The Lunar Observer

A Publication of the Lunar Section of ALPO
David Teske, editor
Coordinator, Lunar Topographic Studies Section Program

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

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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.

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MARCH 2024

In This Issue

Online readers, click on images for hyperlinks

Lunar Reflections

Greetings to all lunar observers. I hope that you find this issue of *The Lunar Observer* interesting. First off, about that first page of this issue. Please remember that this is a volunteer position. I am needing to limit the number of submissions per observer as time is valuable. Please understand.

We have some interesting articles here. This month marks the 100th month that the Entre Ríos Astronomy Association of Oro Verde, Argentina has contributed material about the Moon to our newsletter. Read about it and view their astronomical outreach on pages 11-13. Also in this month, I received my first image of the Moon taken with a “smart telescope”, a SeeStar 50S. Just a few days later, Greg Shanos sent in an article “Lunar Imaging With the New ZWO SeeStar S50”. Is this the future of amateur astronomy? Also in this issue, Greg Shanos discusses the Lunar X and V, István Zoltán Földvári along with is wonderful drawings sent in a report of new lunar craters named after his Hungarian countrymen, Neil Wiley, a new contributor discussed a recent image of Aristoteles he took and compared it with historical Moon maps, similar in fashion to what Alberto Anunziato did with Eudoxus. Alberto also led us on an exploration of wrinkle ridges in Mare Serenitatis and a most interesting Focus-On article of Lacus Mortis. Jon Bosley, another new contributor, investigated a possible new escarpment near the Lunar South Pole and Paul Walker tours Mare Humorum and the Plato region with some fun topographic studies. As always, Tony Cook has led us on interesting Lunar Geologic Change. Plus, many wonderful lunar images in the Recent Topographic Studies. Thanks 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 (872 views in February!) 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 Chains of Craters. Observations are due to Alberto and myself by April 20, 2023.

Edited by David Teske: david.teske@alpo-astronomy.org
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Back issues: http://www.alpo-astronomy.org/

Lunar Topographic Studies

Coordinator – David Teske - david.teske@alpo-astronomy.org
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Observations Received

Name	Location and Organization	Image/Article
Alberto Anunziato	Paraná, Argentina	Article and drawing *Some Wrinkle Ridges on the Western Shore of Mare Serenitatis,* Drawing of Bürg*, Focus-On: Lacus Mortis, One of the Strangest Looking Parts of the Moon* and *The “Enigmatic Wall” of Trouvelot in Eudoxus*.
Jon Bosley	Central Texas, USA	Article and image *Brisbane H Dorsum (Unofficially) Or Possible Escarpment Fault.*
Francisco Alsina Cardinalli	Oro Verde, Argentina	Images of Mons Piton, Censorinus (4), Hyginus N, Linné, Proclus, Lacus Mortis (4, Theophilus, Chacornac, Copernicus and Plato (2).
Maurice Collins	Palmerston North, New Zealand	Image of the 3.4-day old Moon, 4.4-day old Moon, 6.4-day old Moon, 11.4-day old Moon, Theophilus, Mare Serenitatis and Maurolycus.
Michel Deconinck	Artignosc-sur-Verdon in Provence, France	Drawing of Lacus Mortis.
Jef De Wit	Hove, Belgium	Drawing of Lacus Mortis.
Massimo Dionisi	Sassari, Italy	Images of Sinus Amoris, Posidonius, Aristoteles, Maraldi, Lacus Mortis, Zähringer, Gaudibert, Cauchy, Capella, Bohnenberger, Fracastorius, Fracastorius B, Piccolomini, Theophilus, Gardner and Meton.
Walter Ricardo Elias	Oro Verde, Argentina	Article and image *The AEA Celebrates 100 TLO Numbers*, images of Aristarchus (2), Riccioli and Santbech.
Howard Fink	New York, New York, USA	Model of Lacus Mortis.
István Zoltán Földvári	Budapest, Hungary	Drawings of Amundsen, Baade and Hausen.
Desiré Godoy	Oro Verde, Argentina	Image of Lacus Mortis.
Philippe Heully	Bouère, France	Drawing of Lacus Mortis.
Rik Hill	Loudon Observatory, Tucson, Arizona, USA	Images of Lacus Mortis (11), articles and images *Cracks In the Lake, Aristotele’s Crater* and *The Posidonius Adventure.*

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

Lunar Topographic Studies

Coordinator – David Teske - david.teske@alpo-astronomy.org
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Assistant Coordinator-Wayne Bailey– wayne.bailey@alpo-astronomy.org
Website: http://www.alpo-astronomy.org/

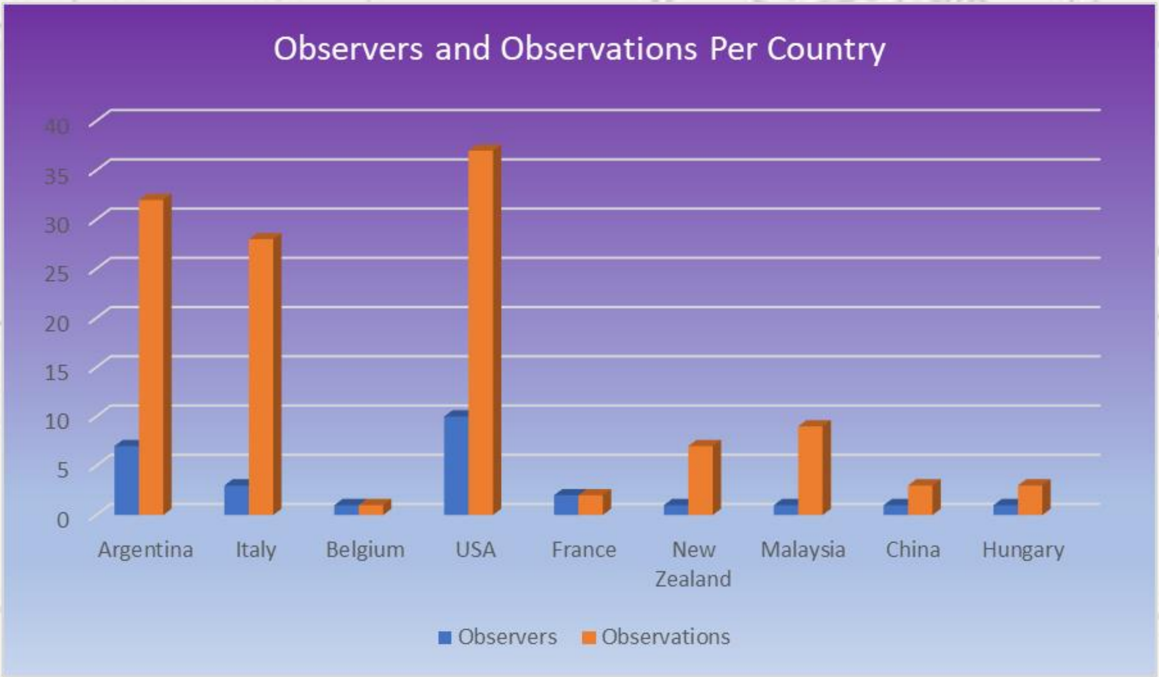
Observations Received

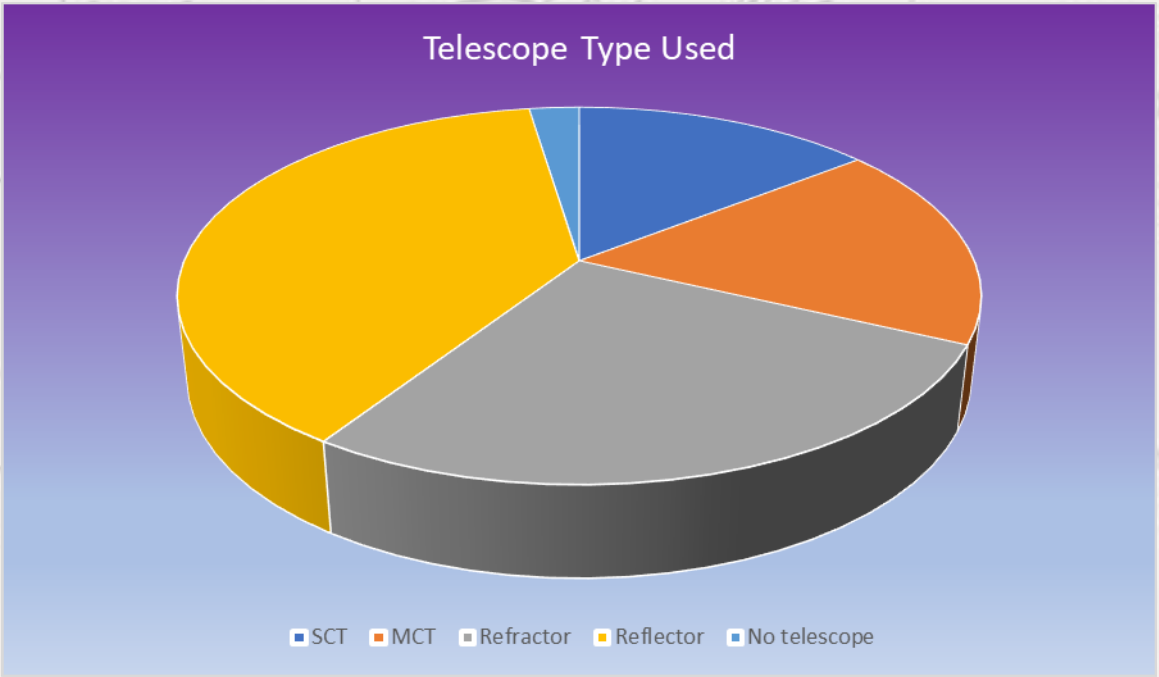
Name	Location and Organization	Image/Article
Eduardo Horacek	Mar del Plata, Argentina	Images of Lacus Mortis (3).
Luigi Morrone	Agerola, Italy	Images of Cassini, Cyrillus, Atlas, Aristoteles, Vallis Alpes (3), Posidonius, Ptolemaeus, Boussingault, Archimedes and Metius.
KC Pau	Hong Kong, China	Images of Lamont, Nearch and Posidonius.
Jeffery Padell	Walpole, Massachusetts, USA	Image of the Lunar X and V.
John Robbins	North Aurora, Illinois, USA	Article *Lunar Mapping*.
Pedro Romano	San Juan, Argentina	Images of the Waxing Gibbous Moon, Archimedes, Clavius, Ptolemaeus
Greg Shanos	Sarasota, Florida, USA	Articles and images of *Lunar X and V (2)* and *Lunar Imaging With the New ZWO S50 Smart Scope.*
Fernando Sura	San Nicolás de los Arroyos, Argentina	Image of Copernicus.
Michael Teoh	Heng Fe Observatory, Penang, Malaysia	Images of Lunar South Pole, Delaunay, Walther, Orontius, Maginus, Ptolemaeus, Rima Hyginus, Montes Apenninus and the Full Moon.
David Teske	Louisville, Mississippi, USA	Images of Lacus Mortis (6), article and image *Another Loot at the Brisbane H Dorsum/ Escarpment.*
Randy Trank	Winnebago, Illinois, USA	Image of Lacus Mortis.
Fabio Verza	Milan, Italy, SNdR	Image of Lacus Mortis.
Paul Walker	Middlebury, Vermont, USA	Images of Lacus Mortis, articles and images Mare Humorum and Gassendi and Western Mare Frigoris, Plato and Northern Mare Imbrium.
Neal Wiley	Philadelphia, Pennsylvania, USA	Article and image *A Sunlit Mountain in Dark Aristoteles.*

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

March 2024 *The Lunar Observer* By the Numbers

This month there were 122 observations by 25 contributors in 9 countries.





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 Santos.

The Lunar X and V

Gregory Shanos

The Lunar X & V were visible on February 16, 2024 from 5:30pm to 8:30pm Eastern Time February 17-17 22:30-01:30 UT). The moon was at 54% phase almost near the zenith at 85°. The weather conditions were horrific- completely overcast with a jet stream! Surprisingly, the seeing was above average. I was fortunate to obtain three two-minute videos. The best image was taken during a short break in the clouds through heavy haze at 6:58pm local time or 23h 58m UT. A Meade 60mm 260mm f/4 refractor was piggybacked on a tracking Meade LX6 SCT equatorially mounted telescope. A ZWO ASI 178MM monochrome camera using Firecapture v2.7.14 acquired the video through the refractor. The AVI video was processed using Autostakkert 3.1.4 and Registax 6.1. Further sharpening and processing in Photoshop CS4. Image by Gregory T. Shanos Sarasota, Florida.

Lunar Topographic Studies
The Lunar X and V

February 16, 2024 23h 58m UT. The Lunar X and V are rather difficult to see on the disk of the moon. This image was cropped and push-processed to reveal the X and V near the terminator in high relief. I was also able to observe the X and V visually using a Meade LX200GPS 8-inch GO-TO Schmidt-Cassegrain ACF at 80 power. This cropped image approximates the visual view through an eyepiece of this phenomenon. The Lunar X (also known as the Werner X) is a claire-obscure effect in which light and shadow creates the appearance of a letter 'X' on the rim of the craters Blanchinus, La Caille and Purbach. The X is visible beside the terminator about one-third of the way up from the southern pole of the moon. The Lunar V forms along the northern part of the terminator near the crater Ukert. Image by Gregory T. Shanos Sarasota, Florida.

Lunar Topographic Studies
The Lunar X and V

Lunar X and V, *Jeffery Padell, Walpole, Massachusetts, USA. 2024 February 17 01:56 UT. SeeStar 50 telescope and camera. Note: This is the very first image we received from a SeeStar telescope!*

Lunar Topographic Studies
The Lunar X and V

The AEA celebrates 100 TLO numbers

Walter Ricardo Elias

Back in 2015, a group of amateur astronomers members of the Entre Ríos Astronomy Association (AEA) decided to consider the possibility of making contributions to the world astronomical community in a field of interest. In the search for an accessible activity that would allow members without much knowledge but great passion to actively participate, the possibility of making contributions to ALPO arose. The AEA telescope was then a tool that met some useful characteristics for this task. A Meade 10" Schmidt- Cassegrain reflector model LX200 and a Canon camera. The beginning of institutional participation in "The Lunar Observer". The months passed and the publications of photographs were joined by participation in the lunar geology section, headed by Dr. Antony Cook. With great enthusiasm we began to contribute to a task science that, despite being simple, would prove to be a significant contribution to world astronomy. Since that moment, 100 editions of TLO have passed. A number that is no less, if one considers that people have passed by, but the institution has remained constant in the active participation of its members. During this period the AEA suffered the loss of one of its founding members, César Bretto, who back in 1973 was the first president of the association. His relatives donated a large number of books belonging to Don Bretto to the AEA. Our surprise was great when we noticed that several of them were about the moon and that among their pages there were notes referring to transient lunar phenomena (TLP). Another memorable moment was when, based on a photograph taken with our humble equipment, nothing more nor less than an observation by Cassini itself was removed from the TLP database. Today the youngest members of the AEA continue to venture into this task, led by the director of the research department, Lic. Walter Elias. During these years the AEA was acquiring specialized equipment. CCD cameras, a new telescope, filters of different wavelengths, a new reflex camera and other accessories. Thanks to the drive of the "lunar group", as other partners affectionately call it, the Oro Verde Observatory has also grown in equipment and prestige, positioning it on the world map for its active contributions to the knowledge of our natural satellite.

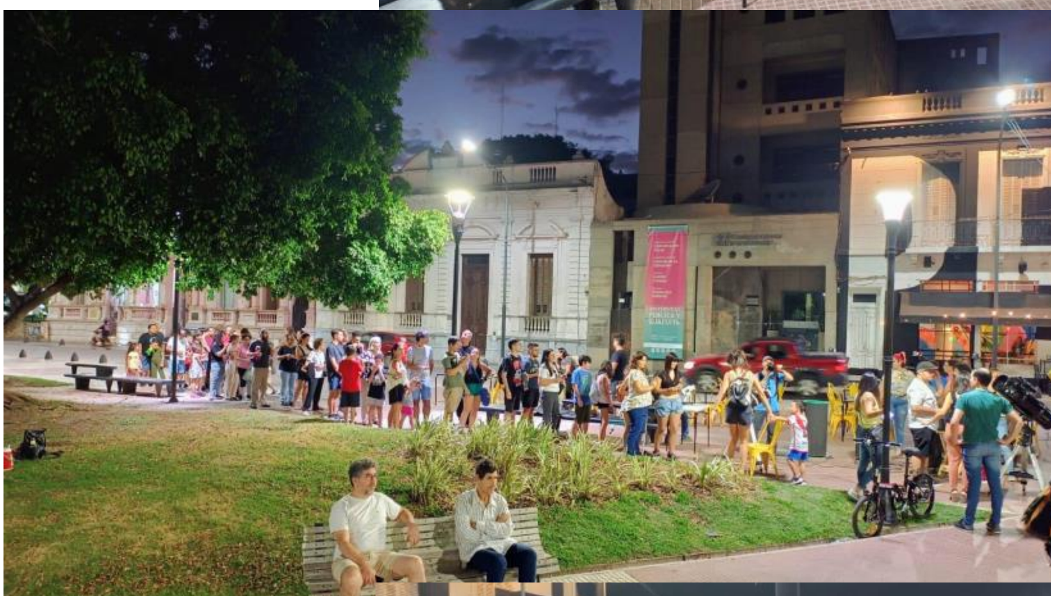
Flying to Mare Crisium! *Gonzalo Vega, Oro Verde, Argentina. 2024 February 17 00:37 UT. Sky Watcher 200 x 1,000 mm WQ5 GoTo telescope, Player One Ceres C camera. The airplane was a Boeing 737-BsAs-Tucuman-LV-GTK. This image was taken at the outreach event images on the next pages.*

Lunar Topographic Studies
The AEA Celebrates 100 TLO Numbers

Lunar Topographic Studies
The AEA Celebrates 100 TLO Numbers

Scenes from a recent outreach gathering of the AEA in Oro Verde, Argentina.

Images courtesy of Walter Ricardo Elias.



Lunar Topographic Studies
The AEA Celebrates 100 TLO Numbers

Mare Humorum and Gassendi

Paul Walker

I'll mention a change I made in sharpening lunar images in Registax 6 in case it is helpful to others. I was recently impressed with the results someone got with an image of Jupiter using these settings. I used them on this image. The key changes are setting Step Increment to 0 and Sharpen to 0.120. Normally in Wavelets I have Initial Layer and Step Increment both set to 1. Sometimes I will use a Denoise setting of about 0.10 for Layer 1. I leave the Sharpen for all layers at the default of 0.100. I typically set the value of Layer 1 to 50 or 100, Layer 2 to about 20, Layer 3 to about 8. Now, I set Step Increment to 0, Sharpen on Layers 1-3 to 0.120 and the value (sliders) of the Layers 1-3 to 100. I find setting Denoise on Layer 1 and 2 to 0.10 helpful. And maybe slide the value of Layer 4 up a little. Along with these changes I recently started using 20% (~1800) of ~9100 frames in my stacks whereas before I was using 6%. These new settings likely require the higher signal to noise that the 20% stacks provide.

An evening of very good seeing:

Visually using the 10" f/5.6 and binoviewers at 366x, in Gassendi crater I could make out the most prominent of parts of Rima Gassendi. I could see the 3 sections on the east side that extend more or less radially from the central peak. I could see most the tangential portion that starts at the middle radial spoke and goes south. I could occasionally glimpse the rille that goes west from the topside of the central peaks. The 3.48 km (2.16 mi) craterlet that sits between the middle and bottom radial spokes was "easy" to see.

I checked out the craterlets in Mare Humorum, I focused on the ones in the middle of the image. I could see a 2.94 km (1.83 mi) crater about 70% of the time. I could not make out a 2.44 km (1.5 mi) crater. A 3.57 km (2.22 mi) and a 2.67 km (2.34 mi) crater were "easy". I viewed using the 10" f/5.6 with binoviewers at ~366x. Part of the difficulty with some of the craters was distinguishing the crater themselves from their light-colored ejecta blanks. The diameters were measured using the Draw & Query line tool in LROC QuickMap (https://quickmap.lroc.asu.edu/).

A good part of Rimae Doppelmayer (lower left side of Humorum was visible. Near Liebig F and J, I could only see the nearby wrinkle ridge and not the rima.

Mare Humorum and Gassendi, *Paul Walker, Middlebury, Vermont, USA. 2024 February 21 02:49 UT, colongitude 47.7°. 10 inch f/5.6 reflector telescope, 2x barlow, Canon T7I camera*

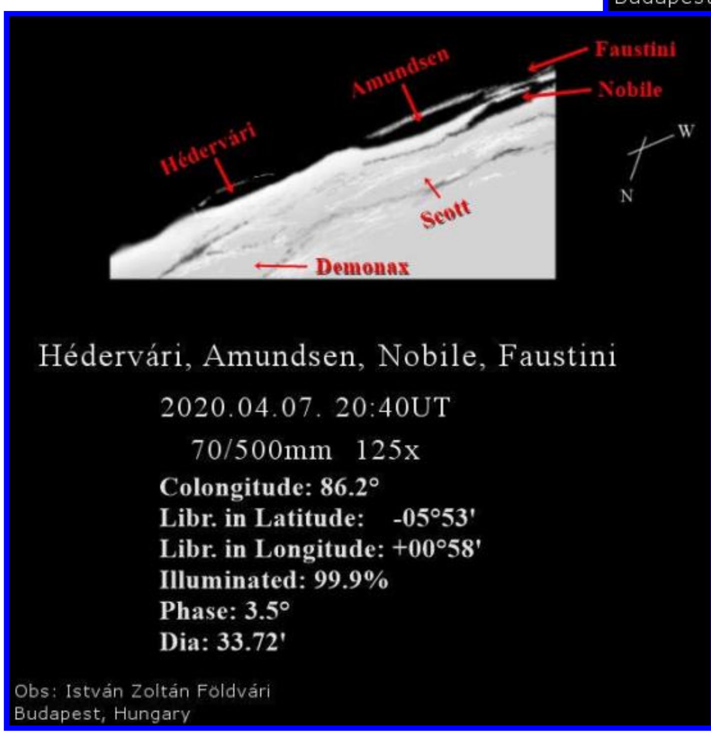
Lunar Topographic Studies
Mare Humorum and Gassendi

Hédervári, Amundsen, Nobile and Faustini

István Zoltán Földvári

Hédervári, Amundsen, Nobile and Faustini, *István Zoltán Földvári, Budapest, Hungary. 2020 April 07 20:27-20:46 UT, colongitude 86.2º. 70 mm refractor telescope, 500 mm focal length, Vixen Lanthanum LV 4mm eyepiece, 125x, Baader contrast booster filter. Seeing 7/10, transparency 6/6.*

*Istvan adds: "*Back in around 1997, there was a description published in our monthly astronomy magazine about the Hungarian geologist Péter Hédervári. (In my country, Péter was a well-known popularizer of science, and he passed away young in 1984.) According to the description, an American astronomer recommended his name to the IAU for a lunar crater. The IAU accepted it, and officially renamed the crater previously known as Amundsen - C to Hédervári. I was very much a beginner at that time, but I found the whole thing fascinating. The Hédervári crater is a libration crater, and they even attached a small map. Whenever we had the opportunity, we went to see Péter's 69km diameter crater.



I managed to purchase the later edition of Rükl (2004), and I was delighted to see that Hédervári had indeed been placed on the map. Later, in 2009, another Hungarian name, Hevessy, was also added to the Moon, but this time it was at the North Pole, and there were serious debates about whether it could be observed with a telescope. So far, we have only been able to identify it in one photo as a small shadow-casting lunar remnant."

A Sunlit Mountain in Dark Aristoteles

Neal Wiley

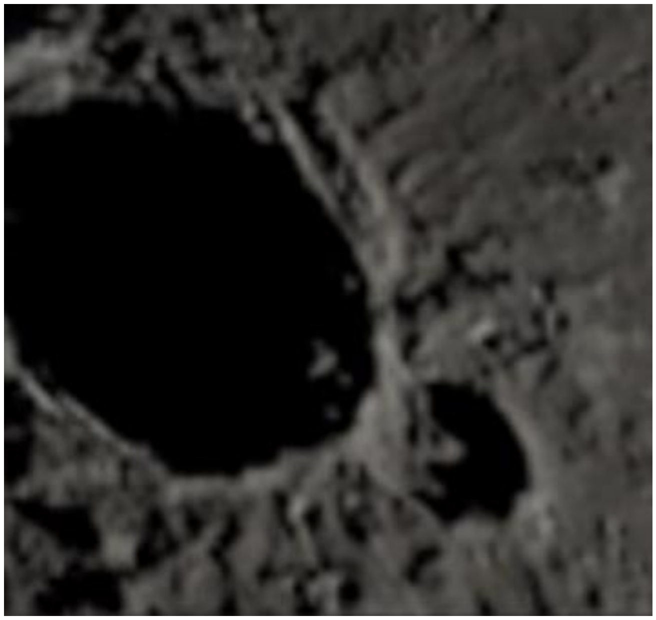
I was excited to get out under the sky on December 18, 2023, and view the almost 6-day-old moon with my 5" MCT after days of rain and gloom. Alas, the forecast clear skies never really materialized. At best, I had half an hour of clear views starting about 6:30 pm Eastern (23:30 UTC). In that window, however, I observed an interesting sight, worthy of a report.

The terminator fell near the Aristoteles-Alexander line, with Eudoxus protruding a bit more into the sunlit hemisphere. The interiors of all three craters were in deep shadow, and the mountains west of Alexander (which have grabbed my attention before) showed scattered sunlit peaks some 75 km or so west of the terminator.

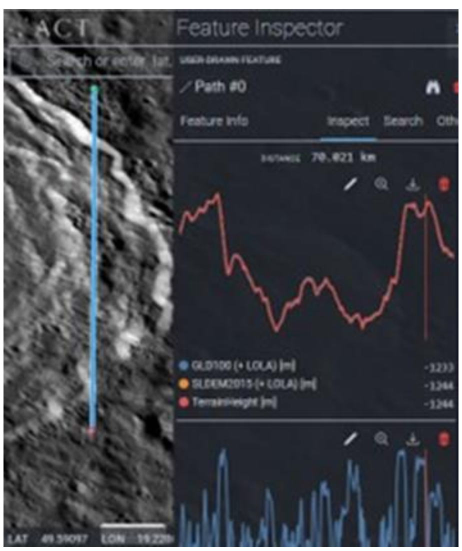
The most noteworthy sight though was bright pinpoint of light within Aristoteles, close to where the crater Mitchell touches the rim. Its position drew my attention-not at the center, or even on the crater floor, but close up under the eastern rim. It was apparently not part of the rim, either, because there was a substantial belt of shadow between it and the rim, and it was not concentric with the rest of the rim. This is interesting because it seemed to suggest that a point on one of the internal terraces is higher than the rim. Perhaps the site of a large subsidence?

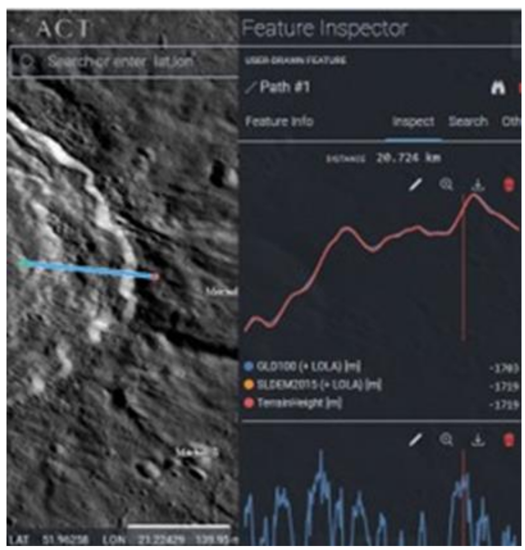
I captured this afocal iPhone snap through thin clouds, for orientation purposes. Aristoteles is near the center, and the point of light is visible at bottom left of the crater.

Here’s a better image cropped from NASA's Dial-a-Moon tool (https://svs.gsfc.nasa.gov/5048/) for 11:30 UTC. This mountain is even more clearly visible here.



I also used the LROC Quickmap altitude feature to run a N-S line about where the mountain must be, and an E-W line through the same spot. Here are the traces:





These definitely show a prominence where my sunlit mountain was located, though not a terribly high one. The E-W trace also shows that it's not in fact higher than the rim, falling some 600 m short. It was obviously still just high enough to kiss the dawn sunlight and give a lovely show, though.

Does this feature have a name? None of the modern sources provide one, but as is often the case, the old masters delivered. Here is a detail from Neison's 1876 map.

There is a feature marked **β** under the east rim close to Mitchell, right about where this mountain is found. On p. 239 of the text, Neison says the crater has: "very lofty complex walls, consisting of parallel chains, much terraced, and rising in high peaks, the two principal being **α** on the east, 10,692 feet, and **β** on the west, 10,500 feet above the interior." (Recalling that the E-W directions were reversed pre-space age.)

So, at least in the 19th century nomenclature, it looks like this peak has a name: Aristoteles *β*.

Some Wrinkle Ridges on the Western Shore of Mare Serenitatis

Alberto Anunziato

Mare Serenitatis is a special place to observe the wrinkle ridges, both concentric with its contour and radial. The most famous of all is Dorsum Smirnov, better known as Serpentine Ridge (it is actually a set of ridges that includes Dorsa Smirnov). When observing the western area of Mare Serenitatis (IMAGE 1) what caught my attention were the quite "dramatic" shadows, especially a kind of gorge between the two dorsa, completely in the dark. The wrinkle ridges we see are part of Dorsum Von Cotta (220 km long), part of Dorsum Buckland (150 km long) further west and Dorsum Owen (50 km long), which looks like a continuation of Buckland northward. I tried to capture the contours of the ridges I was observing. This record is always approximate, since the resolution of my small telescope does not allow small details to be clearly perceived, rather it is a generalized view, always with a tendency to appear more curved in its structure than it really is. I also tried to capture the highest areas (coinciding with the brightest areas), corresponding to the upper and steeper component of the topography of a dorsum, the crest (the lower, wider component is the arch). In this case the crests, or rather their highest parts, over Dorsum Buckland and Dorsum Von Cotta were clearly visible, even with some relief and not merely as brighter areas, that is why I marked these highest ridges with a continuous line.

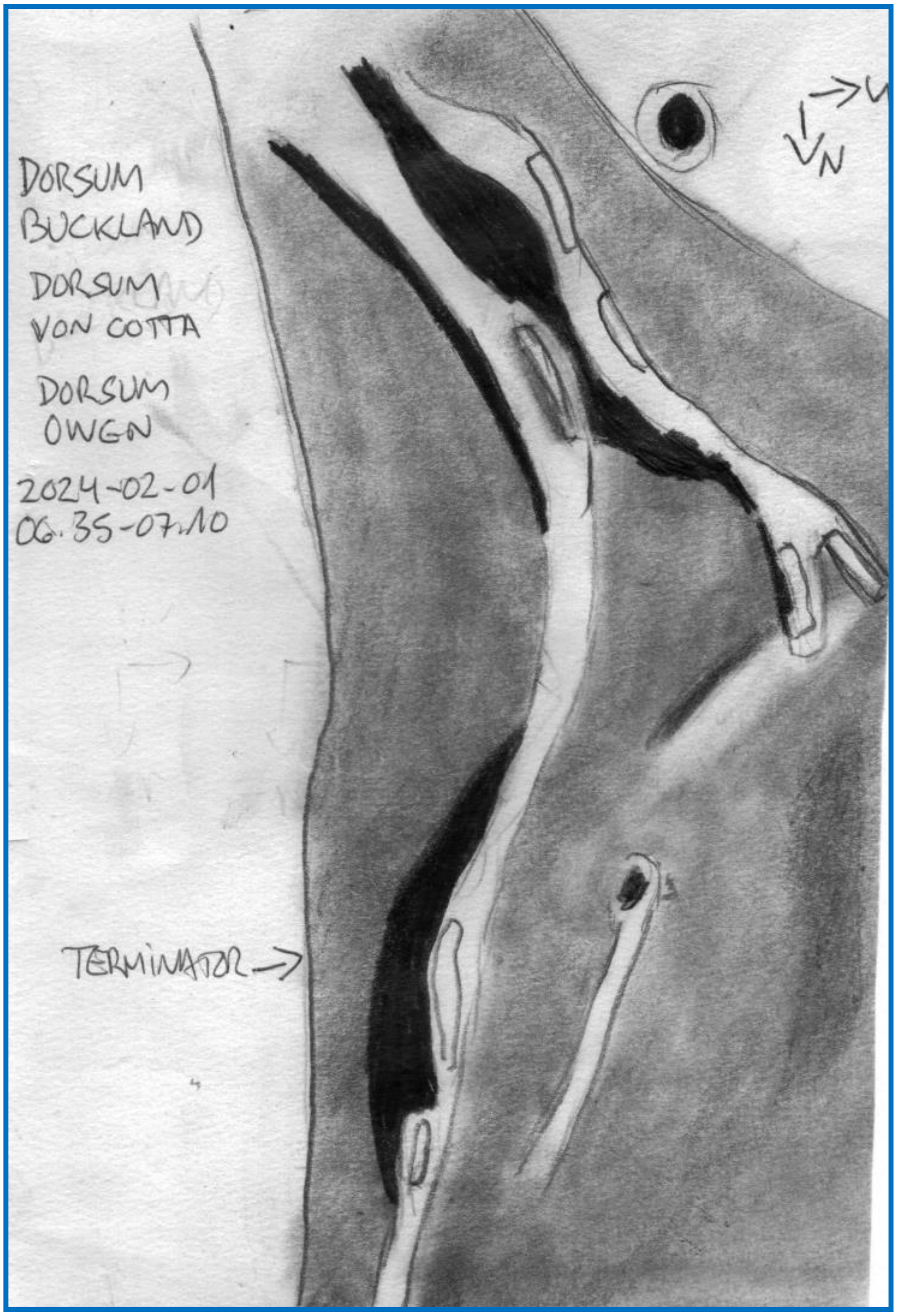


Image 1, Dorsum Buckland, *Alberto Anunziato, Paraná, Argentina. 2024 February 01 06:35-07:10 UT. Meade EX105 Maksutov-Cassegrain telescope, 196x.*

Lunar Topographic Studies
Some Wrinkle Ridges on the Western Shore of Mare Serenitatis

Once the observation was made, I turned to the essential Photographic Moon Atlas for Lunar Observers by Kwok C. Pau (once again), from which I extracted IMAGE 2 (page 247 of Volume 1). In it we see (on the right side) the names of two of the 3 wrinkle ridges that appear in IMAGE 1 (the third is Dorsum Owen, to the right of Dorsum Von Cotta, much shorter). On the left side of IMAGE 2 we see the ridges of IMAGE 1 with favorable oblique illumination (although reversed to IMAGE 1). IMAGE 3 is a detail of the image on the left side of IMAGE 2. Of course, the drawing in IMAGE 1 pales before K. Pau's photograph in IMAGE 3. For me the drawing is instrumental, it simply helps me concentrate on the details that I want to confirm later in the photographic images. The terminator, indicated in IMAGE 1, passes very close to Dorsum Von Cotta, to the east, what is to the west of Dorsum Buckland is not drawn, I simply indicated Sulpicius Gallus for a better understanding of the area (more like a guide when making the final drawing on the paper, to know the names of the dorsa drawn). Dorsum Buckland is only partially drawn, only its southern half, where the ridge appears to bifurcate into two segments.

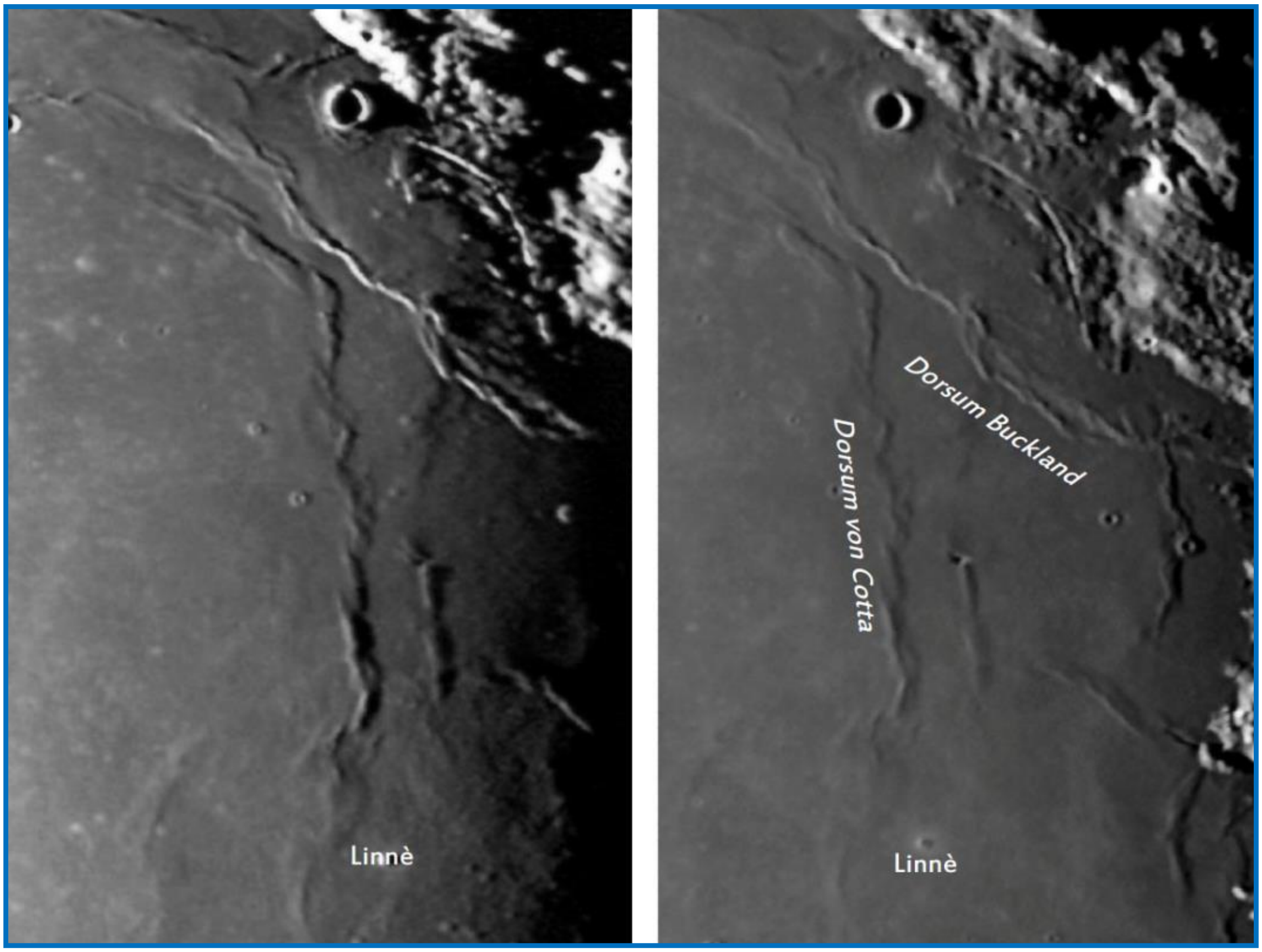


Image 2, Dorsum Buckland *from Photographic Moon Atlas for Lunar Observers by Kwok C. Pau, page 247 of Volume 1.*

Before we move on to comparing IMAGE 1 and IMAGE 3, there are two things I found interesting, besides the Dorsum Buckland and Dorsum Von Cotta crests. First, at the time of the observation I registered a kind of very not very bright spot that seemed to pass through Dorsum Buckland and even a slight shadow, it is a very low transverse segment, the strange thing (observationally) is that it is very weak brightness seemed to pass through above the main segment). Second, Dorsum Owen's starting (or ending) point, which in IMAGE 1 doesn't even cast a shadow, while in IMAGE 3 it seems much more prominent. The initial point is "something similar to a crater" in IMAGE 1, it presented a very unusual elongated shadow for such a small crater, which looks stranger in IMAGE 3. Could it be a crater of volcanic origin? Due to its location with respect to Dorsum Owen, it does not seem that it was later but rather it seems to belong to its structure. Perhaps it could be an example of the possible volcanic origin of a dorsum.

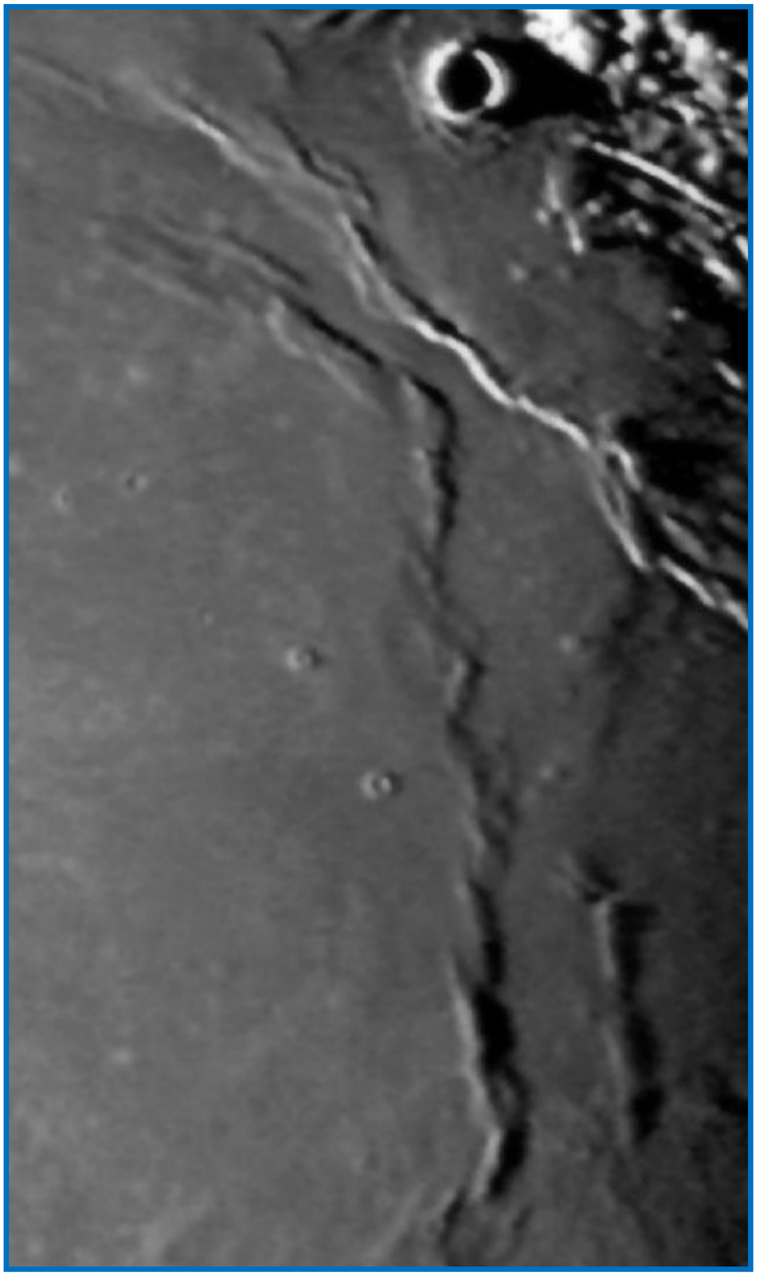


Image 3, Dorsum Buckland *from Photographic Moon Atlas for Lunar Observers by Kwok C. Pau, page 247 of Volume 1.*

IMAGE 4 is a combination of IMAGE 1 (left) and IMAGE 3 (right), which I found interesting to do to compare what is within reach of my small telescope with what a camera captures, also serving to see how accurate my record. The crests I observed are marked with numbers in both images. Crests 1 and 2 are above Dorsum Buckland. Crest 1 appears clearly in both images and is quite similar in both, while crest 2 appears much shorter in my drawing than in Kwok's photograph, where it appears much brighter. Further north of the same wrinkle ridge crests 4 and 5 appear both bright, but I also don't understand why in my drawing only those two segments appear bright (I estimate that they will be much brighter and the camera, for exposure reasons, homogenizes the brightness). In Dorsum Von Cotta I marked crest 3, which appears in the image on the right but which in my drawing appears much more prominent, longer (probably an error) and shadowed to the east on the arch of the dorsum, which is very difficult to observe (that crest must be 100 meters or less high) than in the Kwok image on the right, where it casts a slight shadow to the opposite side. With illumination similar to my observation the shadow of the crest is cast onto the arch as the crest runs over the west edge. Finally crests 6 and 7, on Dorsum Von Cotta appear quite clearly in both images. The image on the right show details of Dorsum Owen's topography that I couldn't observe, and if you see what I drew as a peculiar crater in the image on the right you will notice that it is something even stranger, like some kind of gorge.

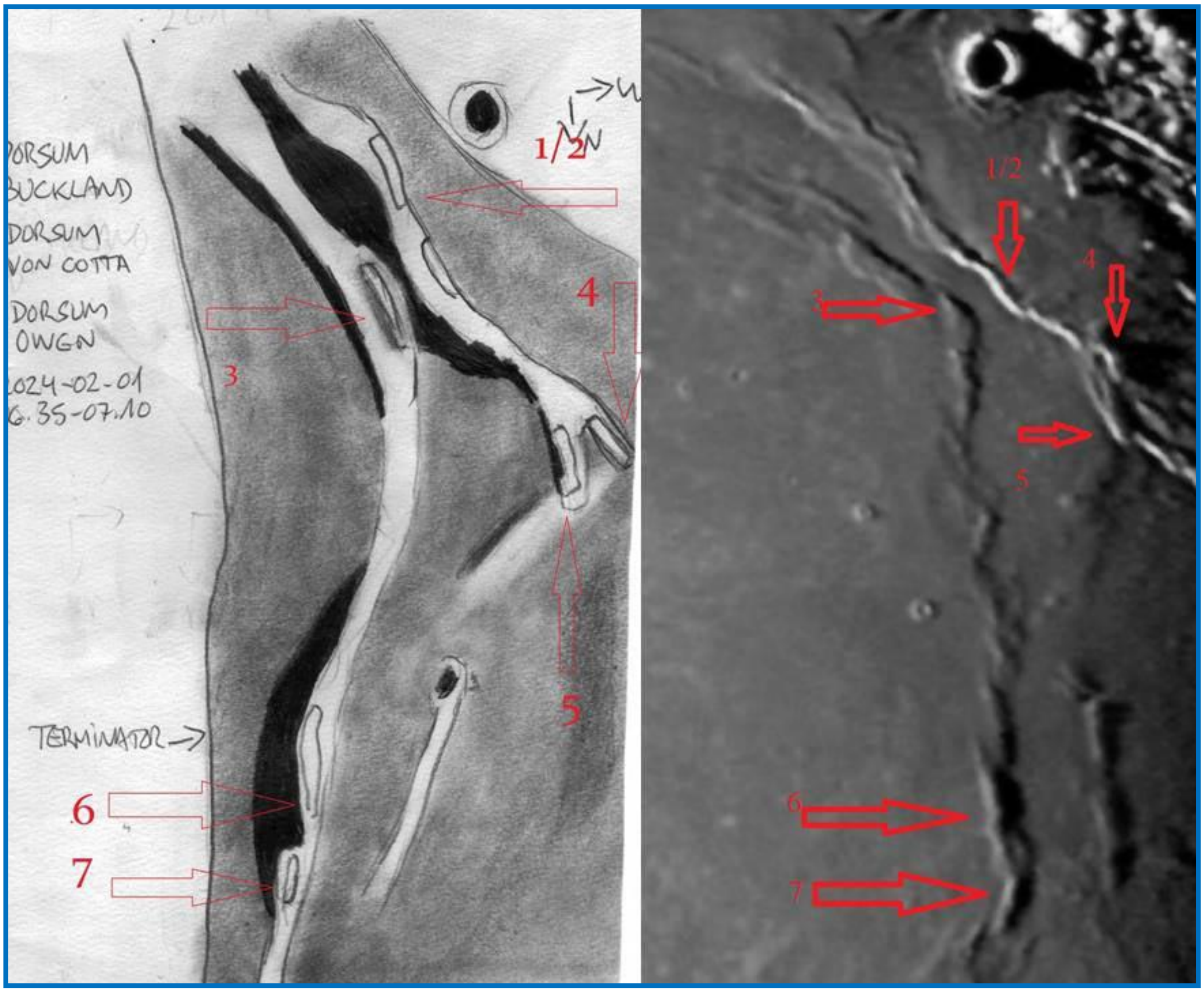
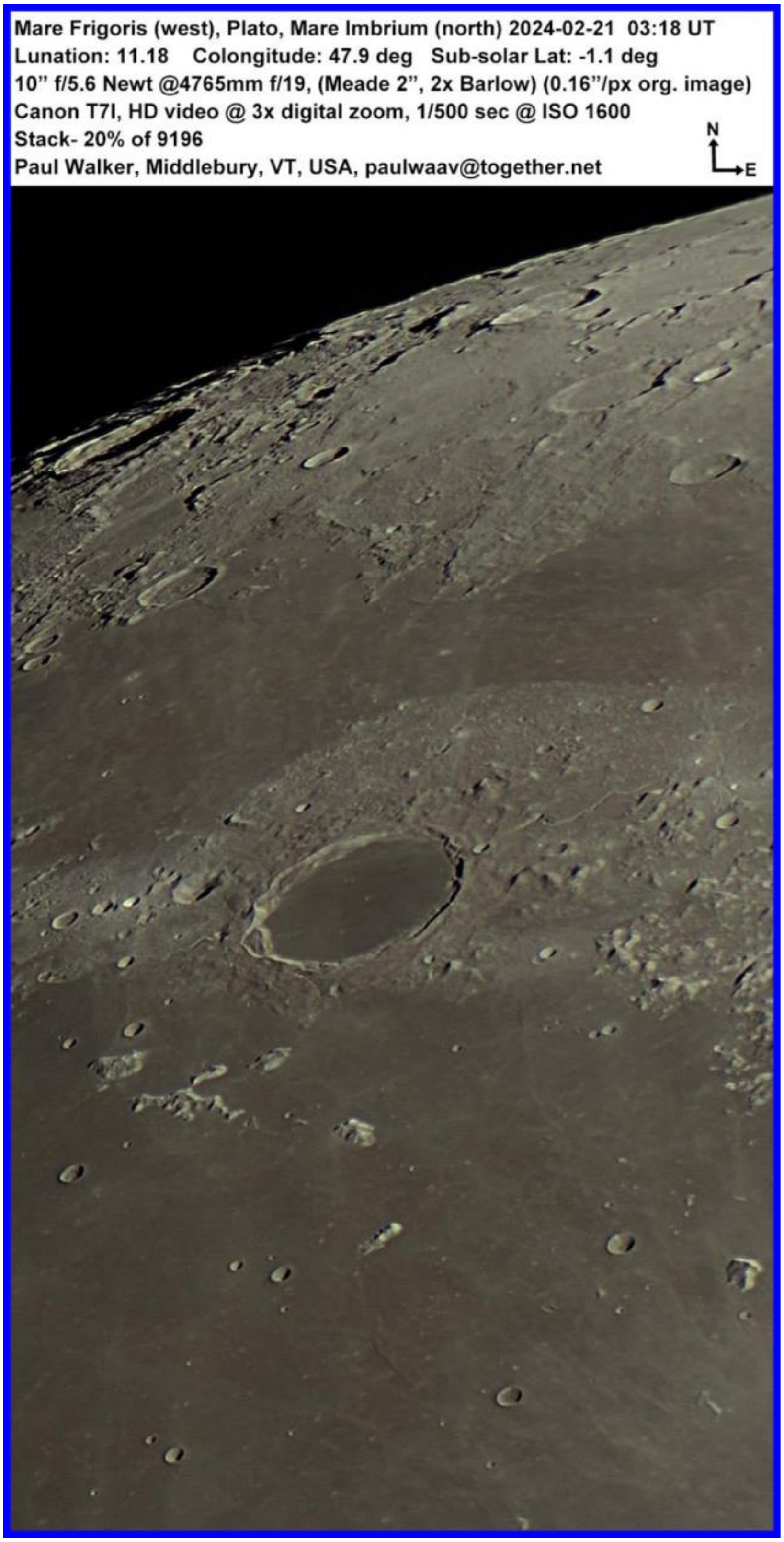


***Image 4, Dorsum Buckland**, a combination of image 1 (right) and 3(left).*

Western Mare Frigoris, Plato and Northern Mare Imbrium

Paul Walker



About 1/3 of Mare Frigoris can be seen across the upper part of this image. With the relatively high sun angle I didn't think any wrinkle ridges would be visible in the image and didn't see any until I looked more carefully. If you follow a 10:30/11:00 heading from Plato across Mare Frigoris you will run into 38 km (23 mi) Fontenelle crater. Starting about the 4:30 position right where there is small crater on Fontenelle's rim is a faint but moderately broad wrinkle ridge. Its most prominent portion can be seen wiggling for about 75 km (45 mi) and slowly curving until it's going pretty much due east. If you look very carefully you can trace it for about 120 km (75 mi) as broken dark streaks. Going almost to a ghost crater on the north side of Frigoris. The ridge actually extends well beyond the ghost crater. In this image you can see a short piece inside the east side of this crater as a light (north) and dark (south) streak and another outside this crater to the east.

