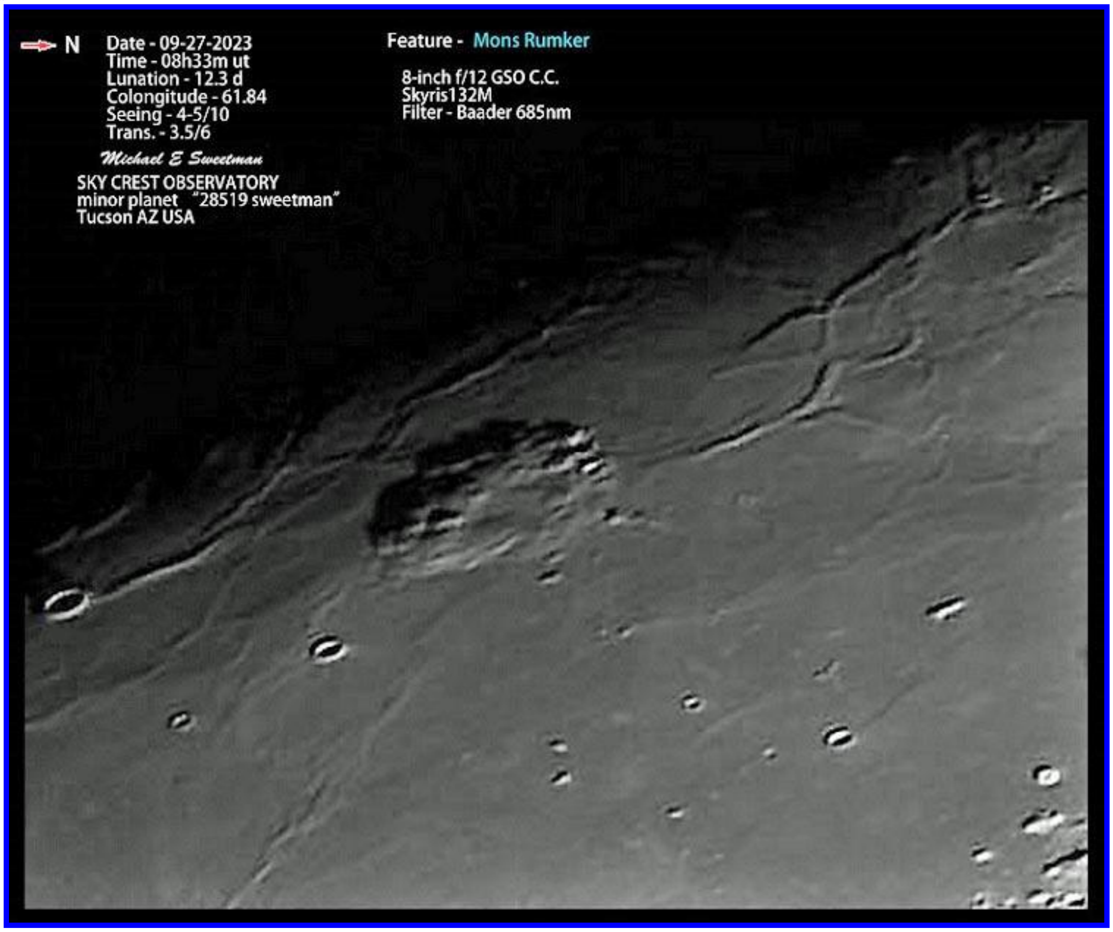
Clavius, *Michael Sweetman, Sky Crest Observatory, Tucson, Arizona, USA. 2023 April 29 06:26 UT, colongitude 16.46°. 8 inch f/12 GSO Classical Cassegrain telescope, Baader IR 685 nm filter, Skyris 132 M camera. Seeing 4-6/10, transparency 3.5/6. North is down, west is right.*





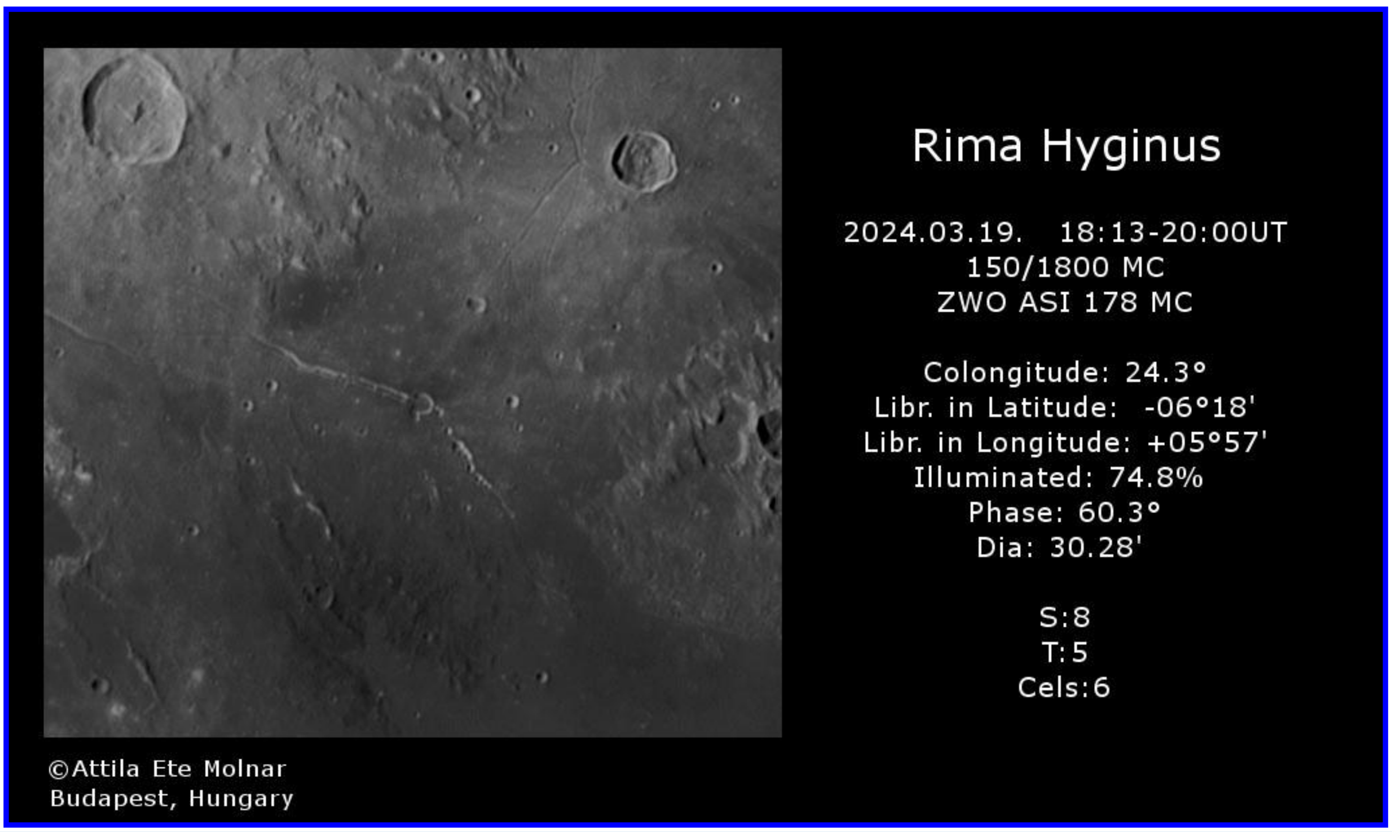
Metius, *Gonzalo Vega, Paraná, Entre Ríos, Argentina. 2024 March 29 04:40 UT. 8 inch Newtonian reflector telescope, 1,000 mm fl, EQ5 go to mount, Player One Ceres C camera.*

Recent Topographic Studies



Mons Rümker, *Michael Sweetman, Sky Crest Observatory, Tucson, Arizona, USA. 2023 September 27 08:33 UT, colongitude 61.84º. 8 inch f/12 GSO Classical Cassegrain telescope, Baader IR 685 nm filter, Skyris 132 M camera. Seeing 4-5/10, transparency 3.5/6. North is right, west is up.*

Rima Hyginus, *Attila Ete Molnar, Budapest, Hungary. 2024 March 19 18:13-20:00 UT, colongitude 24.3º. 150 mm Maksutov-Cassegrain telescope, 1,800 mm fl. ZWO ASI178MC camera. Seeing 8/10, transparency 5/6. North is down, west is right.*

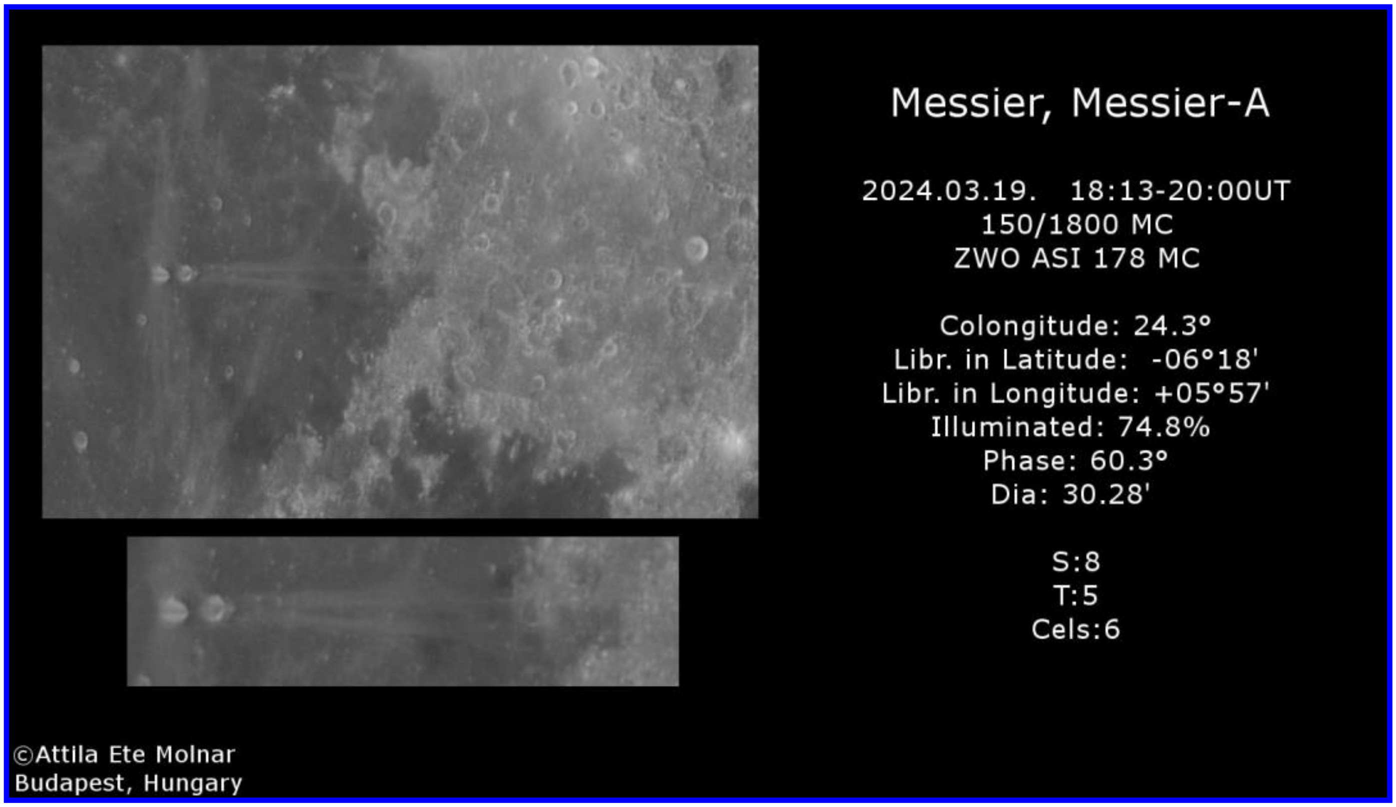


Recent Topographic Studies

8.2 Day-Old Moon, *Maurice Collins, Palmerston North, New Zealand. 2024 May 16 07:20-07:24 UT. FLT 110 mm refractor telescope, 2 x barlow, QHY5III462 camera. North is down, west is right.*

Theophilus, *Gonzalo Vega, Paraná, Entre Ríos, Argentina. 2024 March 29 04:47 UT. 8 inch Newtonian reflector telescope, 1,000 mm fl, EQ5 go to mount, Player One Ceres C camera.*

Recent Topographic Studies



Messier and Messier A, *Attila Ete Molnar, Budapest, Hungary. 2024 March 19 18:13-20:00 UT, colongitude 24.3º. 150 mm Maksutov-Cassegrain telescope, 1,800 mm fl. ZWO ASI178MC camera. Seeing 8/10, transparency 5/6. North is down, west is right.*

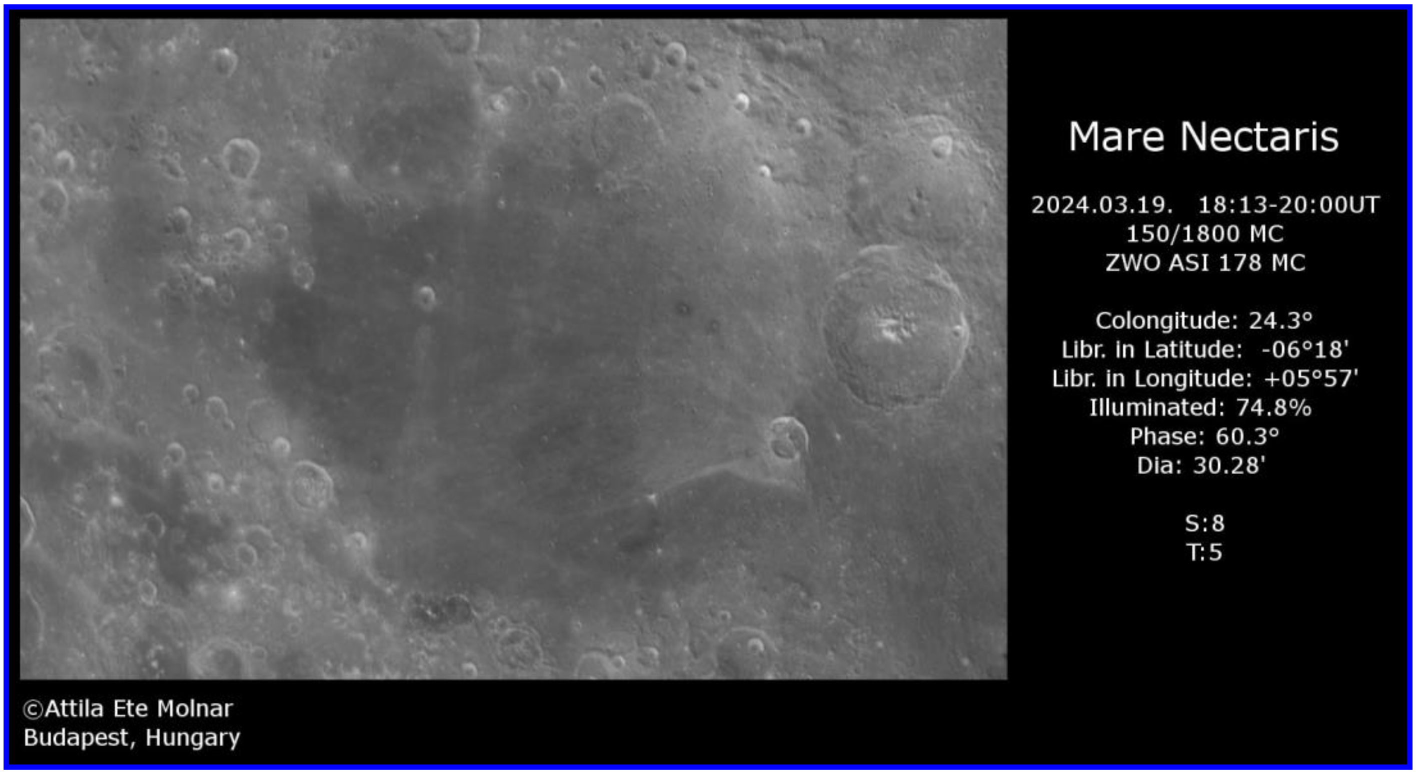
Janssen, *Marcelo Mojica Gundlach, Cochabamba, Bolivia. 2024 May 26 03:25 UT, 90 mm Maksutov-Cassegrain telescope, 1,250 mm fl, ZWO 178B/W camera. Seeing 5/10, transparency 3/6.*

Recent Topographic Studies

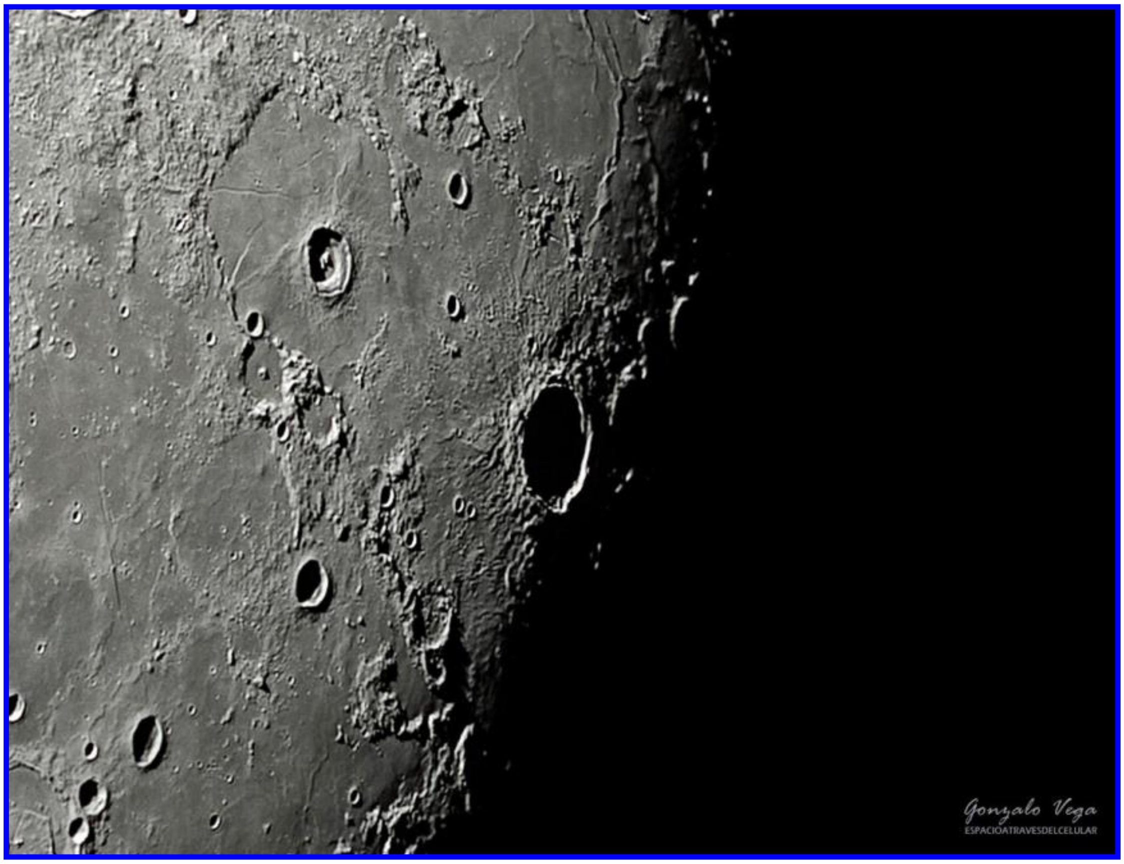
11.2 Day-Old Moon, *Maurice Collins, Palmerston North, New Zealand. 2024 May 19 07:26-07:31 UT. SkyWatcher Espirit 80ED refractor telescope, 3 x barlow, QHY5III462 camera. North is down, west is right.*

Waxing Gibbous Moon, *Juan Carlos Dovis, Sunchales, Argentina. 2024 May 16 22:56 UT. 4.5 inch reflector telescope, Canon EOS Rebel T7 camera.*

Recent Topographic Studies

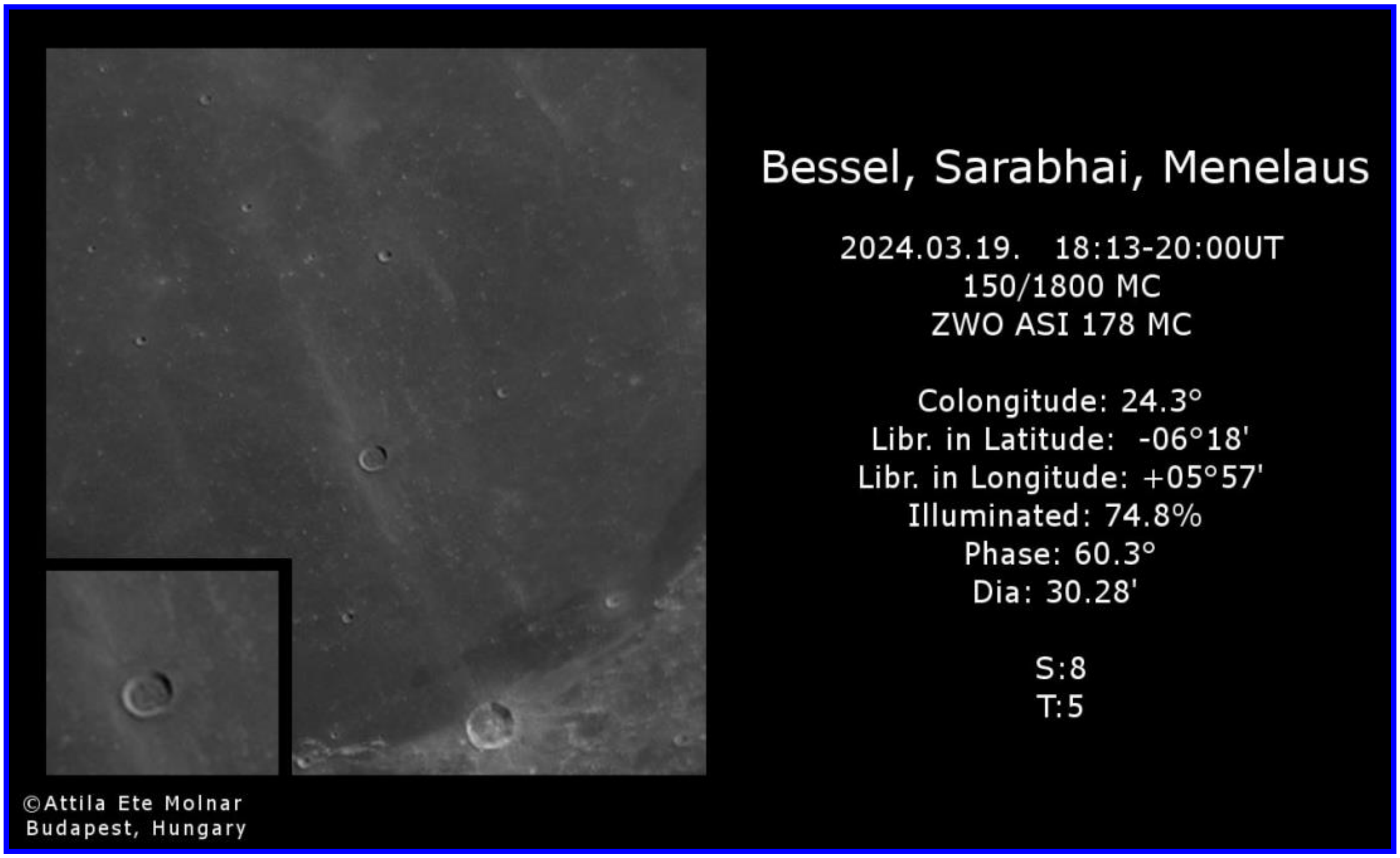


Mare Nectaris, *Attila Ete Molnar, Budapest, Hungary. 2024 March 19 18:13-20:00 UT, colongitude 24.3º. 150 mm Maksutov-Cassegrain telescope, 1,800 mm fl. ZWO ASI178MC camera. Seeing 8/10, transparency 5/6. North is right, west is up.*



Hercules, *Gonzalo Vega, Paraná, Entre Ríos, Argentina. 2024 March 29 04:35 UT. 8 inch Newtonian reflector telescope, 1,000 mm fl, EQ5 go to mount, Player One Ceres C camera.*

Recent Topographic Studies

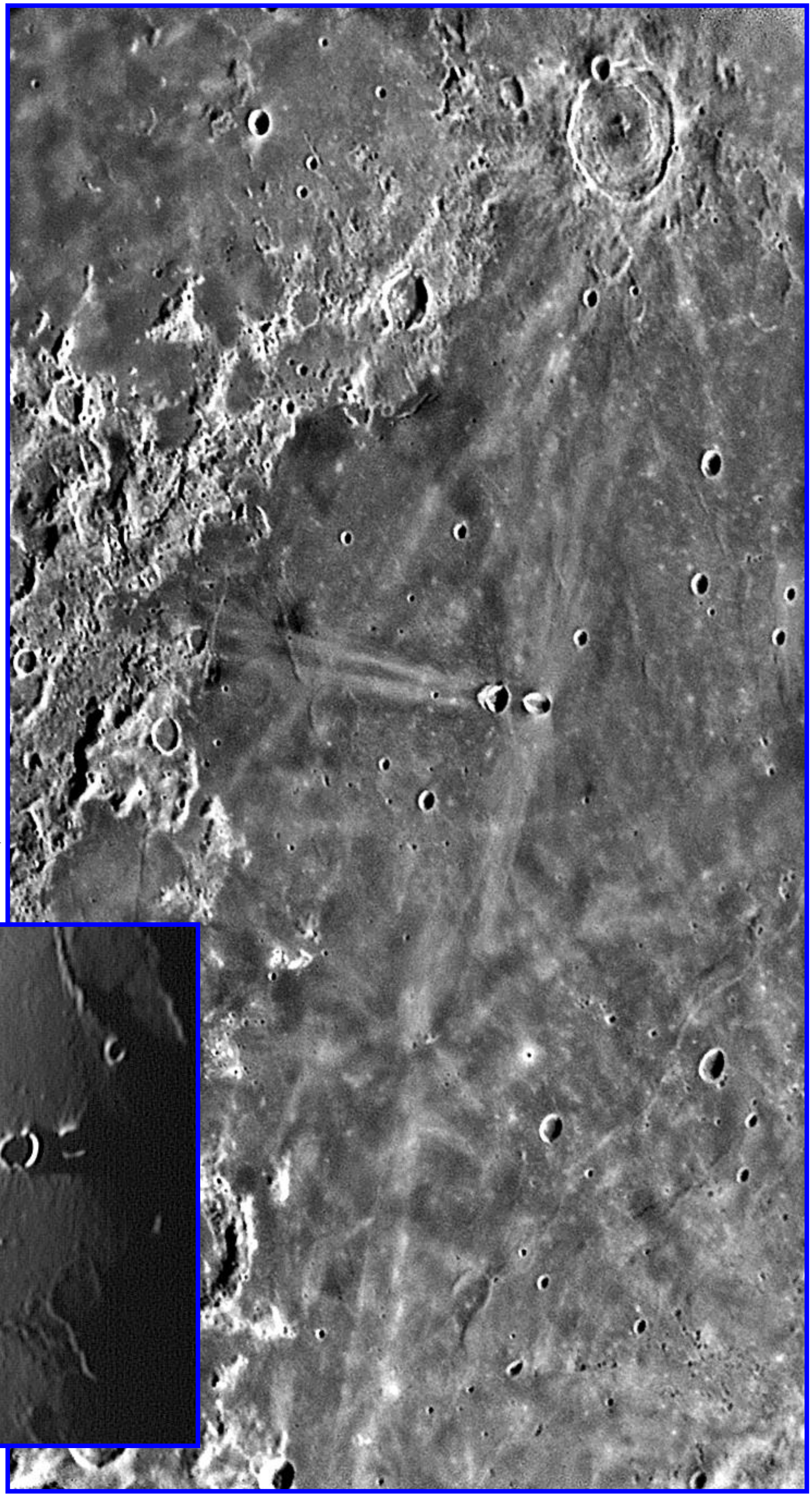


Bessel Sarabhai and Menelaus, *Attila Ete Molnar, Budapest, Hungary. 2024 March 19 18:13-20:00 UT, colongitude 24.3º. 150 mm Maksutov-Cassegrain telescope, 1,800 mm fl. ZWO ASI178MC camera. Seeing 8/10, transparency 5/6.*