Above this ghost crater is a large smooth circular area about ~150 km (90 mi) that looks like a very old crater with another small ghost crater ~55 km (34 mi) nearly centered in it.

In Plato the 6 biggest craterlets are visible, ranging from 2.4 km (1.5 mi) for the one in the center to 1.4 km (0.87 mi) for the one near the east rim.

I really like the detail visible in Mons Pico (south and a little east of Plato) and Montes Teneriffe, the collection of mountains west of Pico. Below Mons Pico is Mons Pico Beta (as labeled on the LAC maps) and below that is a wrinkle ridge with just a hint of shadowing on its west side. Mons Piton is to the far east on the edge of the image. Checking out the craterlets near Mons Pico on LROC QuickMap and I see that some craters down to 1.2 km (0.75 mi) are visible is you zoom in.

Lunar Topographic Studies
Western Mare Imbrium, Plato and Northern Mare Imbrium

The “Enigmatic Wall” of Trouvelot in Eudoxus

Alberto Anunziato

Reading “The Moon”, by Thomas Elger, to document the writing of the text on Lacus Mortis for this month's Focus On section, I came across this phrase “murs enigmatiques”: “A few years ago M. E. L. Trouvelot of Meudon drew attention to a curious appearance which he noted in connection with certain rills when near the terminator, viz., extremely attenuated threads of light on their sites and their apparent prolongations. He observed it in the ring-plain Eudoxus, crossing the southern side of the floor from wall to wall; and also, in connection with the prominent cleft running from the north side of Burg to the west of Alexander, and in some other situations. He terms these phenomena Murs enigmatiques” (page 26). For someone with an imaginative mind, with a taste for the mysterious and the ancient, this phrase (and especially the adjective “enigmatique”) was irresistible. I started my search on the internet and a very interesting text by Nigel Longshaw appeared in the search engine (“Trouvelot’s threads: the “murs enigmatiques” of Etienne Leopold Trouvelot”) in Journal of the British Astronomical Association, vol.117, no.4, p.187-191 (https://adsabs.harvard.edu/full/2007JBAA..117..187L). This text deals at length with Trouvelot's report of an “unusual phenomenon that I had never noticed before.” Trouvelot published his observations of Eudoxus (and other craters) in the famous magazine “L’Astronomie”, directed by Camile Flammarion, in the June 1885 issue, available on the internet at https://archive.org/stream/lastronomie03flamgoog/lastronomie03flamgoog_djvu.txt. Longshaw uses Richard Braum's English translation of Trouvelot's text (and we will use it too). Trouvelot was observing the Moon with his 6.75-inch refractor on February 20, 1877 when he observed in the Eudoxus crater “a thin bright thread crossing the southern part of the crater in a straight line, remaining of uniform width as it passed from one side to the other. In the west, however, it did not quite reach the edge of the crater, which at this spot forms a small indentation, but was separated from it by a narrow gap. In the east the bright thread went right up to the edge of the crater. The western half of this bright thread was bordered by shadows on either side, whilst the eastern part was without shadow on its southern side”. This description is complemented by Trouvelot's drawing (beautiful like all of his) that we see in IMAGE 1. In a subsequent observation, more than a year later, Trouvelot (in the same text) claims to have never distinguished the line again bright, but instead “in the bottom of the crater, one could make out something giving the impression of a fracture at the exact spot where I had seen the bright thread. This mysterious wall has never been seen since”.

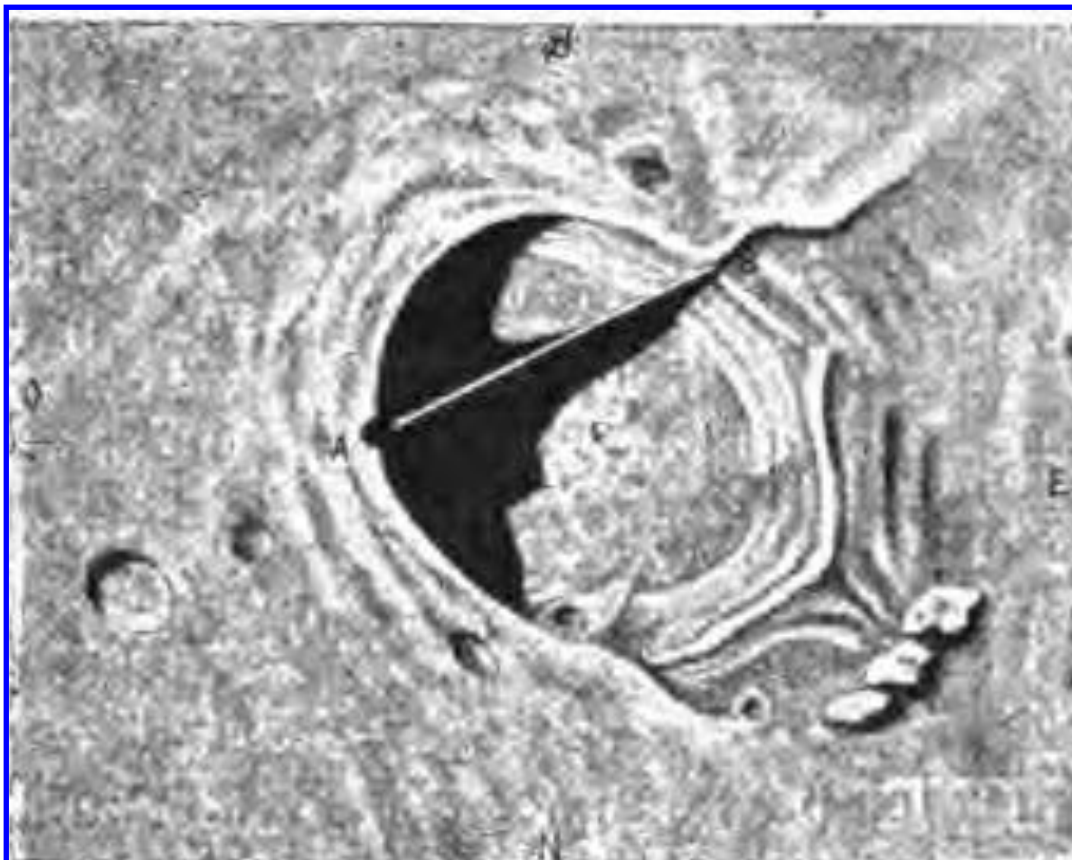


Image 1, Eudoxus*, Trouvelot 1885.*

Lunar Topographic Studies
The “Enigmatic Wall” of Trouvelot in Eudoxus

The first explanation by Trouvelot is that “there existed a break straight and very deep in the W. wall of Eudoxus and which sunlight passing over this opening illuminated the bottom of the crater, and thus formed the straight luminous thread which we have observed”. This explanation is plausible, and Longshaw reports cases of comparable observations of luminous threads originating from gaps in the walls of craters in Torricelli (Longshaw himself), Hesiodus (Koch), Elger (Cichus-Weiss) and others. Of course: “because the formation of a narrow thread of light is probably dependent upon a corresponding narrow “break” in a shadow-casting feature, then circumstances of illumination, solar, lunar and Earth geometry must be favorable. The phenomenon is most apparent when the illuminated “thread” falls onto a smoother surface, such as a Mare or smooth crater floor” (Longshaw). In the original text, Trouvelot discarded the hypothesis of the sunbeam passing through a gap in the wall of Eudoxus for two other reasons: “First, if the bright ray observed was due to the passage of solar rays across a straight gap, one would not see why the luminous thread would be more brilliant tan the parts of the surface which were contiguous and received an equal amount of light. Further, one cannot apprehend how the shadow of the western slope of the crater could be prolonged so far as the summit of the slope opposite, as, at the time, the sun was already more than 20 degrees above the horizon at this spot”.

Trouvelot is inclined to think that it is a kind of wall: “there are on our satellite as long, as narrow and as high as the one that is supposed to exist in Eudoxus to explain the observed phenomenon, and many of these walls are known that we have drawn and observed many times. Curiously, the lunar walls that we have observed are found, precisely, like that of Eudoxus, on the trajectory of certain fractures” (this translation by Trouvelot belongs to me, as well as those that follow), which goes on to enumerate: one that goes from Bürg a Mare Serenitatis, another in the Aristarchus massif, another east of Rhaeticus (it would be interesting to see these examples which Trouvelot claims could be similar to the wall he would have observed at Eudoxus).

There is a small detail, in the words of Trouvelot: “if the observed phenomenon was a wall that crossed the crater, how can we explain why this wall, so easily recognizable on February 20, 1877, has gone unnoticed and has not been seen again? We are in the presence of a dilemma that is not easy to solve.” Truly this wall is very enigmatic. Longshaw says: “Trouvelot’s “thread of light” must have fallen onto the terraced crater walls and rough broken floor of Eudoxus, and as such one would have expected it to be “broken” by the terrain upon which it fell. For this very reason the phenomenon that Trouvelot observed in Eudoxus, and led him to believe what he saw was an illuminated wall-like feature, remains somewhat of a mystery. It would certainly be worthy trying to repeat his observation under the appropriate conditions”. And this was done, as we will see. And it is not one, but several enigmatic walls!

In the December 2022 issue of The Lunar Observer (pages 65/66, corresponding to the “Lunar Geological Change Detection Program” section), our visual observation of Eudoxus appears analyzed by Tony Cook (Section Coordinator). The requirement came from the British Astronomical Association, from Nigel Longshaw (author of the text we quote at length) and consisted of “detect bright spots and linear features within the shadow of the east wall at sunrise.” Tony examines our report on the illuminated areas within the shadow in Eudoxus, comparing it with an earlier image by Brandon Shaw, as seen in IMAGE 2, Eudoxus orientated with north at the top. (Left) A sketch by Albert Anunziato made on 2022 Oct 02 UT 23:20-23:30. (Right) An archive image from Brendan Shaw (BAA) made on 2003 May 08 UT 22:49. Alberto’s sketch (Fig 2– Left), backed up by an early archive image from Brendan Shaw (Fig 2 – Right) does indeed show a couple of linear light features in the shadow on the eastern side of the crater. Whether these satisfactory explain the bright spots and linear features in the shadow or “line of light effect” remains debatable, but at least we have some additional observations to backup any theories”.

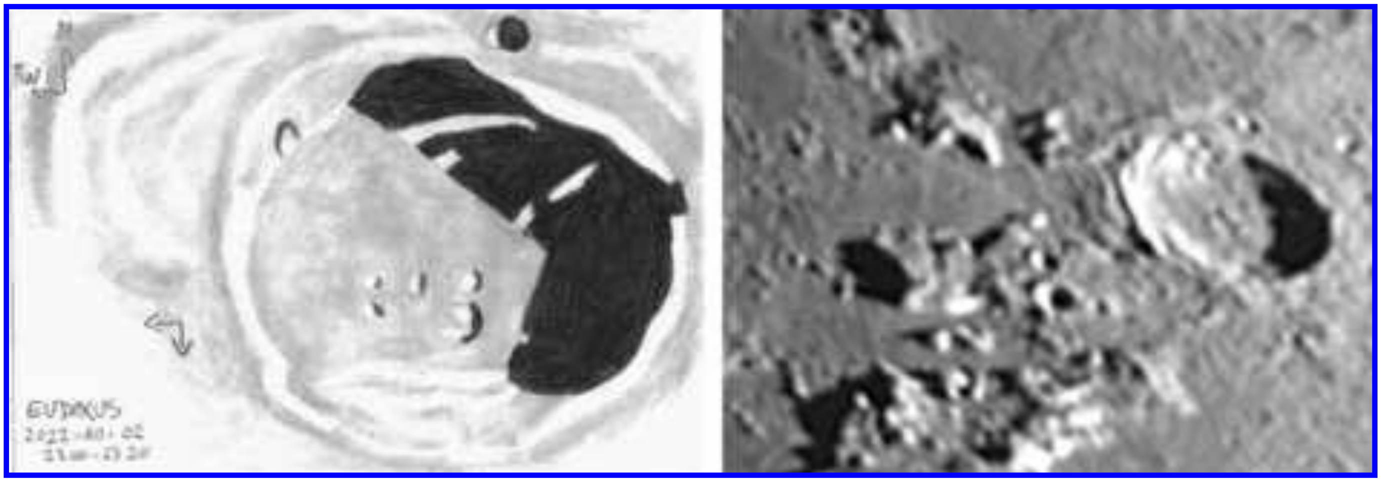


Image 2 Eudoxus

Beyond the inaccuracy in the drawing of the shape of the crater in my drawing, we see that essentially the bright lines (not as bright as the one Trouvelot describes) coincide. The two large lines in the northern area of the shadow cast by the east wall coincide almost exactly. The one located further north in the photograph on the right seems to encompass the area that in the drawing on the left is shown as a small notch, as if the photograph on the right showed an immediately subsequent phase of the illumination of the drawing on the left, so that the illuminated area would have enlarged and merged with the northernmost line. The other long line, further south, is identical in both images, it even breaks at the same height. And further south a small notch in the drawing on the left appears as a slightly larger notch, like a kind of rectangle. In the image on the right in IMAGE 2 there appears to be a very faint line within the shadow, running parallel to the east wall, but we cannot distinguish it with certainty like the others. This means, beyond very small differences between the bright areas within the shadow, that this is not an unusual phenomenon but rather the normal appearance of Eudoxus in that illuminations phase.

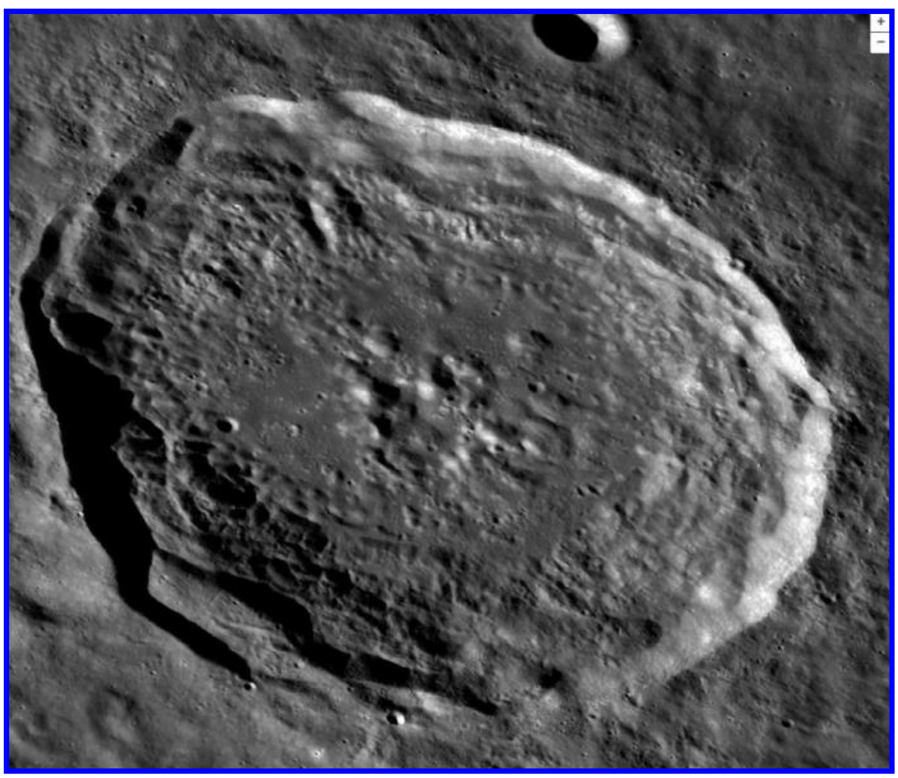


IMAGE 3 illustrates the topography of Eudoxus (from the LROC Quickmap). There is no obvious correlation between the extremely rugged relief of the Eudoxus floor and the bright lines of IMAGE 2. Elger's solution ("Apparent prolongations of clefts in the form of rows of hillocks or small mounds are very common") is quite plausible and, I understand, is close to the solution proposed by Longshaw according to Cook.

Image 3, Eudoxus, *LROC.*

The “murs énigmatiques” of Etienne Trouvelot had an impact on lunar astronomy as well as on literature on the mysterious. And who doesn't like to delve into these old books, full of siren songs of strange facts? At the end of the day, there are many of us who, have been in the same situation as Edgard Alan Poe “upon a midnight dreary, while I pondered, weak and weary, over many a quaint and curious volume of forgotten lore” (The Raven). Perhaps the most famous reference is Charles Fort, who in New Lands claims that what Trouvelot saw is a kind of luminous signal on the Moon, cheating with the translation of the French text, he says in chapter 23: “Upon the night of Feb 20, 1877, M. Trouvelot, of the Observatory of Meudon, saw, in the lunar crater Eudoxus, which, like almost all other centers of seeming signaling, is in the northwestern quadrant of the moon, a fine line of light (L 'Astronomie, 1885-212). “It was like a luminous cable drawn across the crater.” He translates “mince filet lumineux” (well translated by Longshaw as “thin bright thread”) as “luminous cable”, introducing a “technological element” totally foreign to the original observation. How many supposed mysteries are nothing more than manipulation of the original text that are repeated ad aeternum! It is also true that Trouvelot seems to play with the idea when he ends his article with the following words (referring to a different wall): “The considerable length of this wall, its perfect regularity and the daring curve it makes around the crater (as it seems) to avoid it, they make this lunar formation an extremely notable object, making it similar to a kind of gigantic viaduct that more than one engineer would be proud of”. Nineteenth-century astronomy tended to be bold in its assumptions, which led to considerable errors such as the canals on Mars, although it is also true that we owe a lot to its titanic observation effort. It is an interesting challenge to verify the cause of these bright lines on the ground of Eudoxus that repeat cyclically, whether or not they coincide with Etienne Trouvelot's “mur enigmatique”.

Brisbane H Dorsum (Unofficially) or Possible Escarpment Fault

Jon Bosley

Introduction

A large currently undesignated Wrinkle Ridge Brisbane H (unofficially named) or possible large escarpment fault is located upon the southeastern limb of the moon. This fault line seems to not have been catalogued by past lunar selenology, however it is plausible that it has been identified by the much more recent lobate scarp surveys of which over 3000 have been located. It does appear in the Digital Lunar Orbiter Photographic Atlas of the Moon on Photo Number IV-184-H3*. Image 1 shows the fault as imaged from Central Texas during a favorable libration, north is on the right of the image. It is listed as an unofficially named (and nicknamed) wrinkle ridge on wiki resources.

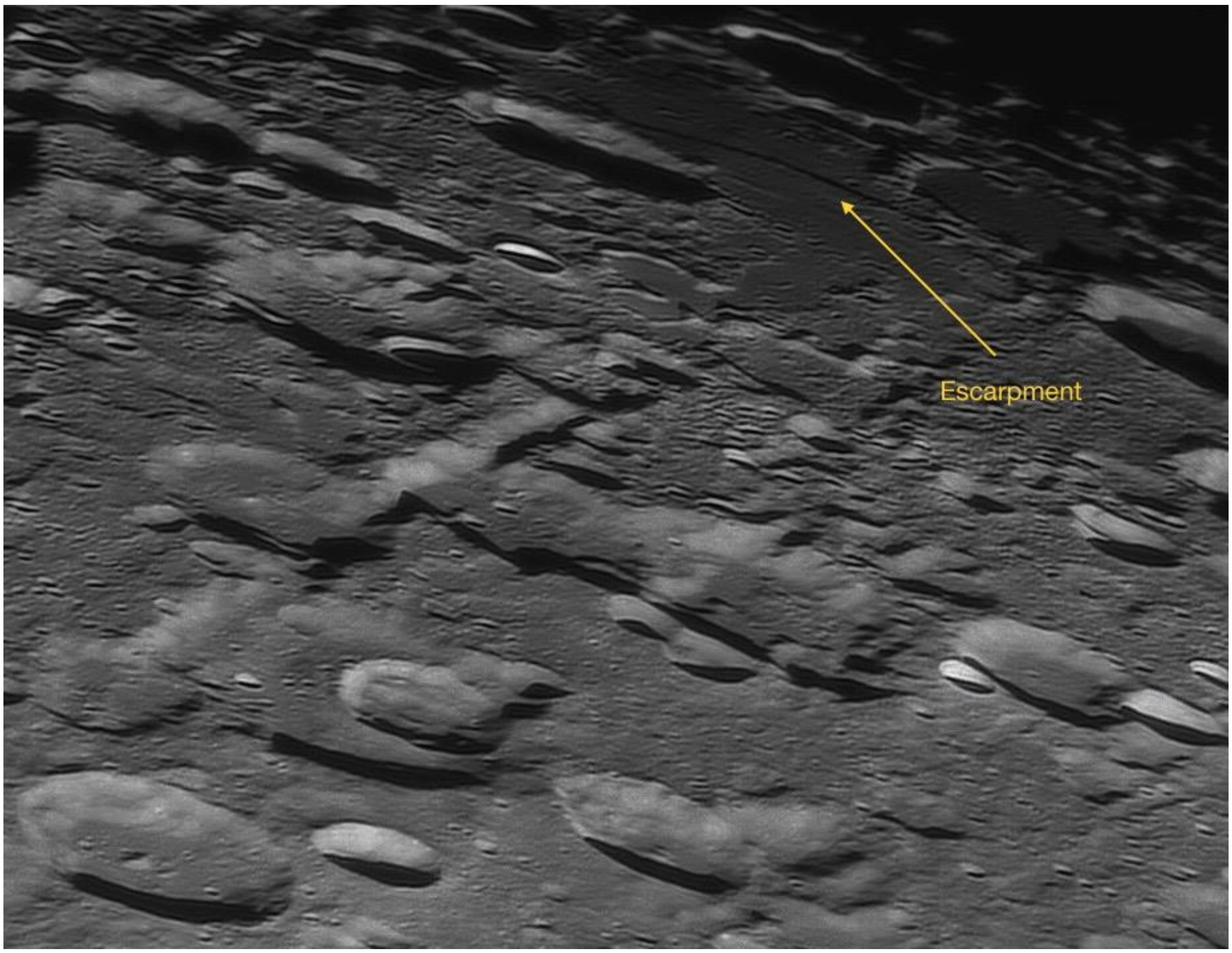


Image 1. Central Texas, 2022 September 12 06:03UT, 450mm Reflector f16.5, Camera Player One Apollo-Mini 429, 610 red filter. Lunation Day 16.7. 95.6% illumined, Colongitude:108.4°.

Location

The fault is located at 50.8°S - 66.1°E to 52.3°S - 65.3°E, the area is covered in Rukl 76, however it is not drawn upon this map. It does appear faintly as a brighter line on map 5 of the 21st Century Atlas of the Moon.

The fault runs from the SE of satellite crater Brisbane H (43.7 km) and terminates at an undesignated 5.6 km crater NE of the satellite crater Hanno A (40.5 km). The fault line crosses from north to south upon a flooded plain. This plain is over 50 km width by approximately 100 km length. It is of interest that the fault runs relatively central upon the plain. Directly to the east of the fault line is a north, south 60 km running crater chain, further to the east is Mare Australe while towards the west is Vallis Rheita.

To be seen well it requires a favorable longitude libration which may explain somewhat as to why it has been excluded from traditional catalogues. Image 2 shows the local area as imaged by the LRO.

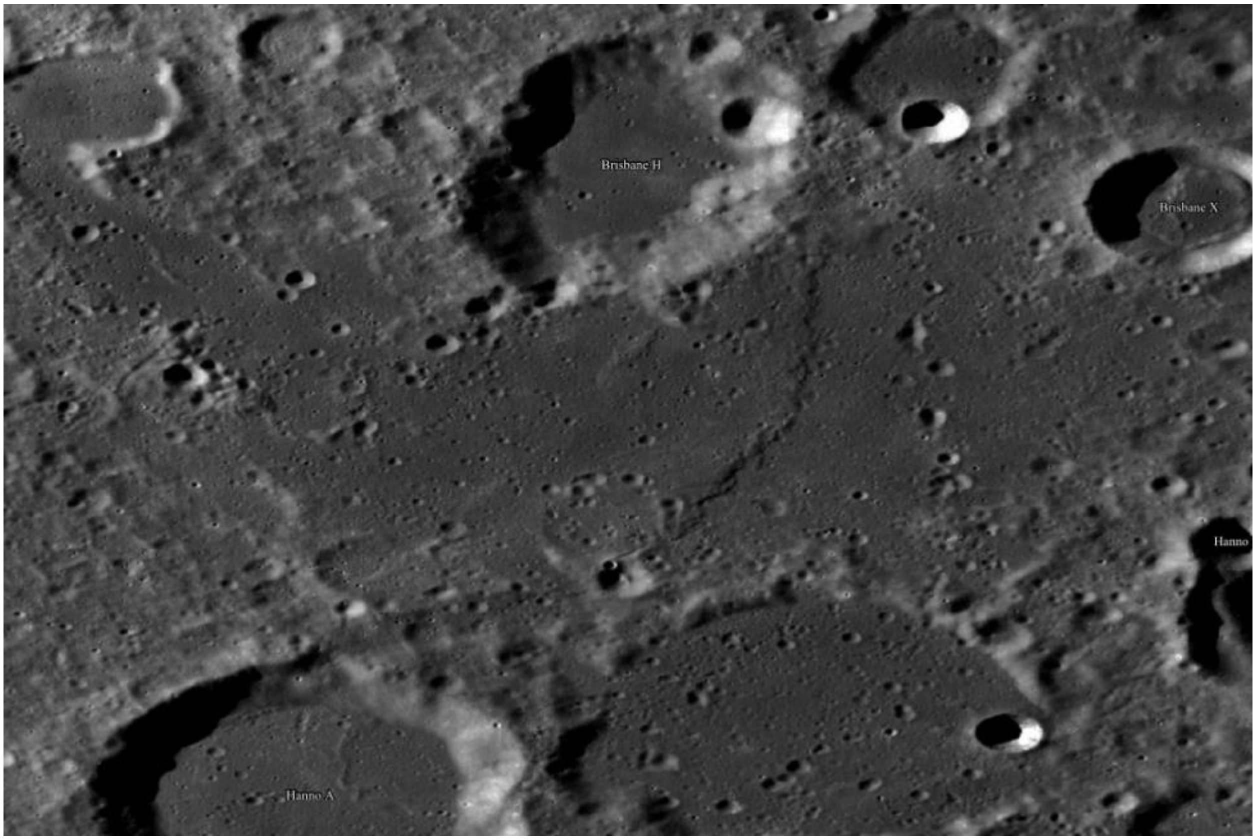


Image 2. LRO image of local area.

Measured Statistics

Using the LRO tool set, it has a measured length of 48 km with a width of between 1-3 km, being widest towards the south section (see image 3.). An unusual feature is its relative shallow slope compared to the other escarpments, averaging from 3° to 7° slope with a 12° maximum. For example, Rupes Cauchy is considered a shallow slope at 15°, this being attributed to micrometeorite weathering.

The flooded plain becomes elevated 157m (average) on its western side by the fault line (image 4). The north and south sections of the fault resemble a typical wrinkle ridge with a rapid drop off in height after the initial elevation however, some parts along the fault have a shallower drop off with areas showing little drop for 10+ kms. This is more indicative of a traditional escarpment (see images 5 & 6). Craters of a maximum of 1 km or less ingress the fault line indicating that it is a late formation typical of lobate scarps.

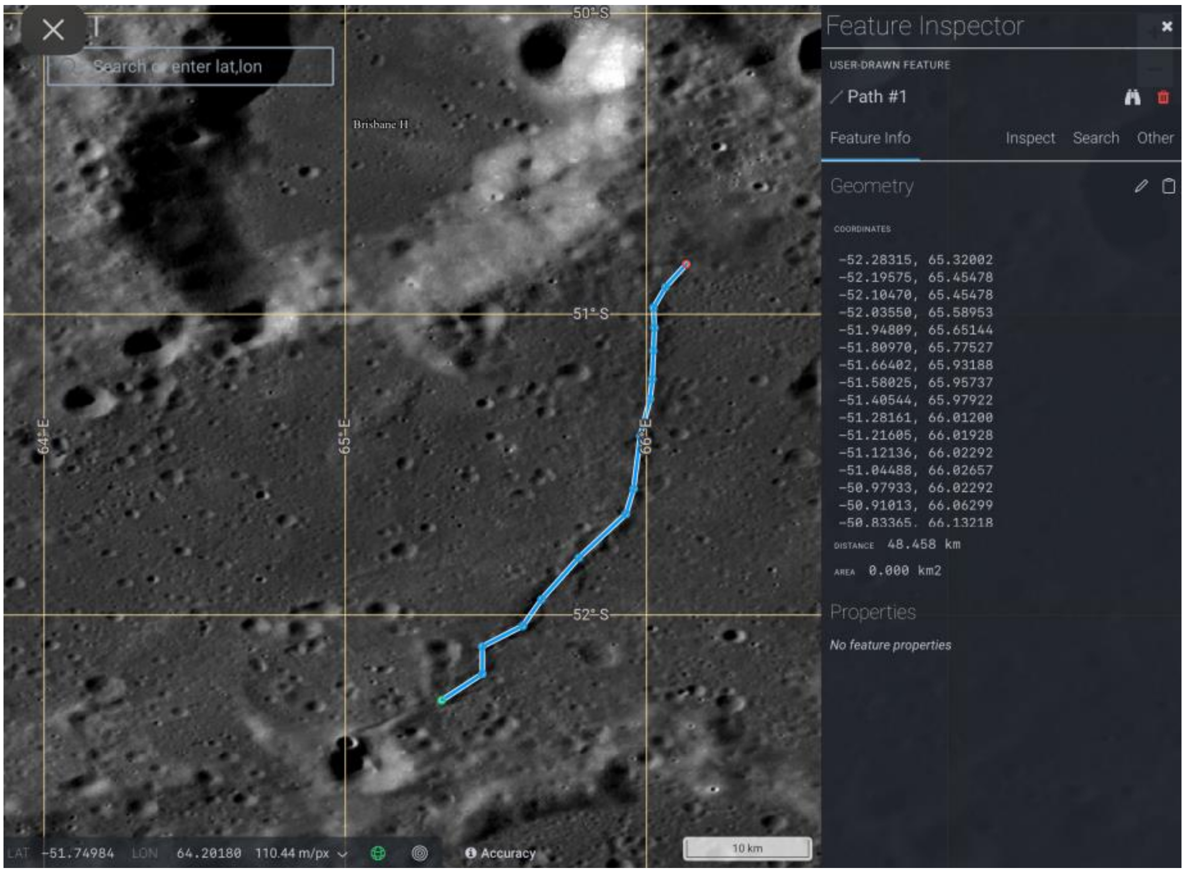


Image 3. Measured Length

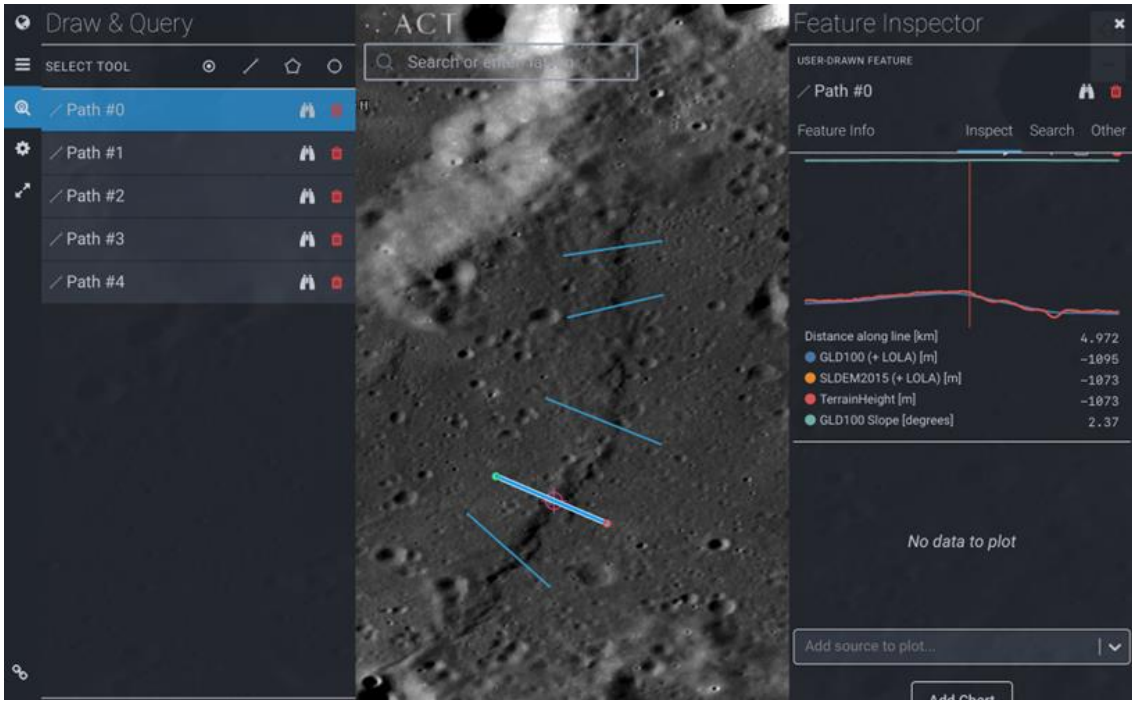


Image 4. Measured Height

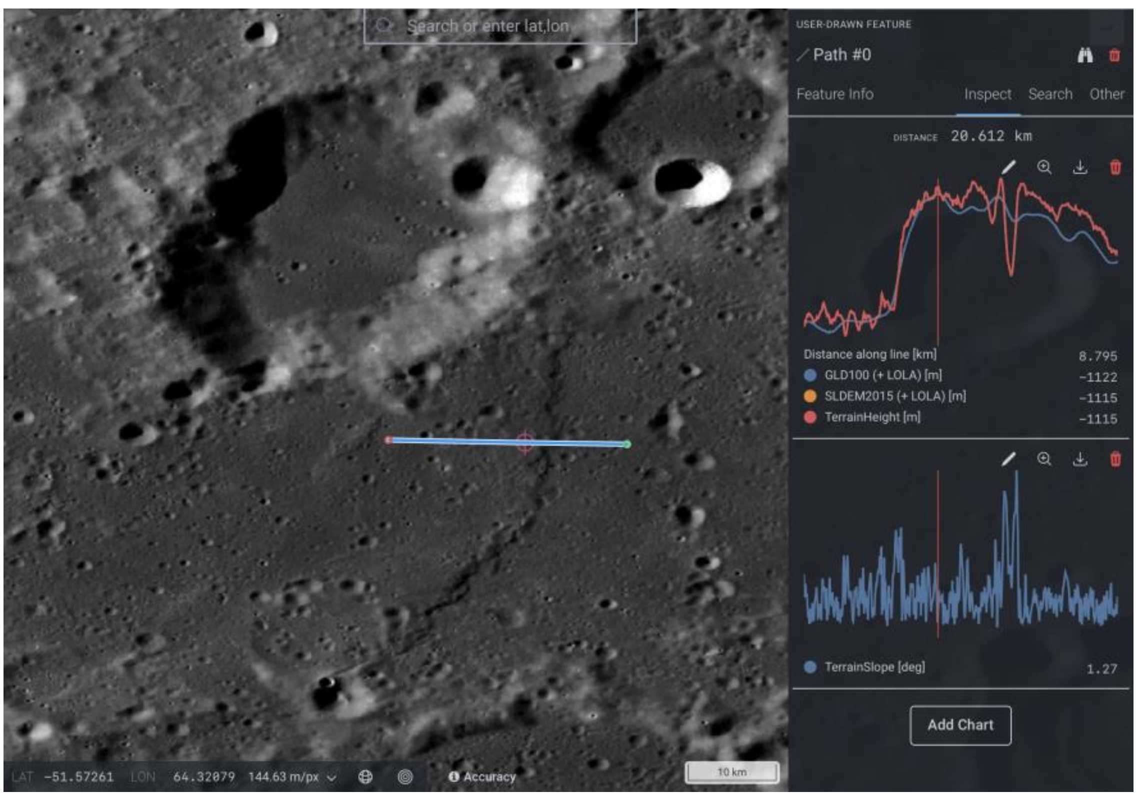


Image 5. Measured Central Drop A.

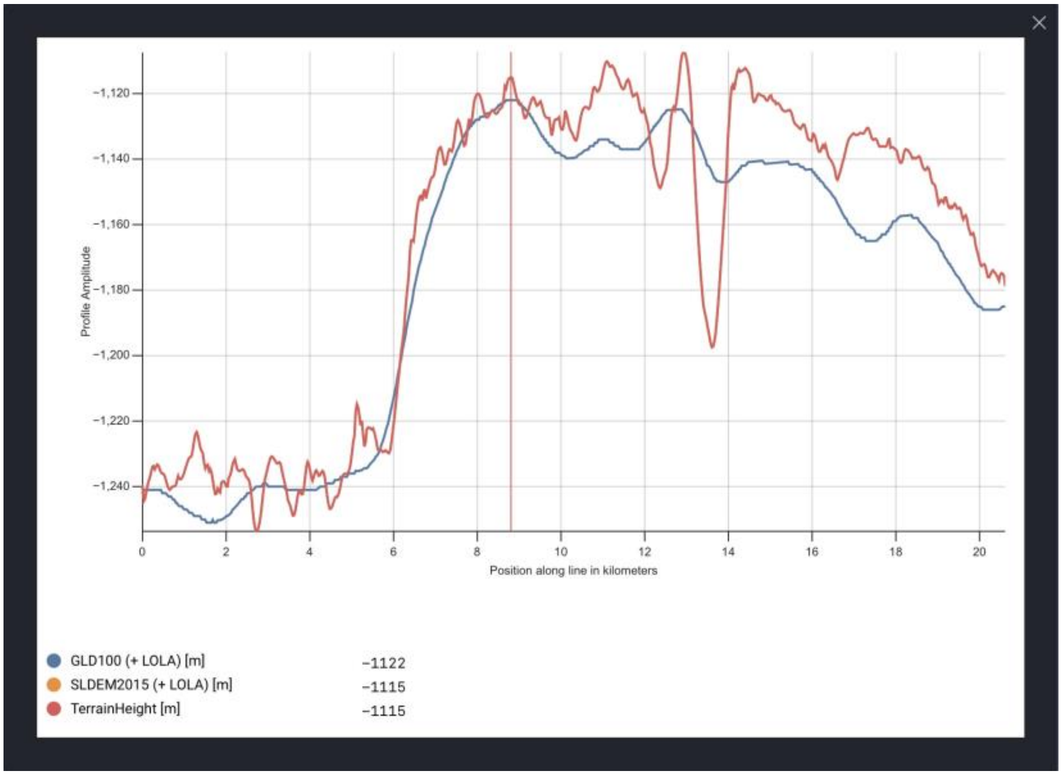


Image 6. Measured Central Drop B.

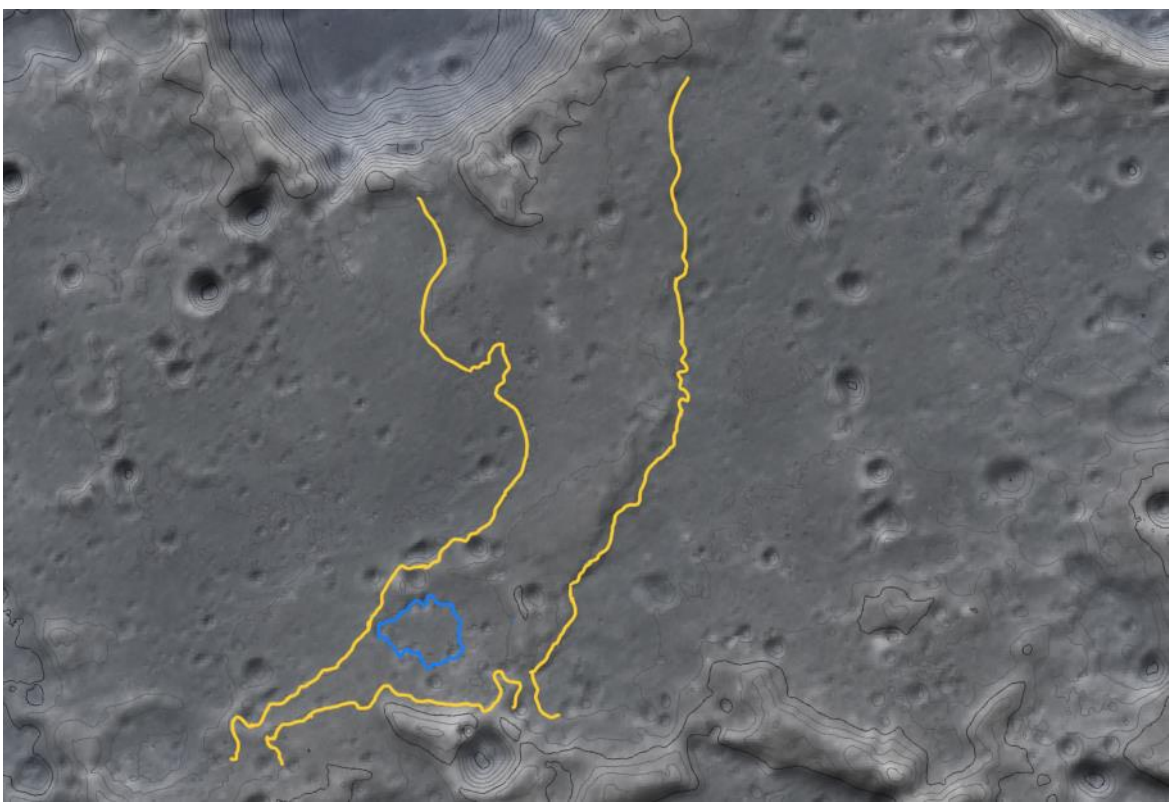


Image 7. Contour Map redmapper moon portal

Fault Height (Image 4}
Point 0 -1073 -1219 = 146
Point 1 - 1146 -1281 = 135
Point 2 -1110 -1215 = 105
Point 3 -1017 -1259 = 242
Point 4 -1128 -1284 = 156
Total =784/5=156.8m

Contour Map

By utilizing relatively new mapping software, based upon LRO data, it is possible to produce a contour map of the fault area (fig 7). The yellow outlines the prominent contour showing the east side fault line and a gentler drop further to the west. This shows a raised plateau that slopes off to the west with the blue highlight representing a depression. While there is some variation within the structure, what is represented is a standalone feature.

Direct Observation

The direct imaging of the fault, during a favorable libration, with a 450mm reflector shows a dark curving linear line. This is typical of a fault line seen at sunset (see image 1). Observation of this feature is not exclusive to large telescopes with cameras. The following is a direct observation report with a 140mm refractor.

Location Central Texas. 2023 December 28 03:50 UT. Seeing 6, Transparency 5.
Lunation Day 15.9, illumination 98.4%, Colongitude: 99.1°.
140mm Refractor 245x, AFOV 0.17°.

The fault line area was not difficult to locate, following the great Vallis Rheita southeast along its trajectory the area of interest was soon found close to the east lunar limb.

Northeast from the crater Hanno A are the remains of a disintegrated wall of an undesignated ghost crater. The fault line was visible heading north, appearing as a dark linear line heading towards the east of Brisbane H crater. It was not visible for the entire distance but to the approximate midpoint between the two craters. A lighter albedo was observed on the west side of the fault, contrasting against the darker plains' material.

Both of Hanno A and Brisbane H eastern crater walls were illuminated by bright sun, while their respective western walls cast thin dark shadows upon their surface floors. Three small brighter albedo features were observed to the east of the fault. These were suspected to be the illuminated eastern walls of the larger craters of the north, south direction of the crater chain, which is located in this area.

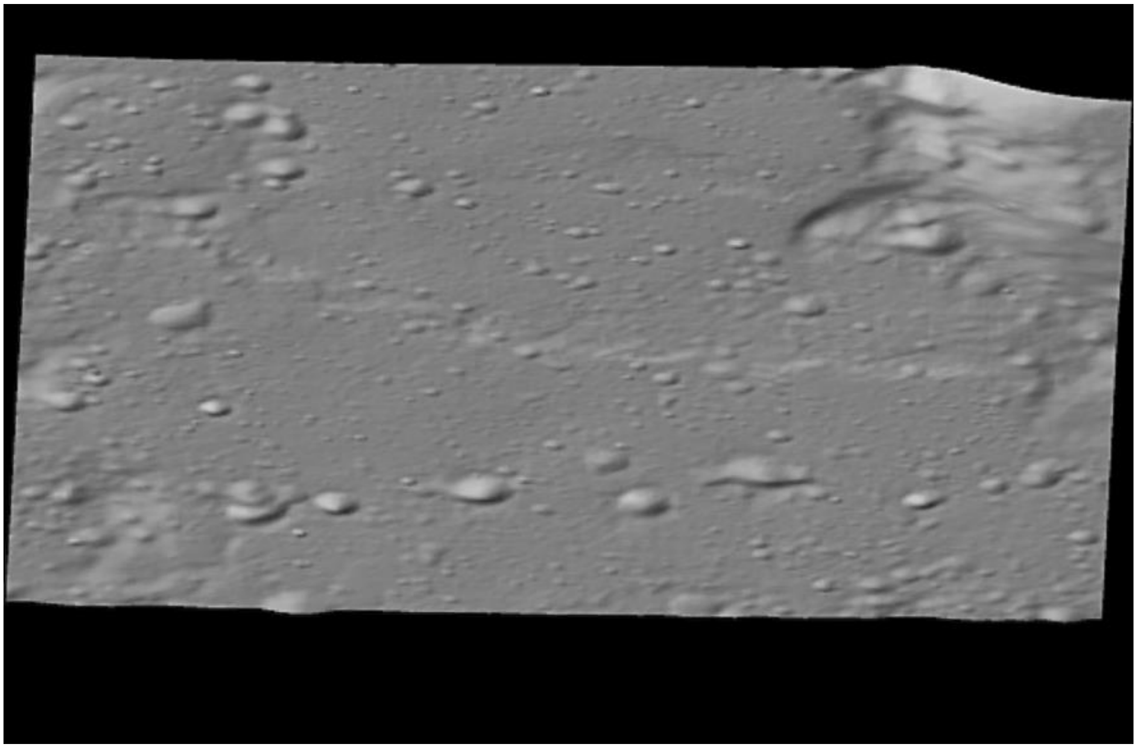


Image 8. The 3-dimensional orthogonal projection shows the fault running left (south) to right (north) with east to the bottom.

Conclusion

The fault represents a significant feature with a notable length of 48 km however, it remains somewhat challenging to observe due to its location and the fact that its visibility is heavily affected by lunar libration. When the lunar longitude libration increases to include Mare Australe, the feature becomes even more difficult to observe as its contrast fades into the plain it runs through. This is typical of images that show Mare Australe such as in "The Cambridge Photographic Moon Atlas" where the fault line becomes invisible.

The faults relatively shallow slope of up to 12° is similar to wrinkle ridges, when compared to the other escarpments we would expect a slope to be a little steeper. It is plausible that it once was but it would require considerable amounts of micrometeorite weathering which would indicate it as an older feature. However, the lack of craters larger than 1 km along its length implies it may well be late Copernicus, similar to lobate scarps. Parts of the fault certainly fall into the designation of a wrinkle ridge however; this is not conclusive and the possibility remains that this may well be a more traditional escarpment fault. A number of notable attributes between the two are evident. The fault line has a more continuous structure and not segmented (image 8). The location of the fault is centrally located upon a plain and not towards its edge. Some parts of the plateau consist of a relatively flat elevated structure which is more indicative of an escarpment. More direct observation and study is encouraged.