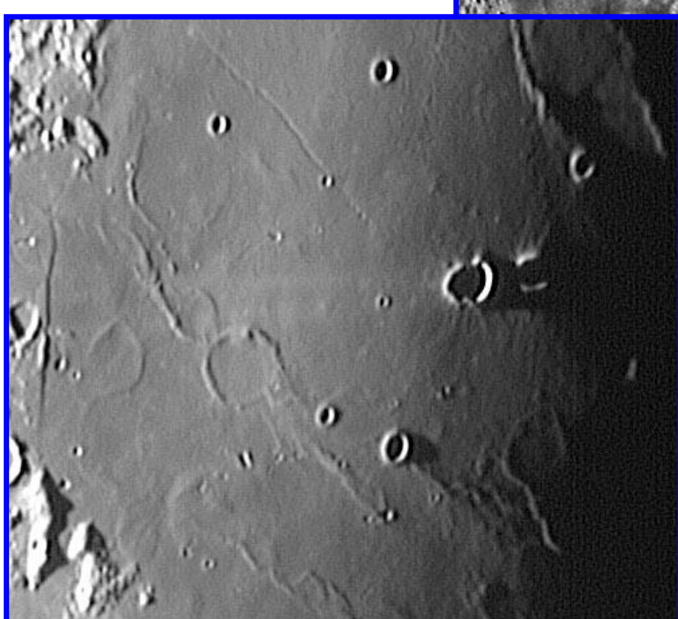
Waning Gibbous Moon, *Gonzalo Vega, Paraná, Entre Ríos, Argentina. 2024 May 25 00:14 UT. Celestron 130 mm Newtonian reflector telescope, 650 mm fl, EQGG3 mount, Moto g52 camera.*

Recent Topographic Studies

Messier, *KC Pau, Hong Kong, China. 2024 May 14 13:03 UT. 10 inch f/6 Newtonian reflector telescope, 2.5x barlow, QHYCCD 290M camera.*

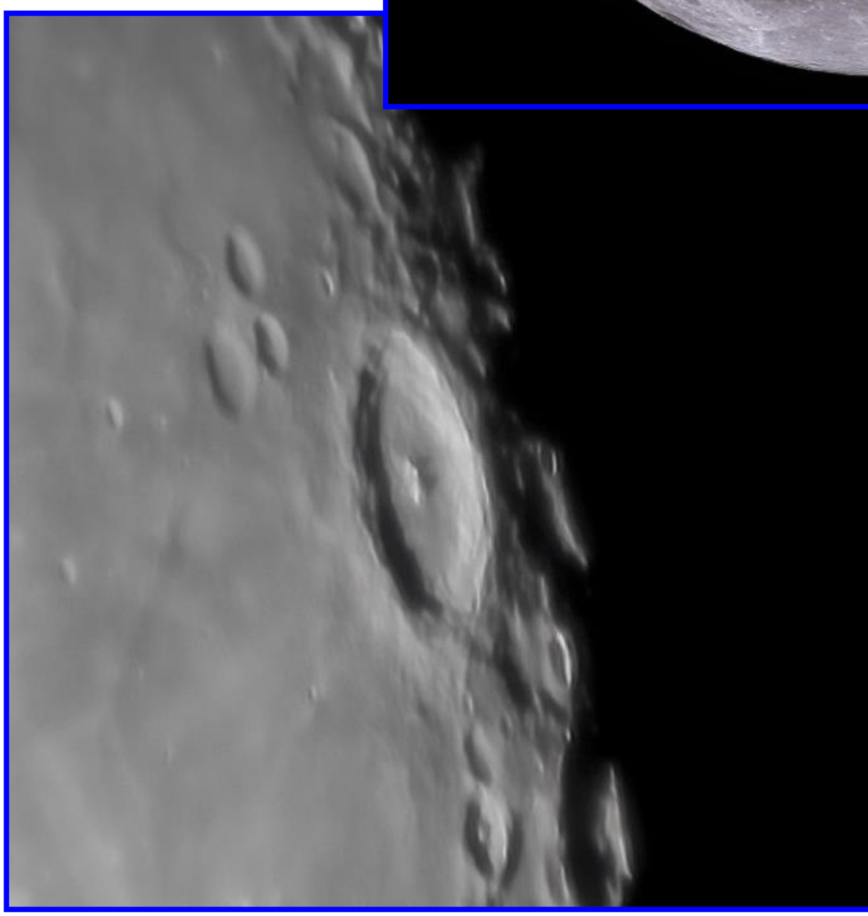


Rima Messier, *KC Pau, Hong Kong, China. 2005 July 24 19:08 UT. 10 inch f/6 Newtonian reflector telescope, 2.5x barlow, QHYCCD 290M camera.*



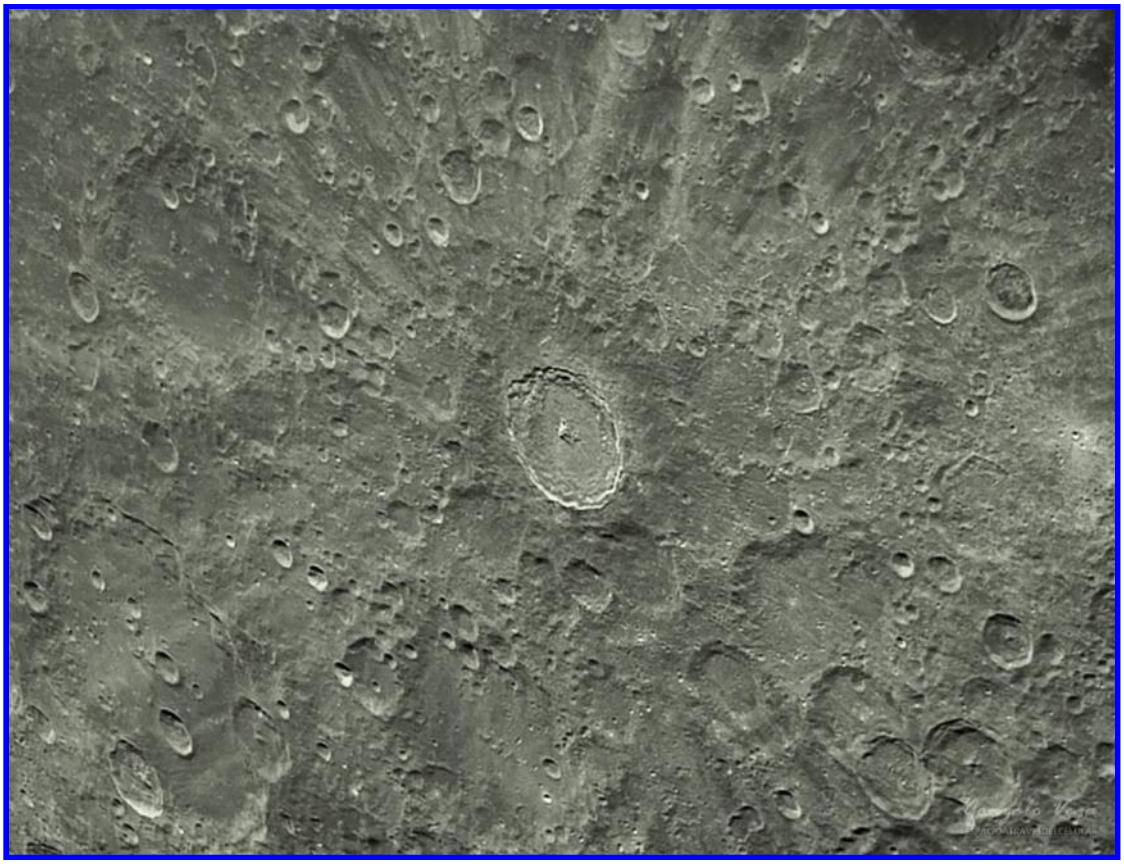
Recent Topographic Studies

15.2 Day-Old Moon, *Maurice Collins, Palmerston North, New Zealand. 2024 May 23 07:43-07:45 UT. FLT 110 mm refractor telescope, QHY5III462 camera. North is down, west is right.*



Langrenus, *Gonzalo Vega, Paraná, Entre Ríos, Argentina. 2024 May 25 00:09 UT. Celestron 130 mm Newtonian reflector telescope, 650 mm fl, EQGG3 mount, Moto g52 camera.*

Recent Topographic Studies

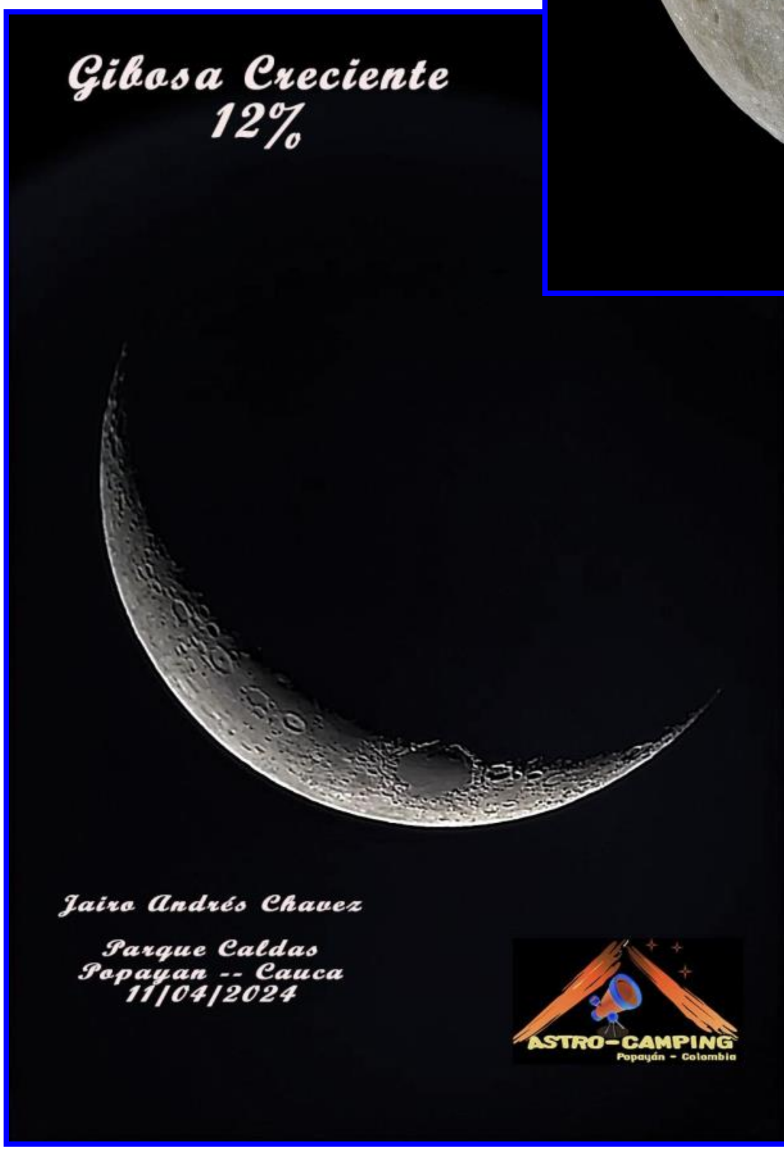


Tycho, *Gonzalo Vega, Paraná, Entre Ríos, Argentina. 2024 March 29 04:45 UT. 8 inch Newtonian reflector telescope, 1,000 mm fl, EQ5 go to mount, Player One Ceres C camera.*

Mare Crisium, *Jairo Chavez, Popayán, Colombia. 2024 April 14 00:18 UT. 311 mm truss tube Dobsonian reflector telescope, MOTO E5 PLAY camera. North is left, west is down.*

Recent Topographic Studies

Waxing Gibbous Moon, *Gonzalo Vega, Paraná, Entre Ríos, Argentina. 2024 March 29 05:08 UT. 8 inch Newtonian reflector telescope, 1,000 mm fl, EQ5 go to mount, Nikon D5100 camera.*