References:

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https://www.lroc.asu.edu/posts/429

http://lroc.sese.asu.edu/posts/984

https://the-moon.us/wiki/Lunar_Dorsum

https://www.lpi.usra.edu/resources/lunar_orbiter/images/aimg/iv_184_h3.jpg

https://www.redmapper.com

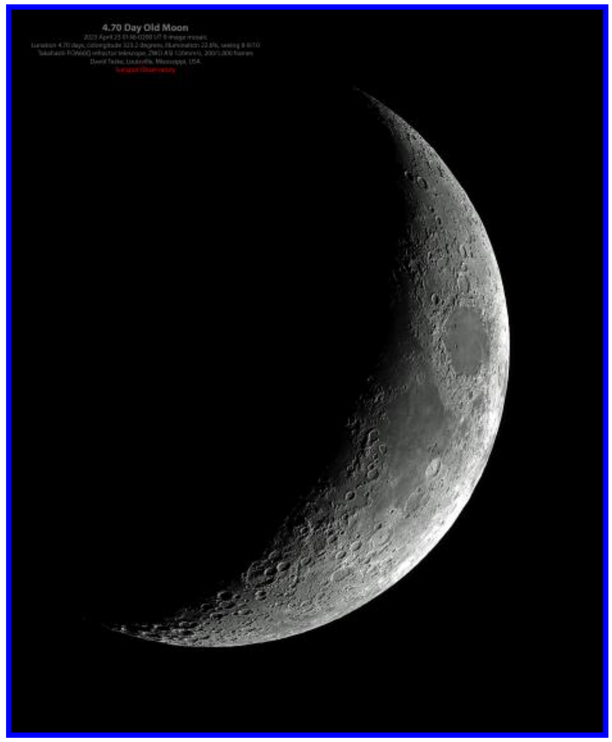
The Cambridge Photographic Moon Atlas. Alan Chu, Wolfgang Paech; First Edition (2012)

Another Look at the Brisbane H Dorsum/Escarpment

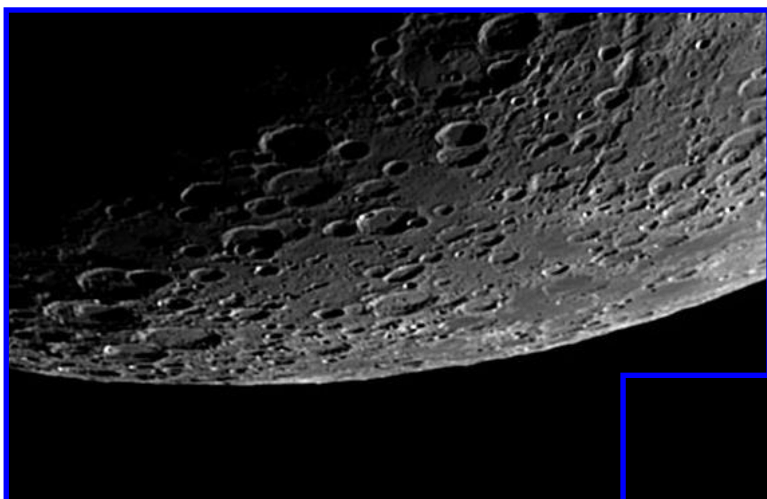
David Teske

Elsewhere in this issue of *The Lunar Observer*, Jon Bosley gave a wonderful report about the Brisbane H Dorsum (Unofficially) or Possible Escarpment Fault which he "discovered" in his lunar images taken with an 18-inch reflector. As Jon reports, it has been briefly discussed elsewhere to a very limited extent. I still think that it is amazing that with a large amateur telescope, one can find new topographic features on our Moon. This, paired with the eyes of the Lunar Reconnaissance Orbiter, can give a whole new light on an area. One remarkable thing in Jon's article is that by using LRO data, he measured the escarpment to be 156.8 m high. That does not seem that high, but at 514 feet high, that sounds mighty formidable to some future astronaut trying to get through this area!

In Jon's report, he says this Brisbane H dorsum/scrap was directly visible through is 140 mm refractor telescope. I decided to see if it was visible through my 60 mm refractor. Sure enough, on 2023 April 25 I was taking several images of the Moon to make a mosaic (image 1). Upon close inspection, the Brisbane H was visible as a light region as depicted in the 21st Century Atlas of the Moon by Wood and Collins in my humble images (images 2 and 3). Next time the conditions are good, I will try to glimpse this escarpment with high magnification. Give it a try, and let us know your results!



Above, Image 1, 4.70 day-old Moon*, David Teske, Louisville, Mississippi, USA. 2023 April 25 01:46-02:00 UT, colongitude 323.2º. Takahashi FOA60Q refractor telescope, IR block filter, ZWO ASI120mm/s camera. Seeing 8-9/10. 9 image mosaic.*



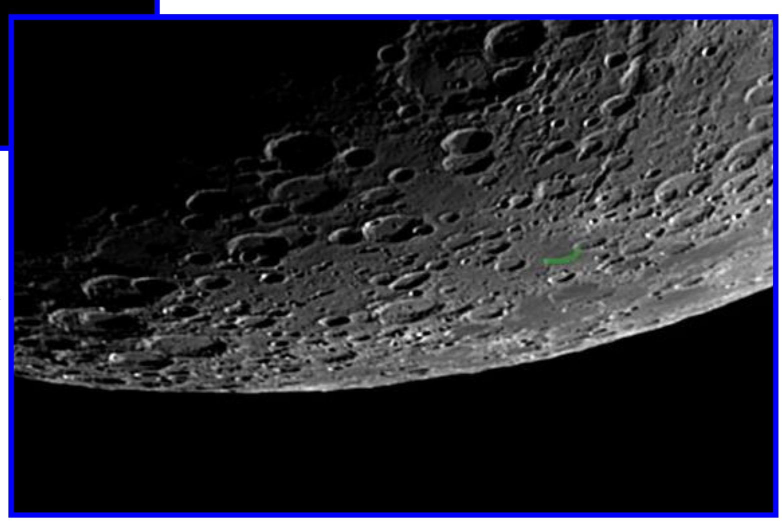


Image 2 Above and Image 3 right, Brisbane H escarpment. *This is an enlargement of image 1. The escarpment is highlighted in image 3 with the green line.*

The Posidonius Adventure

Rik Hill

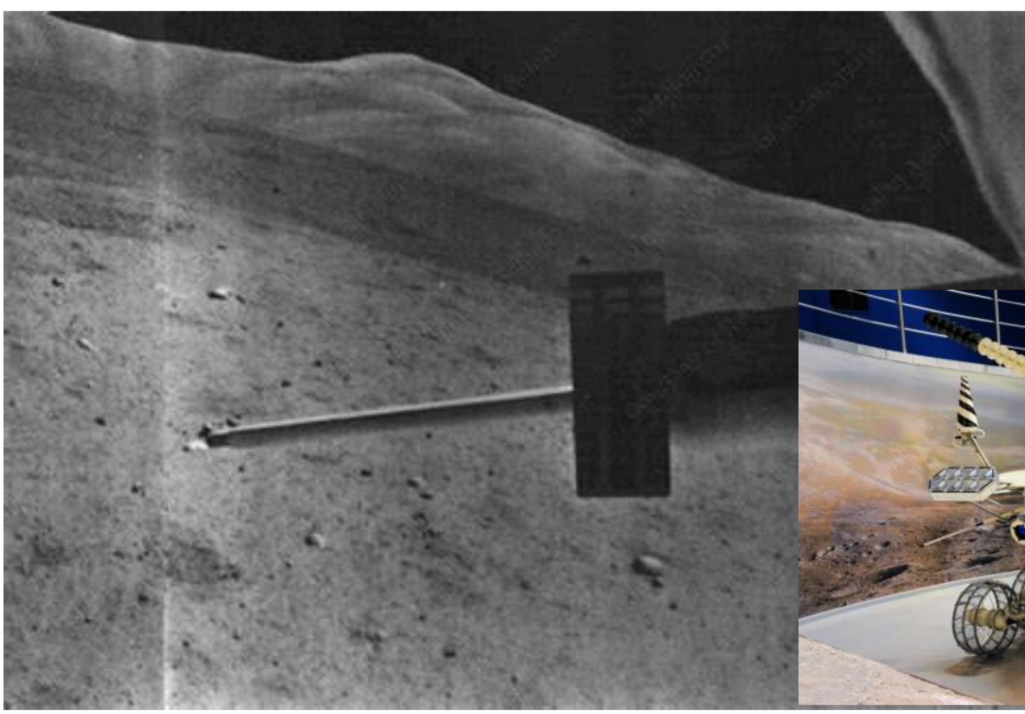
On the northeastern shore of Mare Serenitatis is found the spectacular crater Posidonius (99 km). This is what's called a fractured floor crater (FFC) meaning that it was flooded, the lava receded and the floor cracked resulting in the fissures we call Rimae Posidonius. Posidonius is thought to contain the remnants of an older crater wall seen on the east (right) side. There are two long, parallel north-south rimae immediately apparent on the floor of Posidonius. They are not at all the alike. The one in the middle of the crater is a graben-like rima that ends on the north end where it meets the interior crater wall. The rima to the west is not a linear crack but in orbiter images is seen as tightly sinuous formed by a fluid, probably lava, during some post-impact modification and flooding from Serenitatis as it takes a right-angled turn to the west wall. On the other end it runs up to the northern wall and follows along the inside of that wall all the way to the crater Posidonius (14 km) B on the northeast wall. You'll need a large aperture to follow along its full extent.

South of Posidonius is the ruined crater Chacornac (53 km), as much as a billion years older than Posidonius, from the beginnings of the Moons formation. It has been overlain by ejecta from numerous nearby maria and crater impacts. Notice how the central rima in Posidonius appears to continue south across Chacornac and beyond.

Further south from Chacornac is an embayment off the mare. This is Le Monnier (63 km). The south side of this crater was the landing site for Luna (Lunik) 21. From this landing site the onboard rover, Lunokhod2, traveled 37 km across the surface to the flanks of the southeastern wall, the longest distanced traveled by any lunar roving vehicle ever. This rover had 7 cameras on board. I invite the readers to look up the pictures and exploits of this mission.

There's a nice wrinkle ridge winding its way south from the southern point Le Monnier. This is Dorsa Aldovandri that winds further south for 124 km well out of the limits of this image. To the southeast of Le Monnier is nice crater Römer (41 km) with terraced walls. The interior of this crater is worth the time on a good steady night with highest magnifications! To the left of this crater is a graben-like rima, Rima Romer. Another such rima is to the right of Posidonius just left of the smaller crater G. Bond (19 km). This rima is, as you might expect, Rima G. Bond.

Images of and from Lunokhod2.



Lunar Topographic Studies
The Posidonius Adventure

Posidonius, *Richard Hill, Loudon Observatory, Tucson, Arizonia, USA. 2023 October 04 07:27 UT, colongitude 138.1º. TEC 8 inch f/20 Maksutov-Cassegrain telescope, 665 nm, SKYRIS 132M camera. Seeing 8-9/10. Below, the path of Lunokhod2 (Bing).*

Lunar Topographic Studies
The Posidonius Adventure

Lunar Imaging With the New ZWO SeeStar S50 Smart Scope

Gregory T. Shanos

A novel way to image the moon is with the use of a smart scope. A smart telescope utilizes sophisticated sensors, camera systems, and software to capture stunning images of the universe. I always wanted to purchase a smart scope; however, the price was prohibitive starting at $3,999 to $4999. Recently the ZWO SeeStar S50 has entered the market at an astonishingly low price of $499. This smart scope is one of the most cost-effective, fastest and easiest ways to take impressive images of the Moon, Sun, deep-sky as well as terrestrial objects. In this short review, I shall focus only on how to take impressive images of the Moon with the SeeStar S50. (See figure 1) There is also another smart scope on the market at this price range namely the Dwarf II. I do not own a Dwarf II therefore I cannot say anything regarding this smart scope. I refer everyone to check out YouTube videos that do side by side comparisons of the Dwarf II, SeeStar and other smart scopes before you decide which one to purchase.

The SeeStar is easy to use and setup. It only takes approximately 5 to 10 minutes to set up the telescope and you are ready to go. After turning on the device, you sync it using built-in Wi-Fi to your iPhone/Android cell phone or Apple iPad. I highly recommend using an iPad since the image appears rather small on a cell phone. Next you need to calibrate the compass by turning the alt-azimuth mounted telescope and tripod 360 degrees several times until the telescope states the calibration is complete. Next you need to level the SeeStar. There is an auto-level feature that successfully levels the telescope. You are now ready to begin imaging. There are four separate modes, namely Stargazing, Lunar, Solar and Scenery. Just click on Lunar mode and the SeeStar automatically finds the moon! The moon is centered in the field of view and is tracked accordingly. Next click on autofocus and you're ready to image. You can take a single photographic snapshot of the moon which is at lower resolution. (See images 2, 4, & 6). The photograph appears and is saved as a jpg on your cell phone or iPad.

The SeeStar features two video modes namely AVI (Raw) and MP4 (Compressed) for the Sun, Moon, and planets. I recommend using only AVI (RAW) since this is uncompressed and compatible with Autostakkert. However, the file sizes will be very large. For a five-minute exposure, the file size of the video was a whopping 8 GB. This large video file is stored in the SeeStars SSD internal memory which is 64GB in size. A recent software/firmware update now allows for 2X and 4X digital zoom so you can focus on various craters and maria. (See images 4 thru 7). You can then connect the SeeStar and download the video file to your computer. Once the AVI is downloaded you can import it into Autostakkert for aligning and stacking.

Unfortunately, planets in the SeeStar appear very small due to the short focal length of only 250mm. The SeeStar is optimized for a larger field of view that would encompass the Sun, Moon and deep-sky objects.

The ZWO SeeStar S50 software/firmware is updated at least twice a month with new features added at every upgrade. I have contacted ZWO support on several occasions and always receive a response within 24 hours!

The introduction of smart scopes will soon revolutionize the field of amateur astronomy. The SeeStar and other smart scopes are light weight, easy to use and can take scientific quality images suitable for submission and research by the Association of Lunar and Planetary Observers. Examples include images of the Sun for Solar Section, Moon for the Lunar section, comets for the Comet Section, asteroids for the minor bodies section and even exoplanets which are currently in development.

In conclusion, a smart scope in the price range of $499 is affordable and a necessary addition to everyone's arsenal of astronomical equipment. These powerful new instruments make astrophotography easy and fun with an added scientific value.

Figure 1: This smart scope features a 50mm triplet apochromatic lens at a focal length of 250mm at f/5. The sensor is a SONY IMX462MC color CMOS chip with a resolution of 1096 x 1936 pixels (2.1MP) at 2.90 microns. The SeeStar has added features such a built-in dew heater as well as an internal UV-IR cut filter and dual band H-alpha and OIII light pollution filter. The telescope weighs only 3kg or 6.6 lbs. The SeeStar comes complete with a custom fit carrying case, carbon fiber tripod, solar filter, USB-A to USB-C charging cable and Quick-start guide all for only $499. Credit: ZWO website. See the ALPO Observers Notebook at https://soundcloud.com/observersnotebook where I recently recorded a podcast regarding the use of the SeeStar as a research instrument for ALPO.

Image 2: A single photographic snapshot of the moon taken on January 20, 2024 at 18h 08m (6:08 pm) local time or 23h 08m Universal Time. The Moon was 78% waxing gibbous at 55 degrees above the horizon. The seeing was above average and the transparency was very good with clear skies. Prominent maria visible include Mare Crisium, Mare Fecunditatis, Mare Nectaris, Mare Tranquillitatis and Mare Serenitatis. Tycho crater is toward the south.

I

Image 3: The moon on January 20, 2024 at 18h 35m (6:35 pm) local time or 23h 35m Universal Time. The moon was 61 degrees above the horizon. SeeStar S50 smart scope 5-minute AVI video that was aligned and stacked in Autostakkert 3.1.4 and sharpened with Registax 6.1.0.8. A total of 894 out of 3490 frames at 25.6% quality using AP size 40 multiscale with 1032 total alignment points. Minor processing in Photoshop CS4. Note how superior in resolution the AVI aligned, stacked and sharpened image is to a single photographic snapshot of the moon.

Image 4. Single photographic snapshot of the moon at 2X digital magnification on January 20, 2024 at 18h 42m (6:42pm) local time or 23h 42m Universal Time. The moon was 63 degrees above the horizon.

Image 5. The moon on January 20, 2024, at 2X digital magnification on 18h 48m (6:48 pm) local time or 23h 48m Universal Time. The moon was 64 degrees above the horizon SeeStar S50 smart scope 5-minute AVI video that was aligned and stacked in Autostakkert 3.1.4 and sharpened in Registax 6.1.0.8. A total of 4189 out of 17,153 frames at 63.5% quality using AP size 56 multiscale with 253 total alignment points. Minor processing in Photoshop CS4. Note how superior in resolution the AVI aligned, stacked and sharpened image is to a single photographic snapshot of the moon

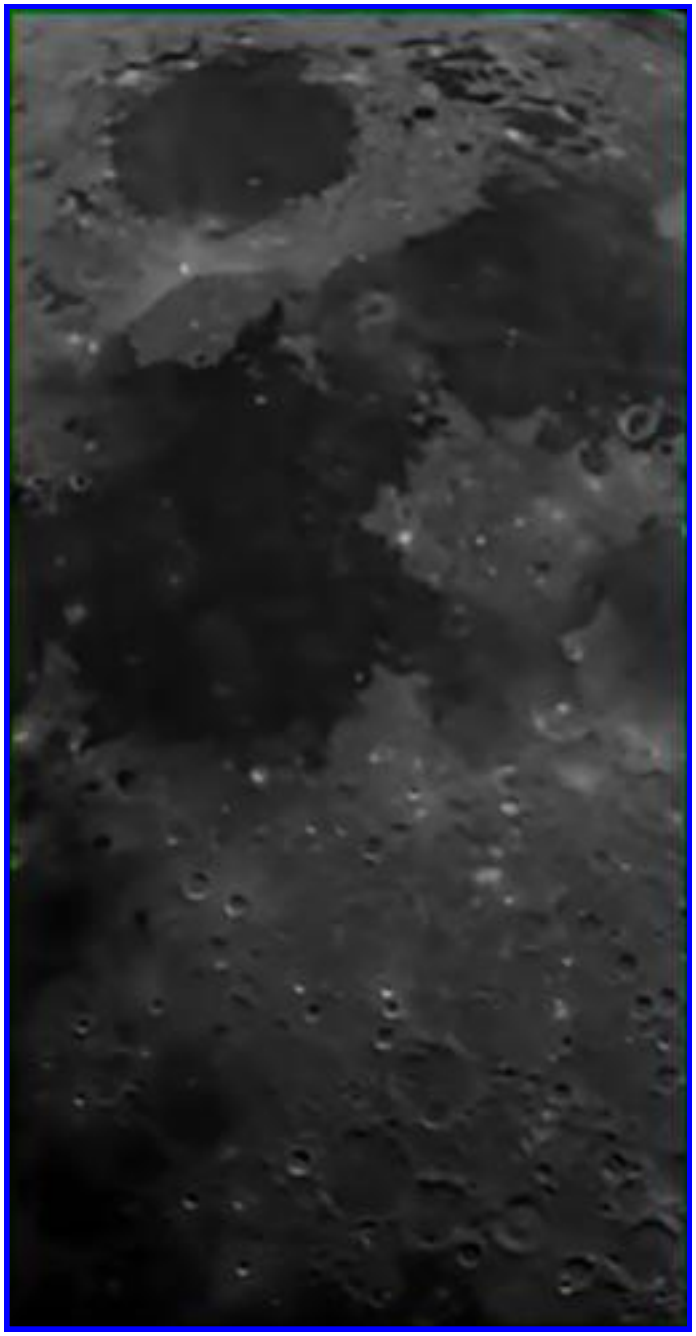


Image 6: Single photographic snapshot of the moon at 4X digital magnification on January 20, 2024 at 18h 50m (6:50pm) local time or 23h 50m Universal Time. The moon was 64 degrees above the horizon. Note the 4X image is too magnified and lacks resolution. Atmospheric turbulence becomes more significant and prominent at this magnification. I do not recommend imaging the moon at 4X zoom.

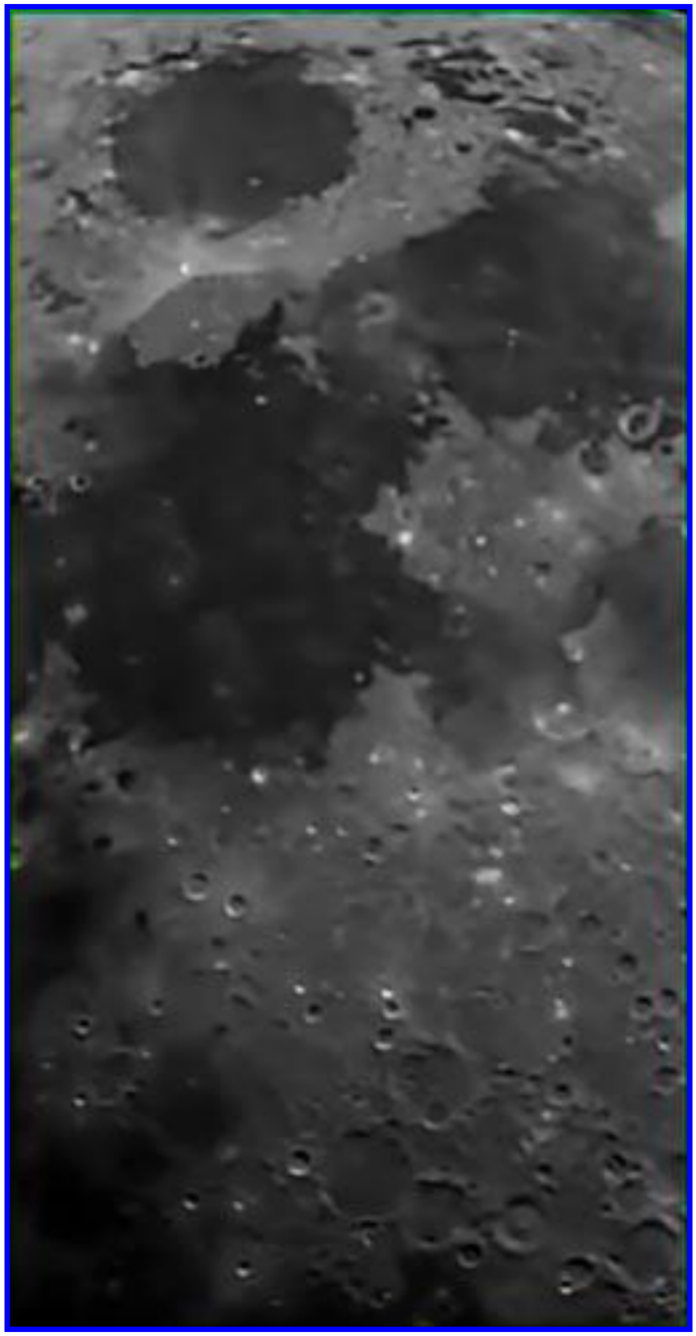


Image 7: The moon on January 20, 2024, at 4X digital magnification on 18h 55m (6:55 pm) local time or 23h 55m Universal Time. The moon was 65 degrees above the horizon. SeeStar S50 smart scope 3-minute AVI video that was aligned and stacked in Autostakkert 3.1.4 and sharpened in Registax 6.1.0.8. A total of 705 out of 2525 frames at 64.7% quality using AP size 48 multiscale with 142 total alignment points. Minor processing in Photoshop CS4. Note the 4X magnified image even when aligned and stacked is of lower resolution and therefore not recommended.

Focus-On: Lacus Mortis:
One of the Strangest-Looking Parts of the Moon

Alberto Anunziato

1.-Description

What is Lacus Mortis? The first impression is that of an eye, a single eye, whose pupil is the Bürg crater. The reference to death in its Latin name (Lake of Death) is not very reassuring. But all this is subjective. The aquatic impression given by the name of the lake is also subjective, like so many selenographic features, but this depends on the first cartographers and their search, conscious and unconscious, for water on the Moon. Once again, what is Lacus Mortis? "One of the strangest-looking parts of the Moon" is Peter Grego's brilliant answer, which we are going to verify in the following pages, in which we will tour an area that includes a very varied landscape.

Lacus Mortis "is generally circular, with the crater Bürg in the center of it. The Lacus is about 150 km (93.2 miles) in diameter and covers about 34,000 sq. km (13,128 square miles). The mare-like floor is of Imbrian-age lavas, but the rounded mountains indicate that the impact that formed the Lacus basin is much older. The mountains are overlain with Fra Mauro Formation materials" (Garfinkle). Therefore, our lake would be a crater (almost a basin) from the pre-Imbrian period flooded in the Imbrian.

A great way to enjoy a bird's eye view, or rather an astronaut's view, of Lacus Mortis, and thus understand it in its entirety, is with the images that Howard Fink and John Robbins have shared with us. John Robbins, in the text "Lunar Mapping" (which is part of this Focus On section) shares three images created from the SLDEM2015 digital elevation models (DEM) of the Lunar Reconnaissance Orbiter (LRO) Quickmap. Figure 1 is an elevation map of all of Lacus Mortis that should be kept in mind to understand the images that follow, as we should also keep in mind IMAGE 1, a 3D digital elevation model, made by Howard Fink, IMAGE 2 is a lower view from the south, both available on https://finkh.wordpress.com/2020/05/13/lacus-mortis/.

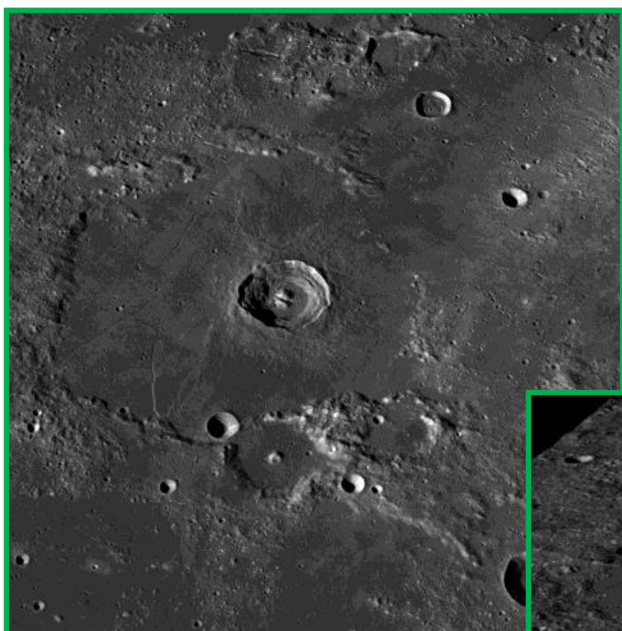


Image 1, Lacus Mortis, *Howard Fink, New York, New York, USA. LAC26 DEM.*

Image 2, Lacus Mortis, *Howard Fink, New York, New York, USA. LAC26 DEM.*

Lunar Mapping

John Robbins

On the Cloudy Nights forum website, David Teske announced that the January 2024 issue of The Lunar Observer (TLO) was available for download. After downloading, I was astonished that I was unaware of this publication, and was impressed with the level of passion and knowledge shared within its pages. My interest in astronomy has gone in cycles and I must've had my head in the sand when it was advertised earlier, likely being too occupied with other things. However, more recently, my interest in observing the Moon has increased and TLO is a welcome and inspiring source of shared information.

Obviously, much of the material in TLO is topographically oriented. Use of LROC QuickMap as a source to create topographic profiles is a useful means to ascertain elevations (and slopes) by a number of your contributors. QuickMap can also make some very nice relief maps on the fly, but the web site has some limitations as of choice of color scales, and selection of contour colors.

To get around some of QuickMap's limitations, I downloaded the SLDEM2015 digital elevation models (DEM) publicly available through NASA's Planetary Geology, Geophysics and Geochemistry Lab web site. The grids are actually hosted at MIT and come in several resolutions described in terms of the number of pixels per degree (PPD). I downloaded the 256 and 512 PPD resolution models, reformatting them into files I could easily ingest (NetCDF) with my mapping software. The grids are available in JPEG2000 and in binary IMG format. I processed the binary IMG format files to create NetCDF files. The SLDEM2015 data has latitude limits of ± 60°. Additional lunar nomenclature files were downloaded from the USGS planetary web site.

Then, I composed Unix scripts able to create custom maps of the lunar surface, with code elements derived from Earth-mapping scripts I had written over the years for employment purposes. The scripts make calls to Generic Mapping Tools (GMT) commands. When running the scripts, the boundaries of a region of interest are specified (in terms of minimum/maximum latitudes and longitudes); a few options can be selected; and, within a few seconds, a post script file is created that can be converted into a PDF or jpg, easily enough. Regrettably, this software is very much tailored to my home computing environment; not easily transported or shared. The software is capable of producing more detailed maps using the 512 PPD resolution DEM, as well. Shading is artificial and applied internally by the software specifying illumination parameters.

Typically, I create contour maps at the 256 PPD resolution, covering a 4° wide and 2° tall region. With the higher, 512 PPD resolution DEM, beautiful maps covering 2° x 1° regions can be created to assist in a more detailed study, but I've seen instances when artifacts are notable in the 512 PPD grids. Most maps each require about 1 to 1.5 MB of space to store, so they're a little on the big side to share with on-line forums. Discovering a means to reduce file size while retaining detail remains a problem.

Figure Captions

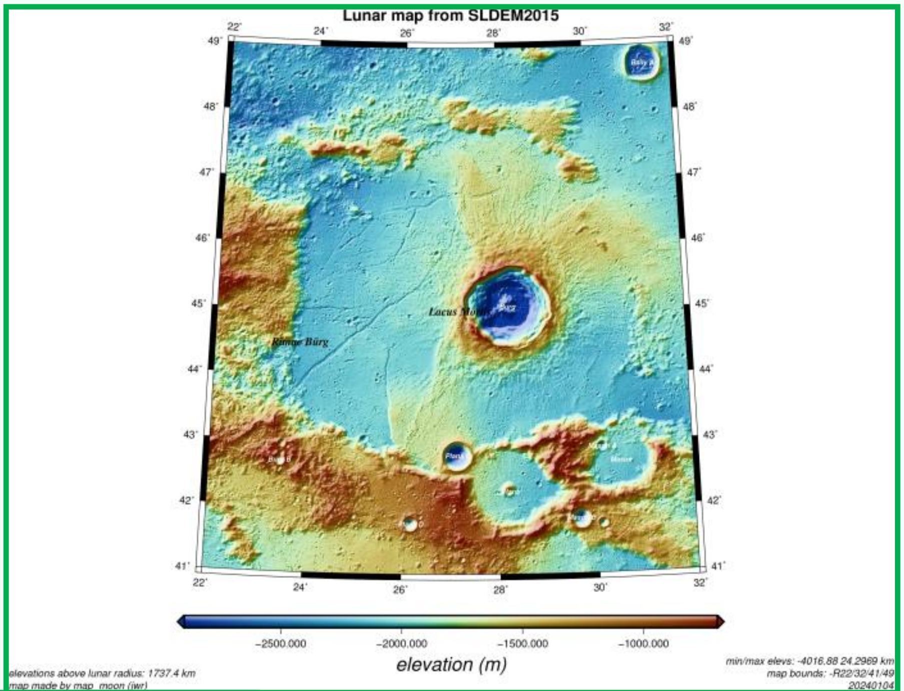
Figure 1. Map of the entire region for this month's Lunar Section focus: Lacus Mortis. For this map, contour lines were omitted to merely show the general topographic character of the area. This map was made using the 256 PPD resolution data. View is from above in a Lambert projection.

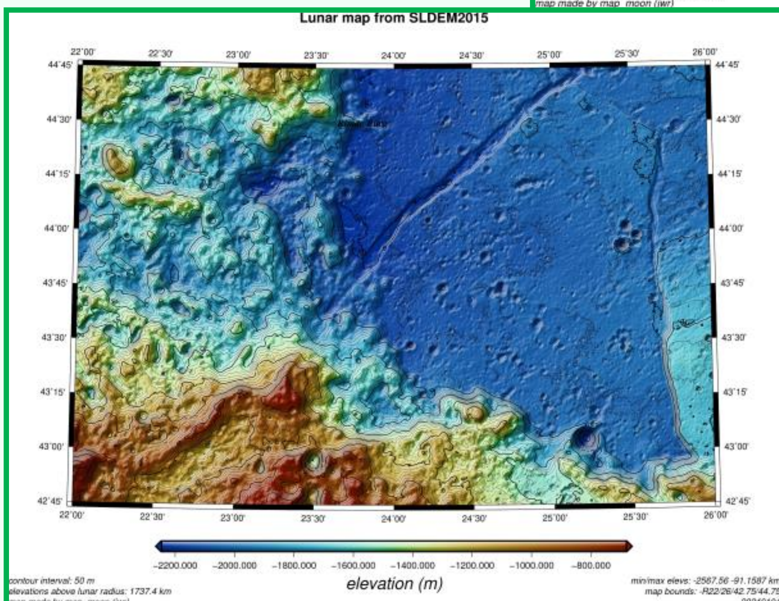
Figure 2. A zoom-in on the SW corner of Lacus Mortis providing topographic details for Rima Bürg I (rille formation in the center) and Rima Bürg II at the right edge, with higher eastern topography.

Figure 3. A zoom-in of the centrally located Bürg crater, ~41 km in diameter. SLDEM2015 estimates the depth of the crater (from highest point on the rim to lowest point in the crater) to be about 3715 meters. The highest point is on the NW rim, -301.145 meters (relative to a sphere of 1737.4 km) at longitude 27° 49' 20.3", and latitude 45° 35' 44.5".

Focus-On: Lacus Mortis One of the Strangest-Looking Parts of the Moon

Figure 1. Map of the entire region for this month's Lunar Section focus: Lacus Mortis. For this map, contour lines were omitted to merely show the general topographic character of the area. This map was made using the 256 PPD resolution data. View is from above in a Lambert projection.





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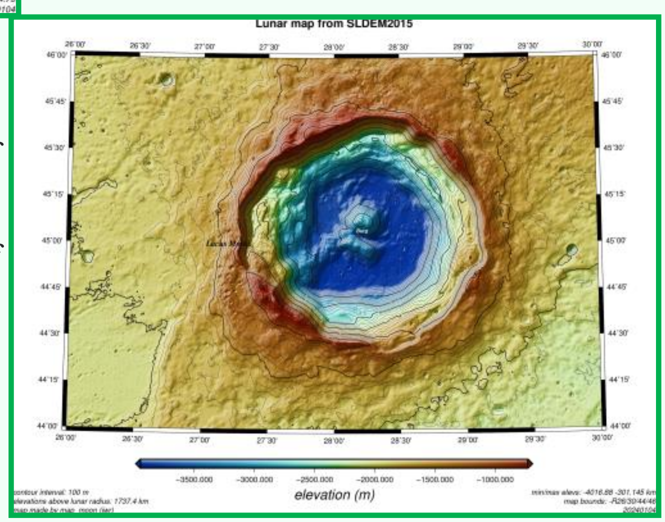


Focus-On: Lacus Mortis One of the Strangest-Looking Parts of the Moon

IMAGE 3 is a broader panoramic view, also a 3 D DEM, which we recommend using on the source website (https://www.astrobin.com/full/ipd0tn/0/?q=LAC%20026) , in which you can zoom in on the place you want to see in more detail. Here's how Howard describes the tool of the SLDEM2015 DEM: “SLDEM2015 is a digital elevation model that covers the Moon from 60 degrees North to 60 degrees South at a resolution of 512 pixels per degree, or 59 meters per pixel. From that data I selected a sector corresponding to the area of a specific Lunar Astronautical Chart and mapped the elevation data onto a sphere the size of the Moon. The surface is painted by a sector the same size from the WAC Moon Morphology map, a 100 meter per pixel image of the whole Moon. This object is oriented so the view is from the south at an oblique angle to get more of a three-dimensional view and is captured as a PDF snapshot of about 25 megapixels grayscale. There are 144 LAC charts that map the Moon; Lacus Mortis is on LAC 026”.

Well, we leave the LRO views in lunar orbit back to our planet, from which it is not so easy to find Lacus Mortis (“Do you consider Lacus Mortis - The Lake of Death - a crater? Because of the mare-like term "Lacus" some observers just see it as a patch of mare material linking Mare Frigoris and Lacus Somniorum”, Wood, 2004) although Bürg is a little more prominent, as we see in IMAGE 4, a beautiful panoramic view.

Image 3, Lacus Mortis, *Howard Fink, New York, New York, USA. LAC26 DEM.*

Image 4, Lacus Mortis, *David Teske, Louisville, Mississippi, USA. 2022 February 09 01:53 UT, colongitude 359.3º. 3.5 inch Questar Maksutov-Cassegrain telescope, IR block filter, ZWO ASI120MM camera. Seeing 9/10.*

Focus-On: Lacus Mortis One of the Strangest-Looking Parts of the Moon

This is because Lacus Mortis is so old that it has almost lost its walls, which is seen in IMAGE 5: "Its western wall makes a clear bay in the uplands, and this extends into narrow fingers of hills that mark the ancient crater's original rim in the north and the south. The ring is broken by lava flows to the east, but a line of hills can be seen protruding above the plain to the east" (Grego). In IMAGE 6 and 7 we see the layout of the edge of Lacus Mortis (the east wall, of which we see nothing more than "a line of hills", is the right edge in these images). Wood (2004) points out two interesting features of the walls of Lacus Mortis: "Lacus Mortis is a depression lower than most of its surroundings, especially the rubbly plateau to the west. Notice the faint diagonal lineation's in the rubbly material? They are probably flow marks in this jumble of ejecta from the Imbrium basin. Notice also that the walls of Lacus Mortis do not define a circle or an ellipse - they have distinct straight edges. These linear wall segments are part of the lunar grid system, marked also by the polygonal sides of Ptolemaeus, the Straight Wall, the Alpine Valley and other straight features. Some of these linear features are related to basins, but others could have formed by tidal stressing early in lunar history when the Moon was much closer to Earth". It is not so easy to observe the "flow marks in this jumble of ejecta from the Imbrium basin" on the west wall, which is the highest.

Image 5, Lacus Mortis, *Francisco Alsina Cardinalli, Oro Verde, Argentina. 2024 February 17 01:03 UT. Meade 8 inch reflector telescope, 2x barlow, QHY5L-II-M camera.*

Image 6, Eudoxus to Bürg, *Richard Hill, Loudon Observatory, Tucson, Arizonia, USA. 2015 April 14 02:27 UT. TEC 8 inch f/20 Maksutov-Cassegrain telescope, 665 nm, SKYRIS 445M camera. Seeing 8/10*

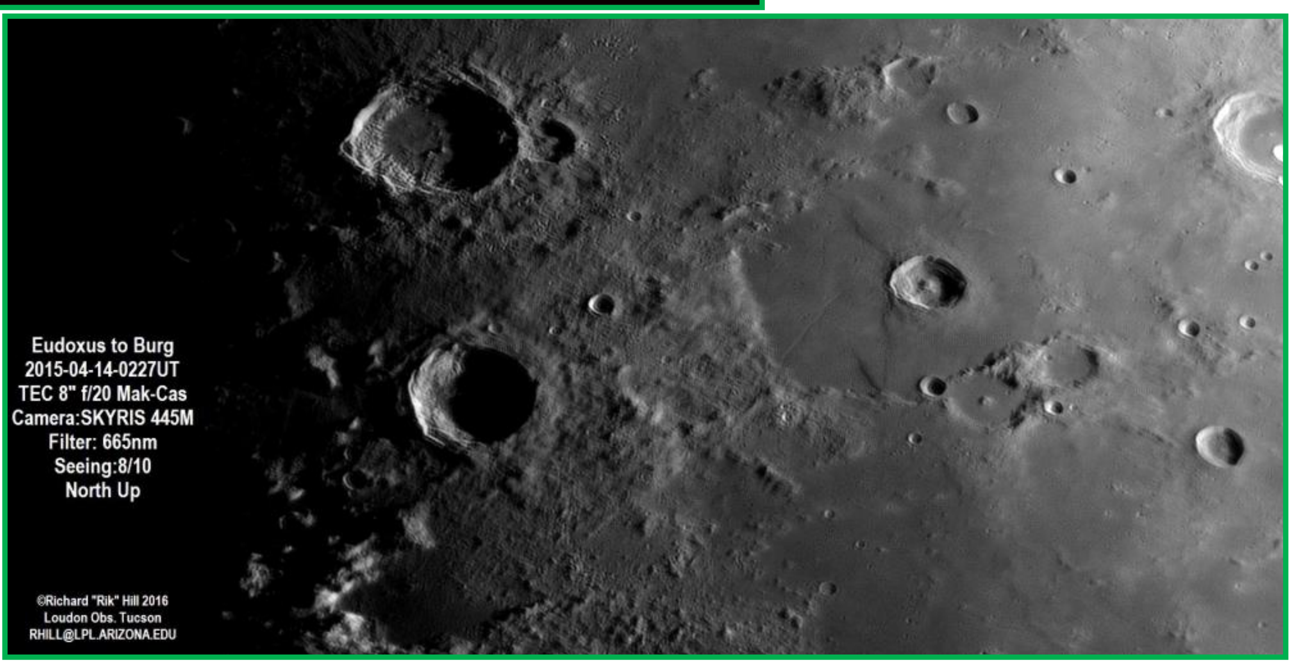


Image 7, Aristoteles to Hercules, *Richard Hill, Loudon Observatory, Tucson, Arizonia, USA. 2017 March 08 02:08 UT. TEC 8 inch f/20 Maksutov-Cassegrain telescope, 665 nm, SKYRIS 445M camera. Seeing 8/10.*

Where they are seen most clearly is in IMAGE 8, and a little less clearly in IMAGE 9. Easier to observe is the polygonal design of the walls, which can be seen in the previous images, as well as in IMAGE 10.

Image 8, Lacus Mortis, *Richard Hill, Loudon Observatory, Tucson, Arizonia, USA. 2015 October 03 08:08 UT. TEC 8 inch f/20 Maksutov-Cassegrain telescope, 665 nm, SKYRIS 445M camera. Seeing 8/10.*

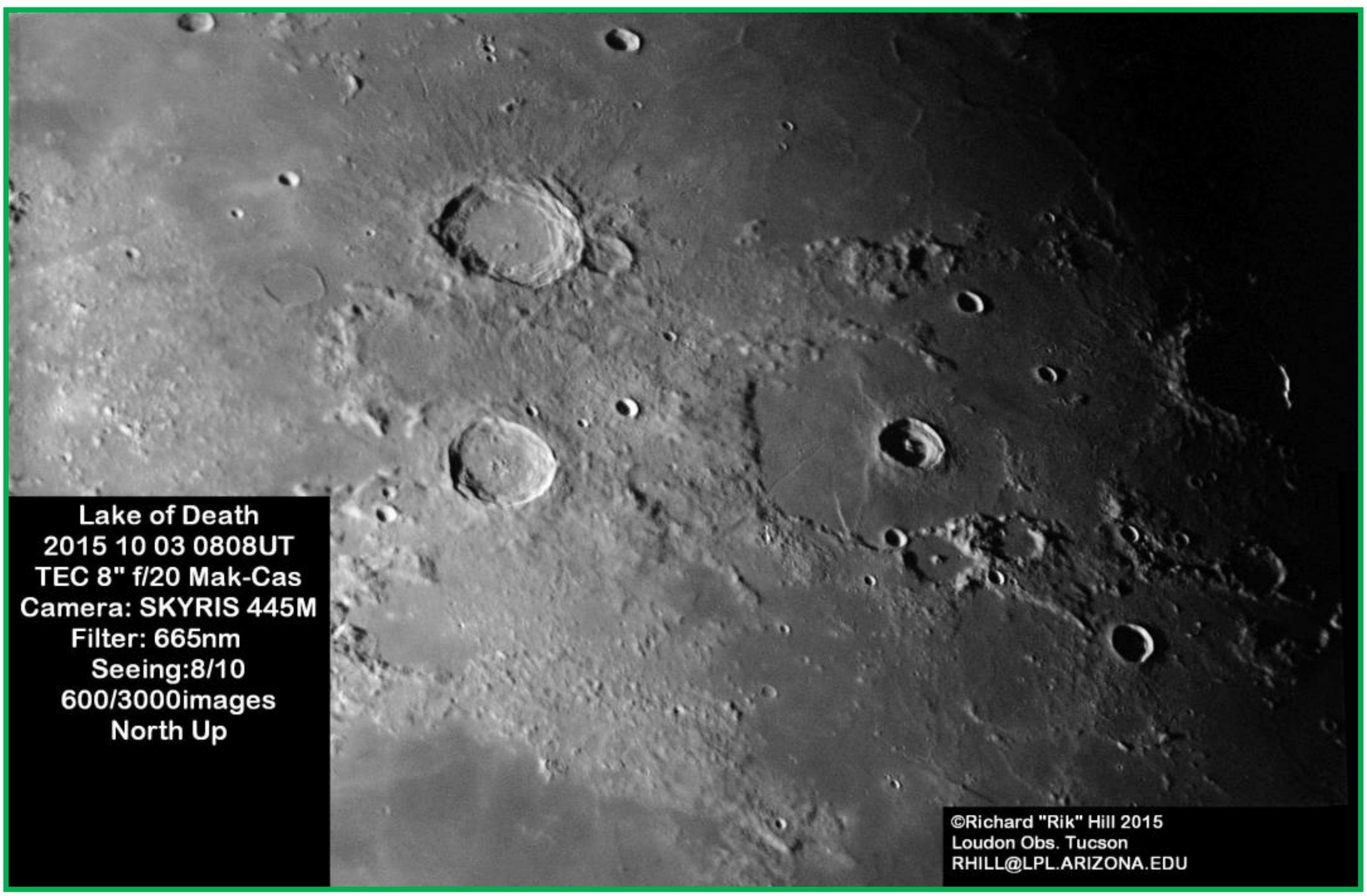


Image 9, Lacus Mortis, *Francisco Alsina Cardinalli, Oro Verde, Argentina. 2018 October 15 23:47 UT. Meade 8 inch reflector telescope, QHY5-II camera.*

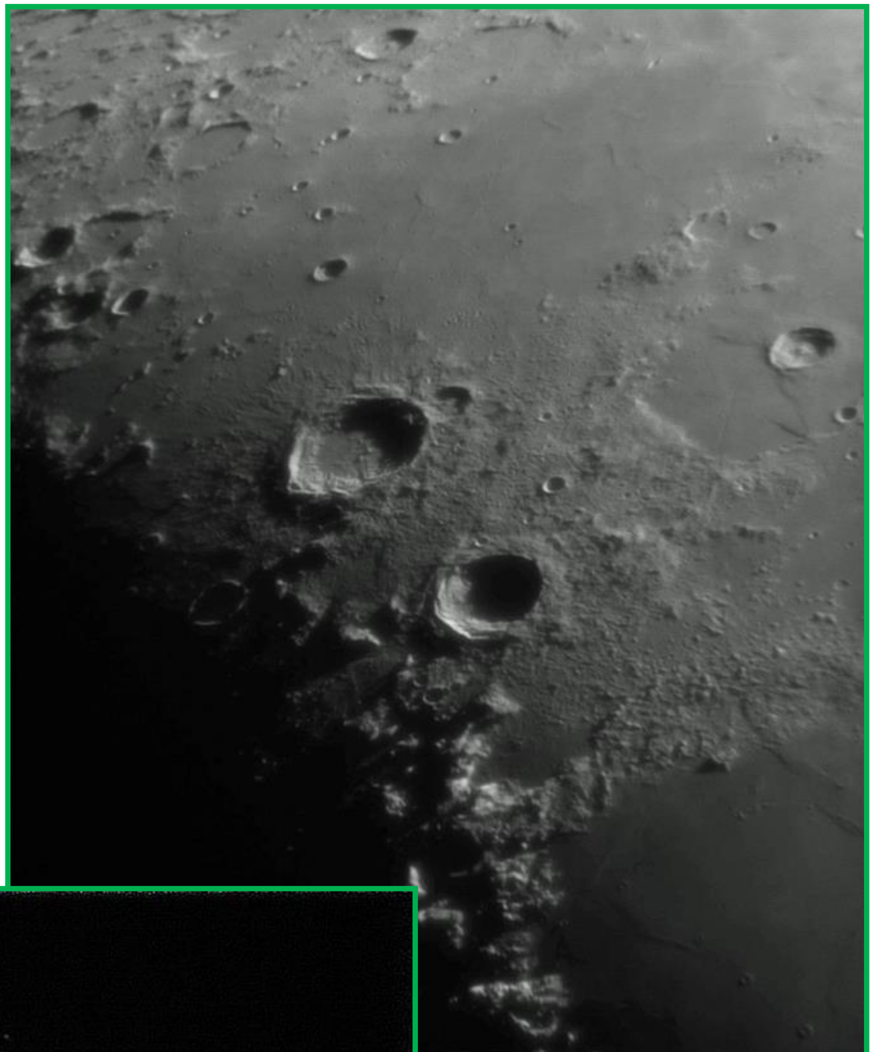


Image 10, Lacus Mortis, *Francisco Alsina Cardinalli, Oro Verde, Argentina. 2016 March 27 04:45 UT. Celestron Edge HD 11 inch Schmidt-Cassegrain telescope, Caon EOS Digital Rebel ES camera.*

Like all lunar features, perhaps more markedly, Lacus Mortis changes greatly as the illumination changes. In IMAGES 11 to 13 it is dawn over Lacus Mortis, the only high wall (the west one) shines slightly, the western part of Bürg shines brightly and the wrinkle ridge that crosses our lake from north to south casts a shadow to the west.

Image 11, Lacus Mortis, *Eduardo Horacek, Mar del Plata, Argentina. 2023 October 19 21:01 UT. 150 mm Maksutov-Cassegrain telescope, Canon EOS Rebel T5i camera.*

Image 12, Lacus Mortis, *Eduardo Horacek, Mar del Plata, Argentina. 2023 November 18 20:23 UT. 150 mm Maksutov-Cassegrain telescope, Canon EOS Rebel T5i camera. North is down, west is right.*

Image 13, Lacus Mortis, *Francisco Alsina Cardinalli, Oro Verde, Argentina. 2019 August 06 23:27 UT. Meade 8 inch reflector telescope, QHY5-II camera.*

In IMAGE 14 the illumination is that of dusk over the lake: the west wall casts a shadow, the eastern part of Bürg is the one that shines intensely, the central wrinkle ridge does not cast a shadow but has a slight glow and, very interesting, is the ideal moment to observe the series of small elevations that are the only remnant of the east wall. In IMAGE 15 we see Lacus Mortis with frontal illumination.