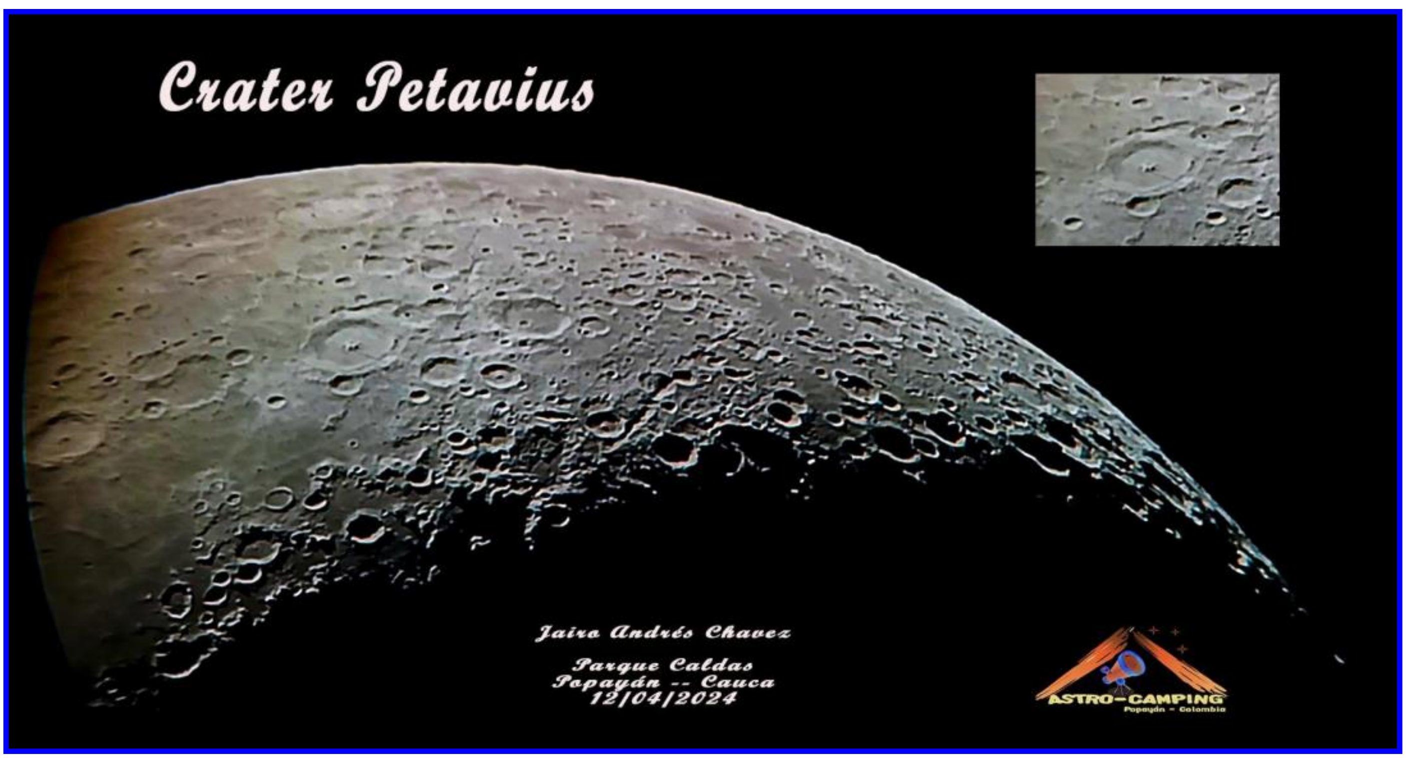


Waxing Crescent Moon, 12%, *Jairo Chavez, Popayán, Colombia. 2024 April 11 23:27 UT. 311 mm truss tube Dobsonian reflector telescope, MOTO E5 PLAY camera. North is right, west is up.*

Recent Topographic Studies

***Waxing Crescent Moon**, Alan Trumper, Oro Verde, Argentina. 2024 May 15 22:28 UT. Celestron 11 inch Schmidt-Cassegrain telescope, 40 mm ocular, iPhone 14 Pro Max camera.*

***Petavius,** Jairo Chavez, Popayán, Colombia. 2024 April 13 00:10 UT. 311 mm truss tube Dobsonian reflector telescope, MOTO E5 PLAY camera. North is left, west is down.*



Recent Topographic Studies

Petavius, *Gonzalo Vega, Paraná, Entre Ríos, Argentina. 2024 May 25 00:01 UT. Celestron 130 mm Newtonian reflector telescope, 650 mm fl, EQGG3 mount, Moto g52 camera.*

Waxing Crescent Moon, 21%, *Jairo Chavez, Popayán, Colombia. 2024 April 13 00:02 UT. 311 mm truss tube Dobsonian reflector telescope, MOTO E5 PLAY camera.*

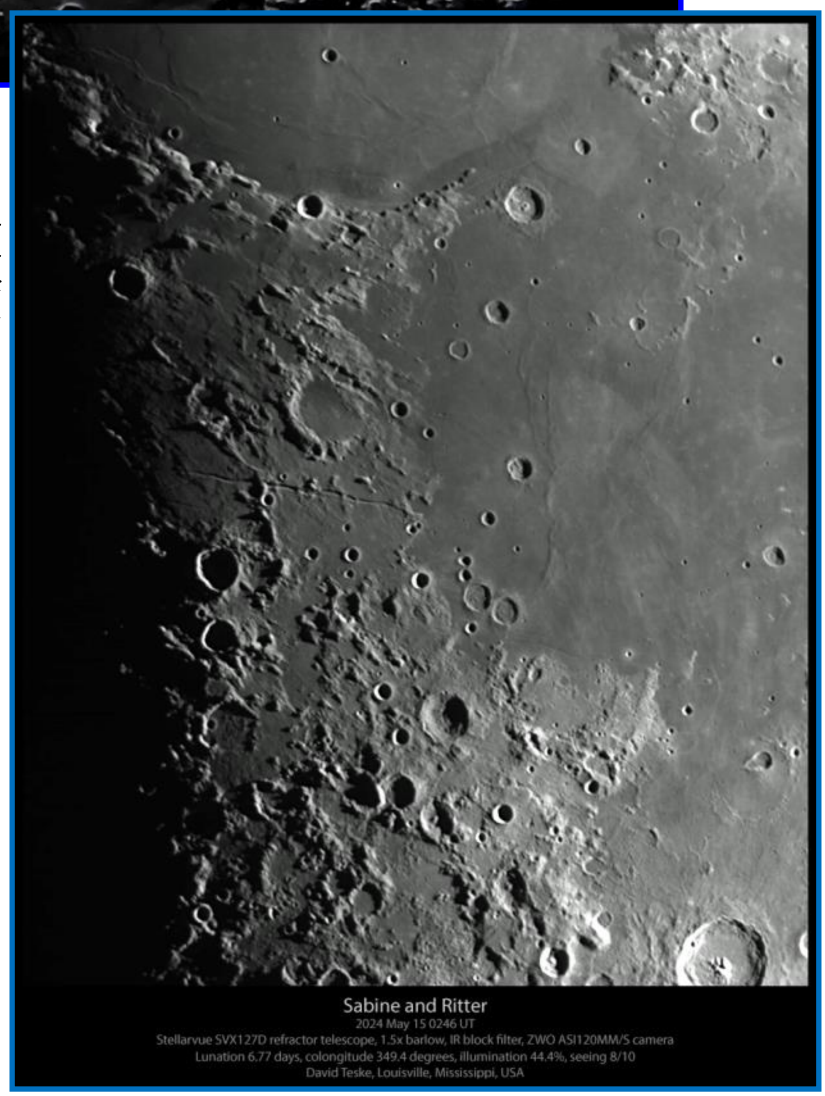
Recent Topographic Studies

Petavius, *Gonzalo Vega, Paraná, Entre Ríos, Argentina. 2024 May 25 00:10 UT. Celestron 130 mm Newtonian reflector telescope, 650 mm fl, EQGG3 mount, Moto g52 camera.*

Mare Crisium, *Jairo Chavez, Popayán, Colombia. 2024 April 13 00:13 UT. 311 mm truss tube Dobsonian reflector telescope, MOTO E5 PLAY camera. North is left, west is down.*

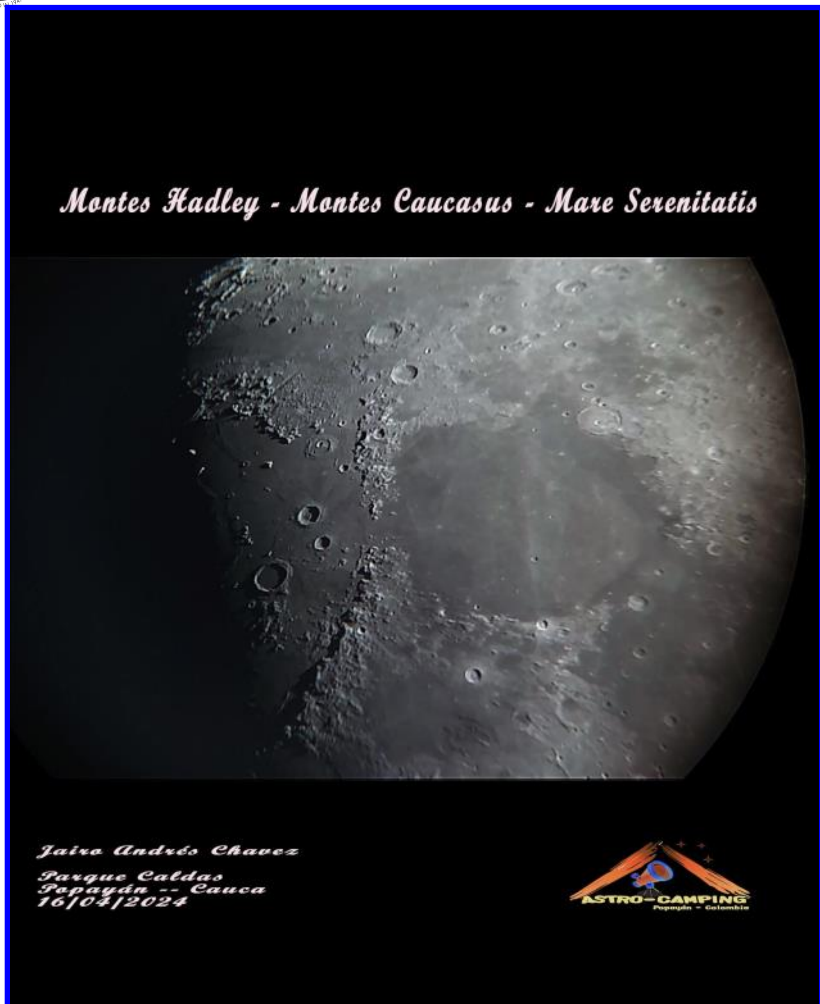
Recent Topographic Studies

Mare Nectaris, *Jairo Chavez, Popayán, Colombia. 2024 April 14 00:08 UT. 311 mm truss tube Dobsonian reflector telescope, MOTO E5 PLAY camera. North is left, west is down.*



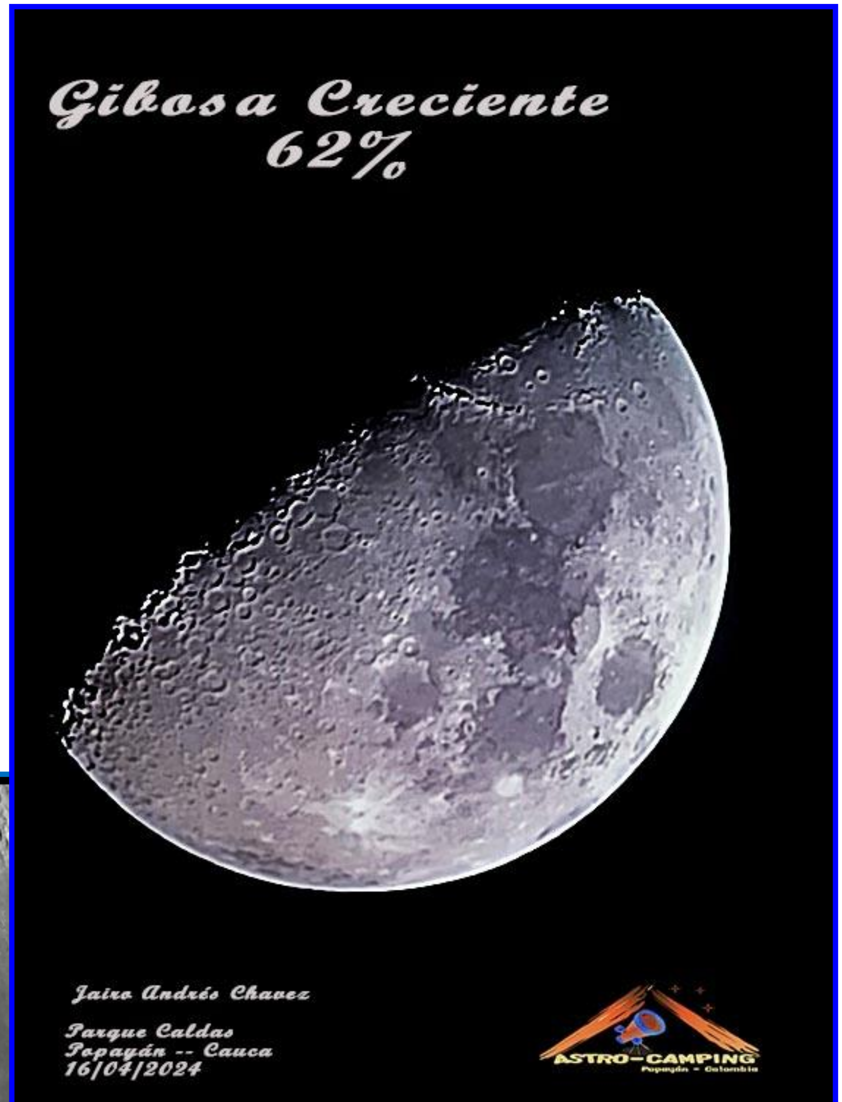
Sabine and Ritter, *David Teske, Louisville, Mississippi, USA. 2024 May 15 02:46 UT, colongitude 349.4°. 127 mm refractor telescope, 1.5x barlow, IR block filter, ZWO ASI120MM/S camera.*