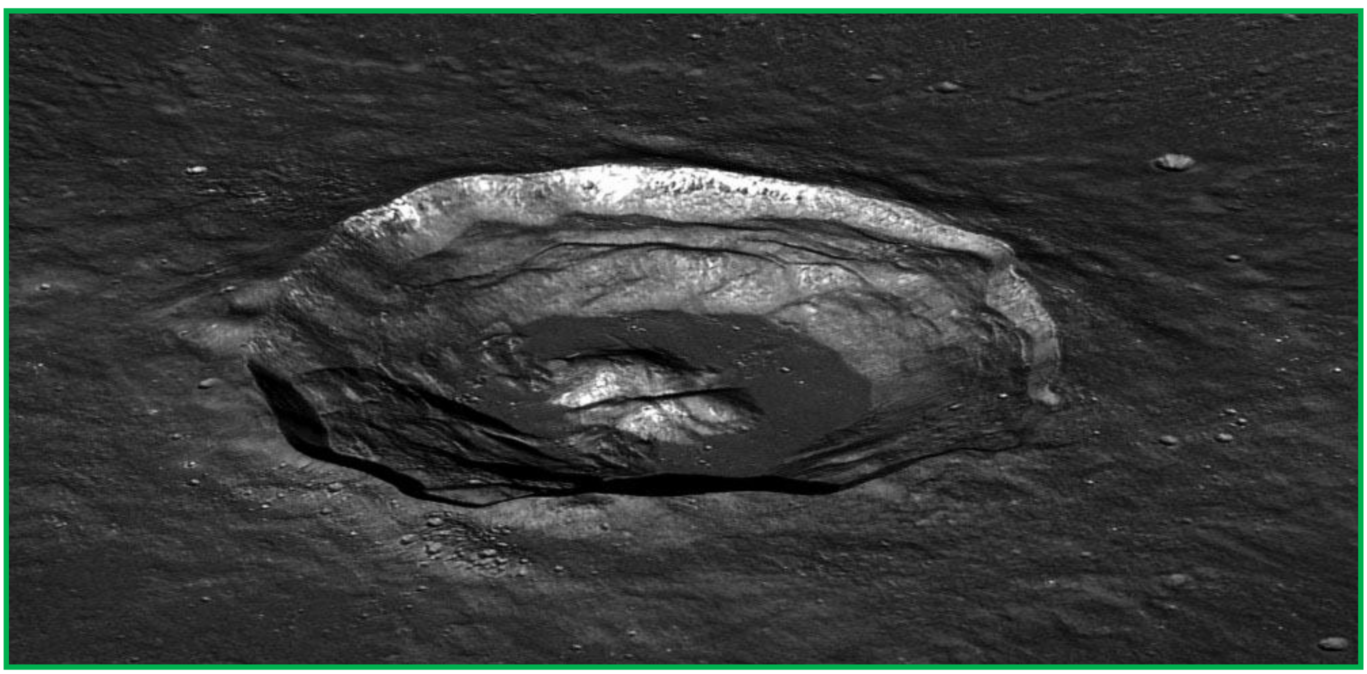
Image 14, Lacus Mortis, *Eduardo Horacek, Mar del Plata, Argentina. 2024 January 30 04:59 UT. 150 mm Maksutov-Cassegrain telescope, Canon EOS Rebel T5i camera. North is down, west is right.*

***Image 15, Lacus Mortis**, Desiré Godoy, Oro Verde, Argentina. 2019 November 08 01:36 UT. 203 mm reflector telescope, QHY5-LII-M camera.*

2.-Bürg

The near-central crater of Lacus Mortis is perhaps the most noticeable feature of the visual landscape. Bürg is a "Copernican-age crater near the center of Lacus Mortis (40 kms diameter) and more than 3000 meters deep. "Its interior walls are terraced slump down, covering most of the floor of the crater" (Garfinkle). IMAGE 16 is a 3 D DEM from LRO Quickmap data.

***Image 16, Lacus Mortis,** Howard Fink, New York, New York, USA. LAC26 DEM.*



It is worth keeping this in mind to analyze the characteristics of this crater, summarized by Elger: “noteworthy formation, 28 miles in diameter, on the Mare, N. of Plana. The floor is concave, and includes a very large bright mountain, which occupies a great portion of it. The interior slopes are prominently terraced, and there are several spurs associated with the glacis on the S. and N.E.”. First, its complex system of terraced walls, typical of the young (geologically speaking) Copernican craters, as we see in the image that accompanies Rik Hill's text and in IMAGE 17, in which we can distinguish the terraces even on the east wall in shadows. Second, “In relation to the size of the crater, the smooth floor is small” (Garfinkle), as can be seen in IMAGE 17 and more notably in IMAGE 18.

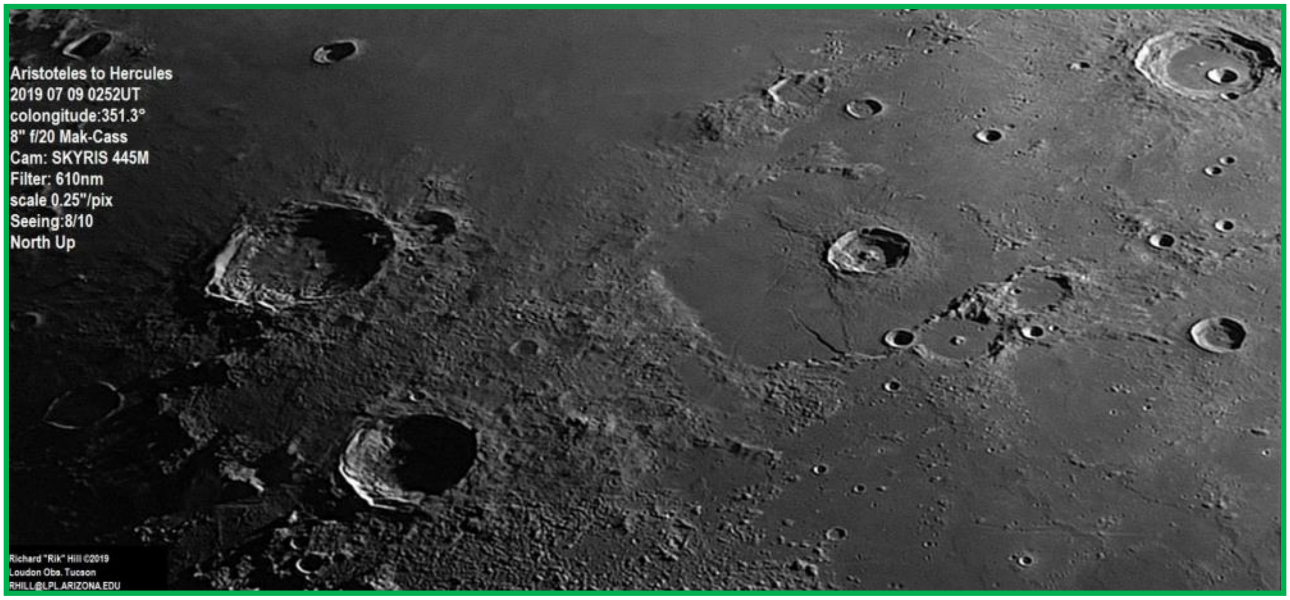
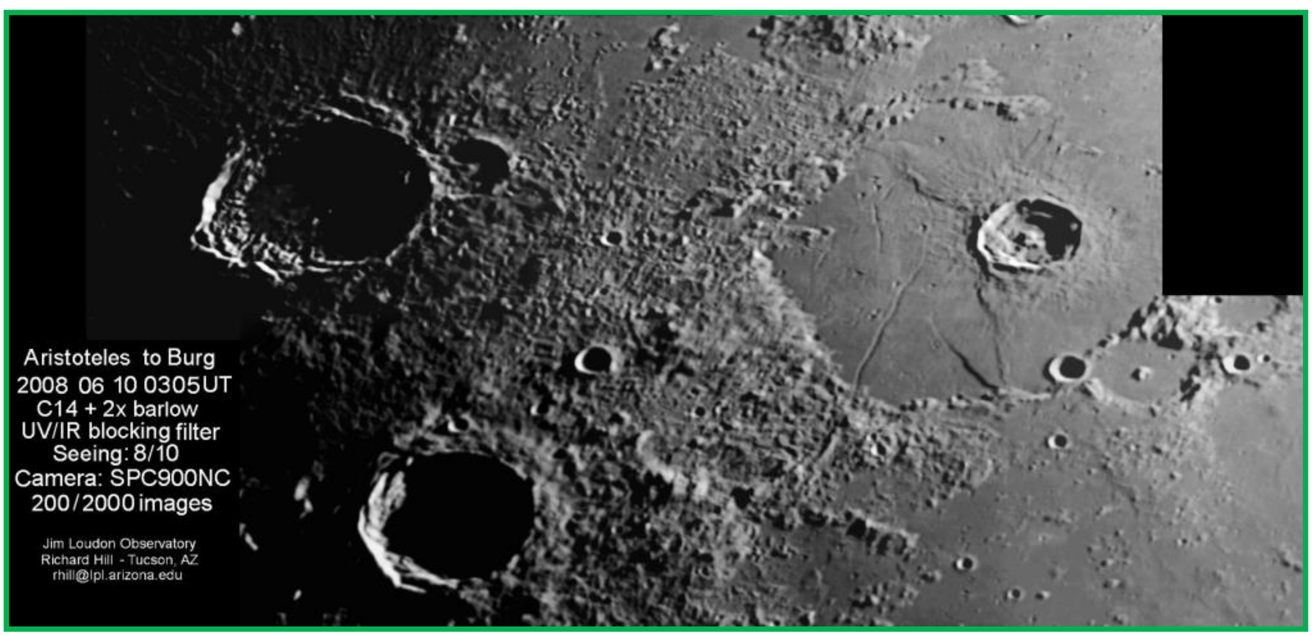


Image 17, Aristoteles to Hercules, *Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2019 July 09 02:52 UT, colongitude 351.3º. TEC 8 inch f/20 Maksutov-Cassegrain telescope, 610 nm, SKYRIS 445M camera. Seeing 8/10.*

Image 18, Aristoteles to Bürg, *Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2008 June 10 03:05 UT. Celestron 14 inch Schmidt-Cassegrain telescope, 2x barlow, UV/IR blocking filter, SPC900NC camera. Seeing 8/10*



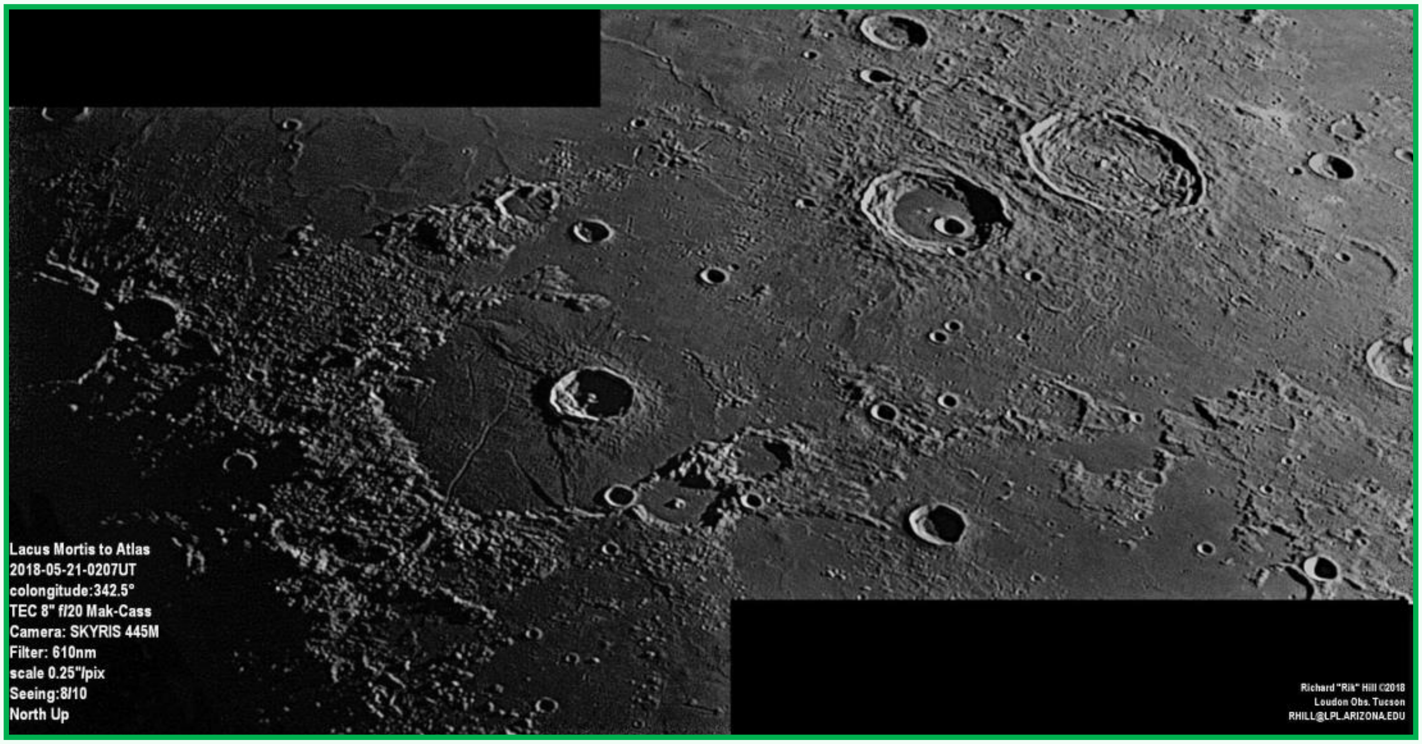
Focus-On: Lacus Mortis One of the Strangest-Looking Parts of the Moon

Cracks In the Lake

Rik Hill

A view that is as breathtaking as the Montes Alpes, or Archimedes to the Montes Apenninus is frequently missed in the early waxing crescent phases of a lunation because the moon is in the evening sky for a short time. Here you see large crater Atlas (90 km) on the right side of the image with the nice system of Rimae Atlas on the floor. To the left is Hercules (71 km) identifiable with the crater Hercules G (13 km) on its floor. Up above them both to the north, on the edge of this image is Keldysh (34 km). On the opposite side of Hercules, near the bottom of the image is the crater Grove (29 km) a little smaller than Keldysh.

Much further to the left from Hercules, is the distinctive crater Bürg (41 km) with its herringbone ejecta blanket. It sits in the middle of a hexagonal feature that is Lacus Mortis surrounded by the many Rimae Bürg of different types and origins. Below Bürg are two craters I find fascinating. The one on the left is Plana (46 km), with a tiny central peak and to the right of it is Mason (44 km) almost exactly the same size with no central peak. Then on the left edge of this image is Aristoteles (90 km) with little Mitchell (31 km) on its right (east) wall. So, when the moon is 5 days old, make the effort to see this region, it's well worth it.



Lacus Mortis to Atlas, *Richard Hill, Loudon Observatory, Tucson, Arizonia, USA. 2018 May 21 02:07 UT, colongitude 342.5°. TEC 8 inch f/20 Maksutov-Cassegrain telescope, 610 nm, SKYRIS 445M camera. Seeing 8/10.*

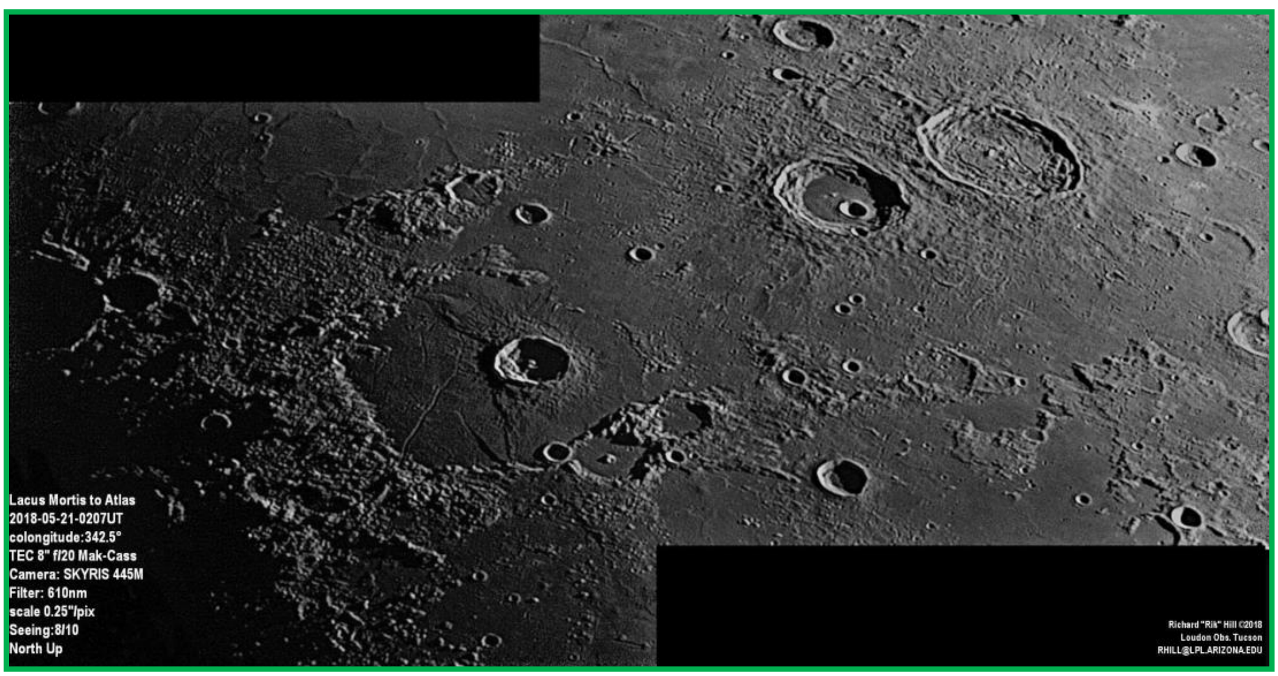
This originally appeared in the July 2018 The Lunar Observer.

Focus-On: Lacus Mortis One of the Strangest-Looking Parts of the Moon

Third, “Bürg has a central peak complex that appears to have at least three summits” (Garfinkle), it is not so easy to distinguish the three peaks, since from Earth they look more like two, as you can see if you zoom in on IMAGE 19. Fourth, “The crater rises sharply from the mare and is surrounded by a rumpled and pock-marked ejecta blanket that spread in ray-like splatter patterns over most of the eastern half of Lacus Mortis” (Garfinkle), Bürg “sits upon a triangular wedge of higher ground that may be Lacus Mortis’ original central uplift”, as we see in extraordinary detail in IMAGE 20 (which accompanies a text by Rik Hill that also appears in this section).

Image 19, Lacus Mortis, *Francisco Alsina Cardinalli, Oro Verde, Argentina. 2016 March 27 04:45 UT. Celestron Edge HD 11 inch Schmidt-Cassegrain telescope, Canon EOS Digital Rebel ES camera.*

Image 20, Lacus Mortis to Atlas, *Richard Hill, Loudon Observatory, Tucson, Arizonia, USA. 2018 May 21 02:07 UT, colongitude 342.5º. TEC 8 inch f/20 Maksutov-Cassegrain telescope, 610 nm, SKYRIS 445M camera. Seeing 8/10.*



Focus-On: Lacus Mortis One of the Strangest-Looking Parts of the Moon

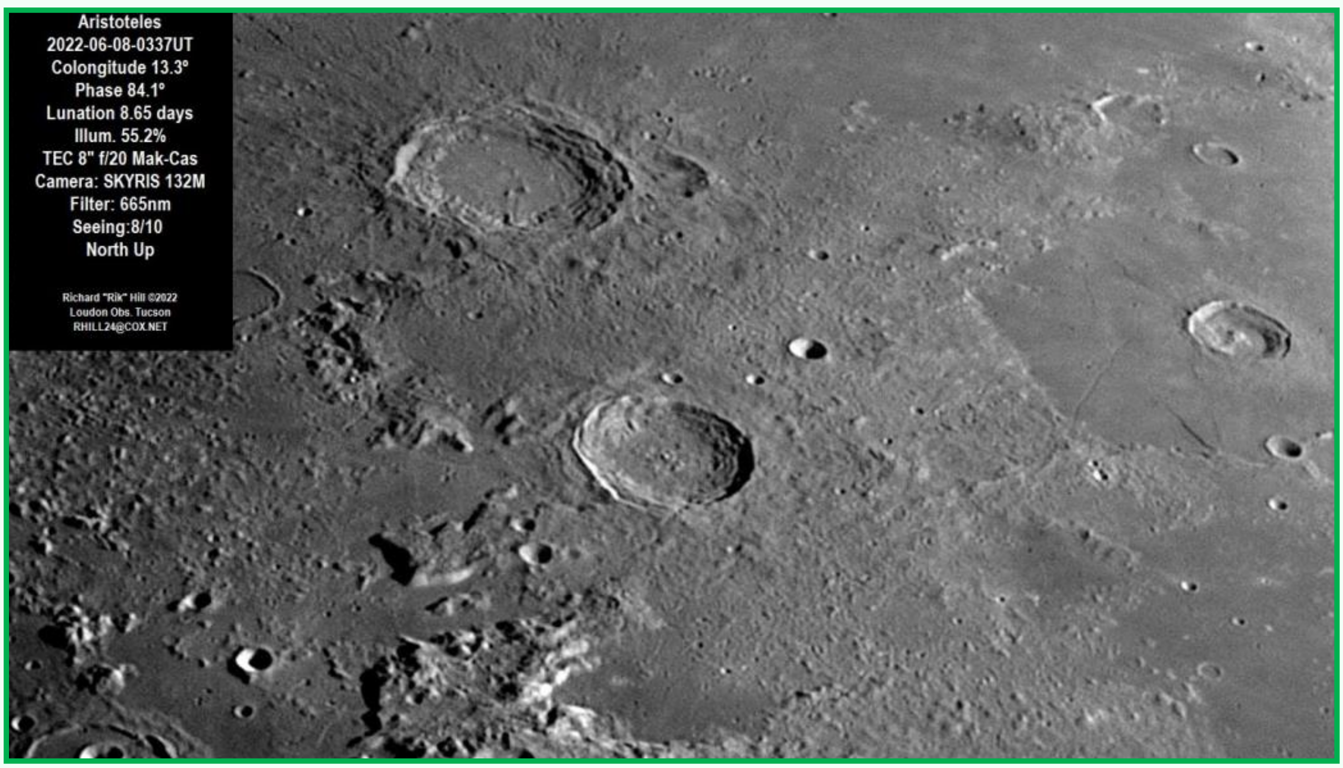
Aristotele's Crater

Rik Hill

On the south side of the of the east end of Mare Frigoris is the great crater Aristoteles (90 km dia.). Visible 6 days into the lunation it is very obvious being almost the same size as Copernicus. It is certainly large enough, but has no defined central peak, only a few hills at its center. The walls are wonderfully terraced especially on the east side with a well-defined ejecta blanket beyond showing a nice radial splash pattern to the north. Mitchell (31 km) on the eastern wall of Aristoteles, is completely overlain by ejecta from its larger, much younger neighbor. To the west is an even older ring crater Egede (37 km) nearly completely buried by ejecta from numerous impacts and floods.

To the south of Aristoteles is another similar though slightly younger crater Eudoxus (70 km). This crater also is large enough but lacks a clear central peak with only about a dozen smaller hills in the center. The ejecta blanket is closer in to the crater and more hummocky lacking any radial splash. Here to, notice the terracing is better defined on the eastern half of the crater. Farther south is a flat area that is Alexander (85 km) just the ruins of a very ancient crater some 4 billion years old. West of Eudoxus are two craters the largest of which is Lamech (14 km) and a little farther on the land rises to a wonderful plateau bounded on the west and south by spectacular kilometer high cliffs. What a magnificent sight this would be from the surrounding mare surface.

On the right edge of this image is the crater Bürg (41 km) that sits in the center of the fascinating Lacus Mortis (155 km) that contains numerous rimae of differing origins one of which, Rima Bürg, you can see going from the west wall of the Lacus to just north of Bürg. Off the south edge is another very different rima, an obvious vertical fault. Notice how straight that west wall of the Lacus is. The walls of this Lacus are very polygonal when the whole of it is shown. But that's for another day.



Aristoteles, *Richard Hill, Loudon Observatory, Tucson, Arizonia, USA. 2022 June 08 03:37 UT, colongitude 13.3º. TEC 8 inch f/20 Maksutov-Cassegrain telescope, 665 nm, SKYRIS 132M camera. Seeing 8/10.*

This was originally in the October 2022 The Lunar Observer.

Focus-On: Lacus Mortis One of the Strangest-Looking Parts of the Moon

The complexity of the ejecta mantle (what Elger called “glacis”, a term that has fallen into disuse today) is typical of young craters, not yet so exposed to eons of space weather. An interesting fact about the Bürg “glacis”: “the mound-like rim of Bürg gives way to stripes of ejecta draping the lava. The Clementine color ratio images reveals the ejecta to be red - compositionally different than the surrounding lava - the crater has excavated below the lava to bring up highland rocks” (Wood, 2006). Fifth, Bürg is very deep, which can be seen in Figure 3 of Robbins' text, and deeper in contrast to the height of its location, which makes its shadow actually very impressive when the lighting is very oblique, as we see in IMAGE 21.

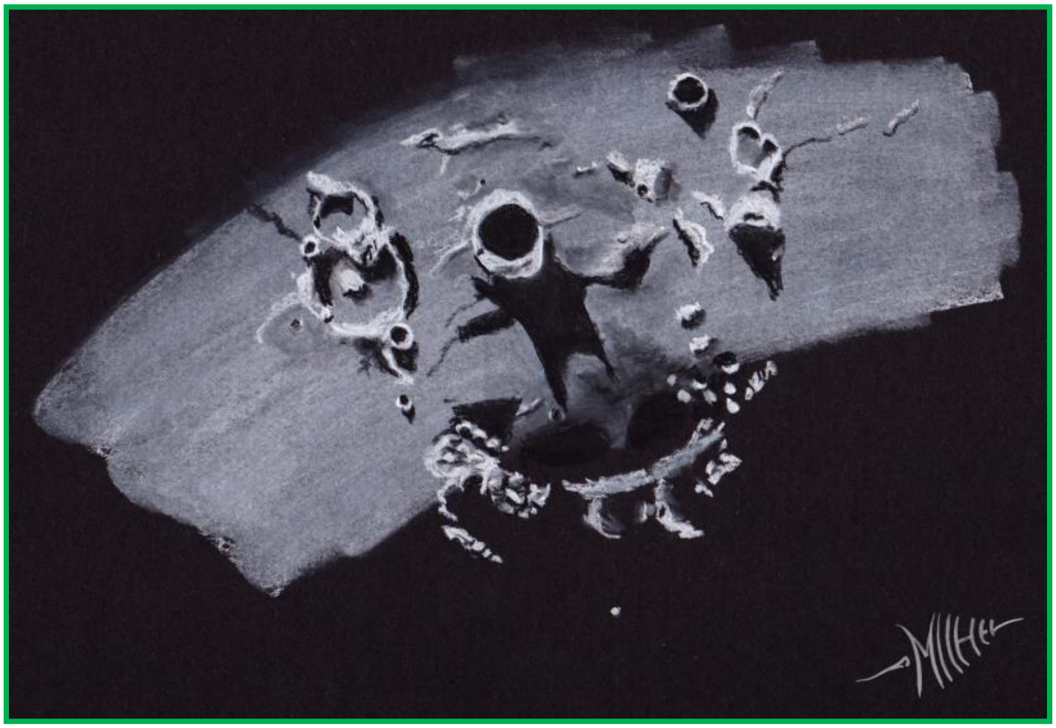


Image 21, Lacus Mortis*,* *Michel Deconinck,* Artignosc-sur-Verdon in Provence*, France. 2024 January 16, 18:15 UT. Takahashi Mewlon 250 mm Mewlon Dall-Kirkham telescope, f/15, 288x. Seeing 2/9, transparency 1/6.*

3.-Wrinkle ridges

Lacus Mortis is a crater flooded with lava and as such we find lunar features related to lava sites, such as the wrinkle ridges. In IMAGE 22 we perfectly see the only wrinkle ridge of Lacus Mortis, which cuts it from south to north (although, strictly speaking, this ridge is actually 4 segments, as we see in IMAGE 23, obtained with the LRO Quickmap).

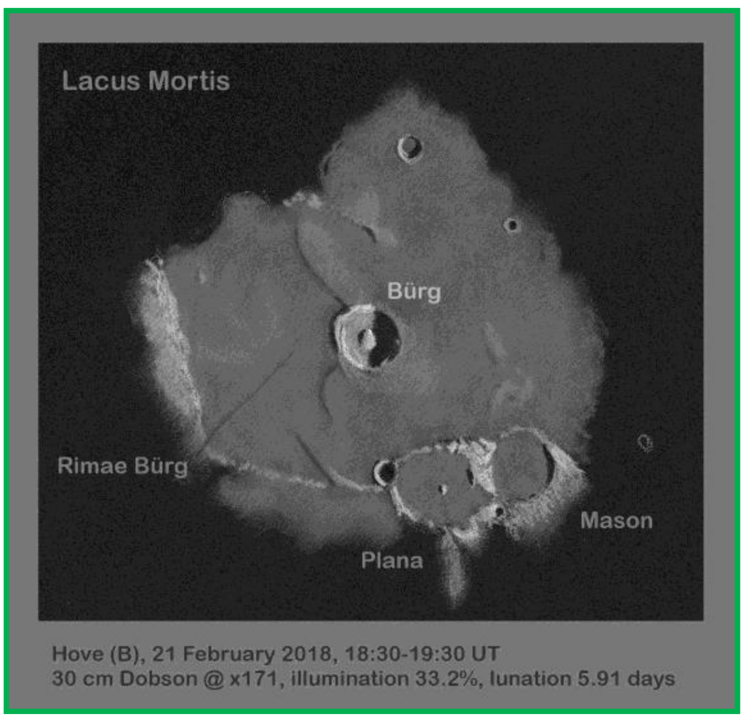


Image 22, Lacus Mortis, *Jef De Wit, Hove, Belgium. 2018 February 21 18:30-19:30 UT. 30 cm Dobsonian reflector telescope, 171x.*

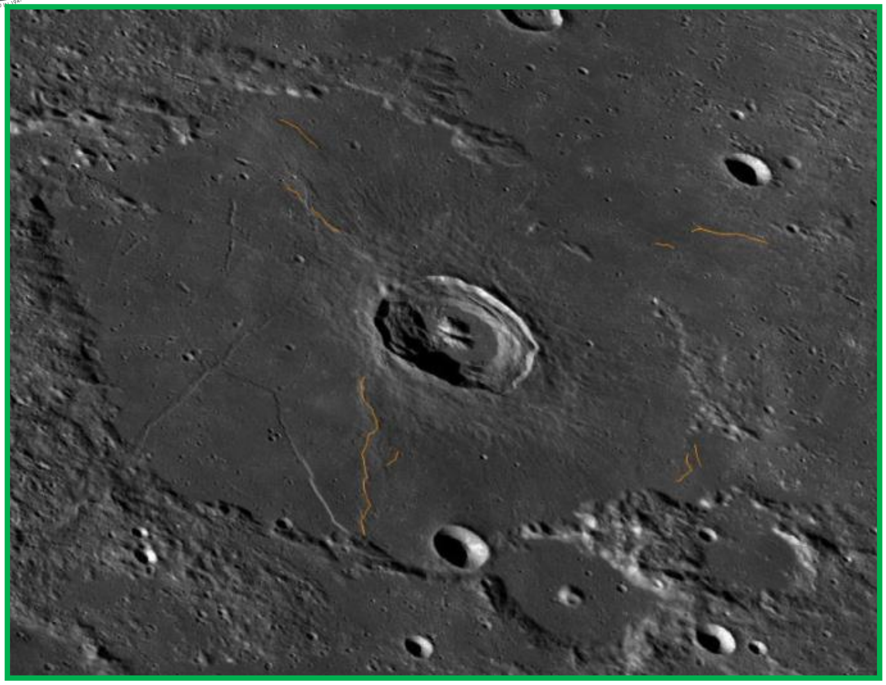


Image 23, Lacus Mortis, *LROC.*

The Bürg crater is in the very center of the unnamed wrinkle ridge that crosses Lacus Mortis, Elger had already been struck by the relationship between the ridges and craters: “It is a suggestive peculiarity of many of the lunar ridges, both on the Maria and elsewhere, that they are very generally found in association with craters of every size. Illustrations of this fact occur almost everywhere. Frequently small craters are found on the summits of these elevations, but more often on their flanks and near their base. Where a ridge suddenly changes its direction, a crater of some prominence generally marks the point, often forming a node, or crossing-place of other ridges, which thus appear to radiate from it as a center”. Although Bürg is obviously later than the ridge, the coincidence increases the attractiveness of the interior of Lacus Mortis. The shape of the central wrinkle ridge is clearly seen in IMAGE 22, also in IMAGE 23: the northern segment (up to Bürg) presents a wide and not very high arch, while the southern segment presents a very narrow arch. Both images, the product of visual observations, can be compared with photographic images in which the dorsum is clearly seen, such as IMAGE 24 to 28, as well as IMAGE 29, with different illumination.

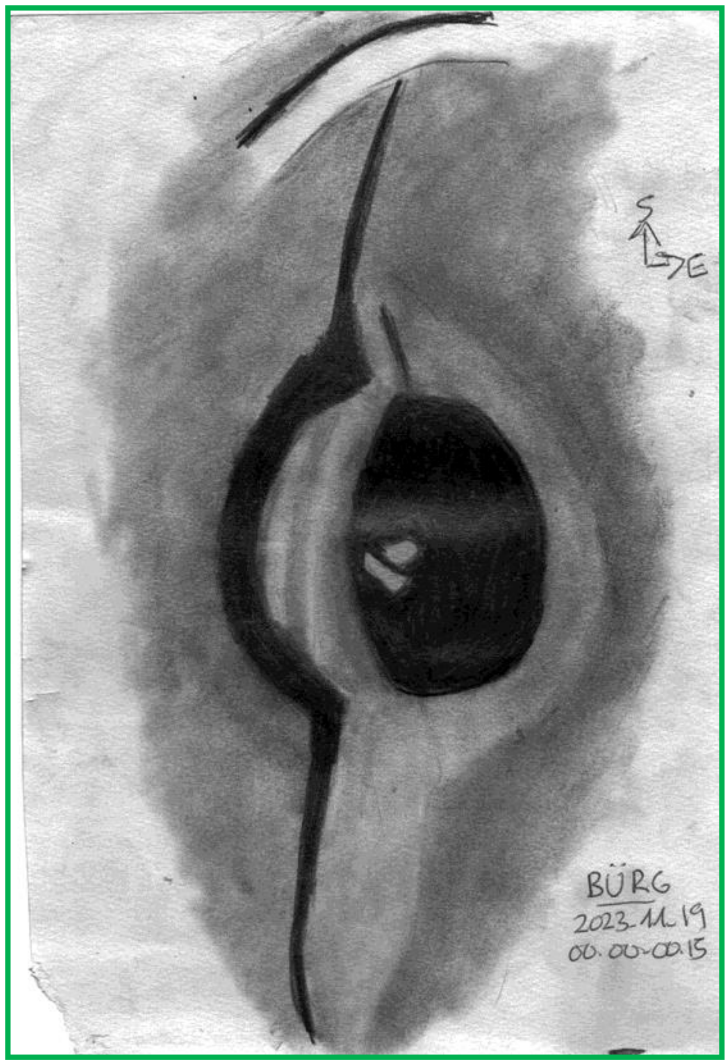


Image 24, Bürg, *Alberto Anunziato, Paraná, Argentina. 2023 November 19 00:00-00:15 UT. Meade EX105 Maksutov-Cassegrain telescope, 196x.*

Focus-On: Lacus Mortis One of the Strangest-Looking Parts of the Moon

Image 25, Aristoteles to Bürg, *Richard Hill, Loudon Observatory, Tucson, Arizonia, USA. 2009 April 01 02:14 UT. Celestron 14 inch Schmidt-Cassegrain telescope, 2x barlow, UV/IR blocking filter, SPC900NC camera. Seeing 8/10.*

Image 26, Lacus Mortis, *David Teske, Louisville, Mississippi, USA. 2023 December 19 00:15 UT, colongitude 345.2°. Takahashi FOA60Q refractor telescope, IR block filter, ZWO ASI120MM camera. Seeing 6/10.*

Focus-On: Lacus Mortis One of the Strangest-Looking Parts of the Moon

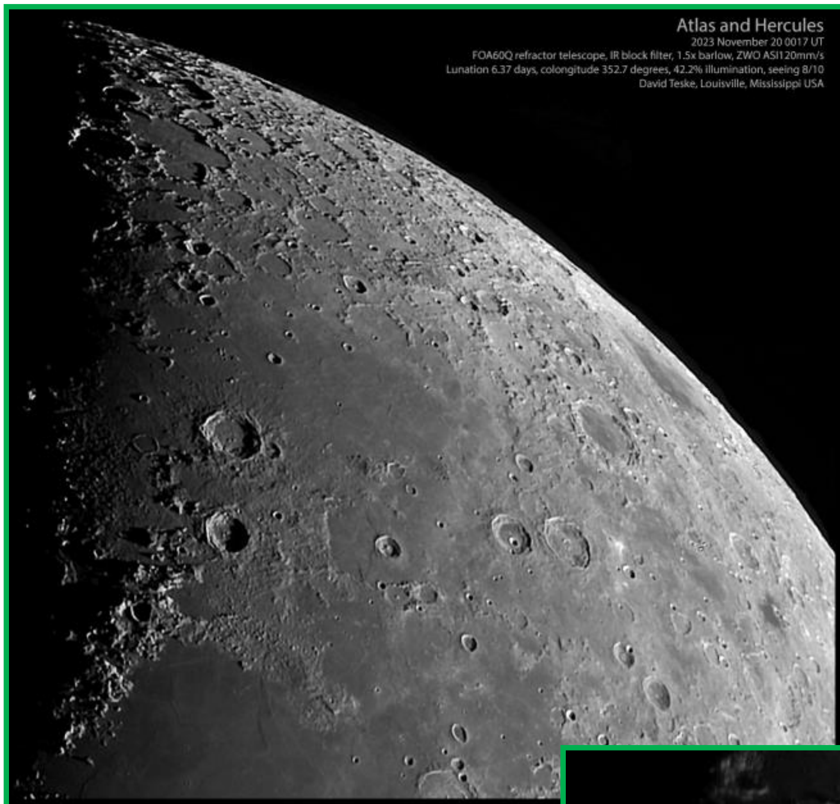


Image 27, Lacus Mortis, *David Teske, Louisville, Mississippi, USA. 2023 November 20 00:17 UT, colongitude 352.7°. Takahashi FOA60Q refractor telescope, IR block filter, ZWO ASI120MM camera. Seeing 8/10.*

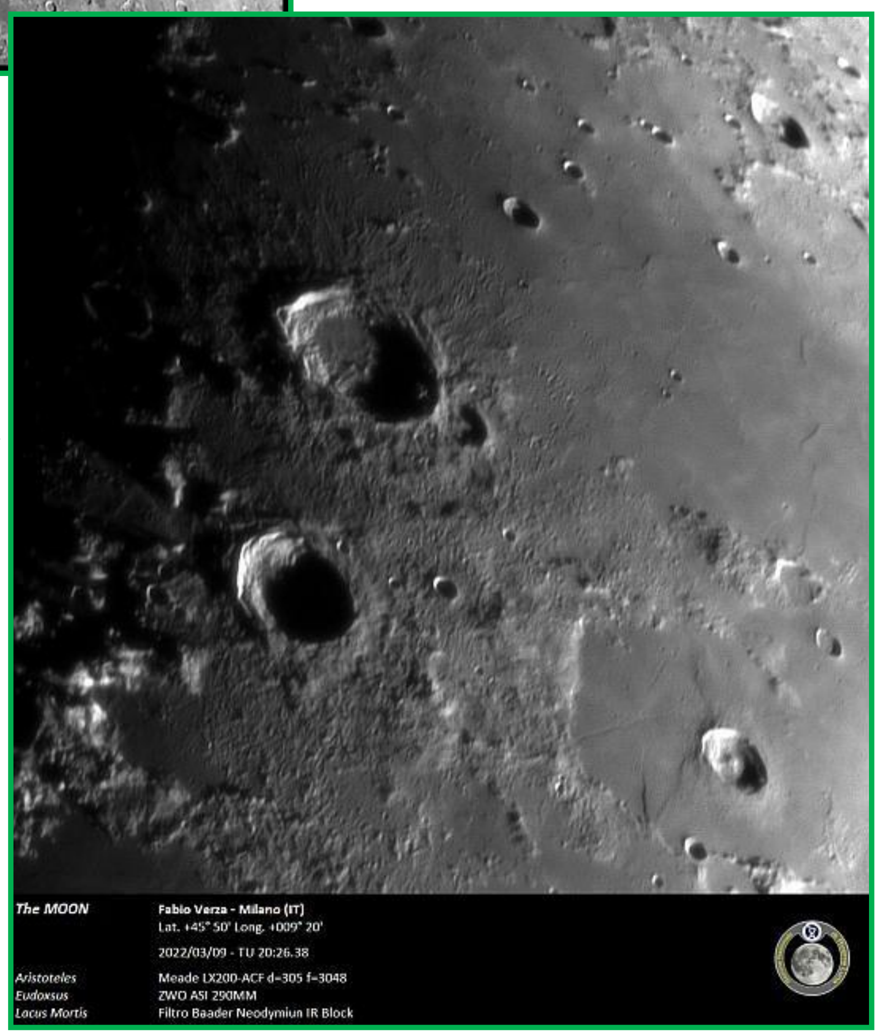


Image 28, Lacus Mortis, *Fabio Verza, Milan, Italy. 2022 March 09 20:26 UT. Meade LX200 ACF 12 inch Schmidt-Cassegrain telescope, Baader Neodymium IR block filter, ZWO ASI290MM camera.*

Focus-On: Lacus Mortis One of the Strangest-Looking Parts of the Moon

Image 29, Lacus Mortis, *David Teske, Louisville, Mississippi, USA. 2022 September 15 08:39 UT, colongitude 143.6^o. 4 inch f/15 refractor telescope, IR block filter, ZWO ASI120MM camera. Seeing 8/10*

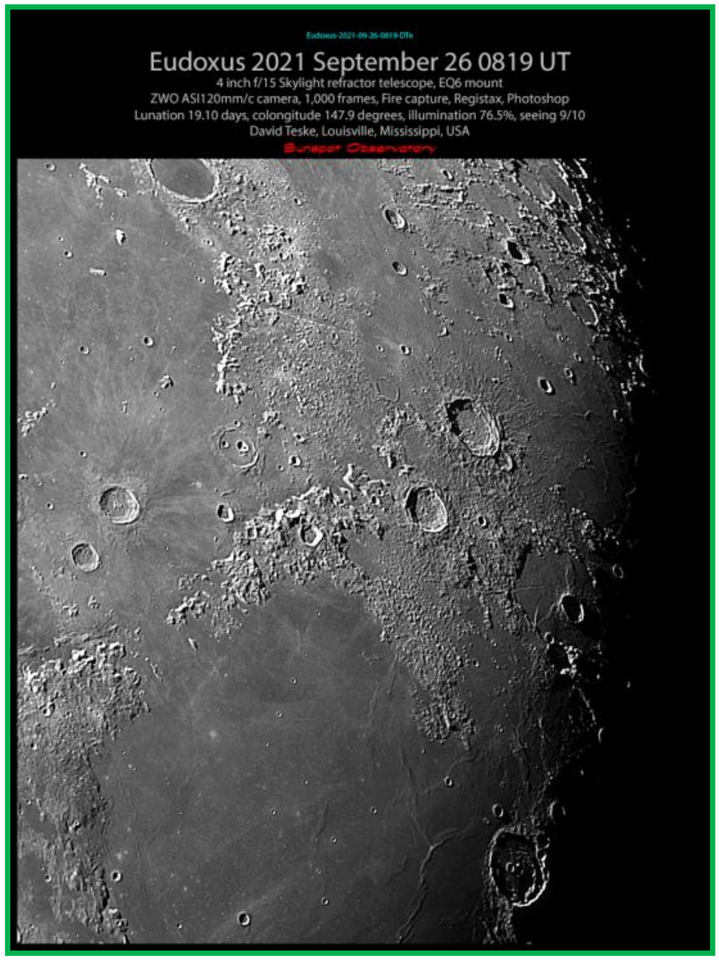
4.-Rilles

The best-known selenographic feature related to the emplacement of lava after the formation of Lacus Mortis is, without a doubt, the rilles: Rimae Bürg I and II, in the western part: "The western half of Lacus Mortis is crossed by Rimae Bürg. The most prominent rille cuts across the plain and links the southwestern wall to the central hills, and another runs from the southern wall to the midpoint of the main rille. These can be resolved through a 100 mm telescope, but other, narrower rilles in the system require at least a 150 mm telescope to discern" (Grego). Rima Bürg I is very prominent in IMAGE 30, which also shows the extraordinary complexity of the Lacus Mortis floor in the surrounding area.

Image 30, Lacus Mortis, *Philippe Heully, Bouère, France. 2023 August 07, colongitude 157.7^o. 406 mm Dobsonian reflector telescope, with binocular and Explore Scientific 14 mm eyepieces.*

Rima Bürg I is also very prominent in IMAGE 31 (Lacus Mortis is in the terminator), as the lighting offers the unique opportunity to see it bright (as in IMAGE 32), it is the one that crosses the lake from east to west. And Rima Bürg II also appears, which runs from north to south, transversally to Rima Bürg I.

*Image 31, **Lacus Mortis,** David Teske, Louisville, Mississippi, USA. 2021 September 26 08:19 UT, colongitude 147.9°. 4 inch f/15 refractor telescope, IR block filter, ZWO ASI120MM camera. Seeing 9/10.*



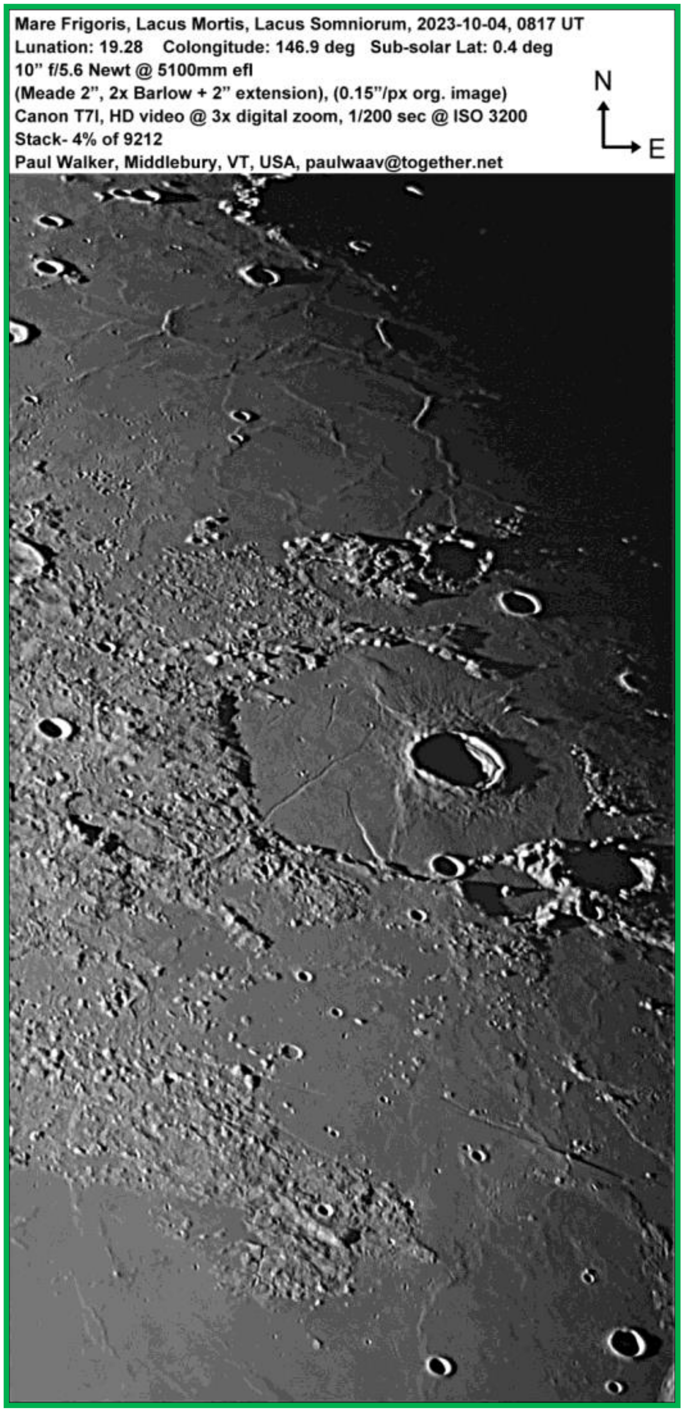
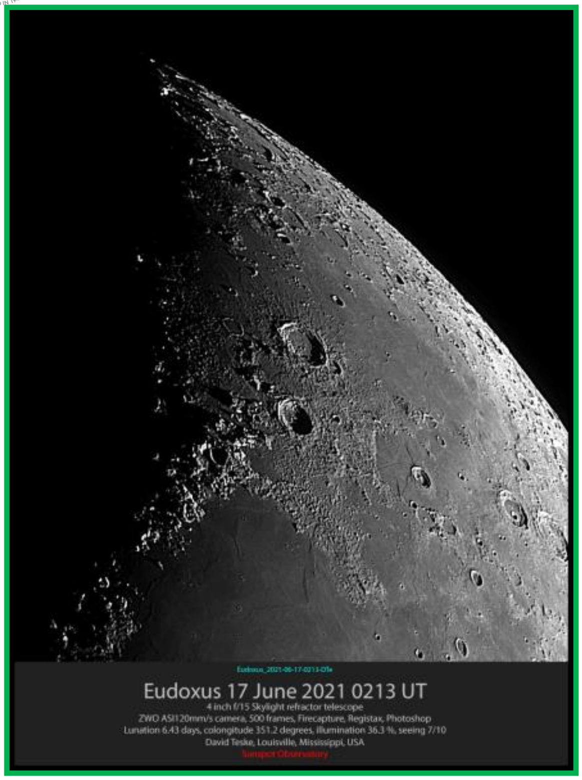


*Image 32, **Lacus Mortis,** Paul Walker, Middlebury, Vermont, USA. 2023 October 04 08:17 UT, colongitude 146.9°. 10 inch f/5.6 reflector telescope, 2x barlow, Canon T7I camera.*



Rima Bürg II presents a peculiarity, which is clearly seen in IMAGE 33: it appears quite dark, the shadow marks something: "Under low morning illumination, the eastern wall of Rima Bürg II (lat 45.00°N, long 25.00°E) appears as a black streak heading north from the base of the southern wall of the Lacus. An elevation shift in the vicinity of this rille is very noticeable, with the eastern region being higher than the western side of the rille" (Garfinkle). The depth of Rima Bürg II is denoted by the shadow and caused by the disparity of heights on both sides of the crack (so is it a rupes?). Charles Wood (2003) calls it "the most intriguing landform", a fault that turns into a rille: "The most intriguing landform, however, is a fault scarp that extends across the southern rim of Lacus Mortis. Look closely and you can see that for the eastern side is the high side of the fault but it turns into a narrow rille! The fault indicates a vertical force, but the rille could form only if there were horizontal extension. This is a very strange transformation that has not been described, much less explained". Another rille is visible on IMAGE 34, with almost the same direction as Bürg II, in the northwest quadrant of Lacus Mortis.

Image 33, Lacus Mortis, *David Teske, Louisville, Mississippi, USA. 2021 June 17 02:12 UT, colongitude 351.2^o. 4 inch f/15 refractor telescope, IR block filter, ZWO ASI120MM camera. Seeing 7/10.*

Image 34, Lacus Mortis, *Fabio Verza, Milan, Italy. 2023 June 25 19:44 UT. Takahashi 210 mm Dall-Kirkham telescope, 1.3x barlow, QHY5III 462C-IR camera.*

Another rille with the same direction can be seen further west in IMAGE 35. Another curious fact, which we can verify in the same IMAGE 35, if we zoom in on Rima Bürg I: “The main diagonal rille on the west side of Lacus Mortis appears to have pits along its floor” (Wood, 2006). In IMAGE 36 we see a wonderful panorama of the features of volcanic origin in the western part of Lacus Mortis, both in the northwest quadrant and in the southwest quadrant (taking Rima Bürg I as the limit). In this image the two most important rilles seem to join together and, what is more striking, the shadow on the east side of Rima (or Rupes) Bürg II is very obvious, it hides the west side of the rille and even from its shape we can deduce how steep is the east wall and its highest points.

Image 35, Aristoteles and Eudoxus, *Richard Hill, Loudon Observatory, Tucson, Arizonia, USA. 2017 April 03 01:24 UT. TEC 8 inch f/20 Maksutov-Cassegrain telescope, 665 nm, SKYRIS 445M camera. Seeing 8/10.*

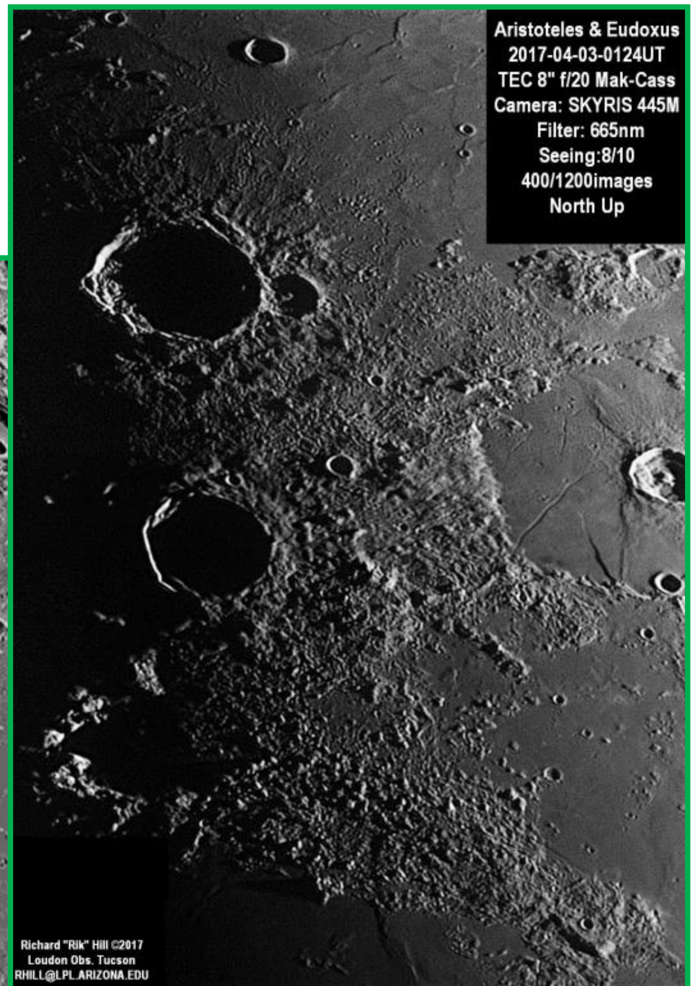


Image 36, Posidonius, *KC Pau, Hong Kong, China. 2024 February 15 11:36 UT. 250 mm Newtonian reflector telescope, 2.5 x barlow, QHYCCD 290M camera.*

In IMAGE 36 we see a great overview of the volcanic features in the western part of Lacus Mortis, both in the northwest quadrant and in the southwest quadrant (taking Rima Bürg I as the boundary). In this image the two most important rhymes seem to come together and, what is more striking, the shadow on the east side of Rima (or Rupes) Bürg II is very conspicuous, hiding the west side of the rhyme and even from its shape we can deduce how steep the east wall is and its highest points.

5.-Domes

The beautiful panorama of the rilles in the western area of Lacus Mortis can be enjoyed in IMAGE 37, in which two small domes, recently discovered, appear on the southwest shore of Lacus Mortis, which we mark in IMAGE 37a, in which the pits can be glimpsed at the tops of these volcanic domes, and the pits at Rima Bürg I are clearly seen.

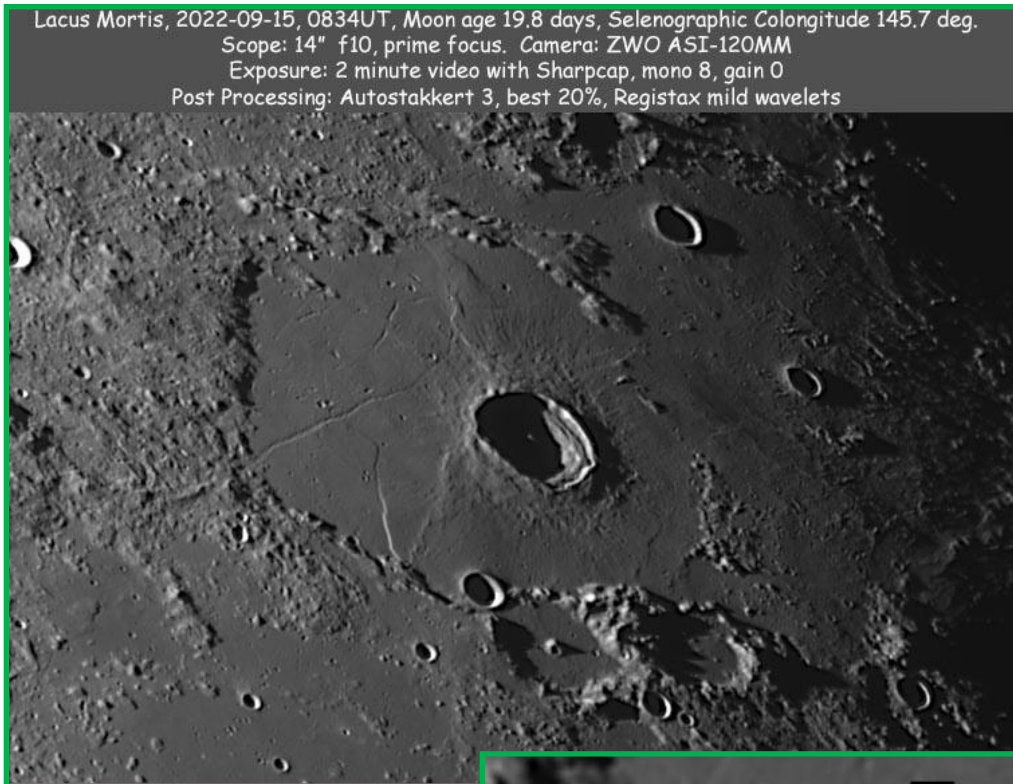


Image 37, Lacus Mortis, *Randy Trank, Winnebago, Illinois, USA. 2022 September 15 08:34 UT, colongitude 145.7º. Celestron 14 inch Schmidt-Cassegrain telescope, f/10, ZWO ASI120MM camera.*

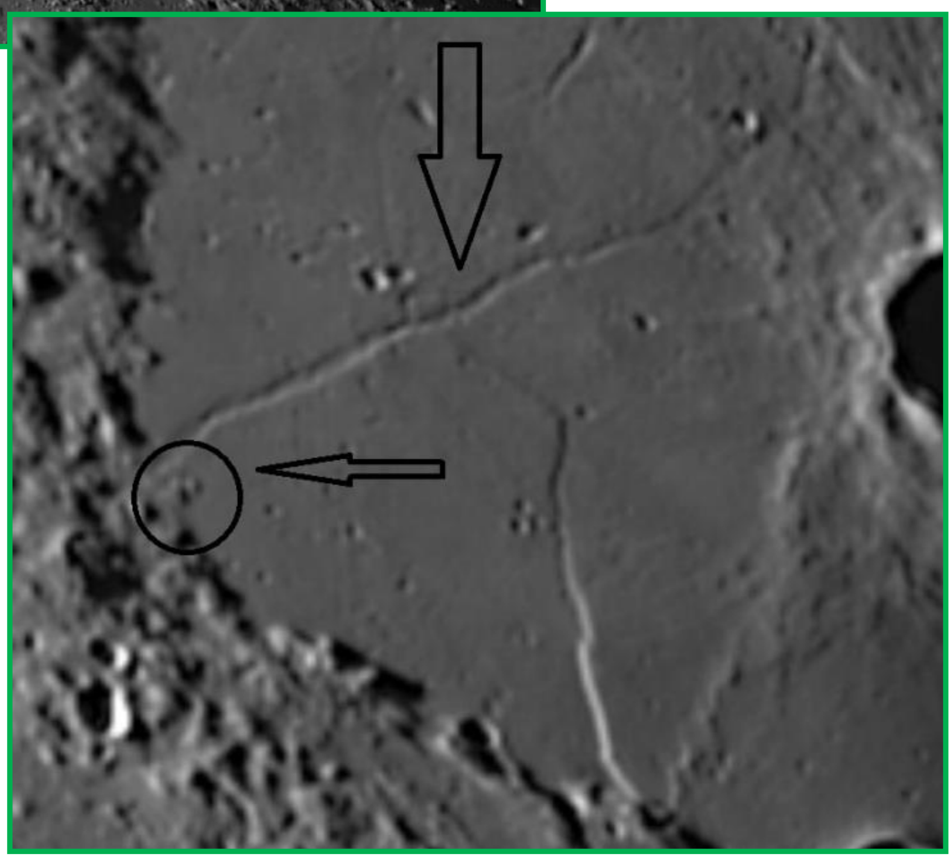


Image 37a, Lacus Mortis, *Randy Trank, Winnebago, Illinois, USA. 2022 September 15 08:34 UT, colongitude 145.7º. Celestron 14 inch Schmidt-Cassegrain telescope, f/10, ZWO ASI120MM camera. This is a close-up of image 37.*

6.-Mason and Plana

Two very similar craters, on the southern edge of Lacus Mortis, contribute to the originality of the selenographic feature that we are describing. In IMAGE 39 and 40 we see both craters with different appearances. If we see IMAGE 40, at the bottom (south) of Lacus Mortis we see Mason on the right: "The Imbrian-age crater is about 33.33 km (20.71 miles) in diameter and 1390 m (4560 feet) deep. Mason is surrounded by degraded mountains of Fra Mauro Formation materials" (Garfinkle). To the left is the older Plana: "The northern rim of this lava-flooded Pre-Imbrian-age crater forms part of the southern shoreline of Lacus Mortis and a portion of Plana's southern rim forms a part of the shore of Lacus Somniorum. Portions of its low northern rim forms a part of the Lacus Mortis shoreline. The square-shaped crater is about 42.97 km (26.70 miles) in diameter and 1800 m (5905 feet) deep. A sharp-summit central peak rises to an elevation of about 1050 m (3444 feet) from the generally smooth floor. The southern wall appears either to be terraced or to have a deep valley running the length of this side of the crater. The eastern wall is joined to the western wall of the crater Mason" (Garfinkle). In Plana Elger sees "a triangular-shaped central mountain, a crater, and at least three other depressions on the S.W. wall where it joins Mason". Can these depressions be seen?

Image 39, Lacus Mortis, *Francisco Alsina Cardinalli, Oro Verde, Argentina. 2016 January 16 00:45 UT. Meade LX200 10 inch Schmidt-Cassegrain telescope, Canon EOS Digital Rebel XS camera.*

Image 40, Lacus Mortis, *Richard Hill, Loudon Observatory, Tucson, Arizonia, USA. 2013 April 18 02:18 UT. TEC 8 inch f/20 Maksutov-Cassegrain telescope, 665 nm, DMK21AU04 camera. Seeing 8/10.*

What can be seen clearly, especially in IMAGE 41, is the strange union of both craters: "What is strange here is the massive mass of mountainous material - like a cosmic cow patty - that fills and overflows the space between them and Lacus Mortis. This feature looks like it oozed into Mason and Lacus Mortis. I don't know what it is, but often isolated massifs (the geologist's term for bulky mountains) like this are fragments of an impact basin rim - is this perhaps a piece of the Serenitatis basin rim?" (Wood, 2006).

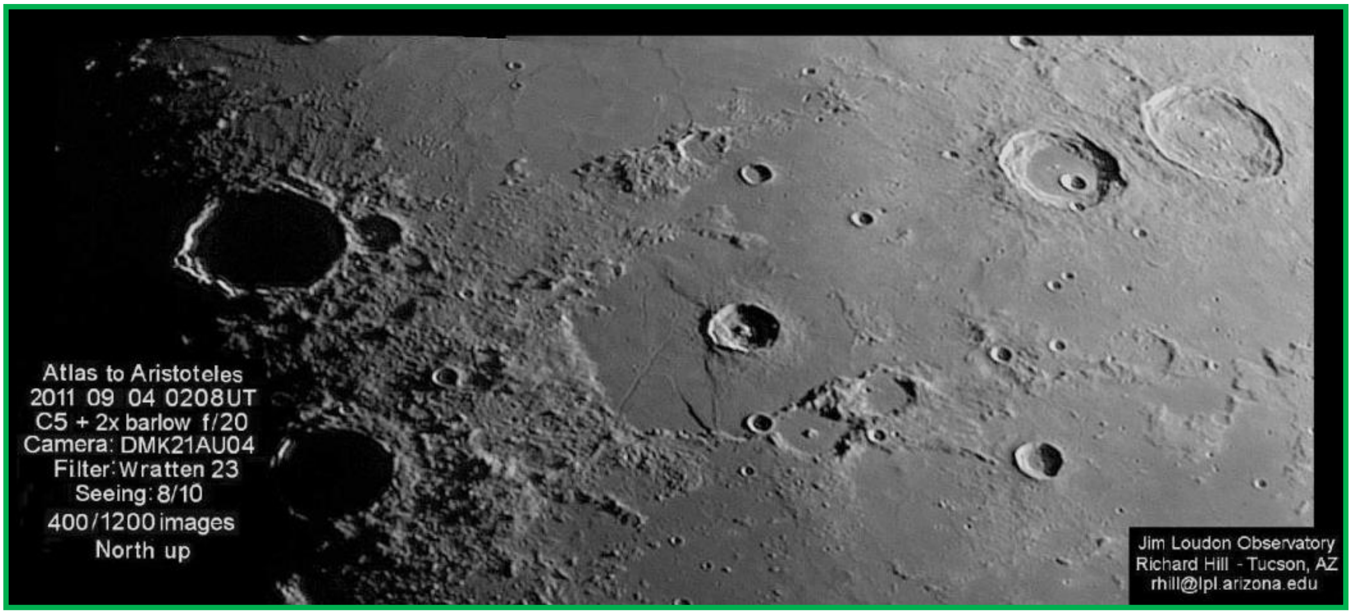


Image 41, Atlas to Aristoteles, *Richard Hill, Loudon Observatory, Tucson, Arizonia, USA. 2011 September 04 02:08 UT. Celestron 5 inch Schmidt-Cassegrain telescope, 2x barlow, Wratten 23 filter, DMK21AU04 camera. Seeing 8/10.*

7.-Failed destination of the Peregrine mission

At the time you are reading this tour of Lacus Mortis, if fortune had been favorable, there would be a lander on its surface. Within the Commercial Lunar Payload Services (CLPS) initiative of NASA, designed to partner with private American companies with the objective of delivering scientific, exploration, and technology payloads to the Moon's surface and orbit (with the Artemis Program returning humans to the Moon as the final goal), the first private lunar mission was awarded to the company Astrobotic in 2019. Astrobotic had chosen Lacus Mortis as the landing site for its lunar lander Peregrine, equipped with different scientific experiments. However, a year ago, in February 2023, the destination was changed to Oceanus Procellarum, more precisely to the Gruithuisen domes, as it was considered of greater scientific interest. First disappointment for those who like Lacus Mortis. The second was more serious, the failure of the mission in January 2024, without being able to reach the Moon. Space is a difficult place; it remains so despite technological advances. The choice of Lacus Mortis has its prehistory, which dates back to 2014 when Astrobotic Technology nominated it as its chosen destination for the lunar mission they were applying for the Google Lunar X Prize. Regarding this first choice of Lacus Mortis already in 2014, Howard Fink shared with us IMAGE 42 with these words: "Here's a picture of a model done to commemorate the Lunar X prize proposed landing sites; Astrobotic was going to land in Lacus Mortis. The model has a 2X vertical scale. I had a booth at the 2015 Lunar and Planetary Conference in Houston." The choice of Lacus Mortis takes us to the final section, since it was proposed to land near a lunar cavern.

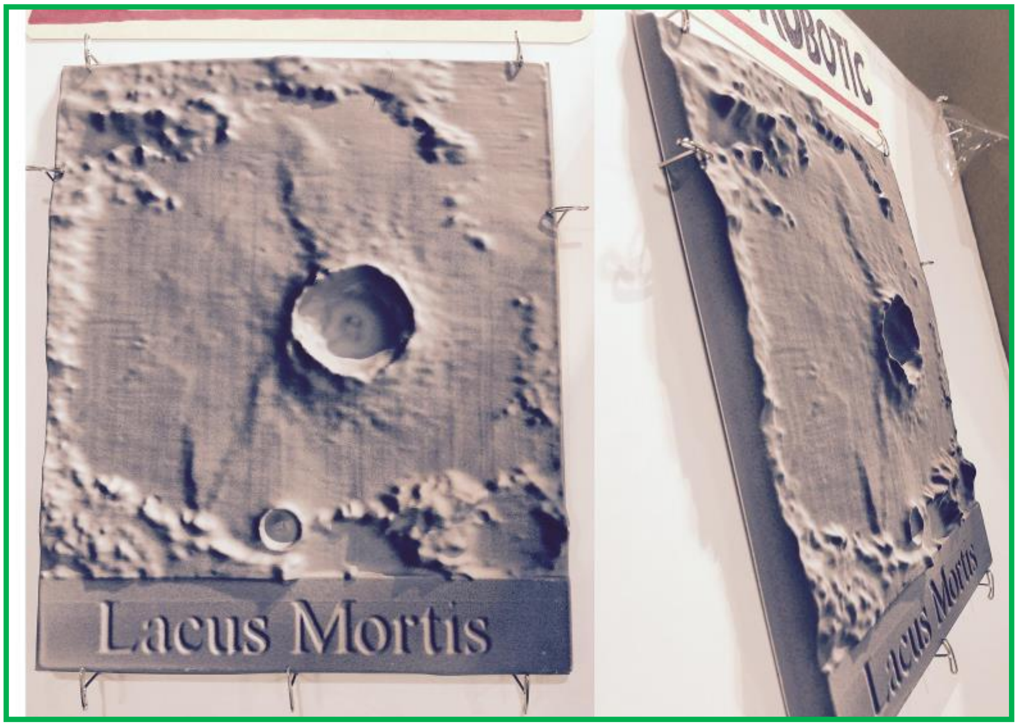


***Image 42, Lacus Mortis Model**, Howard Fink, New York, New York, USA. Howard adds:* "Here's a picture of a model done to commemorate the Lunar X prize proposed landing sites; Astrobotic was going to land in Lacus Mortis. The model has a 2X vertical scale. I had a booth at the 2015 Lunar and Planetary Conference in Houston.

https:finkh.wordpress.com/2020/05/13/lacus-mortis/ This is a digital 3D model using LRO data. Feel free to use any of the images.

8.-Will we live in the caverns of Lacus Mortis?

It is likely that humans will return to inhabit caves, it will not be a civilizational setback, quite the opposite, since we will inhabit the caves of the Moon. More precisely the **s**ubsidence or collapse or pit craters: "These depressions in the terrain are not formed by impacts but rather by the collapse of the terrain over a void, usually creating circular-shaped hollows. Similar to how lava tubes-pits are formed on the Earth, on the Moon, these features could be the entrance to underground caves formed when lava tube ceilings are not resistant enough to support their weight and collapse [1, 2]. Some of them could even be interconnected if their origin is the same volcanic tube through which lava flowed in the past" (López-Martínez et al.). Not only would they be promising astrobiological regions, since they would have their own microclimates and would be ideal for studying the geology of sites not exposed to space weather, but also a safe and natural refuge for astronauts, protecting them from radiation, extreme temperature changes. and meteorites. And it turns out that there is a pit, which would lead to a cavern, in the area near Rima Bürg. López-Martínez et al. carried out a study in which a total of 278 lunar pit craters were analyzed, prioritizing those that would be related to lava tubes according to the following criteria: "(1) morphological characteristics; (2) the proximity of each other's and its possible internal connections; (3) associations with various geological structures (such as lobate scarps, wrinkle ridges, maria or impact craters); (4) their possible origin; (5) different type of geological materials and their proximity to areas abundant in resources (water ice, REE or other materials); (6) their proximity to areas more suitable for landing on the Moon; and (7) proximity to current and future human and robotic missions". From this selection, 4 main candidates emerged, pits located, in order of importance, in Marius Hills, Mare Tranquillitatis, Mare Ingenii and Lacus Mortis (Lacus Mortis Pit). Fourth place among the finalist sites (as ideal places to study as future lunar habitats) went to the Lacus Mortis pit because "it has no confirmation of correlation of a sublunarean void space, such as the other candidates. It is located in a very poor Fe and Ti zone, but it is still in our ranking because it is the only one in the list that has a ramp-shaped inner slide to become easily accessible to the inside with a slope of 22°". I can't wait to go down that "easily accessible" ramp that we see in IMAGE 43 (obtained by the Lunar Reconnaissance Orbiter)! This ramp to the underground Moon is located in the Rima Bürg region, "which is not considered a volcanic channel but could be connected to two extinct volcanoes.

This evidence of past volcanism, added to the found pyroclastic deposits around the graben, could indicate that there was volcanic activity in the past, so the existence of a sublunarean lava tube coincident with the rime Bürg cannot be disregarded” (López-Martínez). Rima Bürg is the longest crack (it is 60 kilometers long) that we see on the left margin of IMAGE 44.

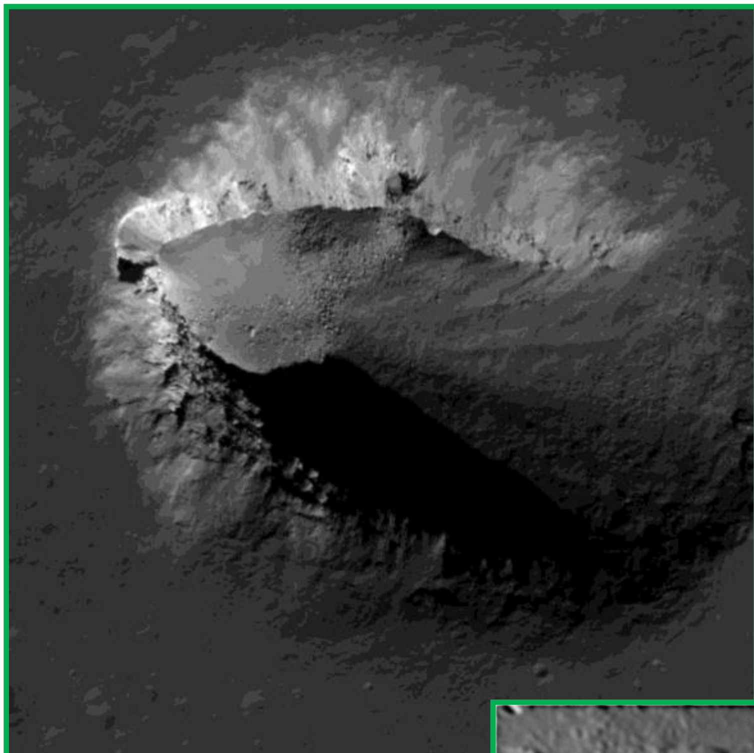


Image 43, Lacus Mortis Pit, *LROC.*

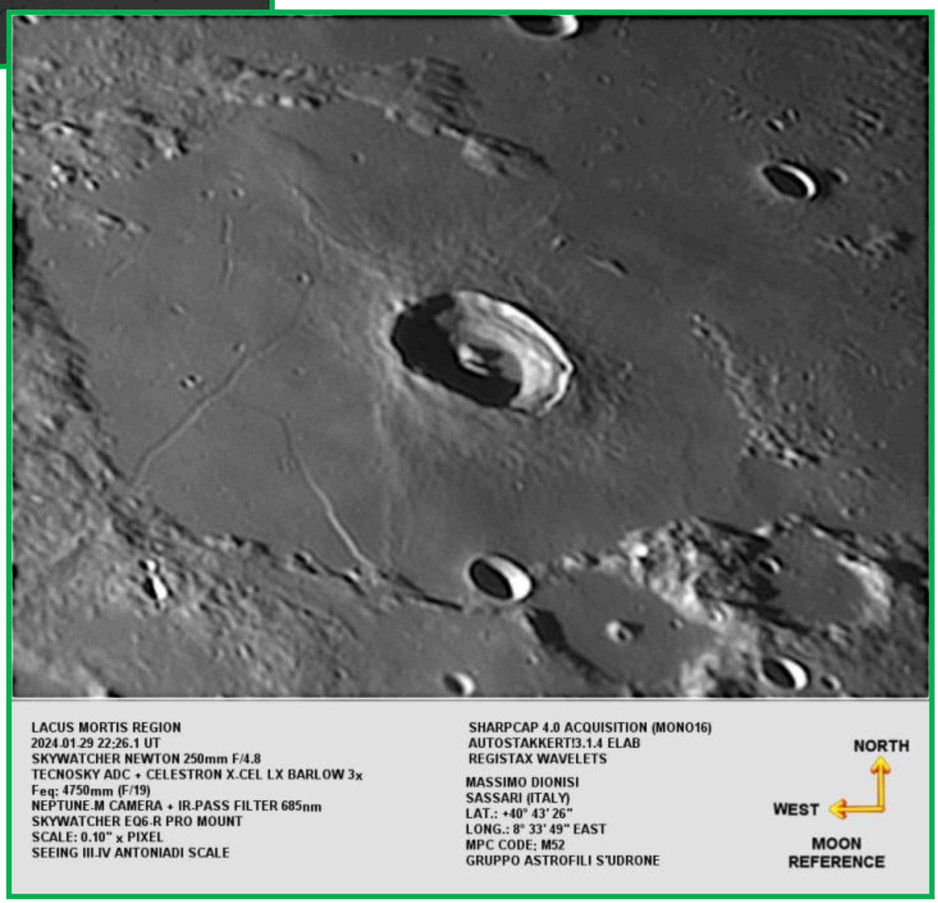


Image 44, Lacus Mortis*, Massimo Dionisi, Sassari, Italy. 2024 January 29 22:26 UT. Sky Watcher 250 mm f/4.8 reflector telescope, Tecnosky ADC, 3x barlow, e.f.l. 4,750 mm, IR pass filter 685 nm, Neptune-M camera. Seeing II-IV Antoniadi scale.*

Focus-On: Lacus Mortis One of the Strangest-Looking Parts of the Moon

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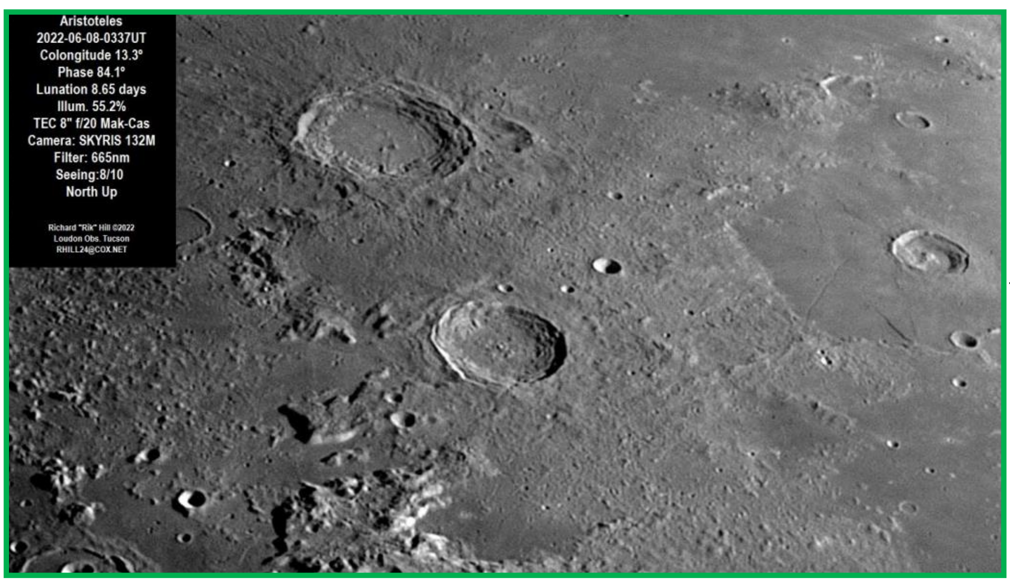
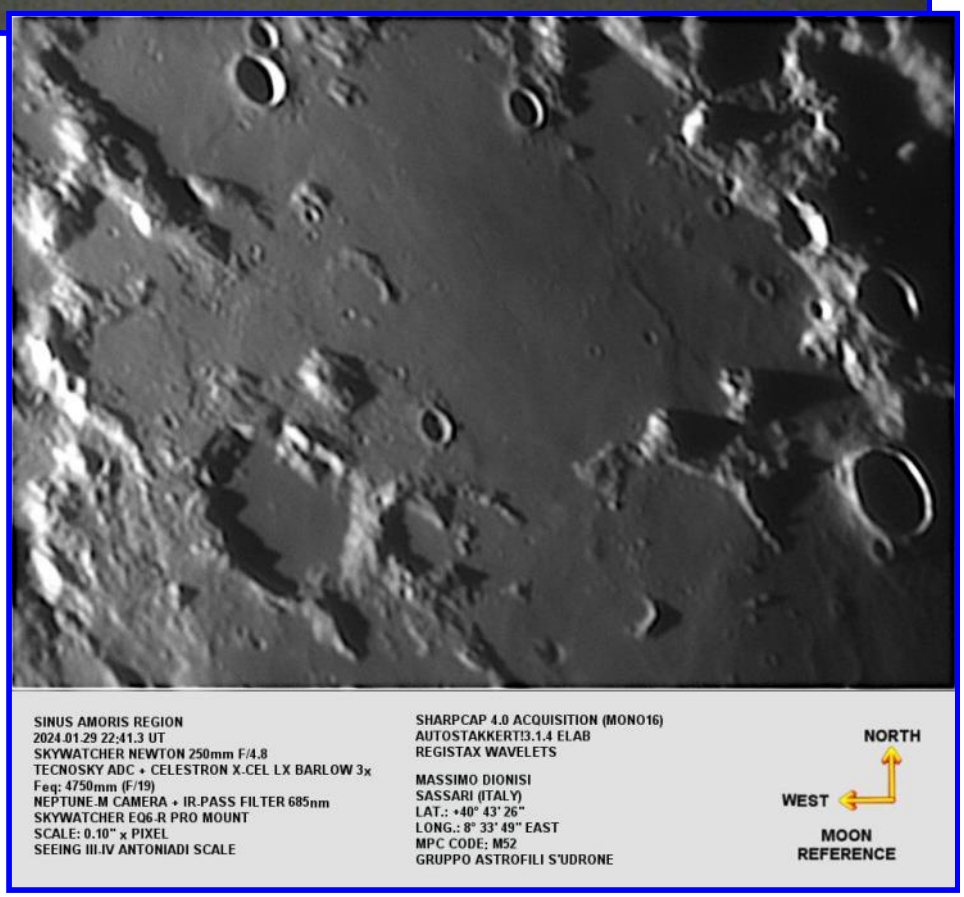


Aristoteles, *Richard Hill, Loudon Observatory, Tucson, Arizonia, USA. 2022 June 08 03:37 UT, colongitude 13.3º. TEC 8 inch f/20 Maksutov-Cassegrain telescope, 665 nm, SKYRIS 132M camera. Seeing 8/10.*

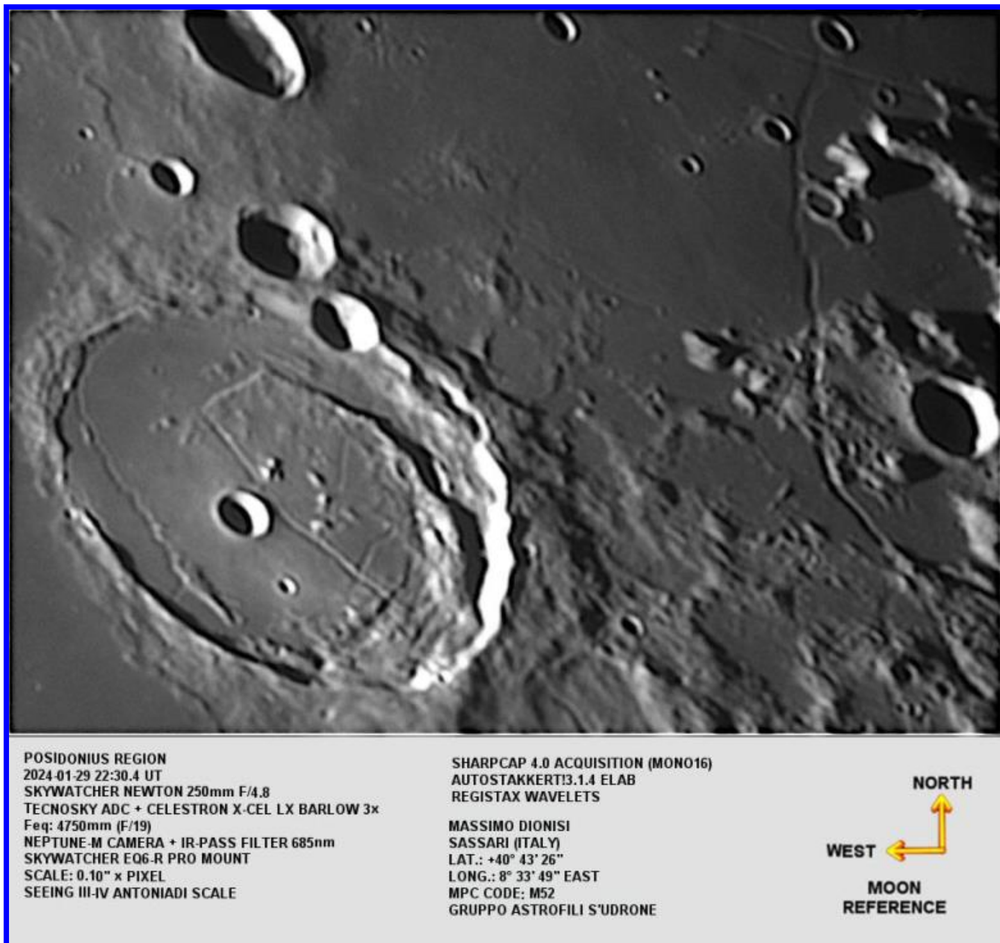
Focus-On: Lacus Mortis One of the Strangest-Looking Parts of the Moon

Aristarchus, *Walter Ricardo Elias, Oro Verde, Argentina. 2024 February 04 06:51 UT. Sky Watcher 150 mm reflector telescope, 750 mm fl, 3 x barlow, QHY5IIC camera.*



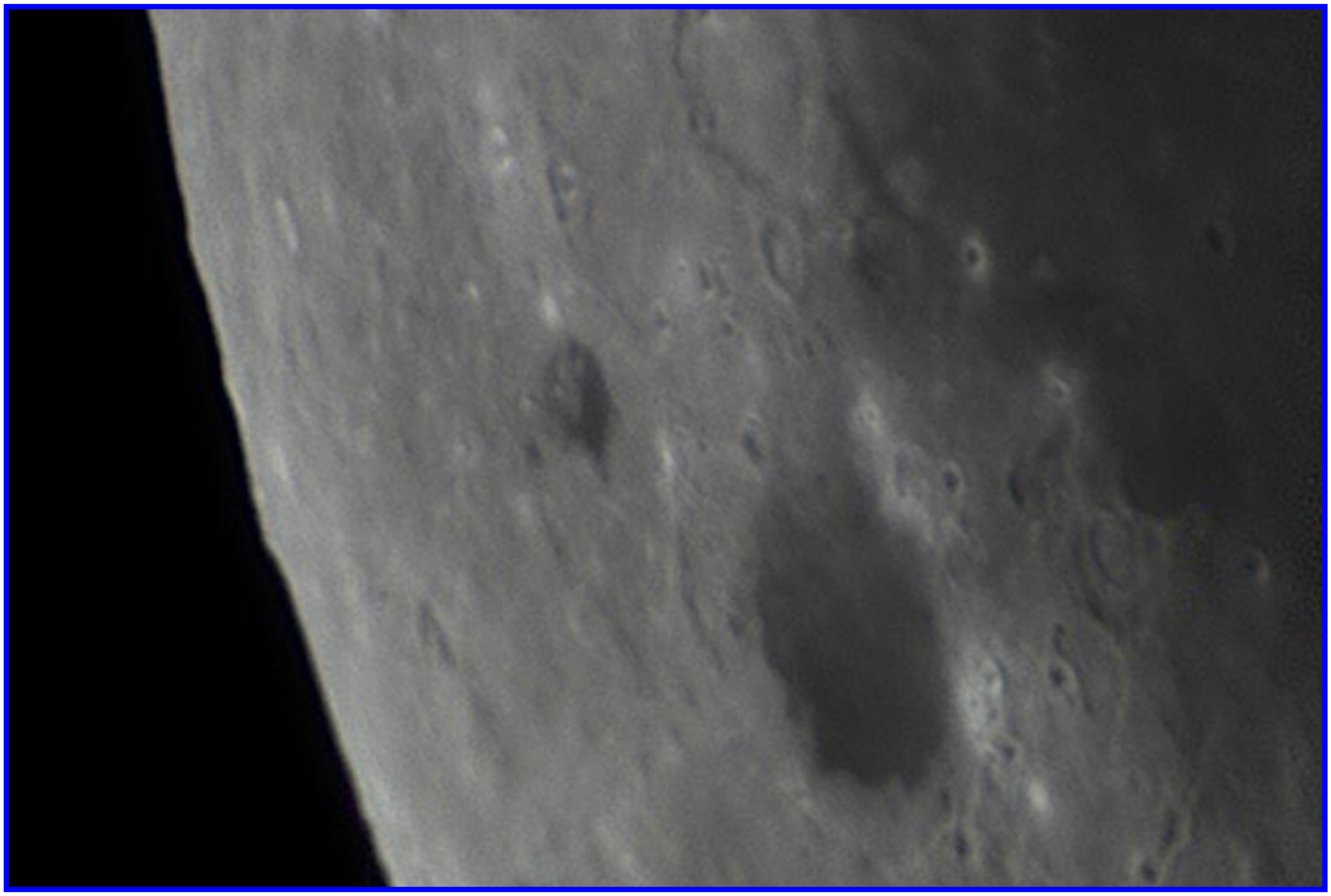
Sinus Amoris*, Massimo Dionisi, Sassari, Italy. 2024 January 29 22:41 UT. Sky Watcher 250 mm f/4.8 reflector telescope, Tecnosky ADC, 3x barlow, e.f.l. 4,750 mm, IR pass filter 685 nm, Neptune-M camera. Seeing II-IV Antoniadi scale.*

Recent Topographic Studies



***Posidonius**, Massimo Dionisi, Sassari, Italy. 2024 January 29 22:30 UT. Sky Watcher 250 mm f/4.8 reflector telescope, Tecnosky ADC, 3x barlow, e.f.l. 4,750 mm, IR pass filter 685 nm, Neptune-M camera. Seeing II-IV Antoniadi scale.*

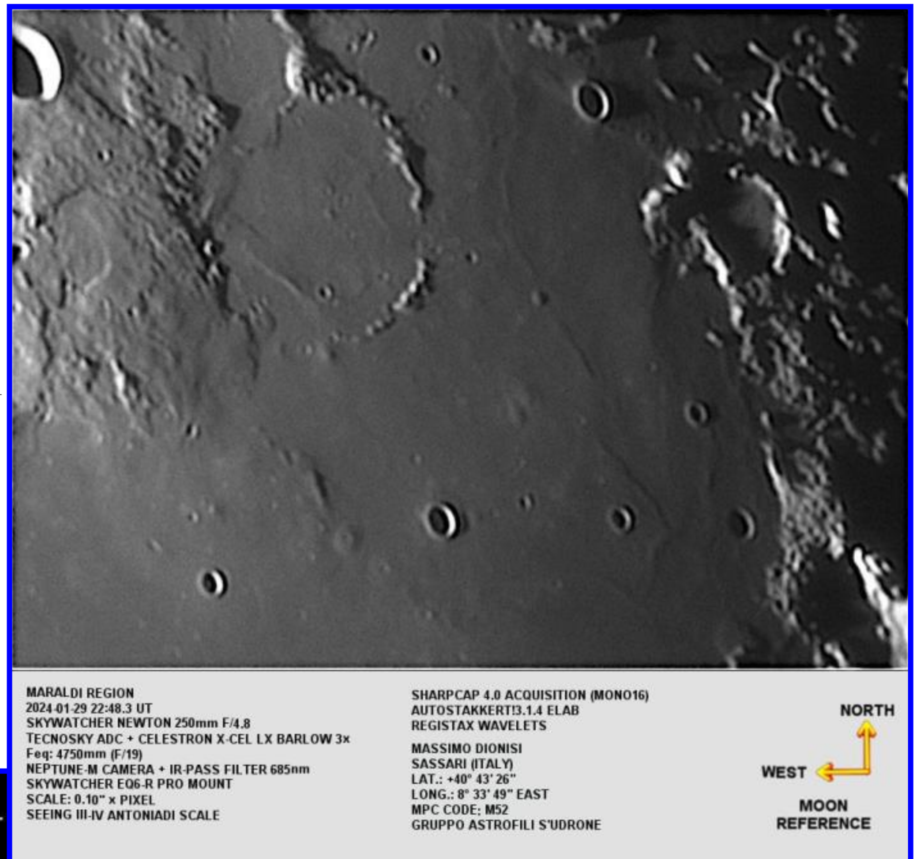
***Censorinus,** Francisco Alsina Cardinalli, Oro Verde, Argentina. 2024 February 17 00:47 UT. Meade 8 inch reflector telescope, 2x barlow, QHY5L-II-M camera.*



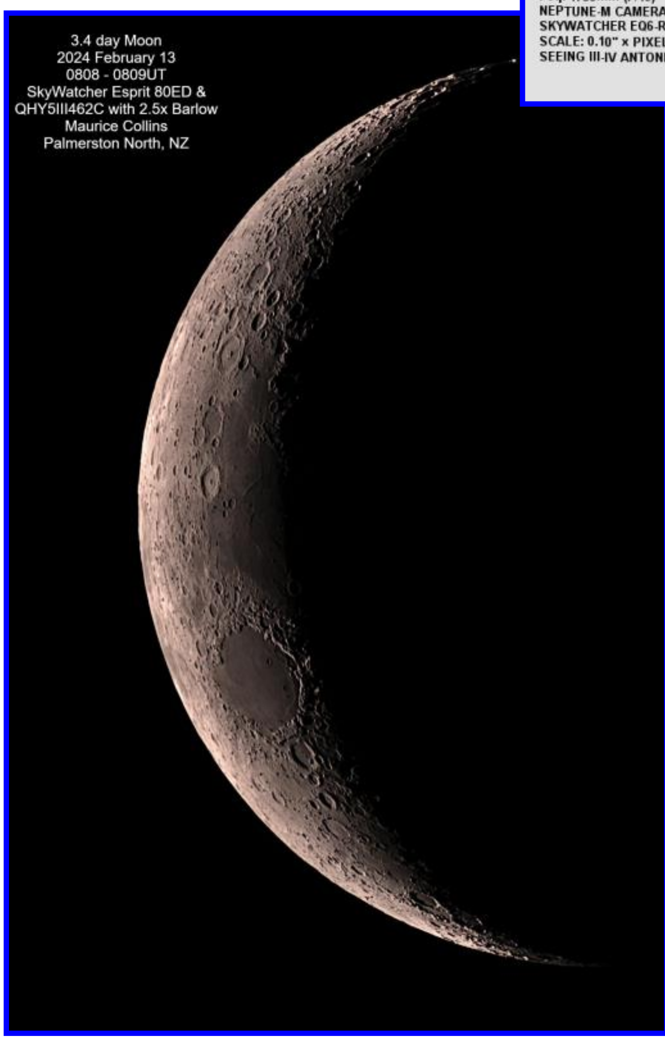
Riccioli, *Walter Ricardo Elias, Oro Verde, Argentina. 2024 February 04 07:03 UT. Sky Watcher 150 mm reflector telescope, 750 mm fl, 3 x barlow, QHY5IIC camera.*

Aristoteles*, Massimo Dionisi, Sassari, Italy. 2024 January 29 22:02 UT. Sky Watcher 250 mm f/4.8 reflector telescope, Tecnosky teleextender 5x, e.f.l. 6,000 mm, IR pass filter 685 nm, Neptune-M camera. Seeing II-IV Antoniadi scale.*

Recent Topographic Studies



***Maraldi**, Massimo Dionisi, Sassari, Italy. 2024 January 29 22:48 UT. Sky Watcher 250 mm f/4.8 reflector telescope, Tecnosky ADC, 3x barlow, e.f.l. 4,750 mm, IR pass filter 685 nm, Neptune-M camera. Seeing II-IV Antoniadi scale.*



***3.4-Day Old Moon,** Maurice Collins, Palmerston North, New Zealand. 2024 February 13 08:08-08:09 UT. SkyWatcher Espirit 80 ED refractor telescope, 2.5x barlow, QHY5III462C camera. North is down, west is right.*

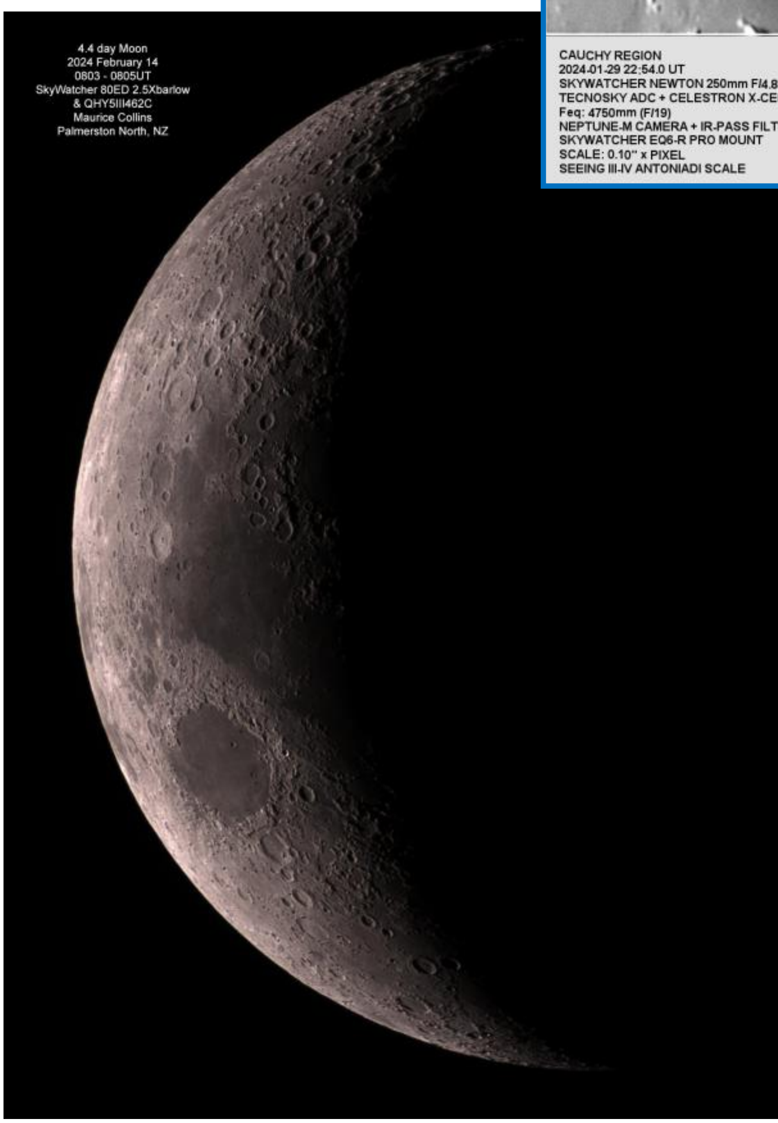
Recent Topographic Studies

***Zähringer**, Massimo Dionisi, Sassari, Italy. 2024 January 29 23:05 UT. Sky Watcher 250 mm f/4.8 reflector telescope, Tecnosky ADC, 3x barlow, e.f.l. 4,750 mm, IR pass filter 685 nm, Neptune-M camera. Seeing II-IV Antoniadi scale.*

***Cassini-Aristillus**, Luigi Morrone, Agerola, Italy. 2024 February 17 17:36 UT. Celestron 14 inch Edge HD Schmidt-Cassegrain telescope, Fornax 52 mount, FFC Baader barlow, Optolong green filter, ASI 174MM camera.*