Recent Topographic Studies



Mare Serenitatis, *Jairo Chavez, Popayán, Colombia. 2024 April 17 00:18 UT. 311 mm truss tube Dobsonian reflector telescope, MOTO E5 PLAY camera.*

Mare Crisium, *David Teske, Louisville, Mississippi, USA. 2024 May 15 02:50 UT, colongitude 349.5°. 127 mm refractor telescope, 1.5x barlow, IR block filter, ZWO ASI120MM/S camera.*



Waxing Gibbous Moon, 62%, *Jairo Chavez, Popayán, Colombia. 2024 April 17 00:35 UT. 311 mm truss tube Dobsonian reflector telescope, MOTO E5 PLAY camera.*

Theophilus, *David Teske, Louisville, Mississippi, USA. 2024 May 15 02:34 UT, colongitude 349.3º. 127 mm refractor telescope, IR block filter, ZWO ASI120MM/S camera.*

Recent Topographic Studies

Lunar Geologic Change Detection Program

Coordinator Dr. Anthony Cook- atc@aber.ac.uk
Assistant Coordinator David O. Darling -DOD121252@aol.com

2024 June

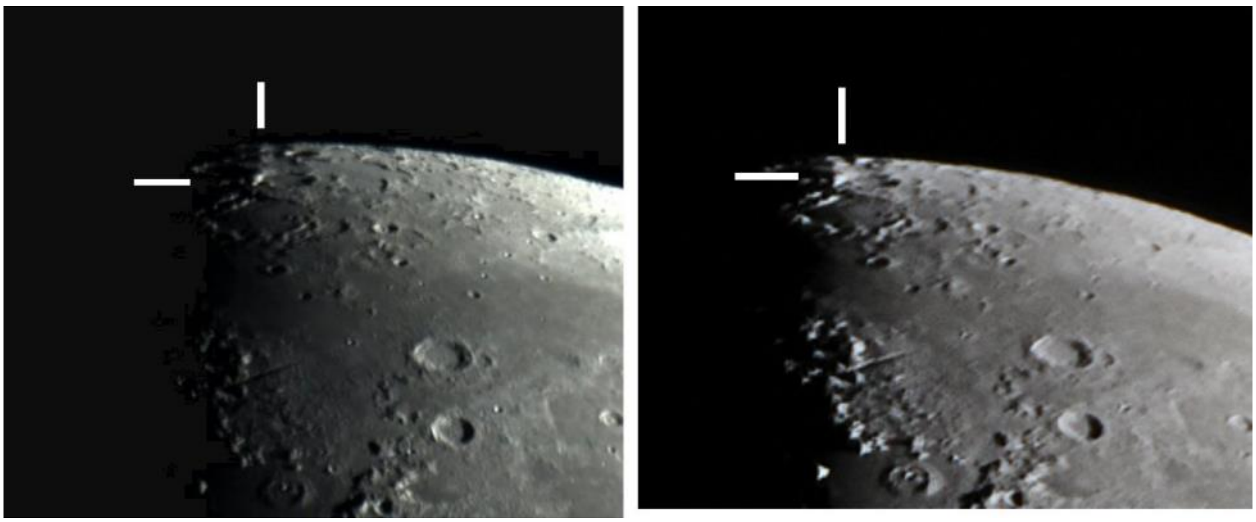


Figure 1. *Barrow Crater, orientated with north towards the top. The west rim has been indicated by tick marks.* ***(Left)*** *As imaged by Anthony Cook on 2024 May 15 – captured from a single frame in a video sequence.* ***(Right)*** *As imaged by Maurice Collins on 2020 Jun 28 UT 06:50.*

LTP Reports Received

One routine query was received from Trevor Smith (BAA) concerning Barrow crater on 2024 May 15 UT 20:30-21:00. He noted that there was an excessively bright slightly elongated. tear drop shaped, patch of white light orientated NE-SW near Moon's northern cusp, on NW rim of Barrow crater. The area affected was approximately 10 x 5 km and was thinnest in the south and far brighter than anything else in the area. A color image (Fig 1 – Left) taken independently by A.C. Cook (Newtown, Wales, UK) confirmed the appearance and that it appeared even brighter than Mons Piton. For comparison, a similar colongitude image (albeit different libration) was found in the archives (Fig 1 – Right) where Mons Piton is perhaps slightly brighter than the west rim of Barrow and WC Bond's west rim was brightening up. I think in view of this it is reasonable just to assume that what Trevor saw was a sunlit slope, just at the right illumination and viewing angle to outshine Mons Piton at sunrise. However, he was right to flag this up. It will receive a weight of 0 in the ALPO/BAA LTP catalog as we like to keep a record of things that were not LTP, but nevertheless unusual in appearance.

Routine reports received for March included: Paul Abel (Leicester, UK – BAA) observed Rima Hyginus and Triesnecker. Leo Aerts (Belgium - BAA) imaged: Alphonsus, Archimedes, Arzachel, Boussingault, Clavius, Copernicus, Cyrillus, Deslandres, Janssen, Lambert, Longomontanus, Mare Tranquillitatis, Mare Imbrium, Mare Insularum, Montes Teneriffe, Moretus, Regiomontanus, Rupes Recta, the south pole area, Posidonius, Theophilus, Tycho and Vallis Alpes. Jay Albert (Lake Worth, FL, USA - ALPO) observed: Cichus, Mons Piton and Plato. Alberto Anunziato (Argentina – SLA) observed: Alphonsus, Aristarchus and Torricellli B. Bob Bowen (Ynyslas, UK – NAS) imaged: several features. Jairo Chavez (Colombia – SLA) imaged: the penumbral lunar eclipse. Maurice Collins (New Zealand - ALPO/BAA/RASNZ) imaged: Clavius, Copernicus, Gassendi, Plato, Schiller and several features. Walter Elias (Argentina – AEA) imaged: Aristarchus and Copernicus. Dave Finnigan (Halesowen, UK – BAA) imaged: Albetegnius, Alphonsus, Arzachel, Eratosthenes, Mons Wolf, Ptolemaeus, Rima Bradley and Rima Hadley. Valerio Fontani (Italy – UAI) imaged: Mutus F. Bill Leatherbarrow (Sheffield, UK – BAA) imaged: Abulfeda, Albategnius, Apianus, Aristillus, Aristotles, Cassini, Curtius, Hipparchus, Lacus Doloris, Licetus, Meton, Schomberger, Stofler and Triesnecker. Luigi Morrone (Italy – BAA) imaged: Agatharchides, Clavius, Copernicus and Plato. Raúl Roberto Podestá (Argentina – SLA) imaged the penumbral lunar eclipse. Trevor Smith (Codnor, UK – BAA) observed: Aristarchus, Mare Crisium, Mons Piton, the lunar North East limb, and the West limb. Aldo Tonon (Italy – UAI) imaged: Eratosthenes, and Tycho. Gonzalo Vega (Argentina – AEA) imaged Aristarchus. Luigi Zanatta (Italy – UAI) imaged: Tycho.

Note that we I have included some BAA pooled observations in with this report.

Analysis of Routine Reports Received (March)

Mons Pico: On 2024 Mar 09 UT 19:32 Leo Aerts imaged the Montes Teneriffe area of the Moon under similar illumination to the following video report from 1987:

On 1987 Mar 09 at UT20:00 M. Mobberley (Sussex, UK) obtained some video of Mons Pico - apparently these show the mountain with a puzzling appearance. The Cameron 2006 catalog ID=300 and the weight=5. ALPO/BAA=1.

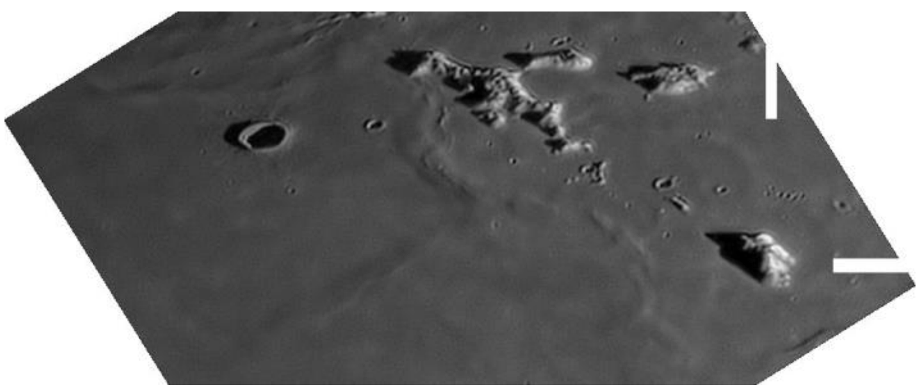


Figure 2. *Mons Pico as indicated by the tick marks, from a much larger image obtained by Leo Aerts (BAA) taken on 2024 Mar 19 UT 19:32. The image has been truncated and re-orientated with north towards the top.*

Fig 2 is what Martin Mobberley should have seen in his video recording from back in 1987. According to communications received from Martin, the VHS tape recording was forwarded to the BAA LTP coordinator, Peter Foley, but was never returned, and we don't appear to have this in our archives – so it's location, and whatever was captured, remains an enigma. But at least Fig 2 shows us what the mountain normally looks like at this colongitude, and there is nothing that I can see which is puzzling. We shall leave the weight of the 1987 LTP report at 1 for now.

Mutus F: On 2024 Mar 14 UT 21:29 and 21:53 Valerio Fontani imaged this crater for the following Lunar Schedule request:

BAA Request: Can you see, or image, 4 points of light in the shadowed floor of the crater? How do these change in appearance over time? This is not a LTP but is still interesting to observe as it might look like a string of pearls effect. Please send any images, or sketches, to: a t c @ a b e r . a c. u k

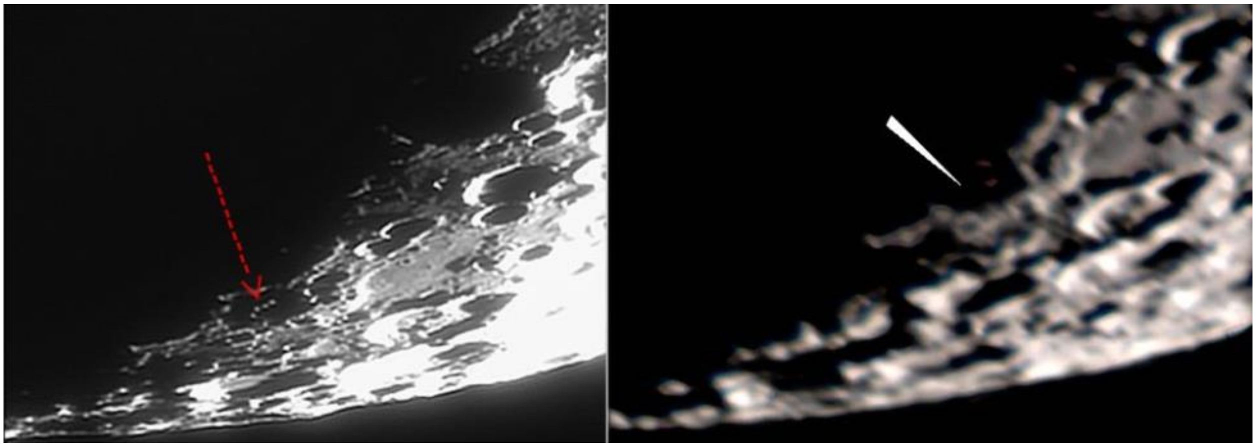


***Figure 3**. Images of the southern tip of the lunar crescent with arrows pointing at the location of Mutus F. North is towards the top. **(Left)** An image taken by Robert Spellman (ALPO) on 2005 Jan 15 UT 01:25. **(Right)** An image by Valerio Fontani (UAI) taken on 2024 Mar 14 UT 21:53.*

Although not a LTP, a ring of pearl-like effect was imaged by Robert Spellman back in 2005 (Fig 3 – Left). The Lunar Schedule website, like LTP predictions has a tolerance, and I think on this occasion Valerio did their best at imaging, but probably a few more minutes were needed before the rim of Mutus F would come into view. It's important to predict these effects as some LTP in the past could be explained by similar illumination.

Promontorium Agassiz: On 2024 Mar 17 UT 18:51 Bill Leatherbarrow (BAA) imaged the Cassini area and this included Promontorium Agassiz under similar illumination to the following report:

On 1888 Jul 16 at UT 05:35? Holden, at Lick observatory, CA, USA saw a "Lunar Volcano, 1st magnitude star on the dark side. Yellow light tinged with red from refractor's secondary spectrum (facet glint? or peak catching sun before others? Hunt saw similar phenomenon in 1863." Corliss states that it was later revealed to be a mountain ridge near the southern termination of the Alpes. Cameron 1978 catalog ID=357 and weight=1. ALPO/BAA weight=1.

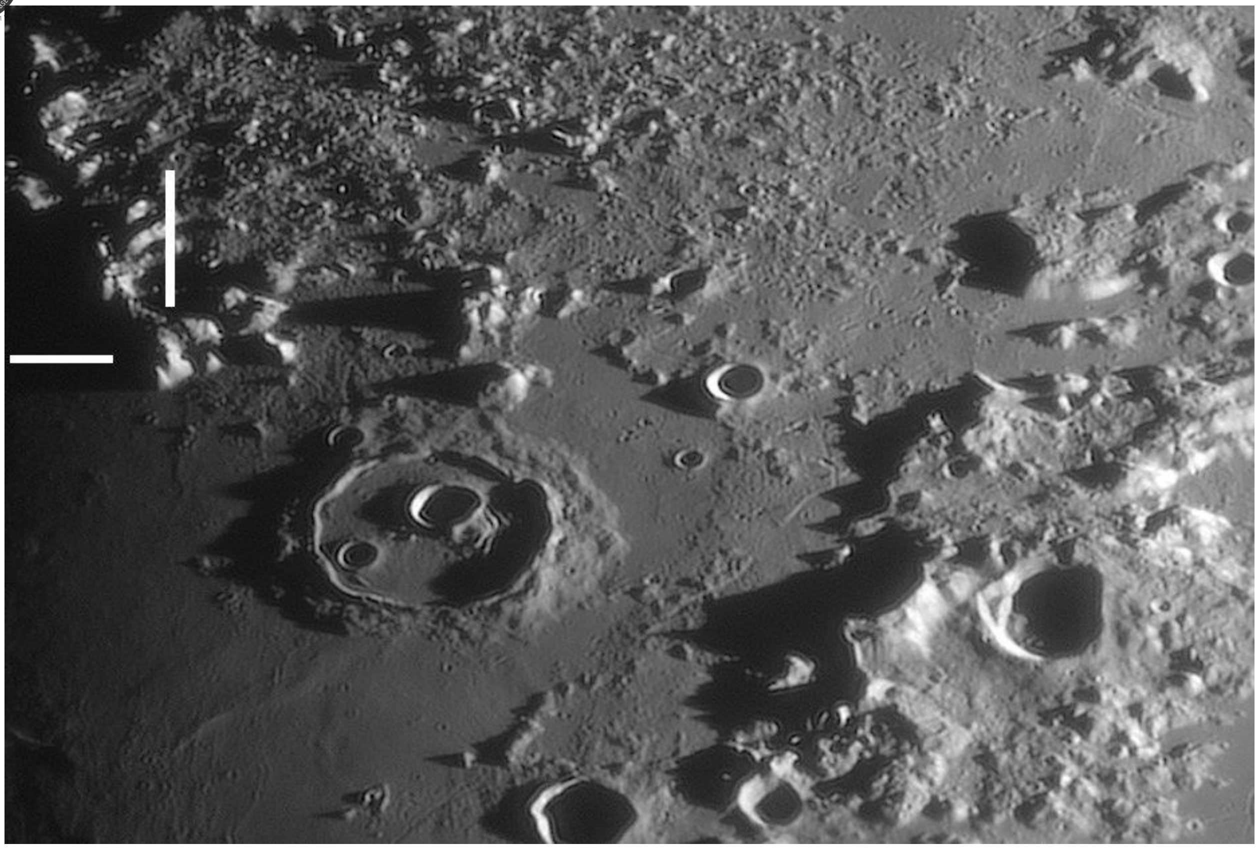


Figure 4. *Promontorium Agassiz as Indicated by the tick marks in this image of the Cassini area imaged by Bill Leatherbarrow on 2024 Mar 17 UT 18:51. North is towards the top.*

Promontorium Agassiz is not especially bright here in Fig 4, but the tolerance threshold of the similar illumination predictions is ±0.5˚, and so it is quite possible that at some point within the colongitude range, and allowing for slope effects with libration, that Promontorium Agassiz could indeed be quite bright, and as Holden says, with the chromatic aberration effect on the Lick refractor, and maybe with seeing effects it could easily appear as a "lunar volcano" appearance, without being an actual volcano. I am tempted to lower the weight to 0, but would like to encourage others to have a go at catching this area, with refractors, and possibly under poor seeing in order to see if we can replicate the Lick telescope results.

Mons Piton: On 2024 Mar 17 UT 21:00-21:40 Trevor Smith (BAA) observed and imaged the Mons Piton area under similar illumination to the following report:

Mons Piton 1843 Jul 04 UT 21:15-22:00 Observed by Gerling (Germany?) "Bright pt. glowing like a star on the S. extension of the Alps. On the following eve. found a small mt. which he did not see before." NASA catalog weight=1. NASA catalog ID=122. ALPO/BAA weight=1.

Figure 5. *The bright mountain just below the center of this image is Mons Piton. It was imaged by Trevor Smith (BAA) on 2024 Mar 17 UT 21:13. North is towards the top.*

Trevor was using a 16-inch Newtonian under poor seeing conditions and a hazy sky at times. He commented that under low magnification, Mons Piton did indeed have the appearance of a bright star (see Fig 5), but when you increased the magnification, it had the obvious shape of an isolated mountain peak emerging from shadow. Trevor commented that he has seen it like this many times before and does not think it unusual. We shall lower the weight of this LTP report from 1 to 0 and remove it from the ALPO/BAA LTP catalog.

Alphonsus: On 2024 Mar 18 Leo Aerts imaged at 18:53 and David Finnigan (BAA) imaged at 20:32 this crater under similar illumination to the following report:

Alphonsus 1966 Apr 28 UT 21:58 Observed by Smith (England, 10" reflector) and Corralitos Observatory (Organ Pass, NM, USA, 24" reflector + Moon Blink) "Reddish patches, (not confirmed at Corralitos with MB tho they give feature as Gassendi in their report)." NASA catalog weight=2. NASA catalog ID #930. ALPO/BAA weight=1.

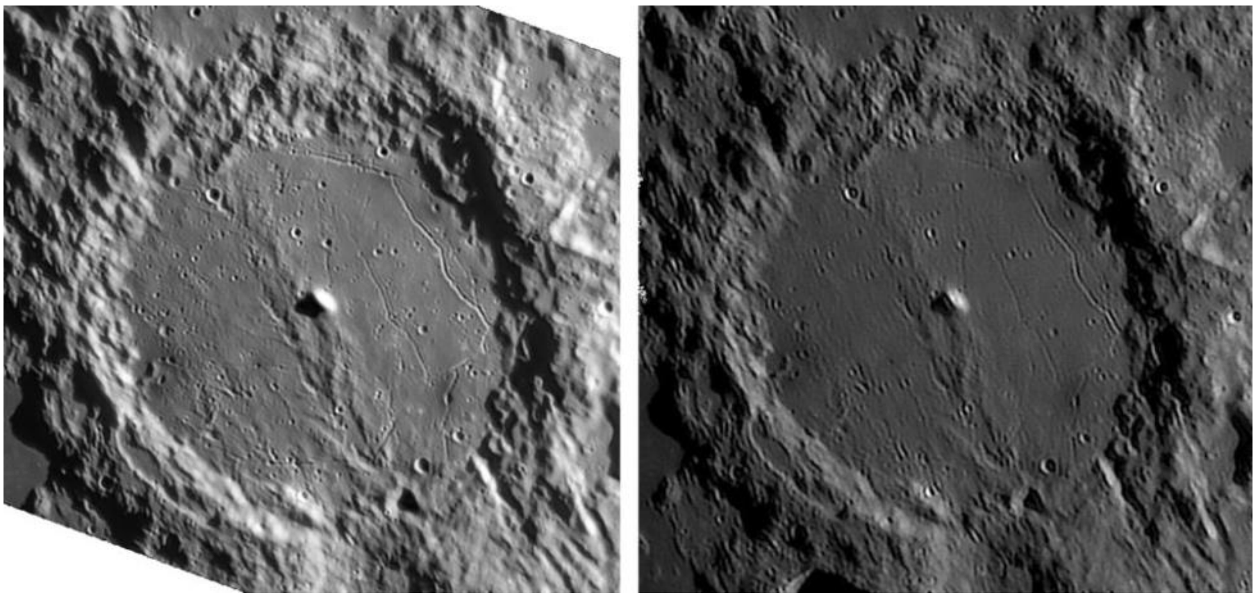


Figure 6. *Alphonsus on 2024 Mar 18 orientated with north towards the top.* ***(Left)*** *Image by Leo Aerts taken at 18:53UT.* ***(Right)*** *Image taken by Dave Finnigan (BAA) at 20:32 UT.*

Although both Leo and Dave imaged in monochrome, Fig 6 shows in a wealth of detail what the crater floor should have looked like on the night of 1966 Apr 28. Leo's image is slightly more detailed in general, but Dave's image shows more detail on the brightest areas and also minor changes in illumination appearance in the 97 minutes between the images. Both images can be used in future to simulate atmospheric spectral dispersion and potential chromatic aberration in the telescope eyepiece for the report of a suspected reddish area to the SE flank of the central peak (according to the BAA Lunar Section Circular Vol 1, No. 8 p4). We shall leave the ALPO/BAA weight at 1 for now.

Tycho: On 2024 Mar 18 UT 19:09 and 21:29 UAI observers Luigi Zanatta and Aldo Tonon respectively imaged the interior of shadow filled Tycho crater for the following Lunar Schedule request:

BAA Request: How early can you see the central peak of this crater illuminated by scattered light off the crater's west illuminated rim? High resolution and/or long exposures needed to capture detail inside the floor shadow. All images should be sent to me on the email address below, whether or not you were successful in capturing the central peak: a t c @ a b e r . a c. u k

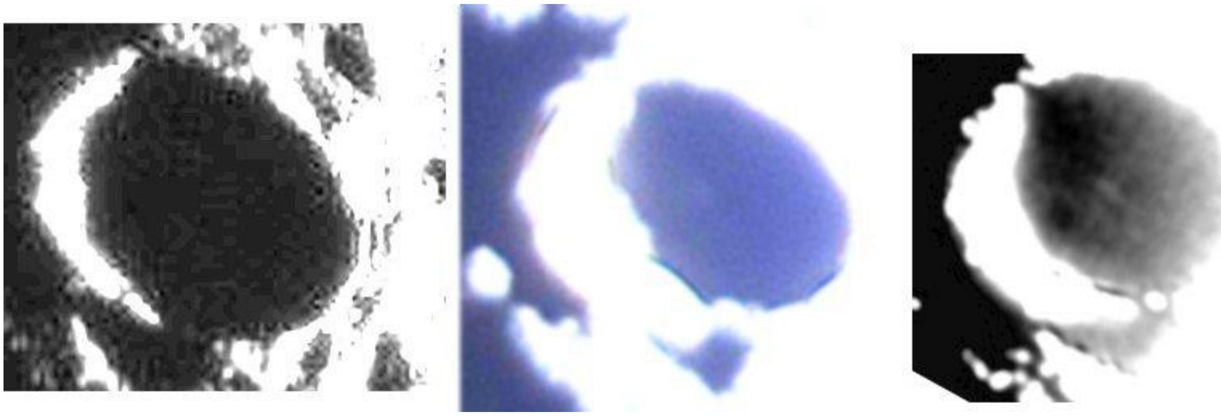


Figure 7. *Highly contrast stretched images of Tycho, orientated with north towards the top.* ***(Left)*** *An image by Luigi Zanatta (UAI) taken on 2024 Mar 18 at 19:09UT.* ***(Center)*** *An image taken by Aldo Tonon (UAI) on 2024 Mar 18 at 21:29UT.* ***(Right)*** *An image taken by Brendan Shaw (BAA) on 2003 May 09 at 21:09UT.*

The visibility of the central peak in a shadow filled floor of Tycho has been a bit of a puzzle since Brendan Shaw imaged it back in 2003 May 09 UT21:04-21:09 with the Sun at an altitude of just +1.2˚ above the horizon (at the center of the crater), when there can be no direct illumination from the Sun. It is most likely that it was receiving secondary illumination from scattered light off of the western illuminated rim. Secondary illumination, inside crater shadows, has been demonstrated in permanently shadowed craters at the lunar south pole using the Shadowcam experiment on the Korean Pathfinder Lunar Orbiter. However, the effect for the central peak of Tycho occasionally repeats at similarly low solar altitudes, but often does not. On this occasion Luigi imaged the crater when the Sun was +1.3˚ above the floor, but no central peak was visible. At 21:29UT Aldo barely detects (Fig 7 – Center) the central peak when the Sun was as high as +2.2˚ above the horizon, i.e. higher than the original Brendan Shaw image (Fig 7 – Right) when it was +1.2˚. Is the reason why modern era cameras can sometimes, and sometimes not (Fig 7 – Left), detect the central peak, compared to Brendan's 2003 era camera (Fig 7 – Right) down to exposure duration, atmospheric transparency and seeing, earthshine illumination, or is there some other explanation? We will continue to explore this interesting effect.

Cichus: On 2024 Mar 20 UT 01:30-01:45 Jay Albert (ALPO) observed visually this crater (Using a 20cm SCT under 3-4/10 seeing and magnitude 3+ transparency) under both similar illumination and topocentric libration to the following Australian report from 1975:

Cichus 1975 Sep 15 UT 11:15-11:30 G.Ryder (Corinda, Australia, 25cm reflector, x250 & x380, seeing good but with some cloud). The interior W. wall of this crater (on the lip) appeared hazy - difficult to bring detail into focus. Neighbouring craters/detail were sharp. Details in the crater wall interior were starting to become visible as time went on, but it had clouded over by 11:30. A Moon Blink was used but no color was detected. ALPO/BAA weight=1.