Recent Topographic Studies

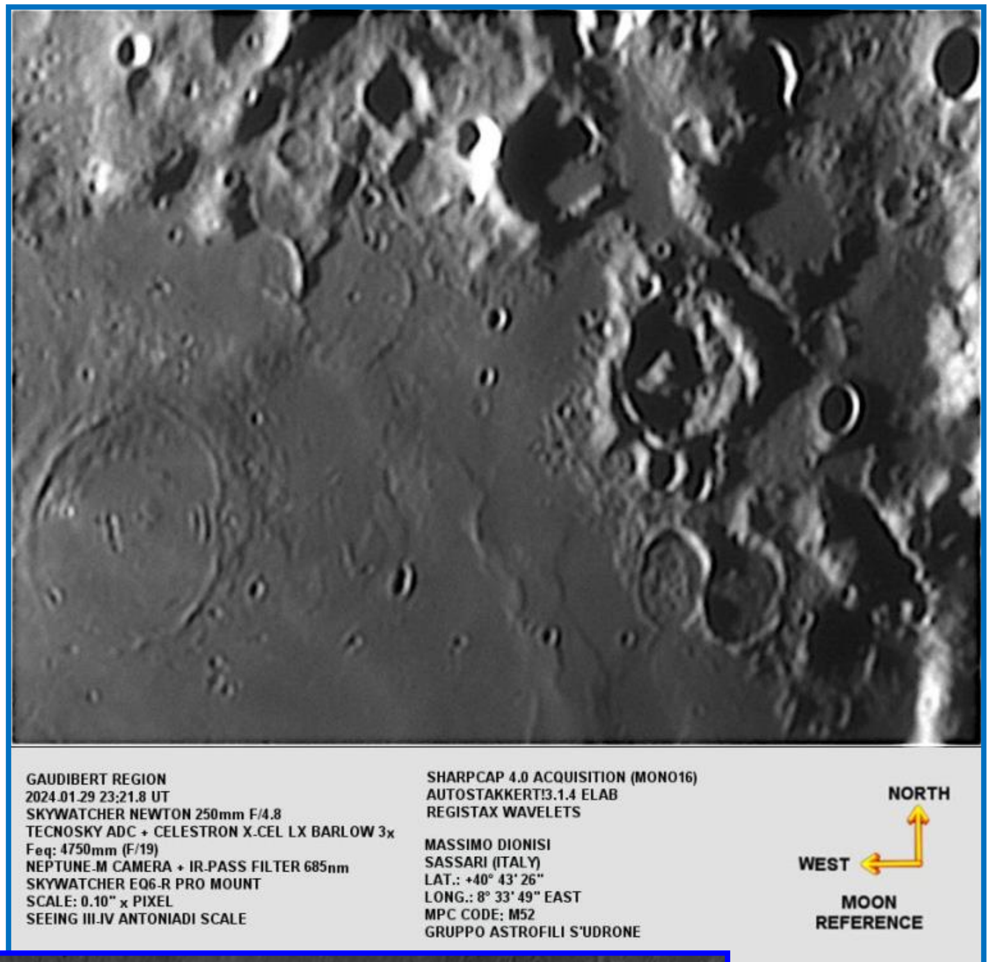
Cauchy, *Massimo Dionisi, Sassari, Italy. 2024 January 29 22:54 UT. Sky Watcher 250 mm f/4.8 reflector telescope, Tecnosky ADC, 3x barlow, e.f.l. 4,750 mm, IR pass filter 685 nm, Neptune-M camera. Seeing II-IV Antoniadi scale.*



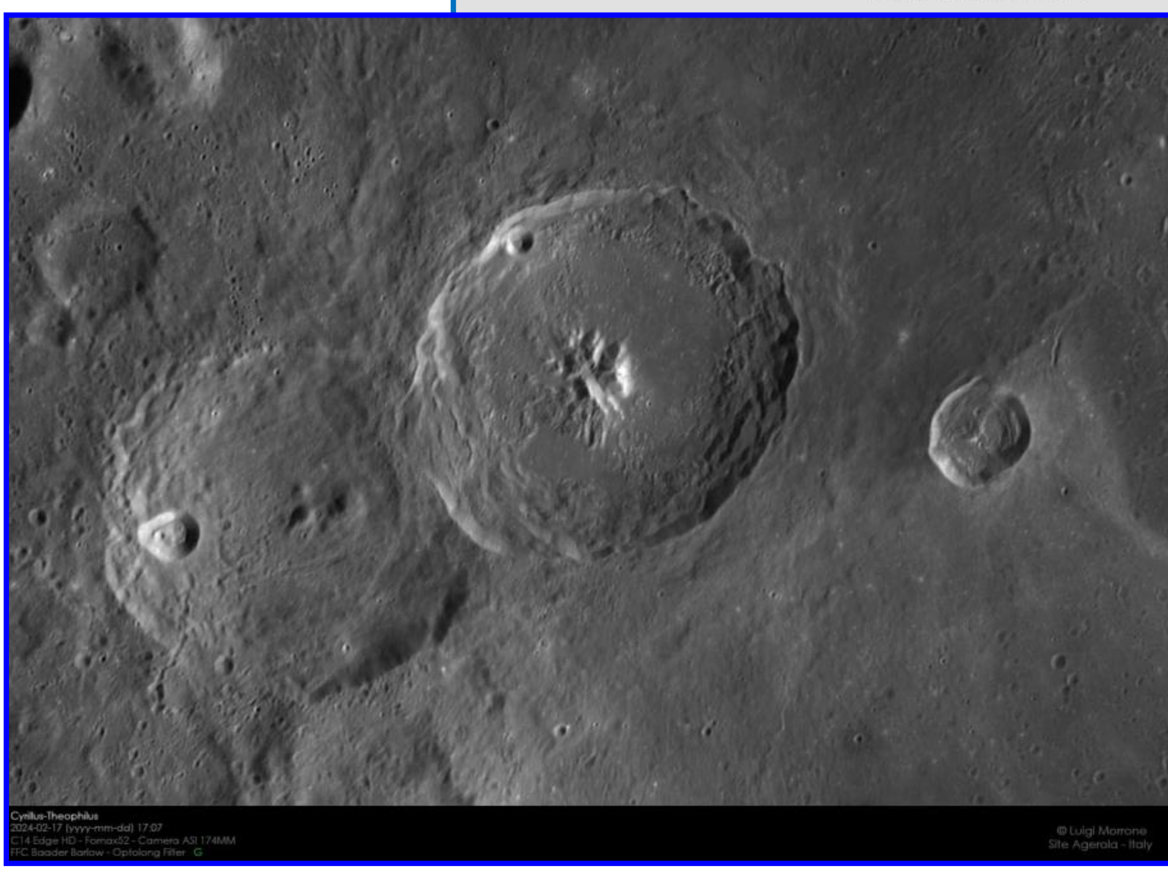
4.4-Day Old Moon, *Maurice Collins, Palmerston North, New Zealand. 2024 February 14 08:03-08:05 UT. SkyWatcher Espirit 80 ED refractor telescope, 2.5x barlow, QHY5III462C camera. North is down, west is right.*

Recent Topographic Studies

***Gaudibert**, Massimo Dionisi, Sassari, Italy. 2024 January 29 23:21 UT. Sky Watcher 250 mm f/4.8 reflector telescope, Tecnosky ADC, 3x barlow, e.f.l. 4,750 mm, IR pass filter 685 nm, Neptune-M camera. Seeing II-IV Antoniadi scale.*



***Cyrillus,** Luigi Morrone, Agerola, Italy. 2024 February 17 17:07 UT. Celestron 14 inch Edge HD Schmidt-Cassegrain telescope, Fornax 52 mount, FFC Baader barlow, Optolong green filter, ASI 174MM camera.*

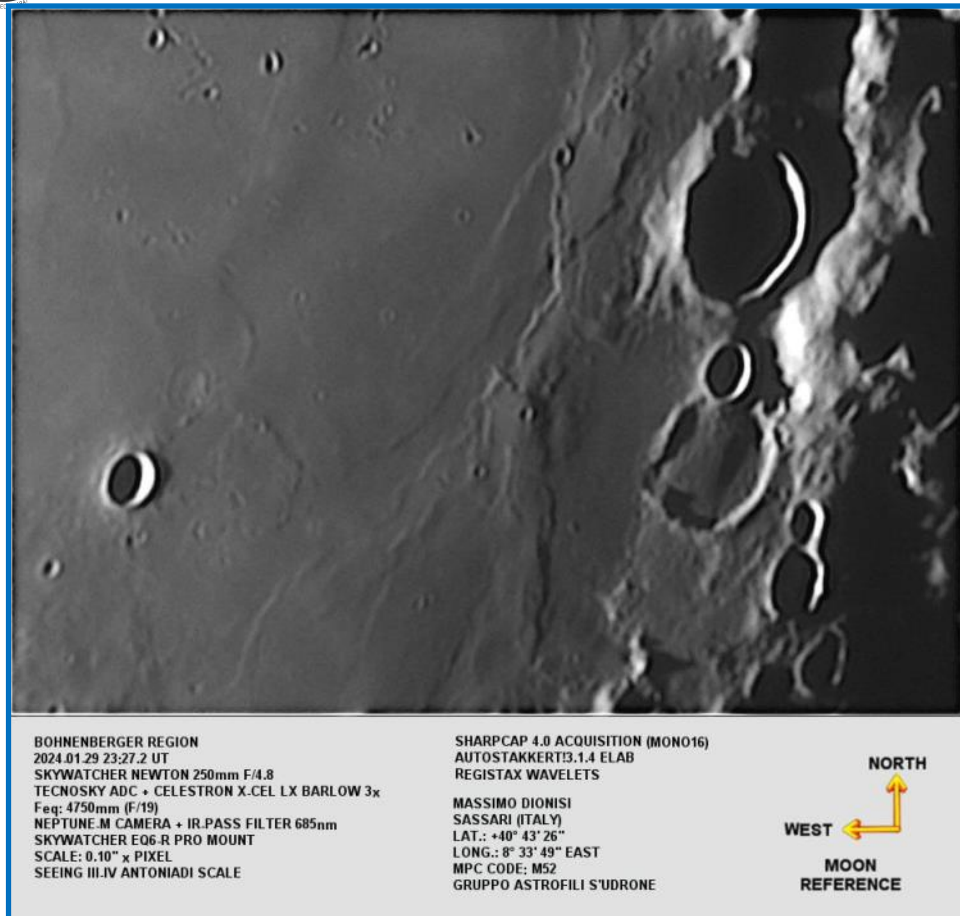


Recent Topographic Studies

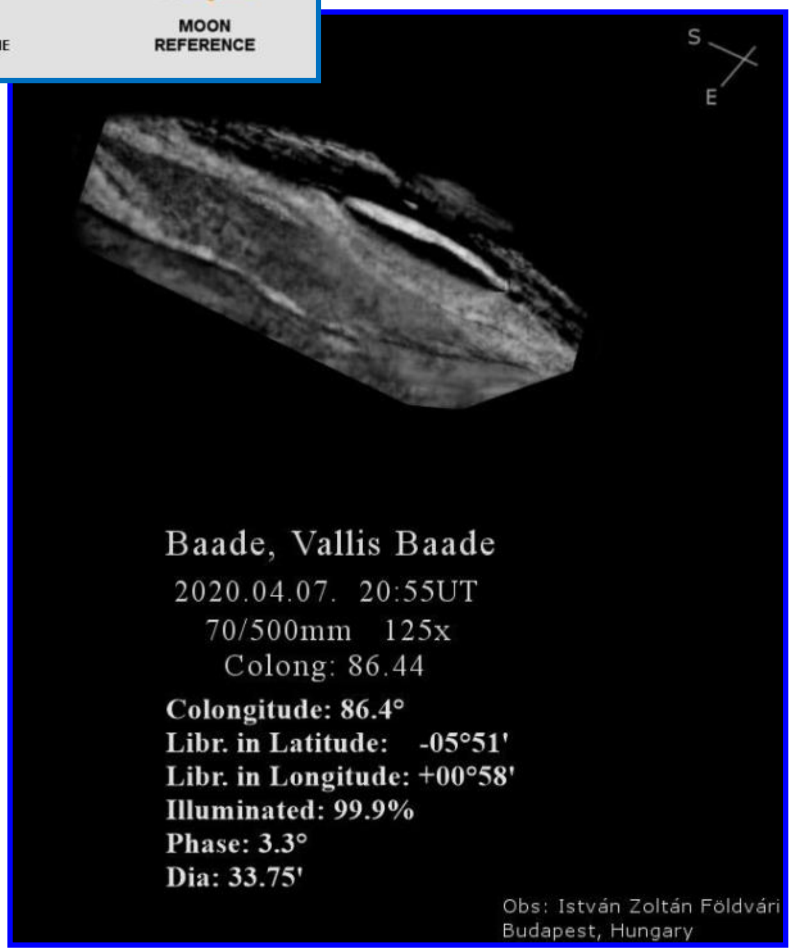
Capella, *Massimo Dionisi, Sassari, Italy. 2024 January 29 23:12 UT. Sky Watcher 250 mm f/4.8 reflector telescope, Tecnosky ADC, 3x barlow, e.f.l. 4,750 mm, IR pass filter 685 nm, Neptune-M camera. Seeing II-IV Antoniadi scale.*

Lunar South Pole, *Michael Teoh, Heng Fe Observatory, Penang, Malaysia. 2024 February 17 13:03 UT. APM-TMB 228/2050 mm refractor telescope, 2x barlow, QHY5III678M camera.*

Recent Topographic Studies



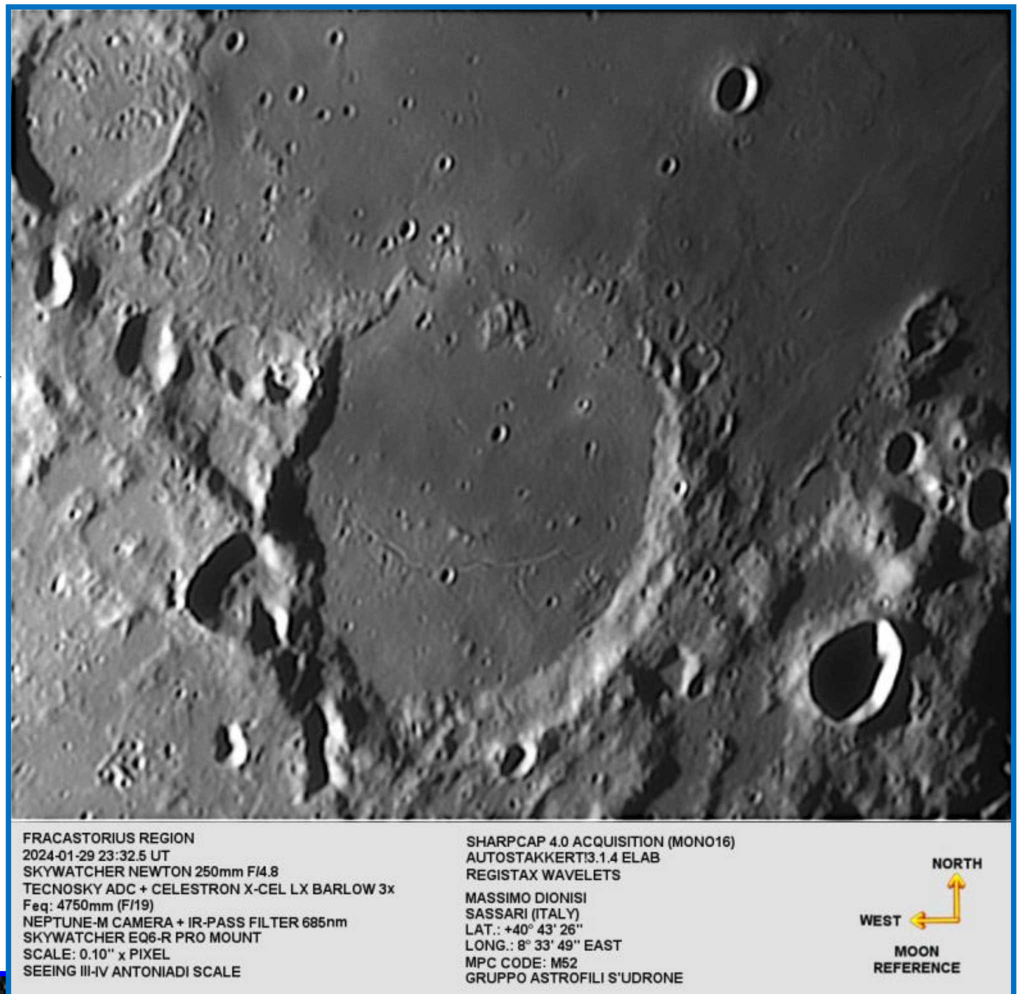
***Bohnenberger**, Massimo Dionisi, Sassari, Italy. 2024 January 29 23:27 UT. Sky Watcher 250 mm f/4.8 reflector telescope, Tecnosky ADC, 3x barlow, e.f.l. 4,750 mm, IR pass filter 685 nm, Neptune-M camera. Seeing II-IV Antoniadi scale.*



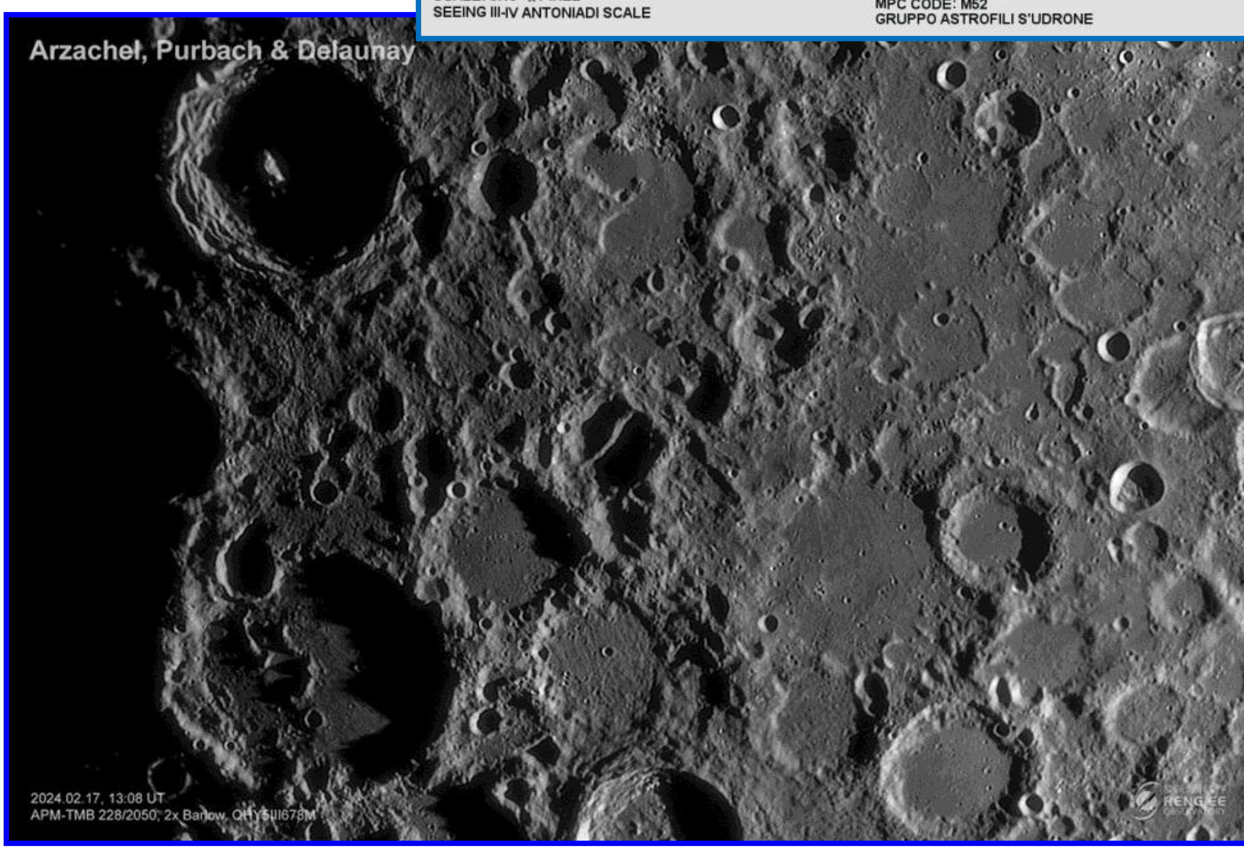
***Baade and Vallis Baade,** István Zoltán Földvári, Budapest, Hungary. 2020 April 07 20:47-21:03 UT, colongitude 86.4°. 70 mm refractor telescope, 500 mm focal length, Vixen Lanthanum LV 4mm eyepiece, 125x, Baader contrast booster filter. Seeing 7/10, transparency 6/6.*

Recent Topographic Studies

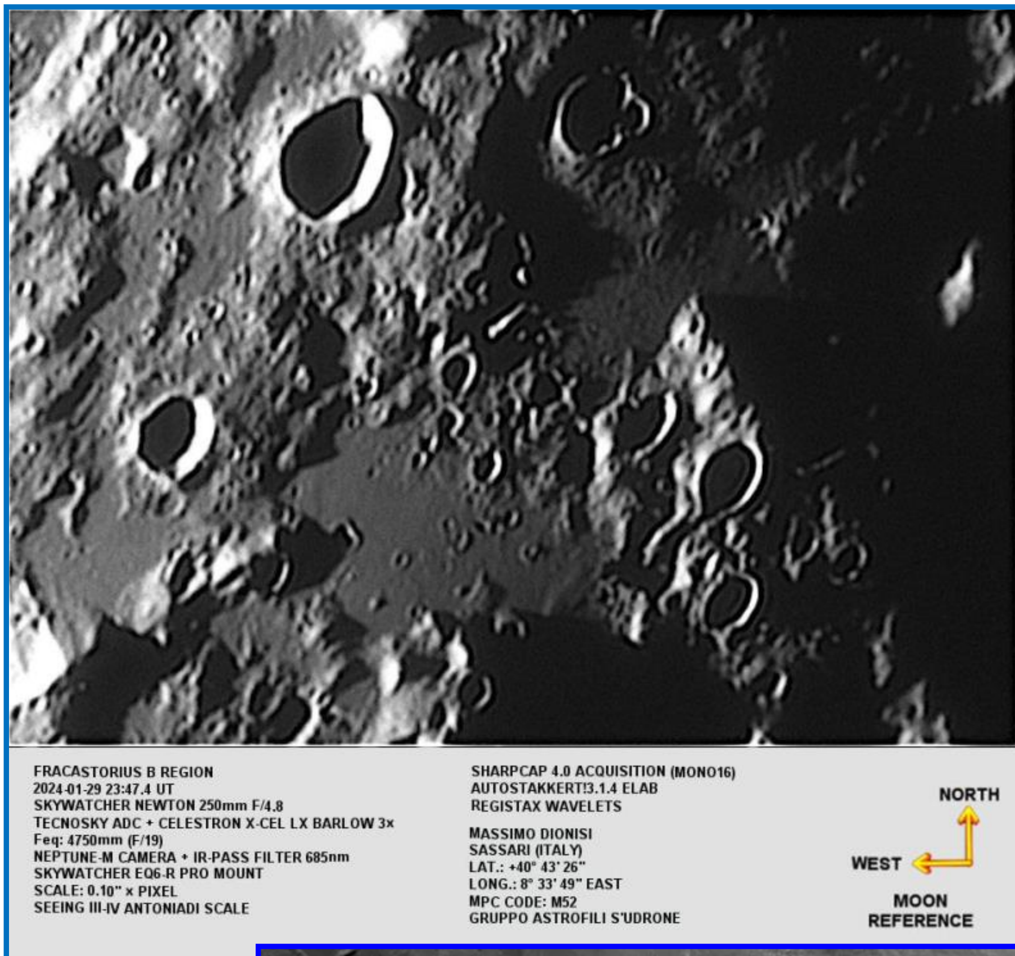
Fracastorius, *Massimo Dionisi, Sassari, Italy. 2024 January 29 23:32 UT. Sky Watcher 250 mm f/4.8 reflector telescope, Tecnosky ADC, 3x barlow, e.f.l. 4,750 mm, IR pass filter 685 nm, Neptune-M camera. Seeing II-IV Antoniadi scale.*



Arzachel, Purbach and Delaunay, *Michael Teoh, Heng Fe Observatory, Penang, Malaysia. 2024 February 17 13:08 UT. APM-TMB 228/2050 mm refractor telescope, 2x barlow, QHY5III678M camera.*



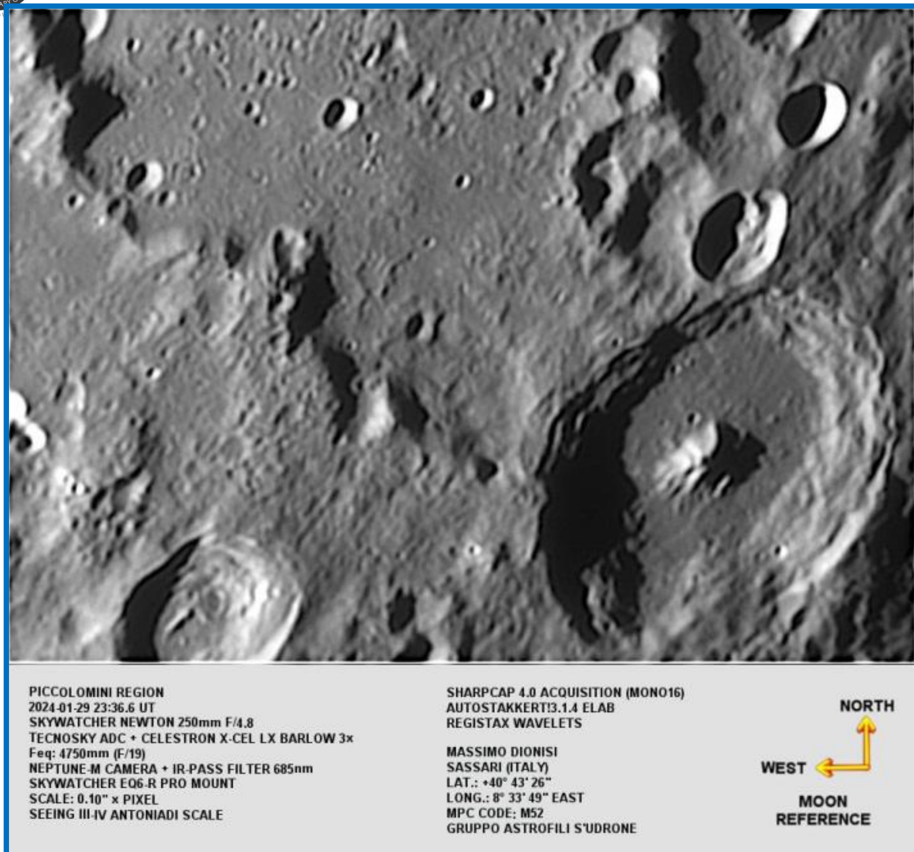
Recent Topographic Studies



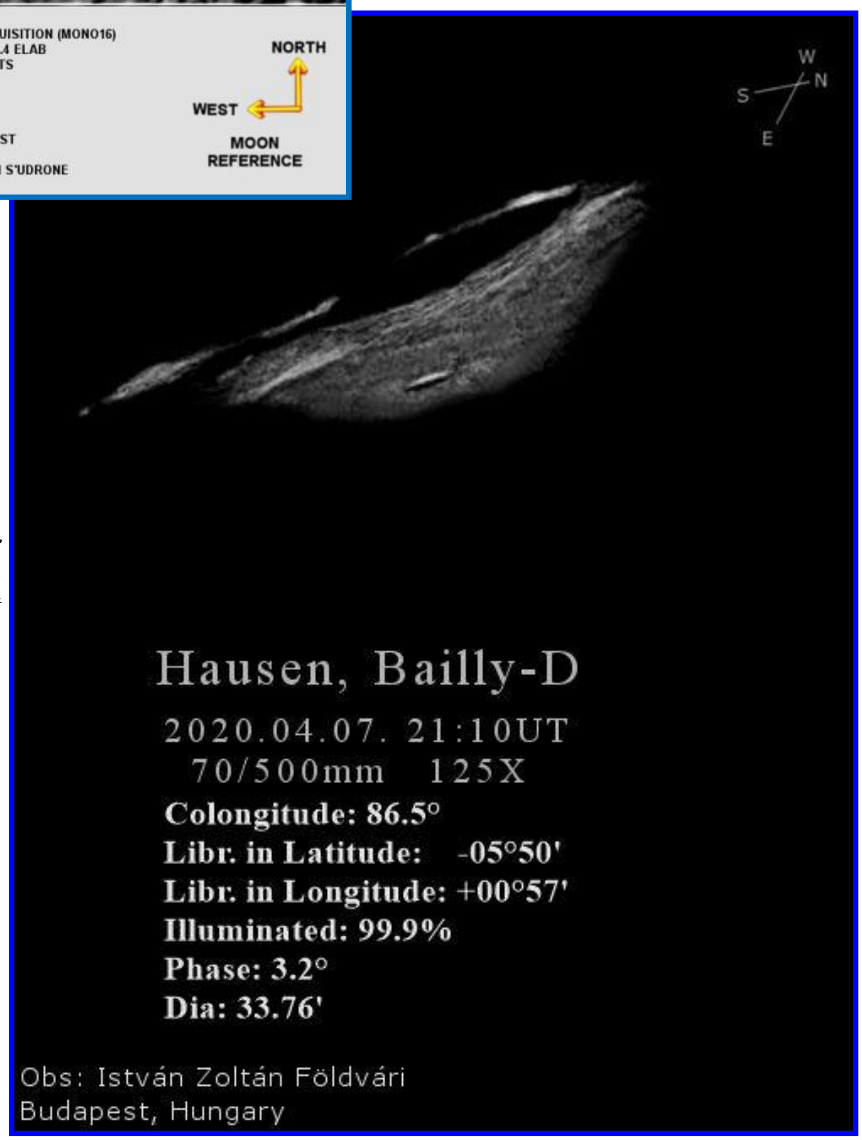
***Fracastorius B**, Massimo Dionisi, Sassari, Italy. 2024 January 29 23:47 UT. Sky Watcher 250 mm f/4.8 reflector telescope, Tecnosky ADC, 3x barlow, e.f.l. 4,750 mm, IR pass filter 685 nm, Neptune-M camera. Seeing II-IV Antoniadi scale.*

***Hercules and Atlas,** Luigi Morrone, Agerola, Italy. 2024 February 17 17:20 UT. Celestron 14 inch Edge HD Schmidt-Cassegrain telescope, Fornax 52 mount, FFC Baader barlow, Optolong green filter, ASI 174MM camera.*

Recent Topographic Studies

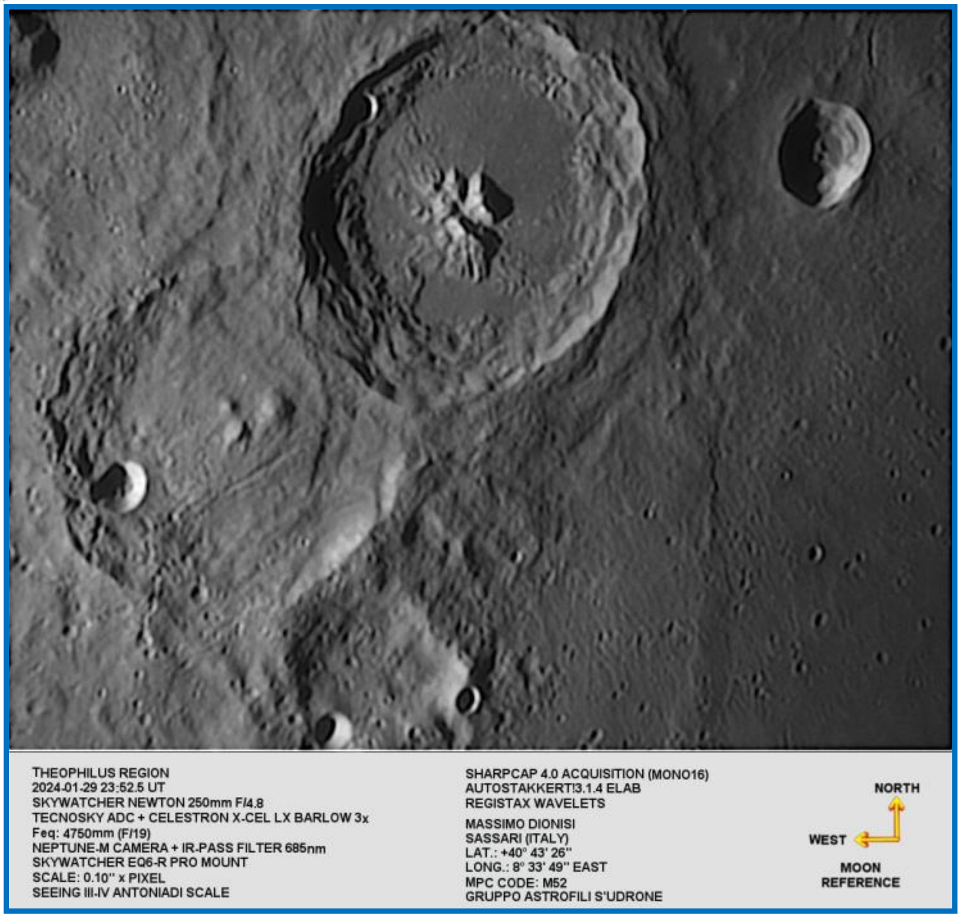


***Piccolomini**, Massimo Dionisi, Sassari, Italy. 2024 January 29 23:36 UT. Sky Watcher 250 mm f/4.8 reflector telescope, Tecnosky ADC, 3x barlow, e.f.l. 4,750 mm, IR pass filter 685 nm, Neptune-M camera. Seeing II-IV Antoniadi scale.*



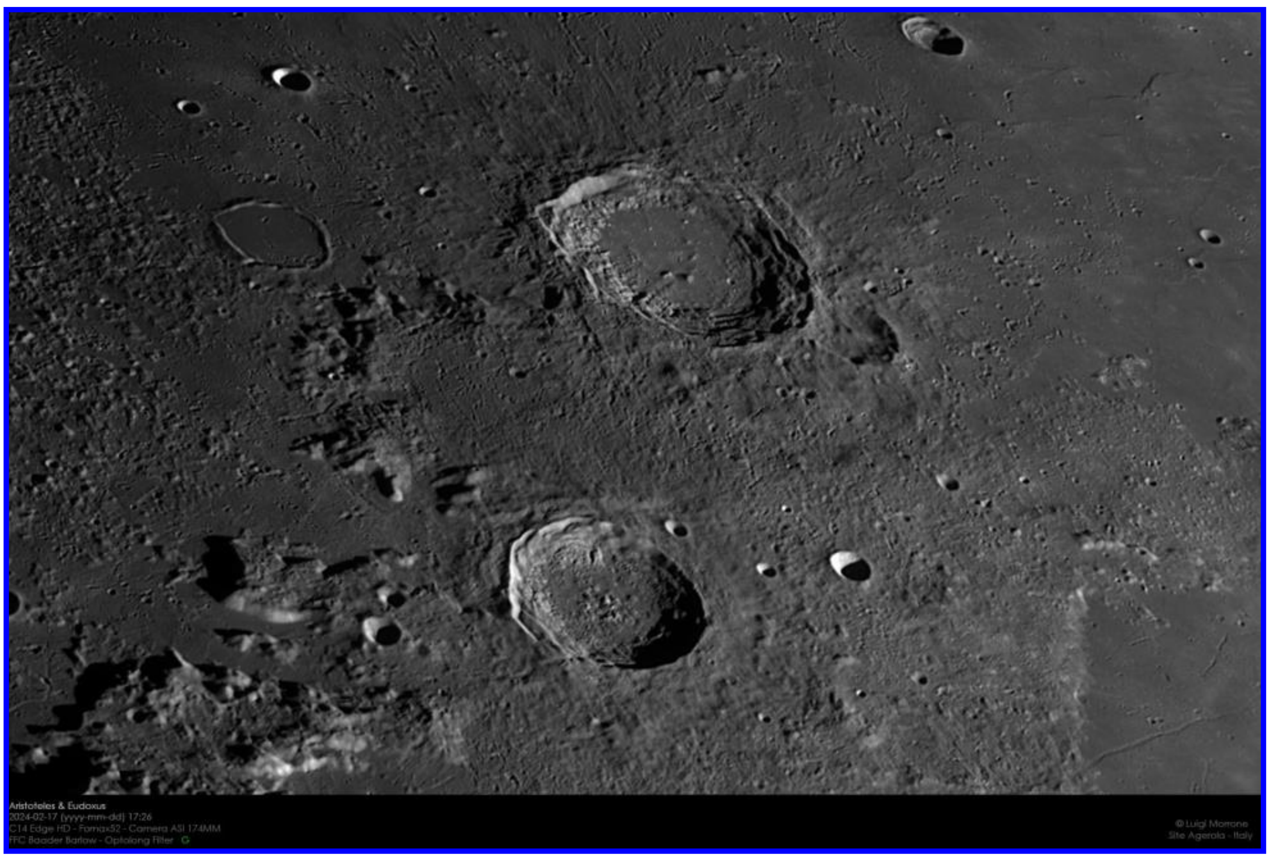
***Hausen and Bailly D,** István Zoltán Földvári, Budapest, Hungary. 2020 April 07 21:03-21:17 UT, colongitude 86.5°. 70 mm refractor telescope, 500 mm focal length, Vixen Lanthanum LV 4mm eyepiece, 125x, Baader contrast booster filter. Seeing 7/10, transparency 6/6.*

Recent Topographic Studies



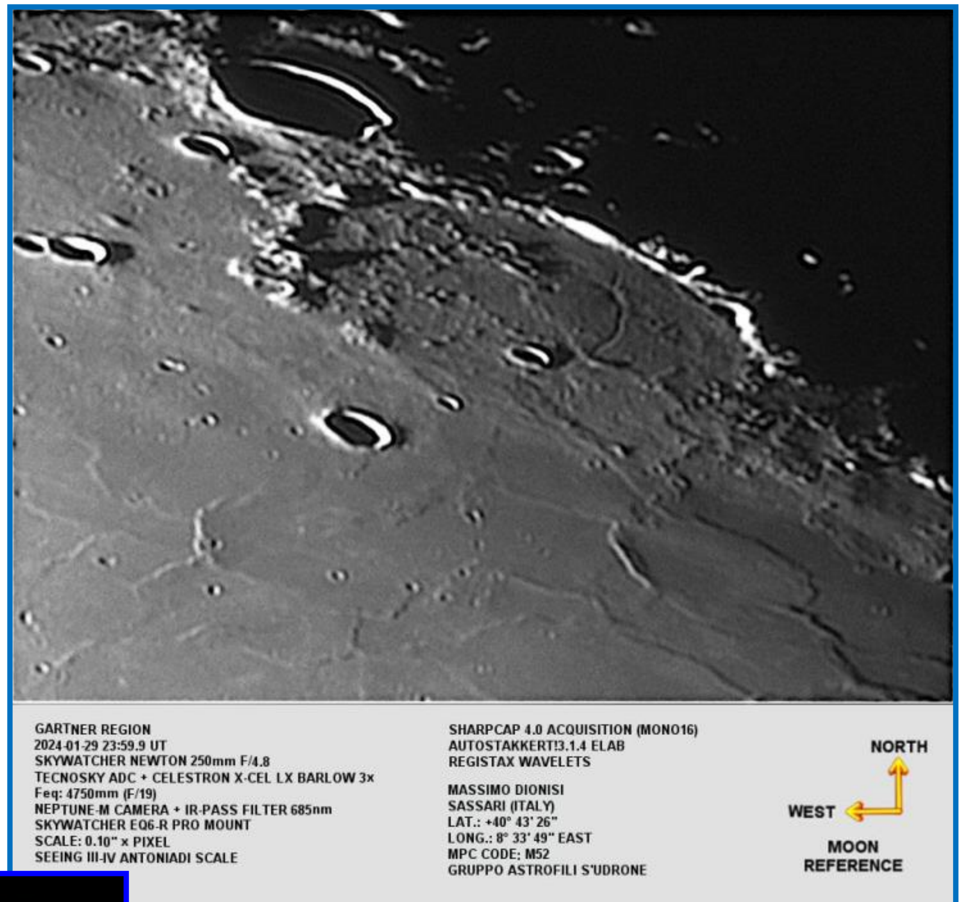
***Theophilus**, Massimo Dionisi, Sassari, Italy. 2024 January 29 23:52 UT. Sky Watcher 250 mm f/4.8 reflector telescope, Tecnosky ADC, 3x barlow, e.f.l. 4,750 mm, IR pass filter 685 nm, Neptune-M camera. Seeing II-IV Antoniadi scale.*

***Aristoteles and Eudoxus,** Luigi Morrone, Agerola, Italy. 2024 February 17 17:26 UT. Celestron 14 inch Edge HD Schmidt-Cassegrain telescope, Fornax 52 mount, FFC Baader barlow, Optolong green filter, ASI 174MM camera.*



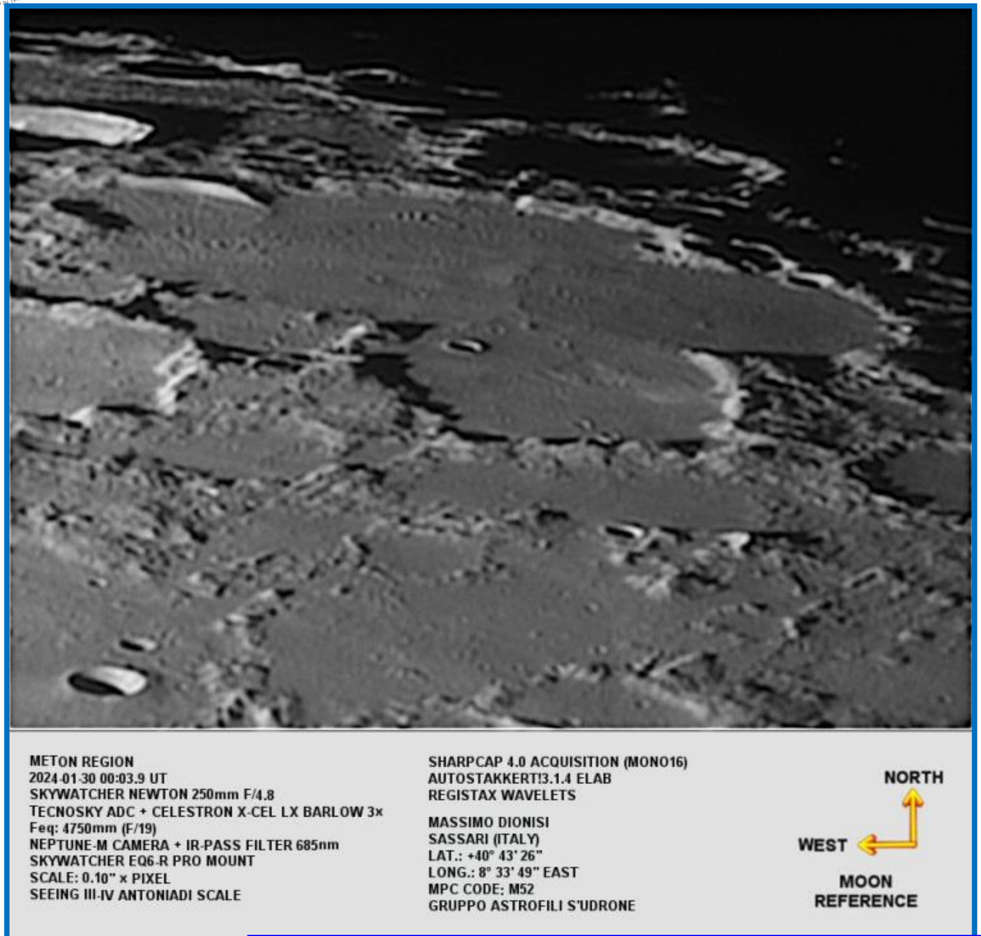
Recent Topographic Studies

Gardner, *Massimo Dionisi, Sassari, Italy. 2024 January 29 23:59 UT. Sky Watcher 250 mm f/4.8 reflector telescope, Tecnosky ADC, 3x barlow, e.f.l. 4,750 mm, IR pass filter 685 nm, Neptune-M camera. Seeing II-IV Antoniadi scale.*



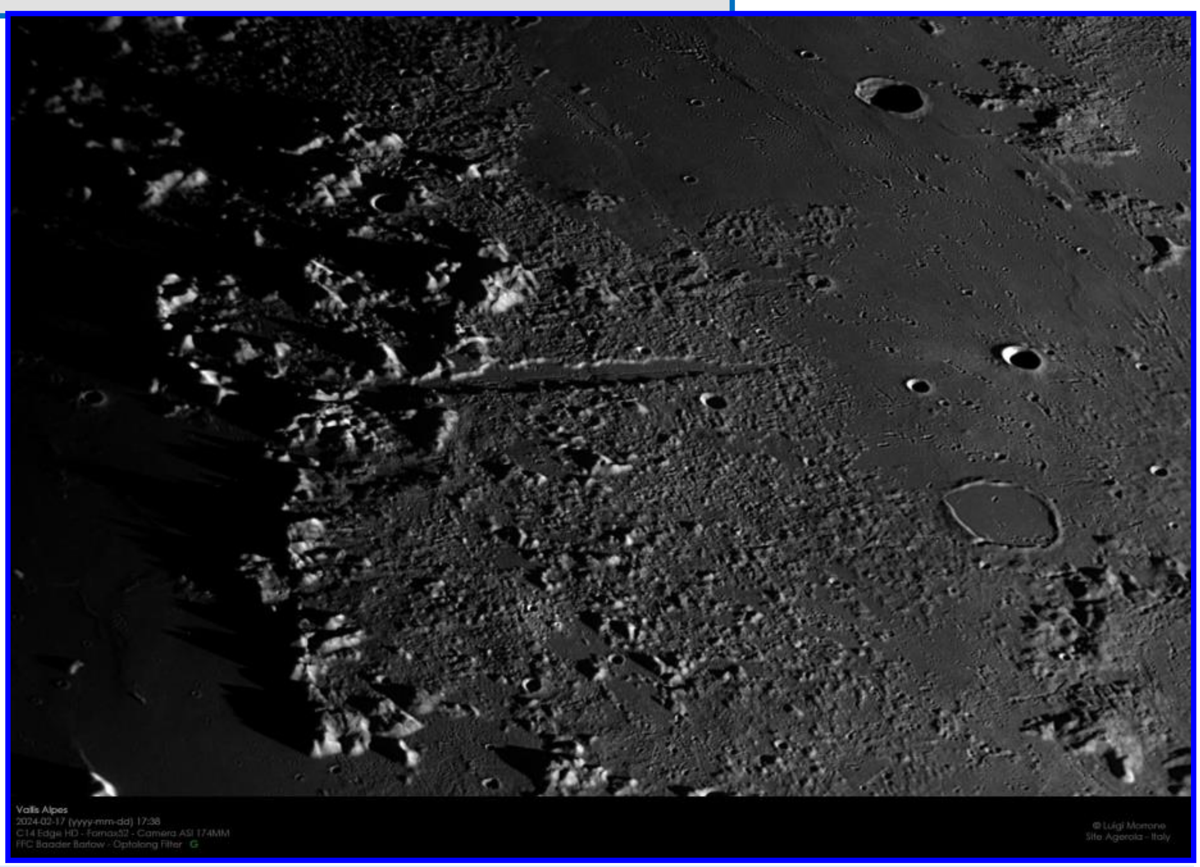
6.4-Day Old Moon, *Maurice Collins, Palmerston North, New Zealand. 2024 February 16 07:51-07:54 UT. SkyWatcher Espirit 80 ED refractor telescope, 2.5x barlow, QHY5III462C camera. North is down, west is right.*

Recent Topographic Studies



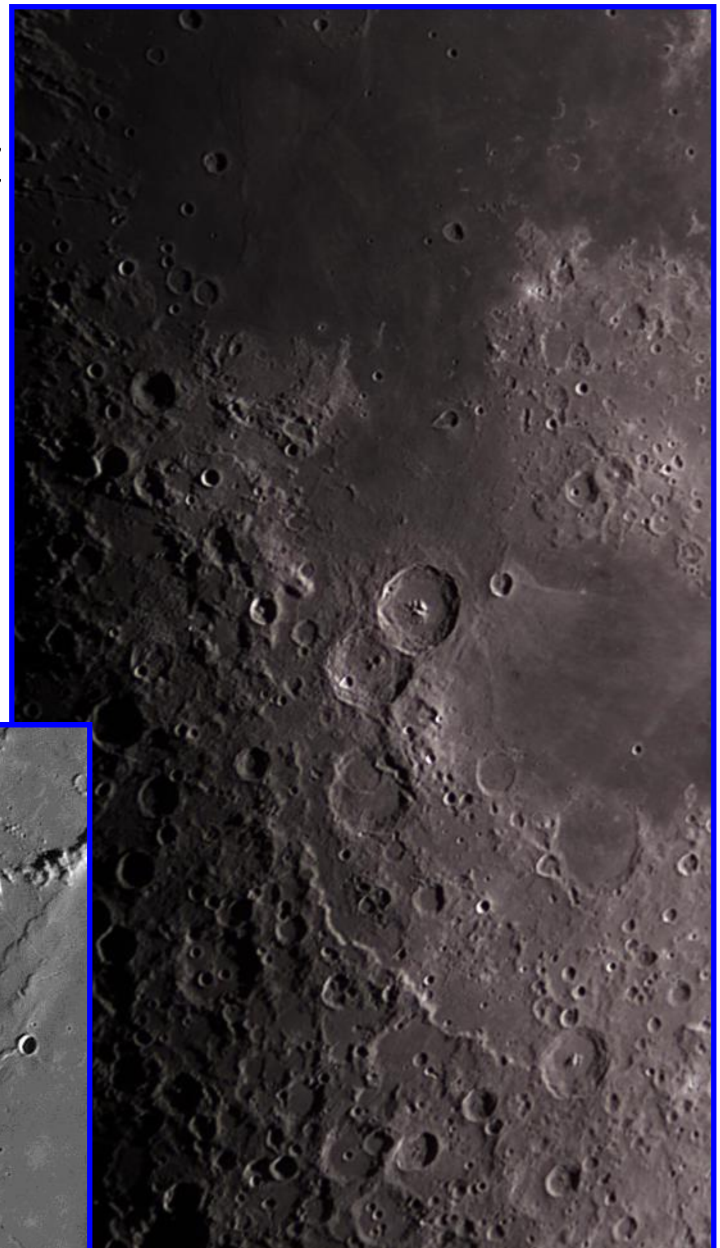
***Meton**, Massimo Dionisi, Sassari, Italy. 2024 January 30 00:03 UT. Sky Watcher 250 mm f/4.8 reflector telescope, Tecnosky ADC, 3x barlow, e.f.l. 4,750 mm, IR pass filter 685 nm, Neptune-M camera. Seeing II-IV Antoniadi scale.*