Jay, using a not too dissimilar sized scope, found that he could not actually see the crater, and thought that it was beyond the terminator. He noted that the terminator ran along the west edge of Mare Nubium, a little west of Kies and along the Rupes Mercator. He could not locate Capuanus either. As sometime happens with observers who live away from the central meridian of Greenwich, they can sometimes get the day number wrong – maybe that is what happened back in 1975? We have covered this 1975 event before in the 2021 Jun newsletter. I shall leave the weight of this report at 1 for now and investigate possible date issues.

Proclus: On 2024 Mar 20 UT 08:14 Maurice Collins imaged the whole Moon under similar illumination to the following report:

On 1982 Feb 03 M.C. Cook (Frimley, UK) got an abnormally low brightness reading for Proclus, despite nearby Censorinus being normal. Crater Extinction Device used. The Cameron 2006 Extension catalog ID was 163 and the weight was 3. The ALPO/BAA weight was 2.

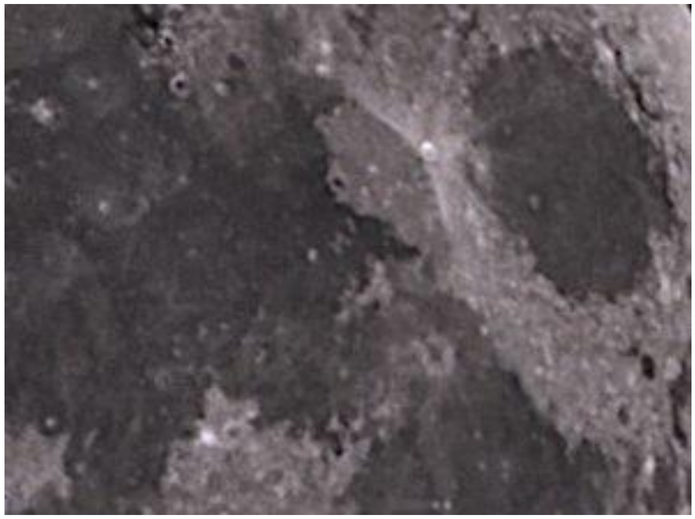


Figure 8. *Proclus and Censorinus, from a larger Moon image, obtained by Maurice Collins (ALPO/BAA/RASNZ) on 2024Mar23 UT 18:14 and re-orientated with north towards the top.*

Looking at Fig 8 visually it appears that most of the area of Proclus is fainter than Censorinus, but the northern rim of Proclus 90 be on equal terms, maybe slightly brighter than Censorinus. Using the digital number values in the image, the N rim of Proclus is of the order of DN=240 whereas the brightest area of Censorinus is around DN=235, so they are almost on parity here in terms of brightness, quite different to what Marie Cook reported back in 1982. However, a proper test would be to observe under similar topocentric libration too as slope angles of crater rims can make a difference. We shall leave the weight of this 1982 report at 2 for now.

Plato: On 2024 Mar 20 UT 18:48 Luigi Morrone (BAA) imaged this area of the Moon under similar illumination to the following report:

Plato 2006 Feb 08 - C. Brook of Plymouth UK, using a 4" refractor x216, noticed at UT 20:10 dark patches coming and going (in terms of visibility) on the floor of Plato. Occasional views of the central craterlet (seen as a white spot) were glimpsed. The dark patches seen lasted about 1-2 seconds before fading out during each visibility cycle. Teneriffe Mountains were checked but no sign of seeing effects that might explain the dark floor patches. By 20:26UT the dark patch effect was fading and by 20:31UT floor detail was visible. Observations ceased at UT 20:34. Seeing conditions were II and the Moon was at a high altitude. Other observers were alerted but came on-line after the effect had finished. ALPO/BAA weight=2.

Figure 9. *Plato as imaged by Luigi Morrone (BAA) on 2024 Mar 20 UT 18:48 and orientated with north towards the top. The inset in the bottom left is a highly contrast stretched version of the floor of the crater which has been blurred to illustrate the effects of atmospheric seeing conditions.*

Well Luigi's image (Fig 9) certainly shows the central craterlet, and one could imagine that back in 2006 that central craterlet would be only visible at times when the seeing conditions allowed. The blurred and contrast stretched insert does show dark patches on the floor but whether these are the ones that Clive Brook was talking about is uncertain. As they are large areal features, their visibility should be independent of seeing conditions but could be affected by changing transparency in that you need a good contrast image in order to see them. I think that I will lower the ALPO/BAA weight to 1.

Aristarchus: On 2024 Mar 23 Walter Elias (AEA) imaged this crater under similar illumination to the 1973 report below and similar illumination and topocentric libration to the 1975 report below:

On 1973 Dec 8 UT18:15-18:20 R.Billington (UK, 2" refractor) reported that Aristarchus was orange. However, 15 minutes earlier, another observer, Livesey made a sketch and did not report any color. ALPO/BAA weight=1.

Aristarchus 1975 Oct 18 UT 20:00? Observed by Foley (Kent, England, 12" reflector) "Deep blue-viol. spot in NW (IAU?) interior corner." NASA catalog weight=3, NASA catalog ID #1415. ALPO/BAA weight=3.

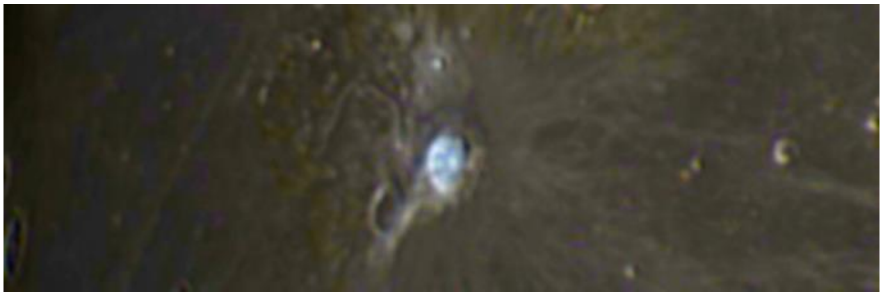


Figure 10. *Aristarchus as imaged by Walter Elias (AEA) on 2024 Mar 23 UT 23:18 and orientated with north towards the top. Note that I have increased the color saturation to 5.0 using the GIMP image processing program in order to enhance any colors present.*

Figure 10 shows no sign of orange except outside the S-E ejecta blanket and no deep blue violet spot in the NW of the crater. We shall therefore leave the weights as they are for both the LTP reports.

Penumbral Lunar Eclipse: On 2024 Mar 25 two observations were submitted, via Alberto Anunziato (SLA) from two of his observers: Jairo Chavez and Raúl Roberto Podestá. There are many LTP reports associated with lunar eclipses. If I were to list them, here they would take up several pages, so for now will just show Jario's and Raúl's images (Fig 11) and suffice to say I cannot see anything unusual in them. On the other hand, this was a penumbral eclipse, which means it is difficult to see a clear obvious shadow.

Figure 11. *The penumbral eclipse of the Moon on 2024 Mar 25, orientated with north towards the top.* ***(Left)*** *Image by Jairo Chavez (SLA) taken at 06:06UT.* ***(Right)*** *image by Raúl Roberto Podestá (SLA) taken at 07:11 UT.*

Both images in Fig 11 were before the maximum extent of the penumbral eclipse at 07:14UT, Raúl's being the closest. There is a definite brightness gradient from north to south – north largely unaffected, and in the south, normally bright craters such as Tycho and Hell were losing their contrast. Aristarchus comes across as one of the brightest features, rivalling Proclus and Censorinus. Part of Proclus is certainly as bright as Aristarchus but overall, the larger areal extent of Aristarchus, at a large brightness, makes it look brighter overall to the eye. So, what might this tell us about past LTP reports during eclipses involving Aristarchus? I think it tells us that the brightness gradient in eclipse shadows makes it very difficult to be objective for visual observers to subjectively say that the crater is unusually bright. Instead, we need to be looking at modelling the shadow to compensate for shadow density gradients. If this effect shows up in comparatively weak penumbral eclipse shadows, imagine how pronounced this would be in darker umbral shadows.

Torricelli B: On 2024 Mar 30 UT 04:08-04:12 Alberto Anunziato (SLA) observed earthshine under a similar lunar phase on the day side of the Moon) to the following report:

On 1985 May 09/10 at UT 22:50-03:10 P.W. Foley (Kent, UK) found that Torricelli B was very bright in Earthshine and was blue in color. The Cameron 2006 catalog ID=272 and the weight=2. The ALPO/BAA weight=2.

Alberto, using a Meade EX 105 at a magnification of x154 could not see Torricelli B. Oddly the phase of the Moon was 70%, and past Full Moon, so earthshine should not have been visible to Peter Foley back in 1985, though he might have just meant the night side?

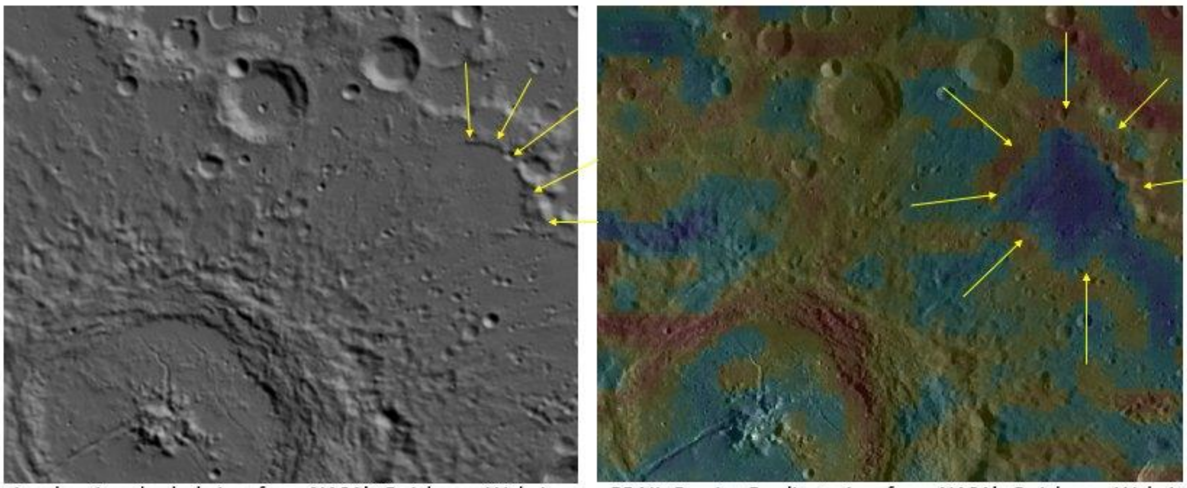
General Information: For repeat illumination (and a few repeat libration) observations for the coming month - these can be found on the following web site: http://users.aber.ac.uk/atc/lunar_schedule.htm . By re-observing and submitting your observations, only this way can we fully resolve past observational puzzles. If in the unlikely event you do ever see a LTP, firstly read the LTP checklist on http://users.aber.ac.uk/atc/alpo/ltp.htm , and if this does not explain what you are seeing, please give me a call on my cell phone: +44 (0)798 505 5681 and I will alert other observers. Note when telephoning from outside the UK you must not use the (0). When phoning from within the UK please do not use the +44! Twitter LTP alerts can be accessed on https://twitter.com/lunarnaut .

Dr Anthony Cook, Department of Physics, Aberystwyth University, Penglais, Aberystwyth, Ceredigion, SY23 3BZ, WALES, UNITED KINGDOM. Email: atc @ aber.ac.uk

Basin and Buried Crater Project

Coordinator Dr. Anthony Cook- atc@aber.ac.uk

This month I thought that I would pick another suspected buried crater at random from the buried crater database and see what we can learn about it. QCMA 88 is located at 66.3˚E, 21.2˚S and has an estimated diameter of 62 km according to: Evans, A. J., J. M. Soderblom, J. C. Andrews-Hanna, S. C. Solomon, and M. T. Zuber (2016), Identification of buried lunar impact craters from GRAIL data and implications for the nearside maria, Geophys. Res. Lett., 43, 2445–2455, doi:10.1002/2015GL067394.



Lambertian shaded view from NASA's Quickmap Website GRAIL Gravity Gradient view from NASA's Quickmap Website

Figure1 *The location of QCMA 88 as indicated by arrows. Details of the datasets involved are given under each image.*

Unlike some of the buried craters that we have tried to find in the past, QCMA 88 has both a partial physical rim, covering about a quarter of its circumference (Fig 1 – Left), and a respectable gravity gradient signature (Fig 1 – Right). I did try the azimuth slope plot from Quickmap, which usually works, but on this occasion was not much help. The diameter that Evans *et al* give, of 62km looks reasonable, though the centre of the crater is more like 66.4˚E 20.9˚S, based upon the gravity gradient data. A weight of 5 out of 10 seems appropriate based upon what is left of the physical rim, and the strength of the gravity gradient. Anyway, if you wish to go and take a look for QCMA 88, it is located just north east of Petavius, but may prove a challenge as its out in the limb area of the Moon and so will be affected in appearance by libration.

If you think that you have discovered a new impact basin, or unknown buried crater, please check whether it has been found previously on the following web site, and if not email me its location and diameter so that I can update the list.

https://users.aber.ac.uk/atc/basin_and_buried_crater_project.htm.

Alternatively, if you want an observational challenge, try to see if you can image one of more of the basins or buried craters at sunrise/set and establish what colongitude range they are best depicted at. Or you can even do this "virtually" with LTVT software. As you can see from the tables on the web sites there are lot of blank cells to fill in on the sunrise and sunset colongitude columns – so a good opportunity for you to get busy!