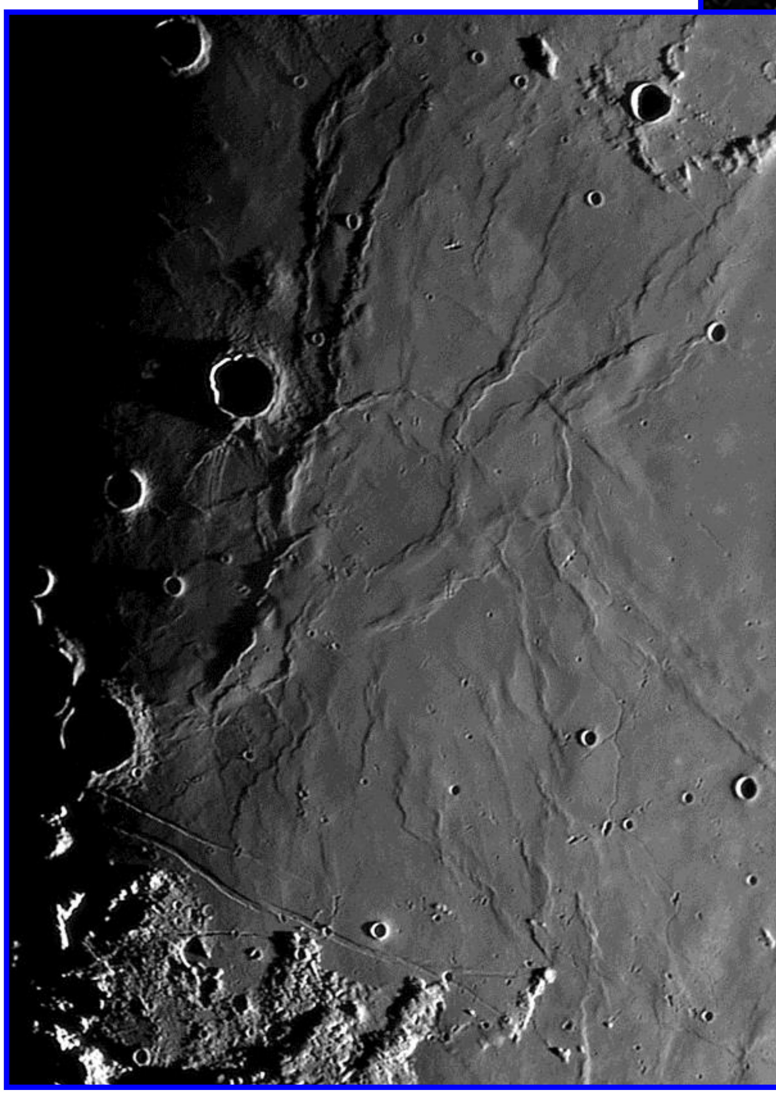
***Vallis Alpes,** Luigi Morrone, Agerola, Italy. 2024 February 17 17:38 UT. Celestron 14 inch Edge HD Schmidt-Cassegrain telescope, Fornax 52 mount, FFC Baader barlow, Optolong green filter, ASI 174MM camera.*



Recent Topographic Studies

Theophilus, *Maurice Collins, Palmerston North, New Zealand. 2024 February 16 07:58 UT. SkyWatcher Espirit 80 ED refractor telescope, 5x barlow, QHY5III462C camera.*





Lamont, *KC Pau, Hong Kong, China. 2024 February 15 12:02 UT. 250 mm Newtonian reflector telescope, 2.5 x barlow, QHYCCD 290M camera.*

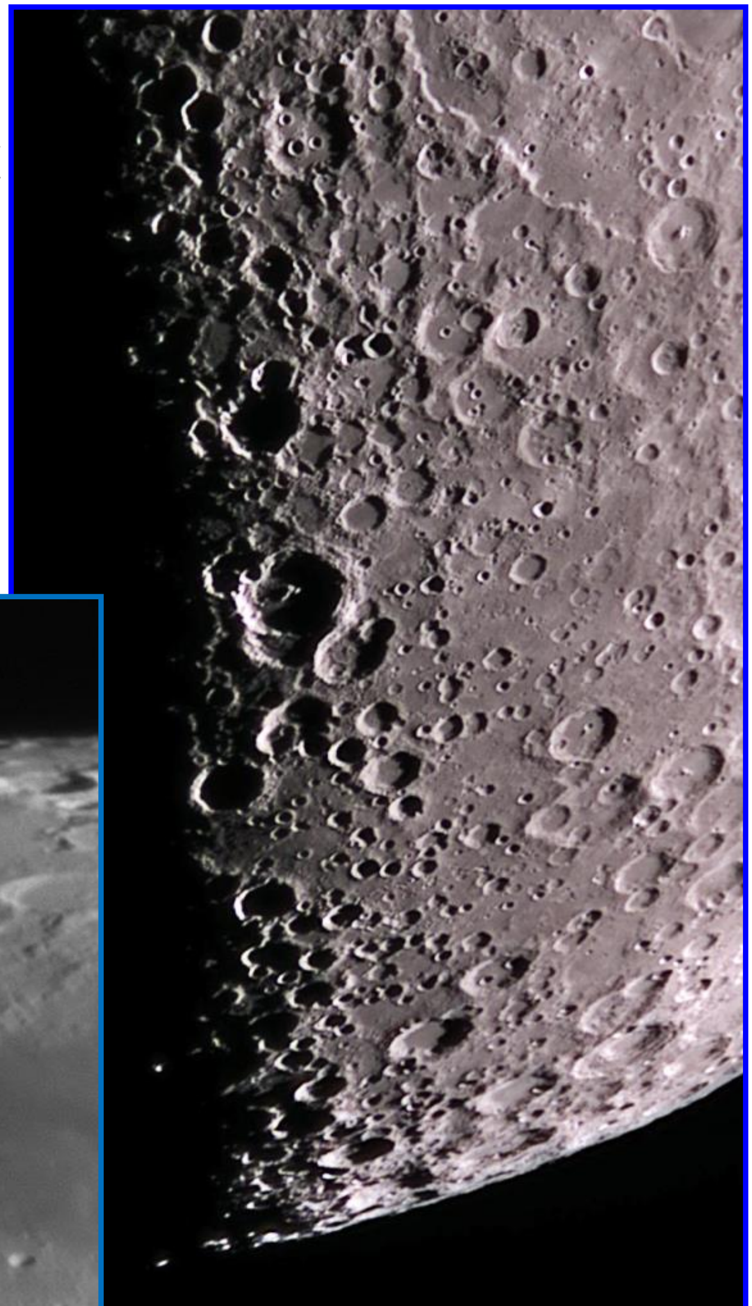
Recent Topographic Studies

Mare Serenitatis, *Maurice Collins, Palmerston North, New Zealand. 2024 February 16 07:59 UT. SkyWatcher Espirit 80 ED refractor telescope, 5x barlow, QHY5III462C camera.*

The Waxing Gibbous Moon, *Pedro Romano, San Juan, Argentina. 2024 January 19 23:00 UT. 102 mm Maksutov-Cassegrain telescope, ZWO ASI120 camera. North is down, west is right.*

Recent Topographic Studies

__Maurolycus,__ Maurice Collins, Palmerston North, New Zealand. 2024 February 16 08:01 UT. SkyWatcher Espirit 80 ED refractor telescope, 5x barlow, QHY5III462C camera.

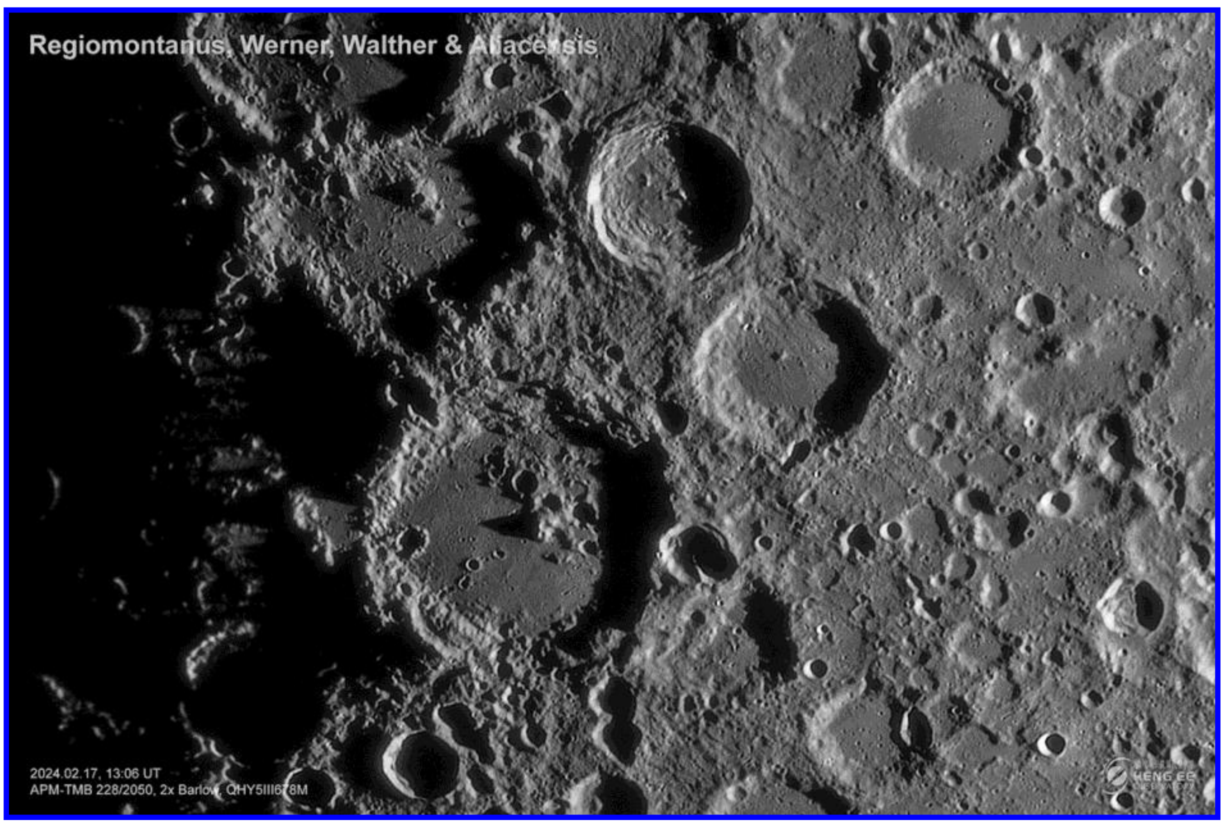


__Plato,__ Francisco Alsina Cardinalli, Oro Verde, Argentina. 2024 January 20 01:20 UT. Meade 8 inch reflector telescope, 2x barlow, IR Pass 685 nm filter, QHY5L-II-M camera.

Recent Topographic Studies

Posidonius, *Luigi Morrone, Agerola, Italy. 2024 February 17 17:41 UT. Celestron 14 inch Edge HD Schmidt-Cassegrain telescope, Fornax 52 mount, FFC Baader barlow, Optolong green filter, ASI 174MM camera.*

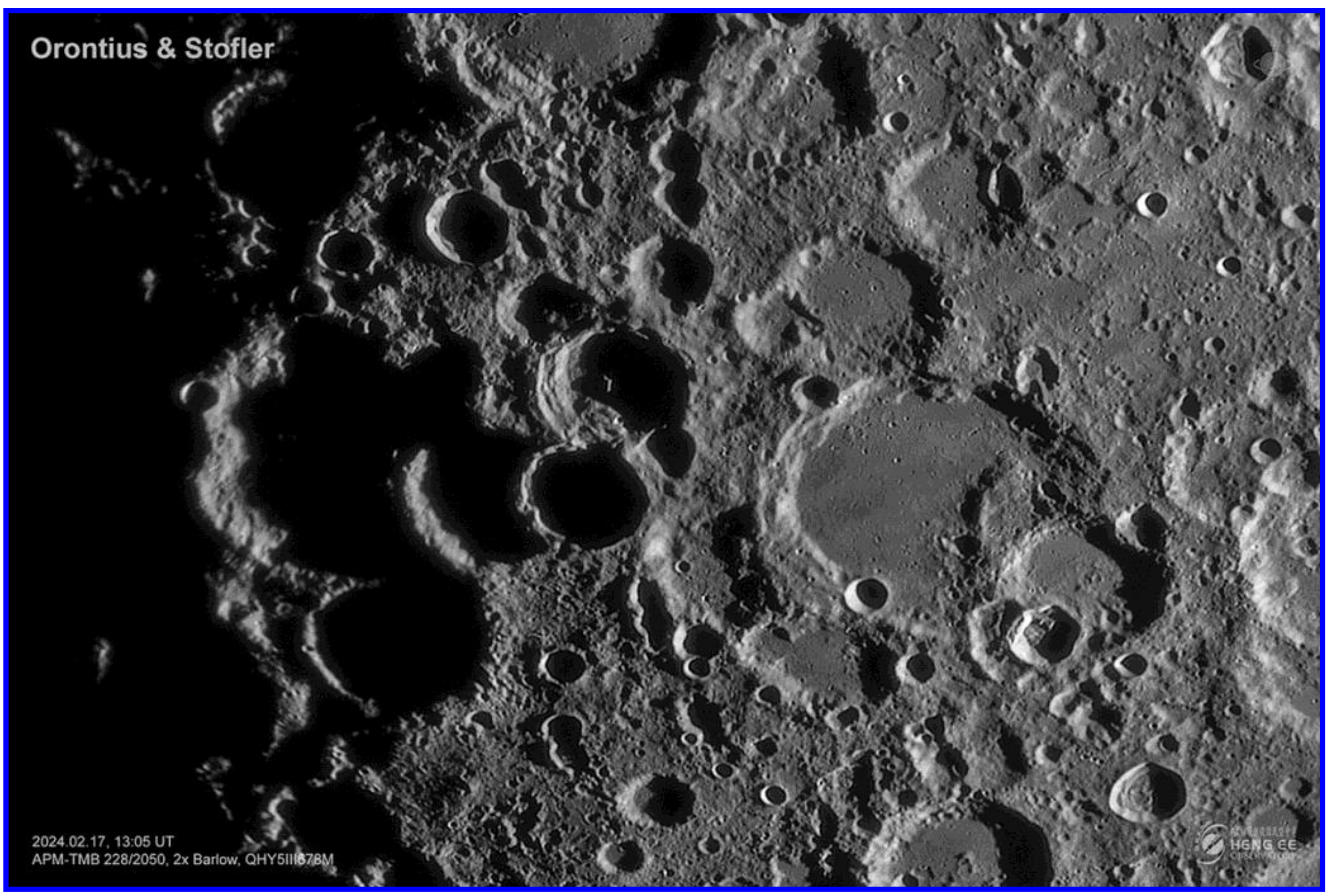
Regiomontanus, Werner, Walther and Aliacensis, *Michael Teoh, Heng Fe Observatory, Penang, Malaysia. 2024 February 17 13:06 UT. APM-TMB 228/2050 mm refractor telescope, 2x barlow, QHY5III678M camera.*



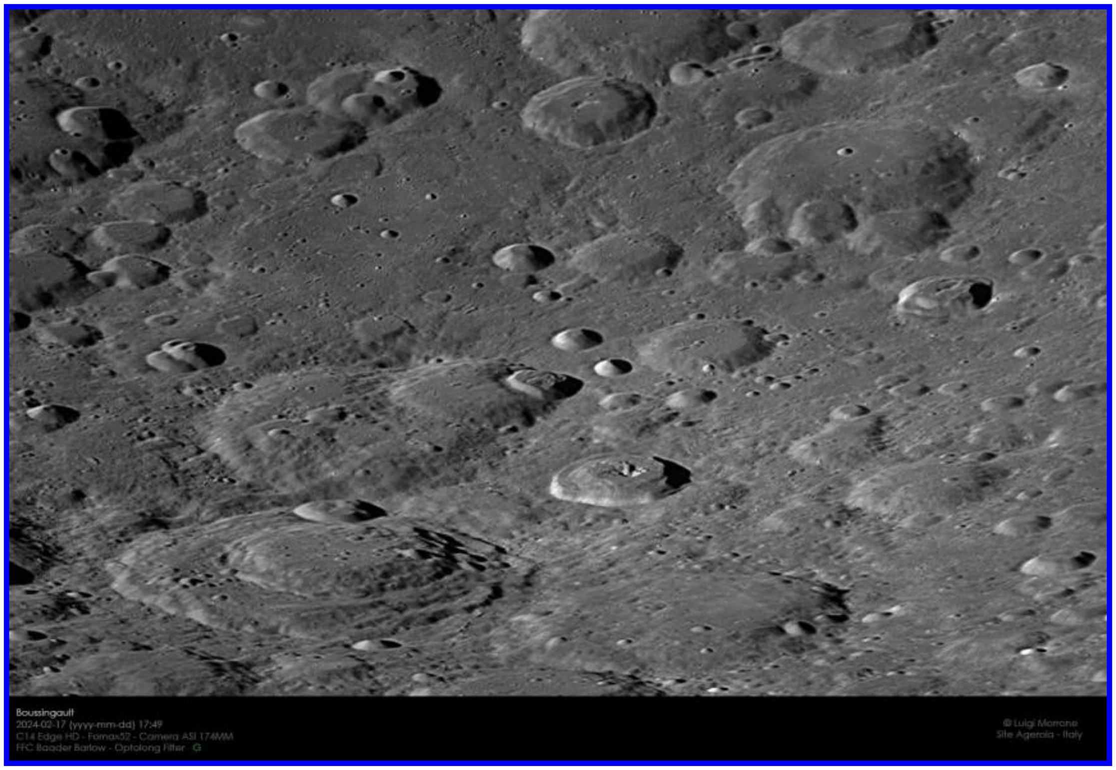
Recent Topographic Studies

Ptolemaeus, Alphonsus and Albategnius, *Luigi Morrone, Agerola, Italy. 2024 February 17 17:59 UT. Celestron 14 inch Edge HD Schmidt-Cassegrain telescope, Fornax 52 mount, FFC Baader barlow, Optolong green filter, ASI 174MM camera.*

Orontius and Stöfler, *Michael Teoh, Heng Fe Observatory, Penang, Malaysia. 2024 February 17 13:05 UT. APM-TMB 228/2050 mm refractor telescope, 2x barlow, QHY5III678M camera.*

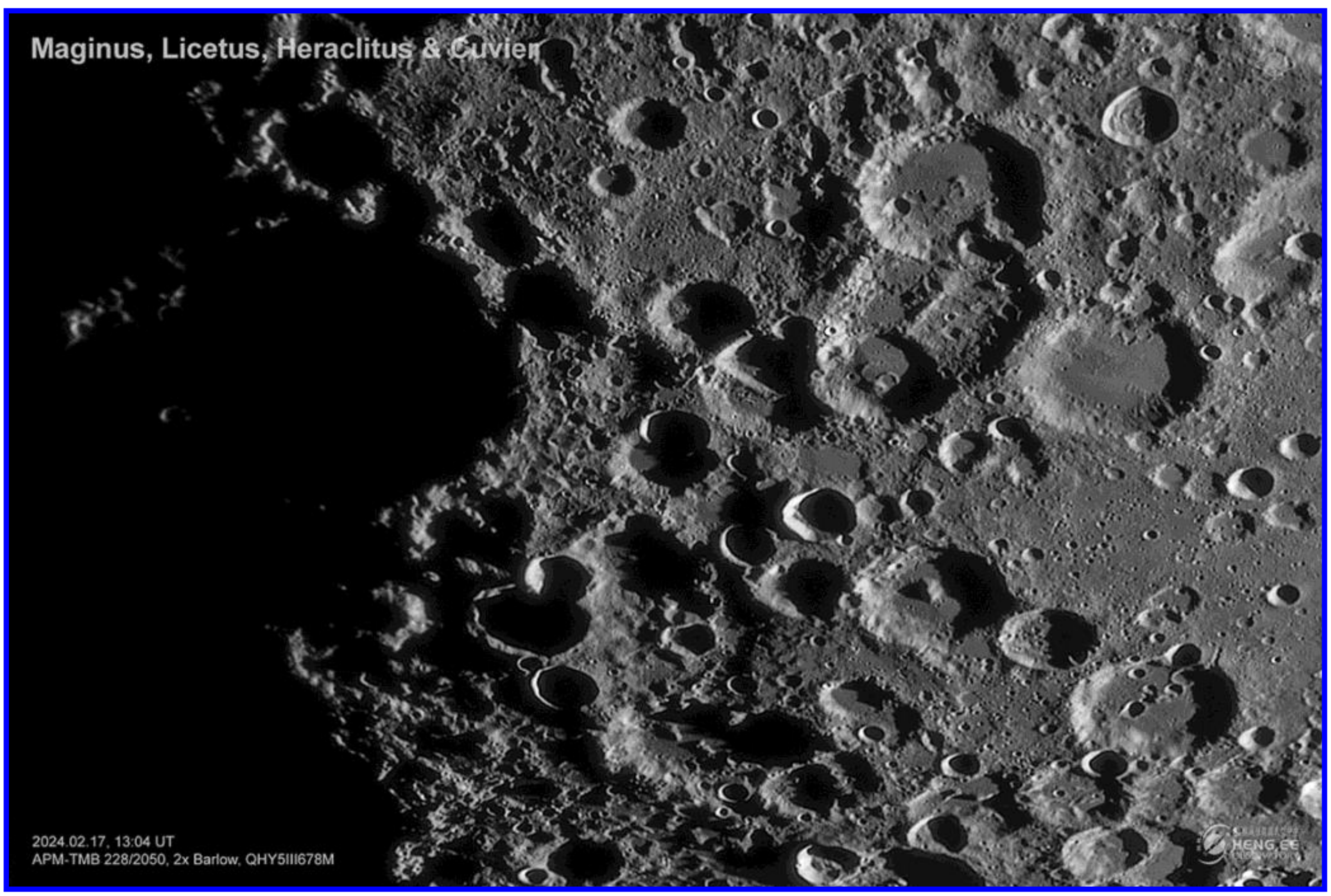


Recent Topographic Studies



Boussingault, *Luigi Morrone, Agerola, Italy. 2024 February 17 17:49 UT. Celestron 14 inch Edge HD Schmidt-Cassegrain telescope, Fornax 52 mount, FFC Baader barlow, Optolong green filter, ASI 174MM camera.*

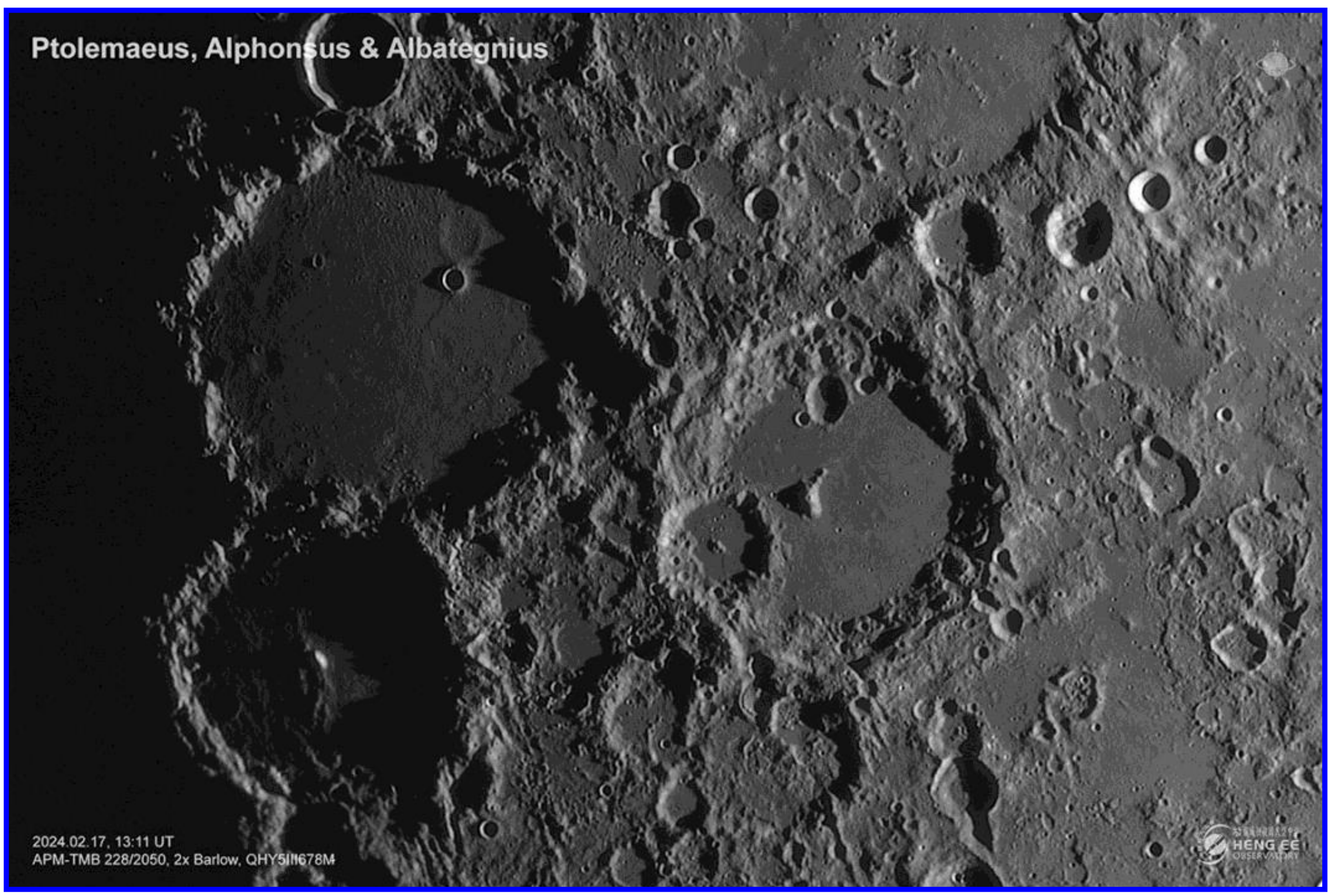
Maginus, Licetus, Heraclitus and Cuvier, *Michael Teoh, Heng Fe Observatory, Penang, Malaysia. 2024 February 17 13:04 UT. APM-TMB 228/2050 mm refractor telescope, 2x barlow, QHY5III678M camera.*



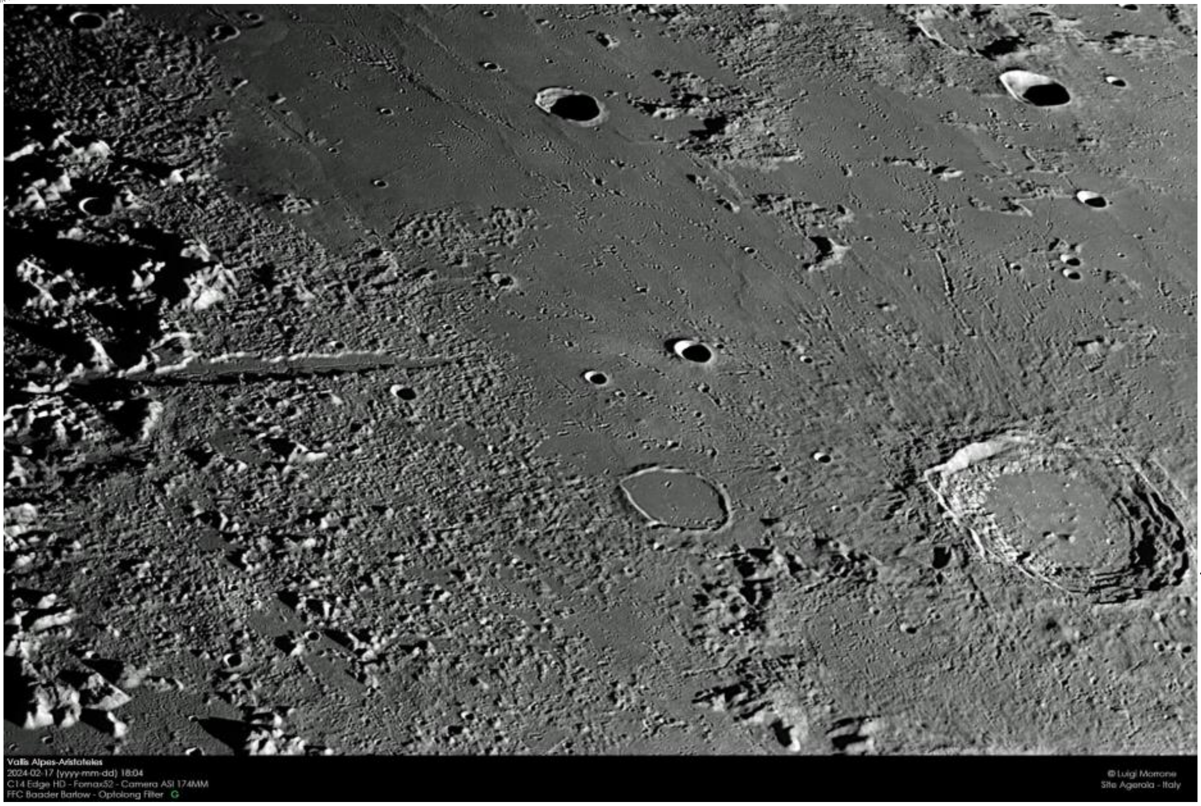
Recent Topographic Studies

Archimedes and Palus Putredinis, *Luigi Morrone, Agerola, Italy. 2024 February 17 18:02 UT. Celestron 14 inch Edge HD Schmidt-Cassegrain telescope, Fornax 52 mount, FFC Baader barlow, Optolong green filter, ASI 174MM camera.*

Ptolemaeus, Alphonsus and Albategnius, *Michael Teoh, Heng Fe Observatory, Penang, Malaysia. 2024 February 17 13:11 UT. APM-TMB 228/2050 mm refractor telescope, 2x barlow, QHY5III678M camera.*

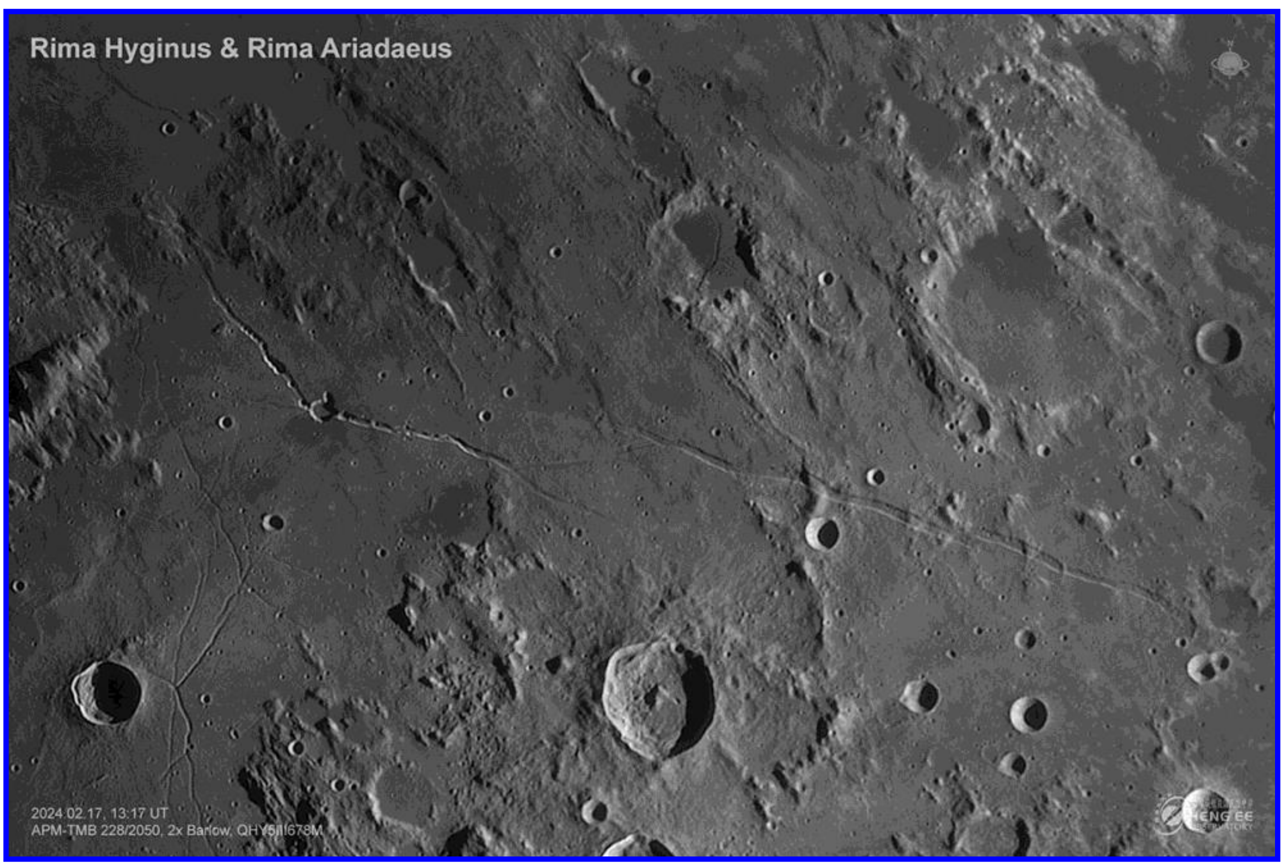


Recent Topographic Studies

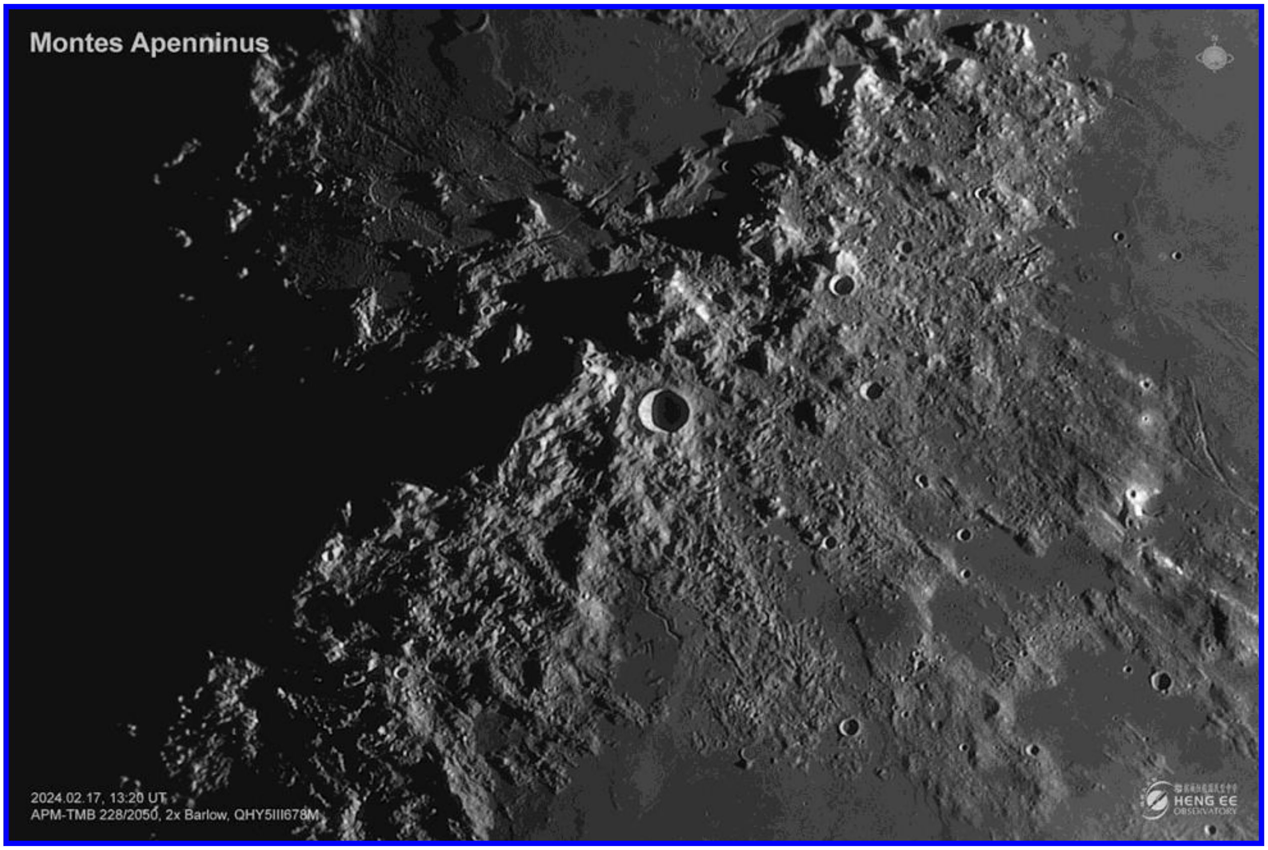


Vallis Alpes to Aristoteles, *Luigi Morrone, Agerola, Italy. 2024 February 17 18:04 UT. Celestron 14 inch Edge HD Schmidt-Cassegrain telescope, Fornax 52 mount, FFC Baader barlow, Optolong green filter, ASI 174MM camera.*

Rima Hyginus and Rima Ariadaeus, *Michael Teoh, Heng Fe Observatory, Penang, Malaysia. 2024 February 17 13:17 UT. APM-TMB 228/2050 mm refractor telescope, 2x barlow, QHY5III678M camera.*

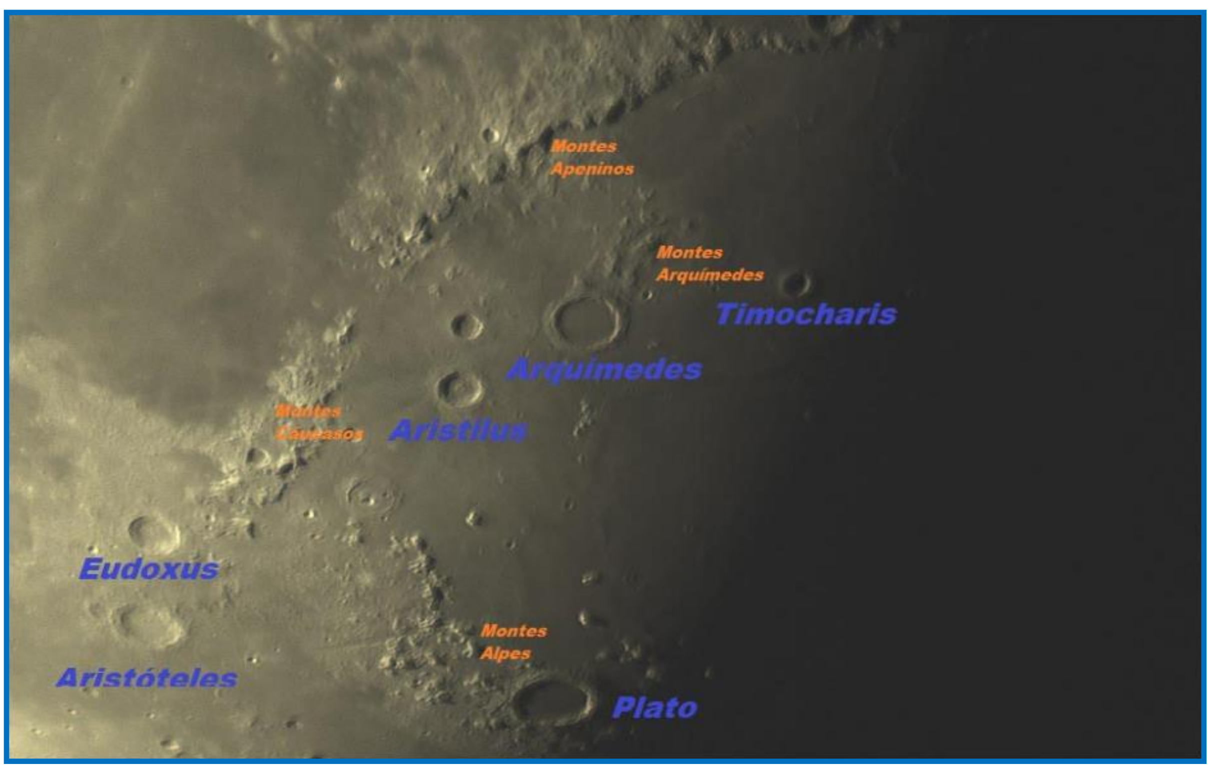


Recent Topographic Studies

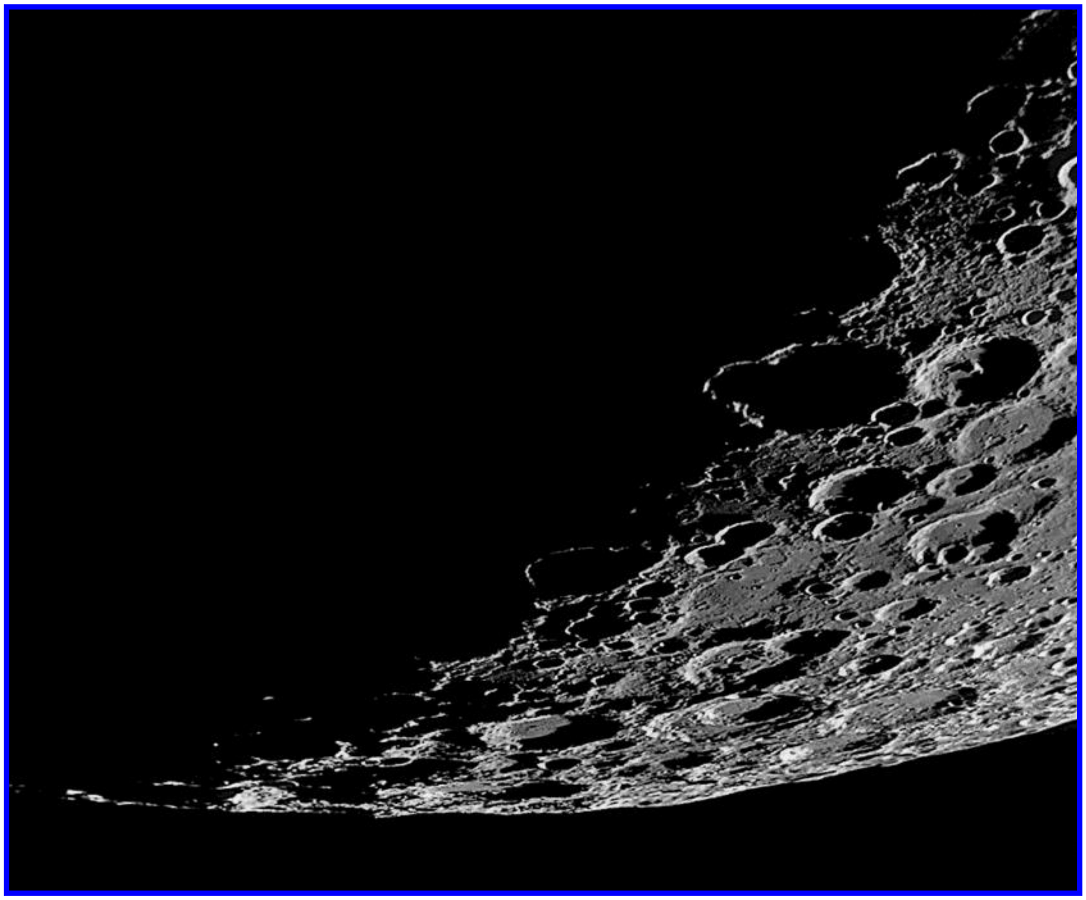


Montes Apenninus, *Michael Teoh, Heng Fe Observatory, Penang, Malaysia. 2024 February 17 13:20 UT. APM-TMB 228/2050 mm refractor telescope, 2x barlow, QHY5III678M camera.*

Archimedes, *Pedro Romano, San Juan, Argentina. 2024 January 19 23:00 UT. 102 mm Maksutov-Cassegrain telescope, ZWO ASI120 camera. North is down, west is right.*



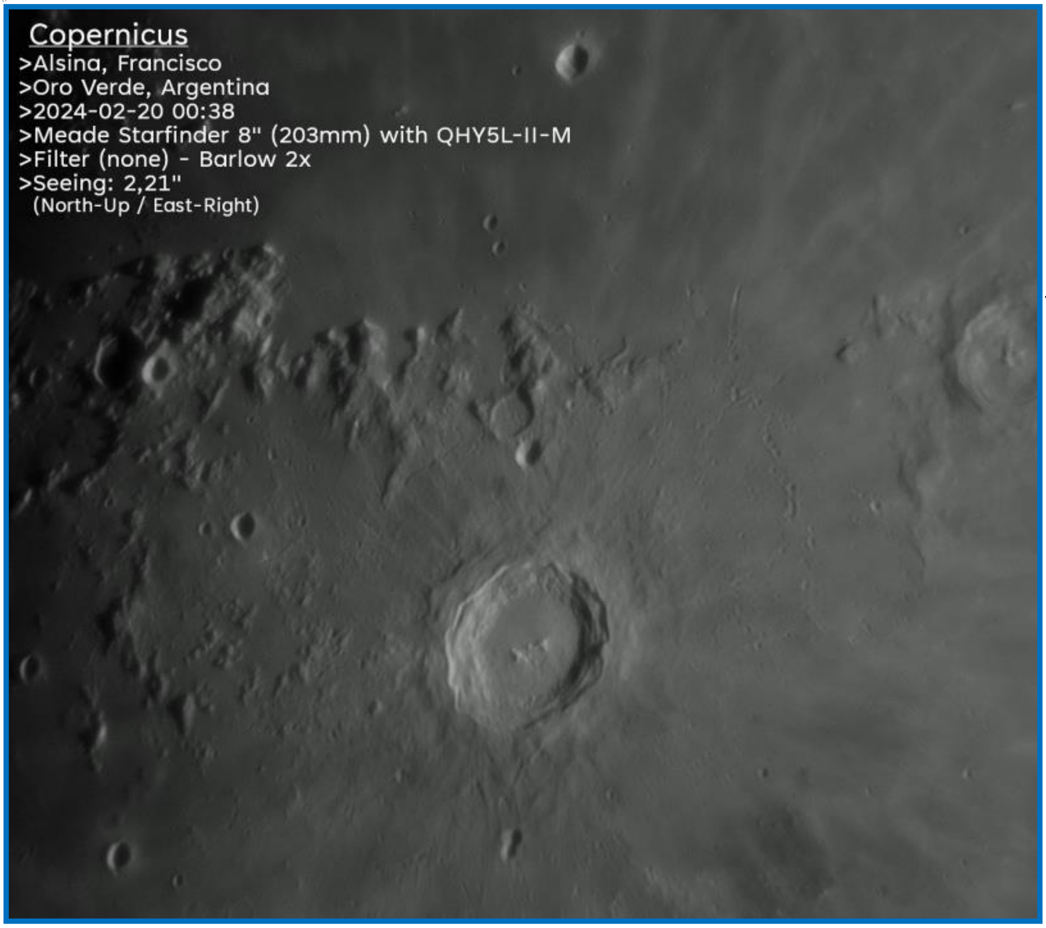
Recent Topographic Studies



Nearch, *KC Pau, Hong Kong, China. 2024 February 14 11:24 UT. 250 mm Newtonian reflector telescope, 2.5 x barlow, QHY-CCD 290M camera.*

Mons Piton, *Francisco Alsina Cardinalli, Oro Verde, Argentina. 2024 January 19 00:43 UT. Meade 8 inch reflector telescope, QHY5L-II-M camera.*

Recent Topographic Studies



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Copernicus, *Francisco Alsina Cardinalli, Oro Verde, Argentina. 2024 January 20 00:38 UT. Meade 8 inch reflector telescope, 2x barlow, QHY5L-II-M camera.*

Metius and Fabricius, *Luigi Morrone, Agerola, Italy. 2024 February 17 17:46 UT. Celestron 14 inch Edge HD Schmidt-Cassegrain telescope, Fornax 52 mount, FFC Baader barlow, Optolong green filter, ASI 174MM camera.*