Lunar Calendar June 2024

Date	UT	Event
1	0300	Neptune 0.02° north of Moon, occultation Southern Africa to Southern Asia
2	0308	Moon at ascending node
3	0000	Mars 2.0° south of Moon
3	0700	Moon at perigee 368,102 km
5	0900	Moon 0.4° south of Pleiades
5	1400	Jupiter 5° south of Moon
6		New Moon (lunation 1255)
8		Greatest northern declination +28.3°
9		East limb most exposed +5.3°
9		South limb most exposed -6.6°
9	0800	Pollux 1.7° north of Moon
13	0900	Juno 0.5° north of Moon, occultation India to Australasia
14	0518	First Quarter Moon
14		Moon at apogee 404,076 km
15	2017	Moon at descending node
16	1800	Spica 1.2° south of Moon, occultation Svalbard to Central Asia
20		Antares 0.2° south of Moon, occultation China to Polynesia
21		West limb most exposed -5.4°
22		Greatest southern declination -28.3°
22	0108	Full Moon
23		North limb most exposed +6.5°
23	0500	Ceres 1.0° south of Moon, occultation North America to Azores
27	1500	Saturn 0.08° south of Moon, occultation Australia to North America
28	0900	Neptune 0.3° north of Moon, occultation Easter Island to Europe
28	2153	Last Quarter Moon
29	0426	Moon at ascending node

AN INVITATION TO JOIN THE A.L.P.O.

The Lunar Observer is a publication of the Association of Lunar and Planetary Observers that is available for access and participation by non- members free of charge, but there is more to the A.L.P.O. than a monthly lunar newsletter. If you are a non-member you are invited to join our organization for its many other advantages.

We have sections devoted to the observation of all types of bodies found in our solar system. Section coordinators collect and study members' observations, correspond with observers, encourage beginners, and contribute reports to our Journal at appropriate intervals.

Our quarterly journal, *The Journal of the Association of Lunar and Planetary Observers-The Strolling Astronomer*, contains the results of the many observing programs which we sponsor including the drawings and images produced by individual amateurs. Additional information about the A.L.P.O. and its Journal is on-line at: **http://www.alpo-astronomy.org**. I invite you to spend a few minutes browsing the Section Pages to learn more about the fine work being done by your fellow amateur astronomers.
To learn more about membership in the A.L.P.O. go to: **http://www.alpo- astronomy.org/main/member.html** which now also provides links so that you can enroll and pay your membership dues online.

SUBMISSION THROUGH THE ALPO IMAGE ARCHIVE

ALPO's archives go back many years and preserve the many observations and reports made by amateur astronomers. ALPO's galleries allow you to see on-line the thumbnail images of the submitted pictures/observations, as well as full size versions. It now is as simple as sending an email to include your images in the archives. Simply attach the image to an email addressed to

lunar@alpo-astronomy.org (lunar images).

It is helpful if the filenames follow the naming convention :

FEATURE-NAME_YYYY-MM-DD-HHMM.ext

YYYY {0..9} Year

MM {0..9} Month

DD {0..9} Day

HH {0..9} Hour (UT)

MM {0..9} Minute (UT)

.ext (file type extension)

(NO spaces or special characters other than "_" or "-". Spaces within a feature name should be replaced by "-".)
As an example the following file name would be a valid filename:

Sinus-Iridum_2018-04-25-0916.jpg
(Feature Sinus Iridum, Year 2018, Month April, Day 25, UT Time 09 hr16 min)

Additional information requested for lunar images (next page) should, if possible, be included on the image. Alternatively, include the information in the submittal e-mail, and/or in the file name (in which case, the coordinator will superimpose it on the image before archiving). As always, additional commentary is always welcome and should be included in the submittal email, or attached as a separate file.

If the filename does not conform to the standard, the staff member who uploads the image into the data base will make the changes prior to uploading the image(s). However, use of the recommended format, reduces the effort to post the images significantly. Observers who submit digital versions of drawings should scan their images at a resolution of 72 dpi and save the file as a 8 1/2"x 11" or A4 sized picture.

Finally a word to the type and size of the submitted images. It is recommended that the image type of the file submitted be jpg. Other file types (such as png, bmp or tif) may be submitted, but may be converted to jpg at the discretion of the coordinator. Use the minimum file size that retains image detail (use jpg quality settings. Most single frame images are adequately represented at 200-300 kB). However, images intended for photometric analysis should be submitted as tif or bmp files to avoid lossy compression.

Images may still be submitted directly to the coordinators (as described on the next page). However, since all images submitted through the on-line gallery will be automatically forwarded to the coordinators, it has the advantage of not changing if coordinators change.

ATTENTION ALL CONTRIBUTORS
Effective Immediately (March 1, 2024)

While it is a great honor to put together The Lunar Observer, we are now overwhelmed by our success with some issues in excess of 200 pages.

The increased time it requires for me to perform this job (as a volunteer) pulls me away from my own family and other obligations. Thus, the following rules are being implemented to improve content flow on my end and provide you with the criteria needed to make the "TLO" even more professional in appearance and subject matter.

1. **Review your image(s) at your location before submitting it/them, then brighten or darken it/them as needed and if required, using whatever tools you have at hand. Images deemed unsuitable (including blurry, out-of-focus or "clouded-out" images) will either be returned for your attention or simply not used.**
2. **Images in jpeg format are preferred but others are also acceptable.**
3. **Crop your images to avoid jagged edges.**
4. **Orient the image so it makes the most sense. North at the top (with Mare Crisium at the upper right) is preferred but not required. To our many wonderful southern hemisphere contributors, please orient as you wish (probably south at top).**
5. **Be very limited on end-of-the-month submissions.**
6. **CHOOSE ONLY YOUR BEST IMAGES and limit the number to no more than eight (8) per each issue of the TLO. (obviously, if there is an article you are writing or contributing to this does not apply).**
7. **The image filename should be submitted with the object name spelled correctly, then the year-month-day-hour-minutes-Your Name or initials So, my image of Copernicus should have a file name of:**

Copernicus_2023-08-31-2134-DTe
means
Copernicus, 2023 August 31, 21:34 UT by David Teske

If we all do this going forward, it should make putting this all together faster and easier. Many of you already do this. Thank you for your contributions and your help. We have a premier lunar resource for the planet.

Please send images/drawings/text to drteske@yahoo.com

ATTENTION ALL CONTRIBUTORS

Effective Immediately (March 1, 2024)

In his efforts to make our organization as professional as possible, the late Walter Haas, the founder of the ALPO, urged that all image and sketch CAPTIONS be as complete as possible. This could enable others to perform their own observations using as much of the original caption data as possible to obtain the same or at least similar results. And while not everyone can provide every detail, we request the following in your captions:

1. Name of feature or object followed by name of imager and their specific location (including geographical coordinates if readily available).
2. Date and Universal Time when image was captured (or sketch was completed) using either the three-letter abbreviation or full spelling of the month to avoid possible month-and-date or date-and-month confusion.
3. Sky seeing (steadiness) conditions (0 = Worst and 10 = Perfect).
4. Sky transparency (opacity of the atmosphere) conditions (poor to good)
5. Intensity conditions (Standard ALPO Scale of Intensity: 0.0 = Completely black and 10.0 = Very brightest features, Intermediate values are assigned along the scale to account for observed intensity of features).
6. Equipment details (including instrument type, brand is optional) and aperture size (inches or mm/cm); telescope mount data (if applicable), camera brand and type, filter data (if applicable), as much exposure data as available (sketchers should provide other pertinent data).
7. Capturing, exposure and processing software data.
8. Personal comments about specific features including north (or south) in the image (sketch), markings and all other items pertinent to the subject being presented.
9. Any other pertinent comments.
10. Email or other contact information.

Below are two sample captions. Both at least attempt to follow the above-stated guidelines

Meton Region as imaged by Massimo Dionisi of Sassari, Italy (10°43’26” N, 8° 33’9” E), on 2024 January 30, at 00:03 UT. Equipment details: Sky Watcher 250 mm, f/4.8 reflector telescope, Tecnosky ADC, Celestron X-cel LX 3x Barlow lens, effective focal length = 4,750 mm, 685 nm IR pass filter, Neptune-M camera, Skywatcher EQ6-R Pro mount. Seeing conditions = III-to-IV (Antoniadi scale). Software details: SharpCap 4.0 acquisition (mono), AutoStakkert! 3.1.4 ELAB, Registax Wavelets.

Lunar craters Hausen and Bailly D as imaged by István Zoltán Földvári of Budapest, Hungary on 2020 April 07, at 21:03-21:17 UT. Colongitude 86.5°. Equipment details: 70 mm refractor telescope, f/l = 500 mm, Vixen Lanthanum LV 4mm eyepiece, 125x, Baader Contrast Booster Filter. Sky seeing = 7 out of 10, sky transparency = 6 out of 6.

When submitting observations to the A.L.P.O. Lunar Section

In addition to information specifically related to the observing program being addressed, the following data should be included:

Name and location of observer
Name of feature
Date and time (UT) of observation (use month name or specify mm-dd-yyyy-hhmm or yyyy-mm-dd-hhmm)
Filter (if used)
Size and type of telescope used Magnification (for sketches)
Medium employed (for photos and electronic images)
Orientation of image: (North/South - East/West)
Seeing: 0 to 10 (0-Worst 10-Best)
Transparency: 1 to 6

Resolution appropriate to the image detail is preferred-it is not necessary to reduce the size of images. *Additional commentary accompanying images is always welcome.* **Items in bold are required. Submissions lacking this basic information will be discarded.**

Digitally submitted images should be sent to:
David Teske – david.teske@alpo-astronomy.org
Alberto Anunziato–albertoanunziato@yahoo.com.ar
Wayne Bailey—wayne.bailey@alpo-astronomy.org

Hard copy submissions should be mailed to David Teske at the address on page one.

CALL FOR OBSERVATIONS:
FOCUS ON: Mare Nectaris

Focus on is a bi-monthly series of articles, which includes observations received for a specific feature or class of features. The subject for the July 2024, will be Mare Nectaris. Observations at all phases and of all kinds (electronic or film based images, drawings, etc.) are welcomed and invited. Keep in mind that observations do not have to be recent ones, so search your files and/or add these features to your observing list and send your favorites to (both):

Alberto Anunziato – albertoanziato@yahoo.com-ar
David Teske – david.teske@alpo-astronomy.org

Deadline for inclusion in the Mare Nectaris Focus-On article is June 20, 2024

FUTURE FOCUS ON ARTICLES:

In order to provide more lead time for contributors the following future targets have been selected:

Subject	TLO Issue	Deadline
Mare Nectaris	**July 2024**	**June 20, 2024**
Aristoteles and Eudoxus	**September 2024**	**August 20, 2024**
Archimedes Region	**November 2024**	**October 20, 2024**
Anaxagoras	**January 2025**	**December 20, 2024**
Clavius	**March 2025**	**February 2025**

Focus-On Announcement
Mare Nectaris: A Small Basin Full Of Wonders

Mare Nectaris is one of the smallest maria on the Moon, but also one of the most varied. It would be very interesting to receive your best images of the most notorious features of Mare Nectaris: the heights of Rupes Altai, Mädler and his complicated design of bright lines (rays or elevations?), the complicated topographies of Fracastorius, Gaudibert and Piccolomini, the rilles, wrinkle ridges and chains of craters that we can find; and, of course, the fantastic trio of Theophilus, Cyrillus and Catherina. And thus take a circular walk through a fairly identifiable basin and understand a little more about its geology and landscape.

FOCUS ON MAY 2024: Due April 20, 2024: CHAIN OF CRATERS

FOCUS ON JULY 2024: Due June 20, 2024: MARE NECTARIS

FOCUS ON SEPTEMBER 2024: Due August 20, 2024: ARISTOTELES AND EUDOXUS

FOCUS ON NOVEMBER 2024: Due: October 20, 2024: ARCHIMEDES, AUTOLYCUS AND ARISTILLUS

FOCUS ON JANUARY 2025: Due December 20, 2024: ANAXAGORAS

FOCUS ON MARCH 2025: Due February 20, 2025: CLAVIUS

FOCUS ON: MAY 2025: Due April 20, 2025: VOLCANIC FEATURES

Francisco Alsina Cardinalli

Focus-On Announcement
Aristoteles and Eudoxus: Similar and Different

The Moon offers us many areas of contrasts, one of them is very close to two areas that we have recently visited in the Focus Section, near Mare Frigoris and Lacus Mortis, two very close giants: the Aristoteles and Eudoxus craters. These two craters, so magnificent and so close, allow an interesting comparison between two geological eras in the same image: the Eratosthenian Aristoteles and the Copernican Eudoxus.

FOCUS ON JULY 2024: Due June 20, 2024: MARE NECTARIS

FOCUS ON SEPTEMBER 2024: Due August 20, 2024: ARISTOTELES AND EUDOXUS

FOCUS ON NOVEMBER 2024: Due: October 20, 2024: ARCHIMEDES, AUTOLYCUS AND ARISTILLUS

FOCUS ON JANUARY 2025: Due December 20, 2024: ANAXAGORAS

FOCUS ON MARCH 2025: Due February 20, 2025: CLAVIUS

FOCUS ON: MAY 2025: Due April 20, 2025: VOLCANIC FEATURES

Germán Savor

Key to Lunar Images In This Issue

1. Bailey
2. Bessel
3. Clavius
4. Crisium, Mare
5. Hercules
6. Hyginus
7. Janssen
8. Lamont
9. Langrenus
10. Messier
11. Metius
12. Nectaris, Mare
13. Nubium, Mare
14. Petavius
15. Philolaus
16. Procellarum, Oceanus
17. Rümker, Mons
18. Sabine
19. Serenitatis, Mare
20. Taruntius
21. Theophilus
22. Tycho