Recent Topographic Studies

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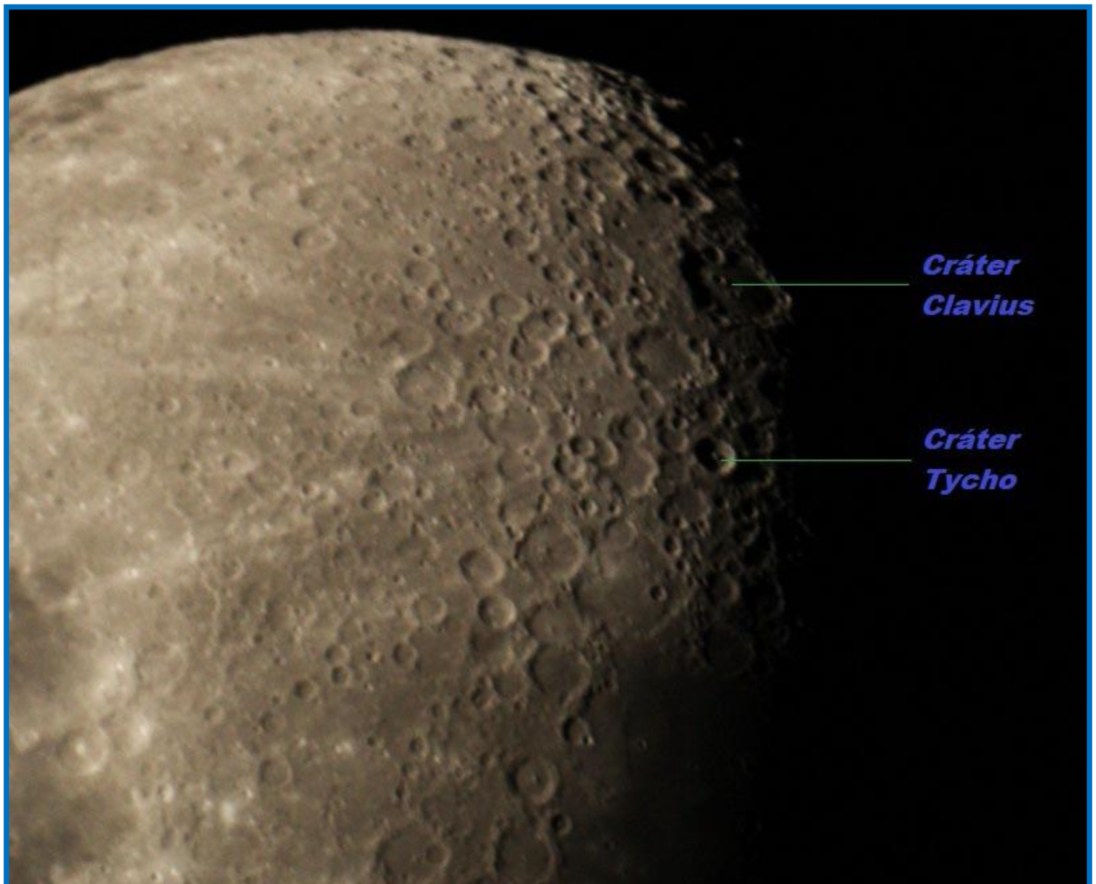
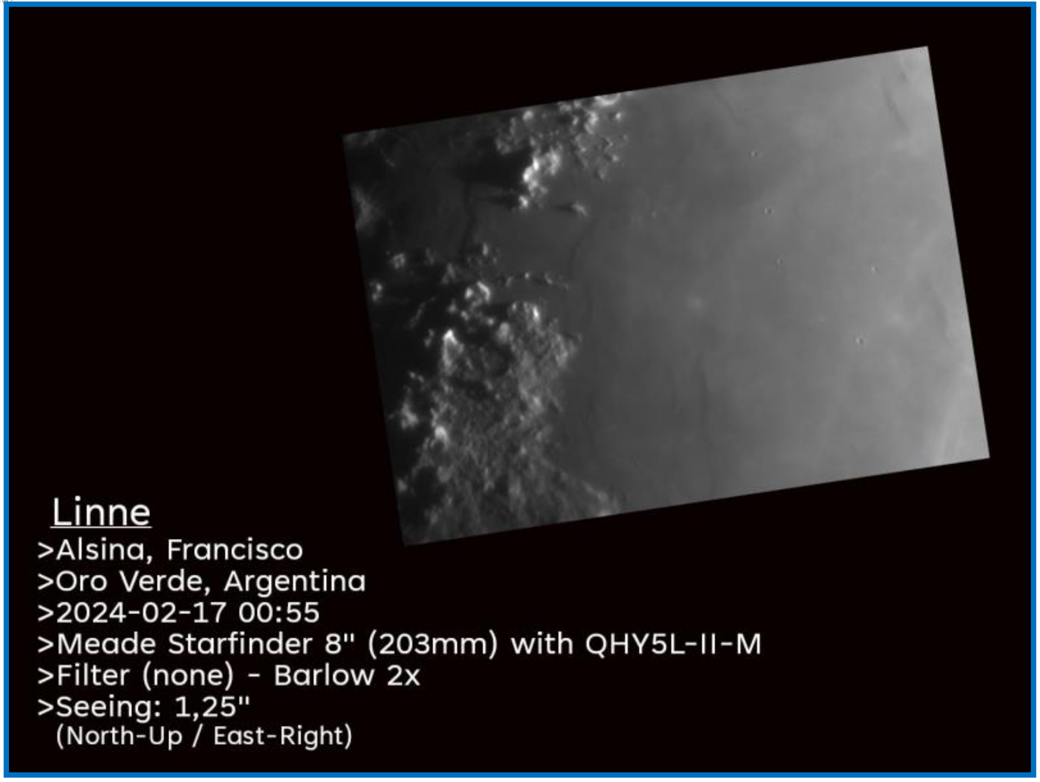
Hyginus N, *Francisco Alsina Cardinalli, Oro Verde, Argentina. 2024 February 17 00:52 UT. Meade 8 inch reflector telescope, 2x barlow, QHY5L-II-M camera.*



Clavius, *Pedro Romano, San Juan, Argentina. 2024 January 19 23:00 UT. 102 mm Maksutov-Cassegrain telescope, ZWO ASI120 camera. North is down, west is right.*

Recent Topographic Studies



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Linné, *Francisco Alsina Cardinalli, Oro Verde, Argentina. 2024 February 17 00:55 UT. Meade 8 inch reflector telescope, 2x barlow, QHY5L-II-M camera.*

Copernicus, *Fernando Sura, San Nicolás de los Arroyos, Argentina. 2024 January 21 02:21 UT. 127 mm Maksutov-Cassegrain telescope, Samsung A22 cellphone camera.*

Recent Topographic Studies

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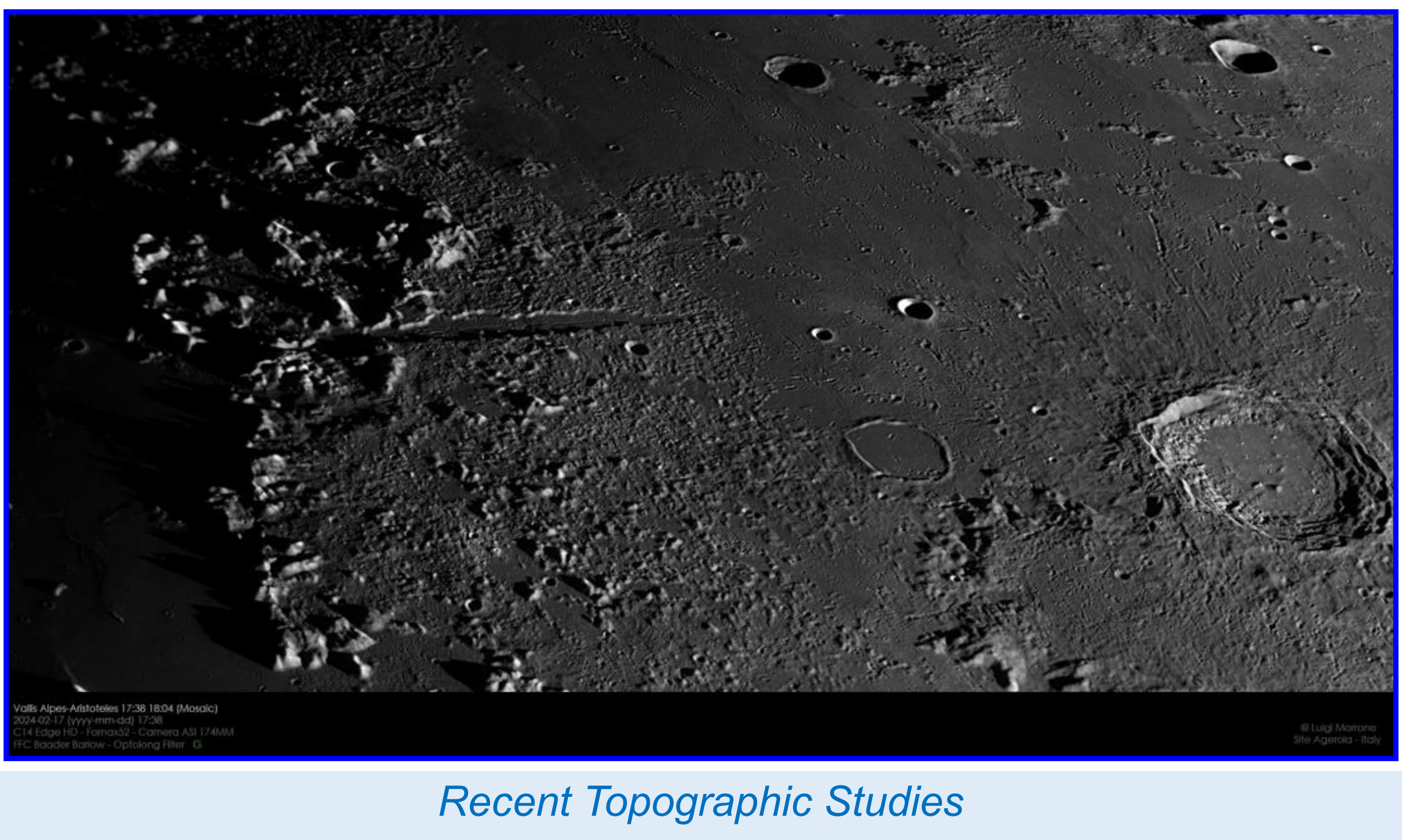
Proclus, *Francisco Alsina Cardinalli, Oro Verde, Argentina. 2024 February 17 00:59 UT. Meade 8 inch reflector telescope, 2x barlow, QHY5L-II-M camera.*

Vallis Alpes to Archimedes, *Luigi Morrone, Agerola, Italy. 2024 February 17 17:38 and 18:04 UT (mosaic). Celestron 14 inch Edge HD Schmidt-Cassegrain telescope, Fornax 52 mount, FFC Baader barlow, Optolong green filter, ASI 174MM camera.*



Recent Topographic Studies

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Full Moon, *Michael Teoh, Heng Fe Observatory, Penang, Malaysia. 2024 February 24 14:14 UT. APM -TMB 228/2050 mm refractor telescope, 0.75x reducer, Canon 60D camera.*

Ptolemaeus, *Pedro Romano, San Juan, Argentina. 2024 January 19 23:00 UT. 102 mm Maksutov-Cassegrain telescope, ZWO ASI120 camera. North is down, west is right.*

Recent Topographic Studies

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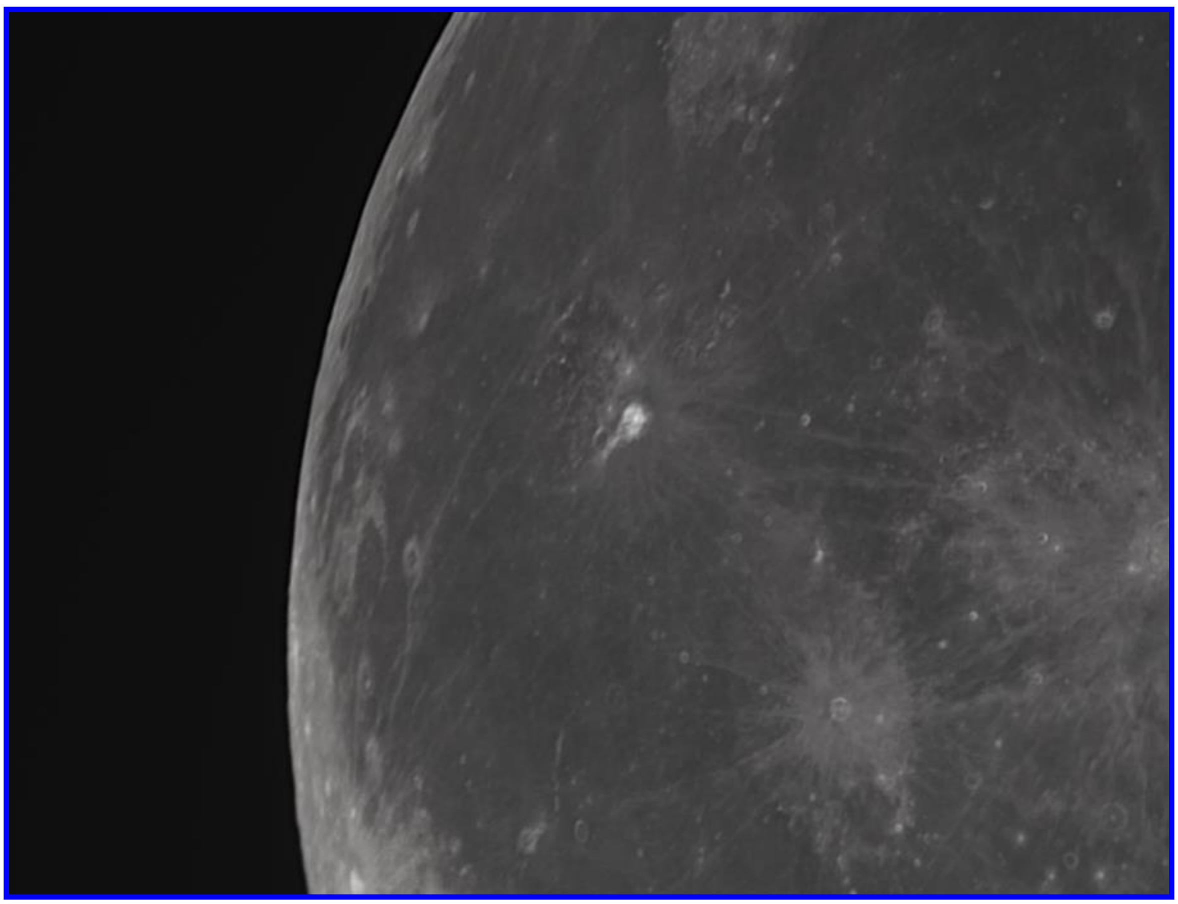
Theophilus, *Francisco Alsina Cardinalli, Oro Verde, Argentina. 2024 February 17 01:14 UT. Meade 8 inch reflector telescope, 2x barlow, QHY5L-II-M camera.*



Aristarchus, *Walter Ricardo Elias, Oro Verde, Argentina. 2024 February 28 02:01 UT. Sky Watcher 114 mm reflector telescope, 900 mm fl, QHY5IIC camera.*

Recent Topographic Studies

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Chacornac, *Francisco Alsina Cardinalli, Oro Verde, Argentina. 2024 February 17 23:59 UT. Meade 8 inch reflector telescope, 2x barlow, QHY5L-II-M camera.*

Censorinus, *Francisco Alsina Cardinalli, Oro Verde, Argentina. 2024 February 18 00:44 UT. Meade 8 inch reflector telescope, 2x barlow, QHY5L-II-M camera.*

Recent Topographic Studies

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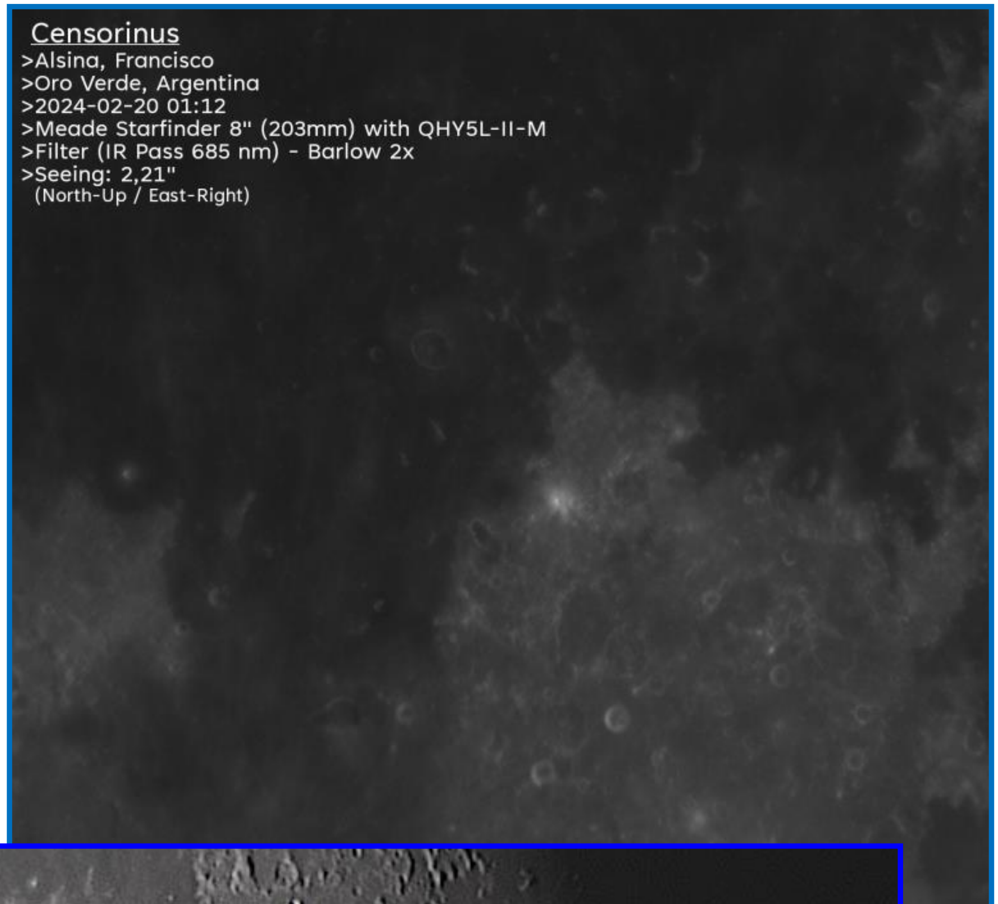
Censorinus, *Francisco Alsina Cardinalli, Oro Verde, Argentina. 2024 January 20 01:12 UT. Meade 8 inch reflector telescope, 2x barlow, IR Pass 685 nm filter, QHY5L-II-M camera.*



Santbech, *Walter Ricardo Elias, Oro Verde, Argentina. 2024 February 28 02:05 UT. Sky Watcher 114 mm reflector telescope, 900 mm fl, QHY5IIC camera*

Recent Topographic Studies

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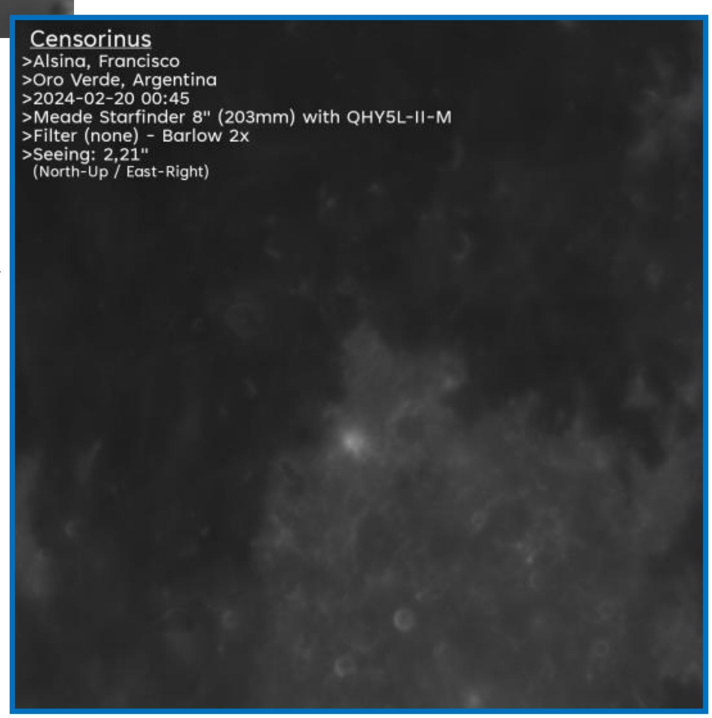
Plato, *Francisco Alsina Cardinalli, Oro Verde, Argentina. 2024 January 20 01:24 UT. Meade 8 inch reflector telescope, 2x barlow, IR Pass 685 nm filter, QHY5L-II-M camera.*



Censorinus, *Francisco Alsina Cardinalli, Oro Verde, Argentina. 2024 January 20 00:45 UT. Meade 8 inch reflector telescope, 2x barlow, QHY5L-II-M camera.*

Recent Topographic Studies

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11.4-Day Old Moon, *Maurice Collins, Palmerston North, New Zealand. 2024 February 21 08:29-08:37 UT. William Optics 110 mm refractor telescope, QHY5III462C camera. North is down, west is right. Maurice adds: "*It cleared up again late last night, but the seeing was poorer than I hoped. The Moon is very low for us at the moment which doesn't help with seeing conditions either. I used the William Optics 110mm refractor, but it wasn't the best tool for the job last night and should have used the 80mm. I found that the 110 was a little heavy for the new iOptron CEM26 mount as far as stability in the wind in concerned, it is quite wobbly! But the mount itself handles the scope fine as far as moving it about, just the tripod legs are quite thin (equal to the ETX's legs at 1.5")."

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 March

News:

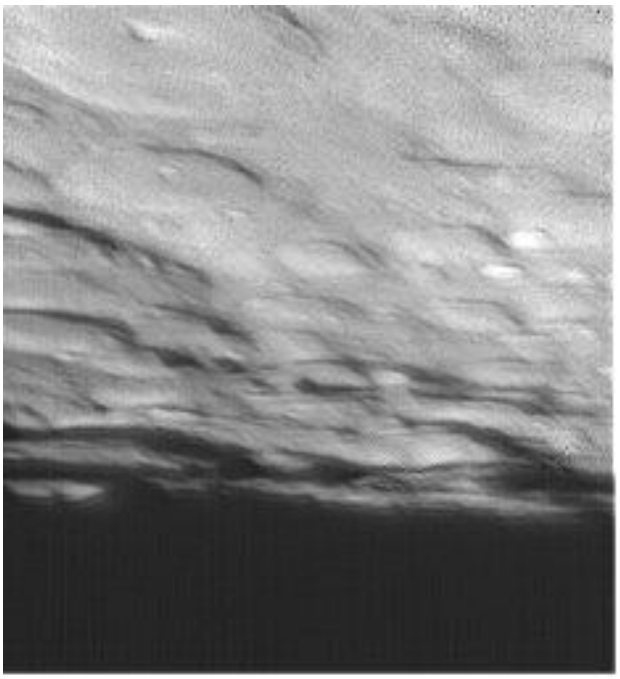

Figure 1. *The landing site of the first private company spacecraft, IM-1, near to Malapert A, captured to the nearest minute of the published landing time of 22 Feb 2024 UT 23:23 UT in the short-wave IR. Seeing conditions were very poor.*

I have often wondered what it would have been like to have been observing the Moon at the time of the Apollo landings. Obviously, one would not be able to see anything of the lunar module at a quarter of a million miles away, but having a view of what the Moon's surface would have looked like at those precise points in time would be an ever-lasting memory.

Roll onto 2024 and we now have a renewed interest in the Moon, leading up to manned returned of the Artemis missions. As a test I decided I would try to image the south pole area of the Moon at the precise moment that the IM-1 probe was landing on 2024 Feb 22. All was not well, it was partly cloudy, the seeing was terrible, and winds were hammering the sides of the 16-inch Dobsonian. I was using a short-wave infrared camera with a filter waveband covering 1.5-1.7 microns. The theory was that possible the rocket engine, or heated ground, might be glowing hot in this waveband and stand out against the nearly Full Moon which was several times less bright at these wavelengths than in visible light. Alas nothing was seen to suggest this was possible, from the video, but it was worth a go. At the bare minimum, I at least obtained a rather rough looking view of the Moon's south pole area around Malapert A.

TLP Reports: No TLP reports were received for January.

Routine reports received for December included: Alberto Anunziato (Argentina – SLA) observed: Aristillus, Copernicus, Eratosthenes, Plato, Vallis Schroteri. Massimo Alessandro Bianchi (Italy – UAI) imaged: several features. Maurice Collins (New Zealand - ALPO/BAA/RASNZ) imaged: Archimedes, Clavius, and several features. Walter Elias (Argentina – AEA) imaged: Kepler and Plato. Valerio Fontani (Italy – UAI) imaged: Cyrillus. Jean-Marc Lechopier (Teneriffe, Spain – UAI) imaged: Cyrillus. Bill Leatherbarrow (Sheffield, UK – BAA) imaged: Bullialdus, Burg-Lacus Mortis area, Catherina, Clavius, Copernicus, Fracastorius, Montes Recti, Piccolomini, Pitiscus-Hommel area, Pythagoras, and Theophilus. Euginio Polito (Italy – UAI) imaged: Aristarchus, Copernicus, Cyrillus, Ramsden and several features. Franco Taccogna (Italy – UAI) imaged: Aristarchus, Copernicus, Cyrillus, Plato, Ramsden, and several features. Aldo Tonon (Italy – UAI) imaged: Aristarchus, Mons Vinogradov, and several features. Alexander Vandenbohede (Belgium – BAA) imaged: Petavius. Fabio Verza (Italy – UAI) imaged: Plato and Ramsden. Ivan Walton (UK - BAA) imaged: Eudoxus. Luigi Zanatta (Italy – UAI) imaged: Plato and Ramsden.

Note that due to extenuating circumstances beyond my control, I have to finish this report early, so a few observations are missing, and will try to include them next month with the rest of the January observations received – then hopefully we shall have caught up.

Analysis of Routine Reports Received (December):

Copernicus: On 2023 Dec 06 UT 06:09 Bill Leatherbarrow imaged this crater very close to the Alberto Anunziato (SLA) observed visually this crater just 9 min outside the ±0.5˚ similar illumination criterion for the following TLP report:

In 1899 Aug 29 at UT 15:30-16:15 Fauth (Landstuhl, Germany) noted that the inner parts of Copernicus glowed in weak phosphorescent light though not directly illuminated by the Sun. He thought it probably due to multiple reflections from lighted walls. The craters Bullialdus and Reinhold did not show this effect though. The Cameron 1978 catalog ID=305 and the weight=0. The ALPO/BAA weight=1.

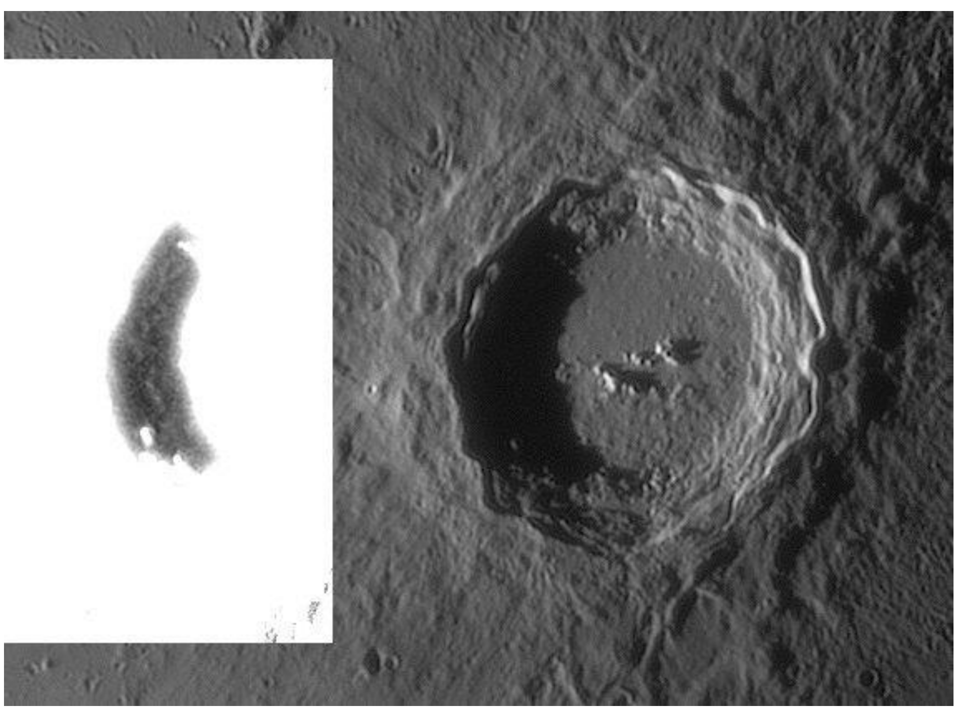

Figure 2. *Copernicus as imaged by Bill Leatherbarrow on 2023 Dec 06 UT 06:09 and orientated with north towards the top. The left insert is a contrast stretched view of the west shadow interior.*

After doing a contrast stretch (Fig 2 – Left), on the inner shadow of Copernicus in Bill's image, it's possible to see some faint terracing inside the interior west shadow – undoubtedly illuminated by light from the rest of the crater. I think it is reasonable therefore to lower the weight from 1 to 0 and remove it from the TLP database. This matches the original Cameron weight of 0. Fauth must have good eyesight to spot this effect though because as you can see its quite faint, even with modern equipment.

Cyrillus: On 2023 Dec 18 UAI members: Valerio Fontani, Jean-Marc Lechopier, Eugenio Polito, and Franco Taccogna, imaged this crater according to the following lunar schedule request:

BAA Request: Cyrillus. There is a small white craterlet just north of the three central peaks. We are interested to receive high resolution images of this in order to find out at what selenographic colongitude, in the lunar evening, that it loses its white spot appearance. Please use scopes larger than 5 inches in diameter. Please email these to: a t c @ a b e r . a c . u k

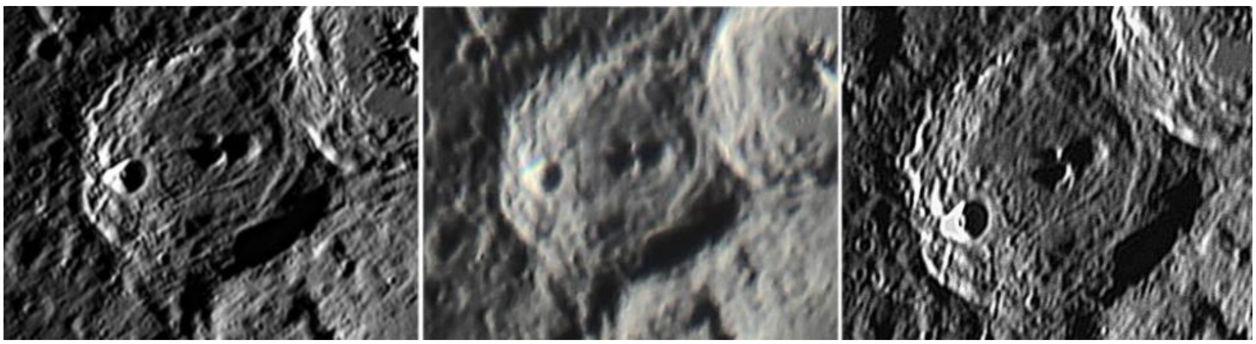

Figure 3**. Cyrillus as imaged by UAI observers on 2023 Dec 18 and orientated with north at the top.* ***(Left) *imaged by Eugino Polito at 16:46 UT* ***(Centre)*** *Imaged by Valerio Fontani at 18:00 UT.* ***(Right)*** *Imaged by Jean-Marc Lechopier at 18:24UT.*

None of the images in Fig 3 reveal the small but bright spot just north of the three central peaks. Therefore, for the evening apparition of this spot, we know that selenography colongitudes: 344.4-345.2˚are too late into the evening, therefore the lunar schedule program will try earlier colongitudes in the evening to see if the light spot shows up.

Mons Piton: On 2023 Dec 20 UT 01:00 Ivan Walton (BAA) used a remotely operated telescope in Chile to capture a whole Moon image, but it included Mons Piton and Proclus which are mentioned in the TLP report below:

On 1992 Oct 04 at UT 02:15-03:18 D. Louderback (South Bend, WA, USA, 3" refractor, x80) found that Mons Piton was very bright and was equal to Proclus (brightness of 9) in white light and 7.5 in violet, and 9.3 in red (Proclus was 9.2 in red). Ïn blue both features = (9?). "Points on Piton affected were B, D, and C (S, W & N resp.) D in violet was fuzzy - ill defined". The Cameron 2006 catalog ID=454 and the weight=4. The ALPO/BAA weight=2.

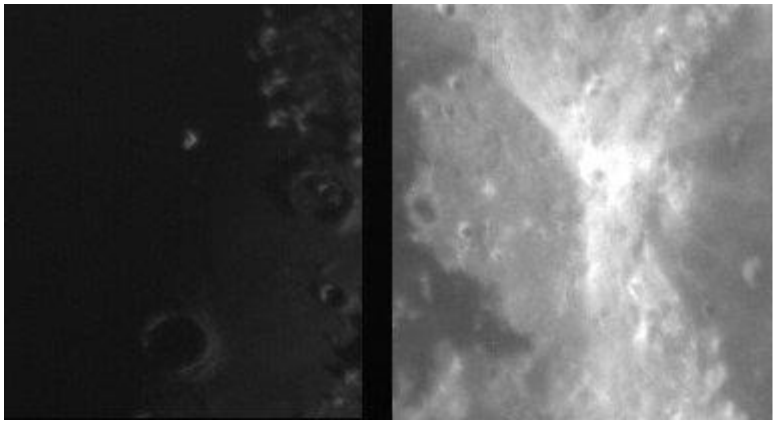

Figure 4. *Subsections of an image by Ivan Walton (BAA) taken on 2023 Dec 20 UT 01:00.* ***(Left)*** *Mons Piton and Archimedes.* ***(Right)*** *Proclus.*

Ivan's image (Fig 4) shows that at this illumination, Mons Piton was less bright than Proclus. We shall therefore increase the ALPO/BAA weight from 2 to 3.

Censorinus and Proclus: On 2023 Dec 21 UT 08:43-08:47 Maurice Collins (ALPO.BAA/RASNZ) made a Moon mosaic (Fig 5 – top) that covered similar illumination to the following report:

On 1981 May 12 UT 22:45-2325 M.C. Cook (Frimley, UK and using a 12" reflector), noticed that Censorinus was very bright, fuzzy and occasionally brighter than Proclus. However, both Foley (Kent, UK) and Amery (Reading, UK) using a C.E.D. found that Proclus was brighter than Censorinus as it had been during April and May 1981. However, Chapman obtained the reverse of this. Cameron 2006 extension catalog ID=138 and weight=3. ALPO/BAA weight=1.

Figure 5. *Wide angle area of the Moon covering the bright ray craters: Censorinus and Proclus, taken by Maurice Collins (ALPO/BAA/RASNZ) on 2023 Dec 21 UT 08:43-08:47 and orientated with north towards the top.* ***(Top)*** *Original image.* ***(Bottom)*** *image highly contrast stretched to bring out the brightest features.*

Although we don't have a functional Crater Extinction Device (CED) now for observers to look at a feature and keep on adding neutral density filters until it's no longer visible – hence estimating its brightness, we can do a similar thing with image processing. This can be achieved by either placing a cursor over the brightest part of a feature and taking an average over a small area. Or alternatively by contrast stretching to darken the rest of the Moon until we only see the brightest features remain – akin to brightness thresholding i.e. anything below a given brightness value is black and anything above is white. Anyway, doing this to Maurice's image (Fig 4 – bottom) shows that Proclus has a greater proportion of bright pixels on its northern rim than Censorinus. I have also checked maximum pixel values, with a cursor, and Proclus also wins out here. Therefore, Proclus is brighter than Kepler. This concurs with the Foley and Amery reports. But contradicts the Chapman observation. To be honest using a CED is tricky. From my own experience of using the device, a few decades ago, I found that when you have the most dense filter in place, the sensitivity of the eye depends upon how long you look through them as the eye/brain get dark adapted. Originally invented by the professional astronomer Dabid Jewitt, the CED was designed originally as a way of comparing bright features in a quantitative way and was a definite improvement of amateurs just saying "Aristarchus is looking bright tonight". Another deficiency of CEDs I suspect is that detectability is affected by contrast of the brightness of a feature to its background, and for small bright features, these can be blurred by poor seeing conditions making them drop their peak brightness considerably as the photon flux is spread into neighbouring pixels on the camera or in one's eyes. Libration of sun-facing slopes affects viewing angle and may also make features appear brighter at the same colongitude on one observing session but less bright on another occasion.

Eratosthenes: On 2023 Dec 22 UT 02:41-02:47 Alberto Anunziato (SLA) observed visually this crater under similar illumination to the following report:

On 1936 Oct 25 at 01:35 UT W. Haas (Alliance, OH, USA, 12" reflector) saw small bright spots on the floor of Eratosthenes, (Pickering's atlas 9A, col. 30deg, shows no spots - according to Cameron). Cameron 1978 catalog TLP=417 and weight=4. ALPO/BAA weight=1.

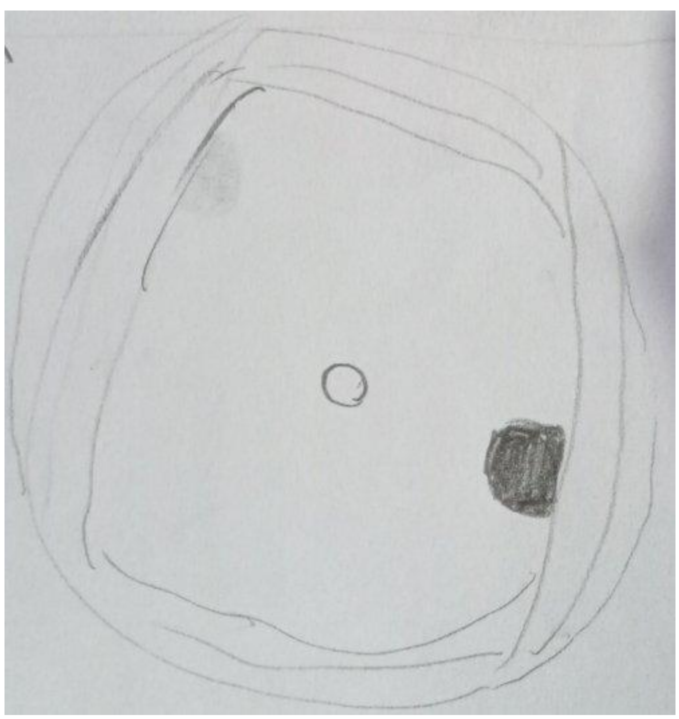

Figure 6. *Eratosthenes as sketched by Alberto Anunziato on 2023 Dec 22 UT 02:41-02:47 using a Meade EX 105 at x196. Sketch re-orientated so that north is towards the top.*

Alberto, commented that there was a bright spot, in a zone as indicated in Fig 6, that he thought could be into the floor, southwest or maybe even in the outer wall? We shall leave this at a weight of 1 for now.

Plato: On 2023 Dec 26 UT 18:00 Franco Taccogna (UAI) imaged during the repeat illumination window, and Massimo Alessandro Bianchi imaged at UT18:40, just 10 minutes after the similar illumination window for the following TLP report:

On 1992 Oct 10 at 18:57-19:04 UT I.S. Brukhanov (of Minsk, Belarus, using a 6" refractor x40 and x98) saw a star like point inside Plato crater of similar brightness to the central peak of Alphonsus. The event lasted 90 seconds before weakening and vanishing completely at 19:04UT. Cameron 2006 catalog extension ID=455 and weight=3. ALPO/BAA weight=3.

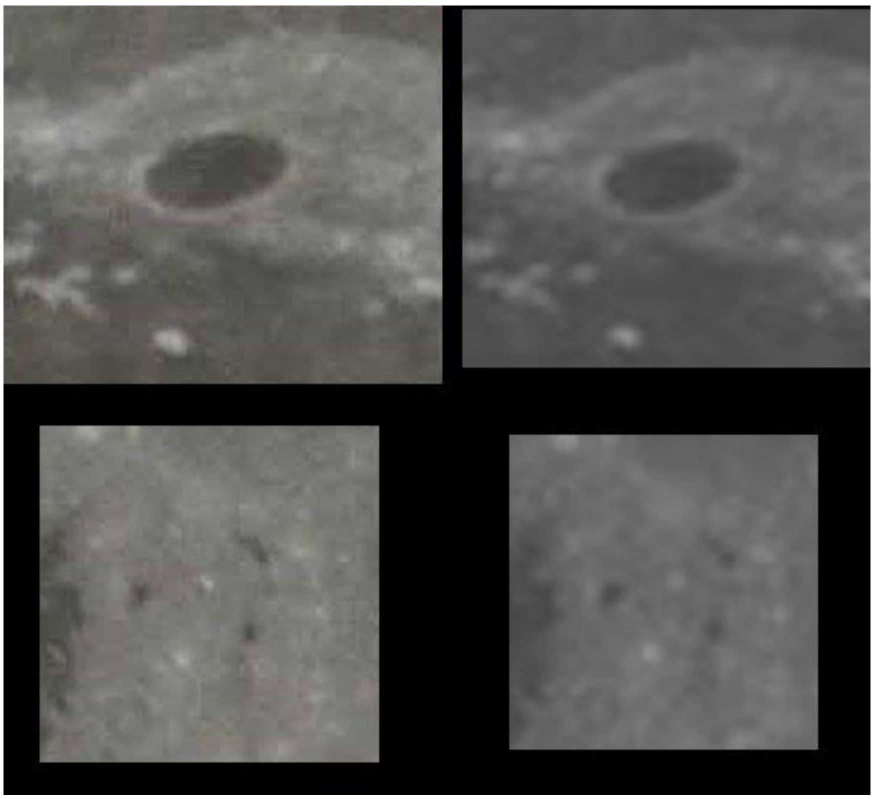

Figure 7. *Plato* ***(Top)*** *and Alphonsus* ***(Bottom)*** *on 2023 Dec 26, cut out from larger image mosaics and orientated with north towards the top.* ***(Left)*** *Taken by Franco Taccogna at 18:30 UT. (Right) Taken by Massimo Alessandro Bianchi imaged at UT18:40.*

No sign can be found of anything on the floor of Plato (Fig 7 Top) representing something of similar brightness to the central peak of Alphonsus (Fig 7 – bottom) and the duration of the 1992 event might infer that it was outgassing or the after effects of an impact event. However no other observers saw this so we shall leave the weight at 3 for now.

Kepler: On 2023 Dec 31 UT 04:06 Walter Elias (AEA) imaged this crater under similar illumination to the following report:

Near Kepler 1966 Dec 31 UT 03:00? Observed by Petrova, Pospergelis (Pulkova Observatory, Russia) "Special glow in this area. Confirmed by photoelectric method (Petrova) & polarimetric (Pospergelis?) almost simultaneously recorded by both" NASA catalog weight=5. NASA catalog ID #1007. ALPO/BAA weight=4.

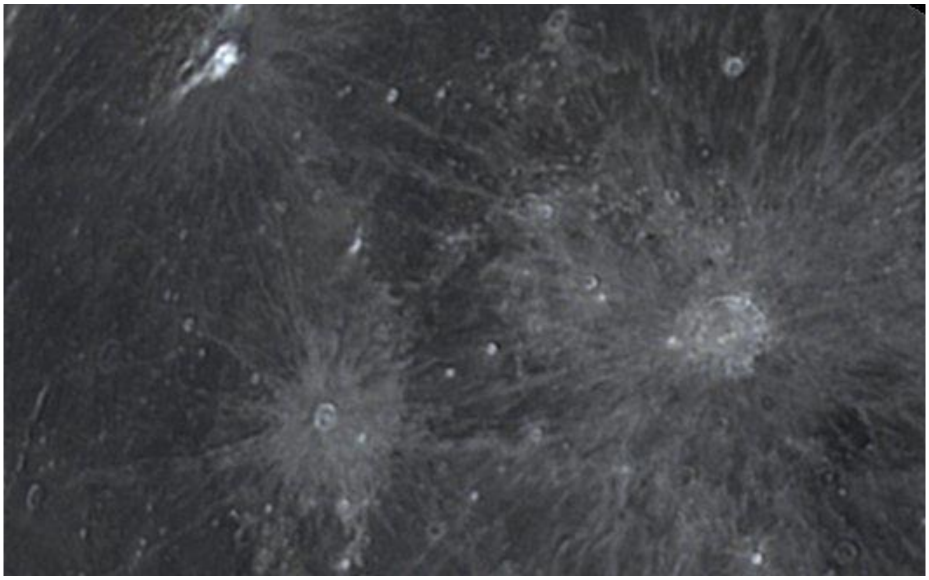

Figure 8. *The region of the Moon in the vicinity of Kepler as imaged by Walter Elias (AEA) on 2023 Dec 31 UT 04:06.*

Figure 8 shows no obvious "special glow" near Kepler – so you can see why Cameron assigned a weight of 5. The ALPO/BAA weight is less at 4 as it is unclear whether an independent confirming report was made. Also the UT given in the Cameron catalog of 03:00 is an estimate, and it is unclear whether the terms "photoelectric" and "polarimetric" imply single point measurements (it can be tricky to guarantee that a photometer aperture is centred exactly over a crater) or had some imaging capability e.g. micro-densitometer scans of photographic plates. But anyway, Walter's image shows that everything should normally appear like Fig 8 in this area with Aristarchus appearing considerably brighter than the ray craters of Kepler and Copernicus. We shall leave the weight at 4 for now until we find out more information about the original report.

Analysis of Routine Reports Received (January):

Alphonsus: On 2024 Jan 18 UT 21:31 Liz Daly (NAS) imaged the Moon for the first time, using a mobile phone against a 20mm eyepiece on a 102 Maksutov Skywatcher (1300 mm focal length). By chance this was under similar illumination to the following 1970's report:

Alphonsus 1972 Sep 15 UT 18:48-18:56 Observed by Hopp (13.25E, 52.5N, 75mm refractor) "Diffuse white to blue area within the crater - not sure" T=4, S=4. Ref: Hilbrecht & Kuveler Moon & Planets (1984) Vol 30, pp53-61. Cameron Catalog weight=1. ALPO/BAA weight=1.

Figure 9: *A wide angle view of the area of Alphonsus, taken by Liz Daly (NAS) on 2024 Jan 18 UT 21:31, orientated with north towards the top. Made using a Skywatcher 102 Mak with 1300mm focal length with a mobile phone attached to a 20mm eyepiece. The image has been sharpened, rotated, and had colour saturation increased to bring out colours. The curve on the right is the edge of the eyepiece.*

Please bear in mind that Fig 9 was Liz's first ever imaging effort at the Moon through a telescope and is only a small part of the original image. Nevertheless, it has sufficient detail to show that what Hopp saw back in 1972, visually through an inferior instrument was most likely the central peak of the crater emerging from the shadow. Liz's image also shows a faint blue colour which could be due to chromatic aberration from the glass in the lens – something which could easily have affected Hopp with a small refractor too. As Cameron had many doubts about the reports in the Moon and Planets paper, principally because they were made with small scopes, I will lower the ALPO/BAA weight from 1 to 0 and remove it from the TLP data base.

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 TLP, firstly read the TLP 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 TLP 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

Lunar Calendar March 2024

Date	UT	Event
3	0900	Antares 0.3^{o} south of Moon, occultation SE North America
3	1523	Last Quarter Moon
4		West limb most exposed -8.0^{o}
5		Greatest southern declination -28.5^{o}
6		North limb most exposed +6.7^{o}
8	0500	Mars 4^{o} north of Moon
8	1700	Venus 3^{o} north of Moon
10	0700	Moon at perigee 356,894 km Large Tides
10	0900	New Moon (Lunation 1252)
12	0118	Moon at ascending node
14	0100	Jupiter 4^{o} south of Moon
14	1200	Uranus 3^{o} south of Moon
15	0300	Moon 0.4^{o} south of Pleiades
16		East limb most exposed +7.3^{o}
17	0411	First Quarter Moon
18		Greatest northern declination +28.4^{o}
19	0700	Pollux 1.5o north of Moon
19		South limb most exposed -6.8^{o}
23	1600	Moon at apogee 406,294 km
25	0700	Full Moon, Penumbral lunar eclipse, West Africa and Europe, Americas, Japan
26	0407	Moon at descending node
26	2000	Spica 1.4^{o} south of Moon
30	1500	Antares 0.3^{o} south of Moon, occultation Polynesia

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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.
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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.

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: Chains of Craters

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 May 2024, will be Chains of Craters. 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 Chains of Craters Focus-On article is April 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
Chains of Craters	**May 2024**	**April 20, 2024**
Mare Nectaris	**July 2024**	**June 20, 2024**
Aristoteles and Eudoxus	**September 2024**	**August 20, 2024**
Archimedes Region	**November 2024**	**October 20, 2024**

Focus-On Announcement
Chains of Craters: The More the Better

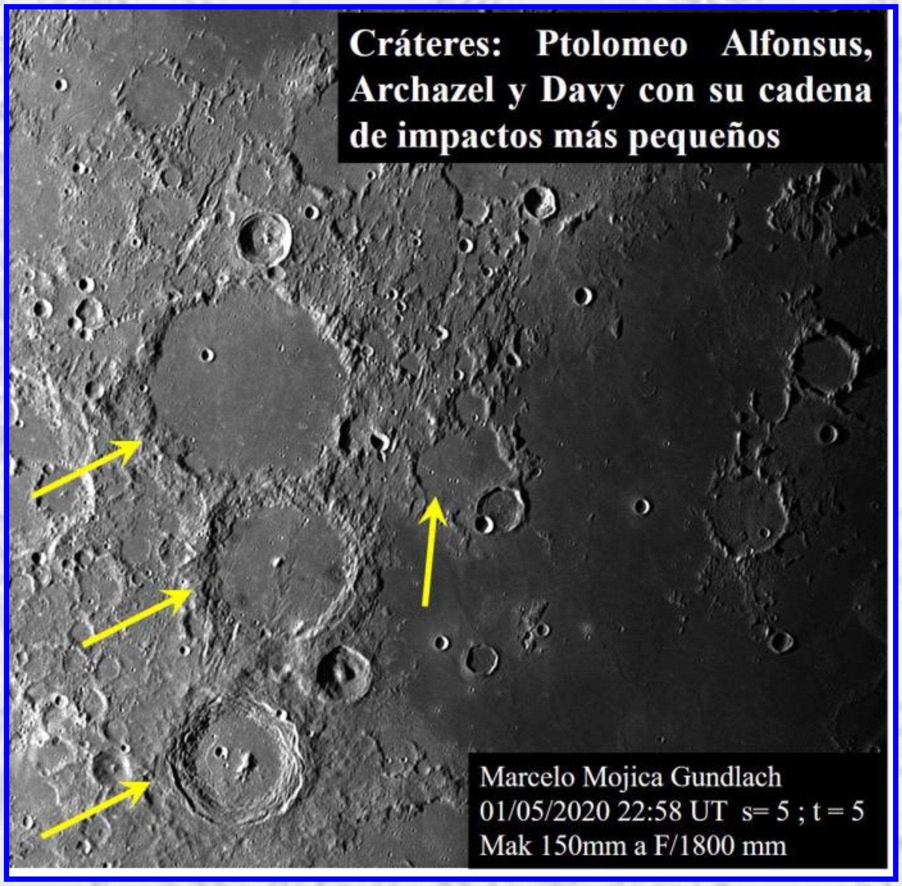
Today we know the origin of the groupings of craters very close to each other, but it took years of progress in our knowledge of the Moon to know if the craters that appear very close to each other have a common origin and what that origin is. We are going to learn about the chains of craters (or Catenae, according to the International Astronomical Union) that appear on the Moon, whether they were produced by the fragmentation of an impactor, by secondary impacts of a main crater or by collapses of volcanic origin. Let's share images of chains of craters from the smallest to the super massive ones like Vallis Rheita.

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



Marcelo Mojica Gundlach

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

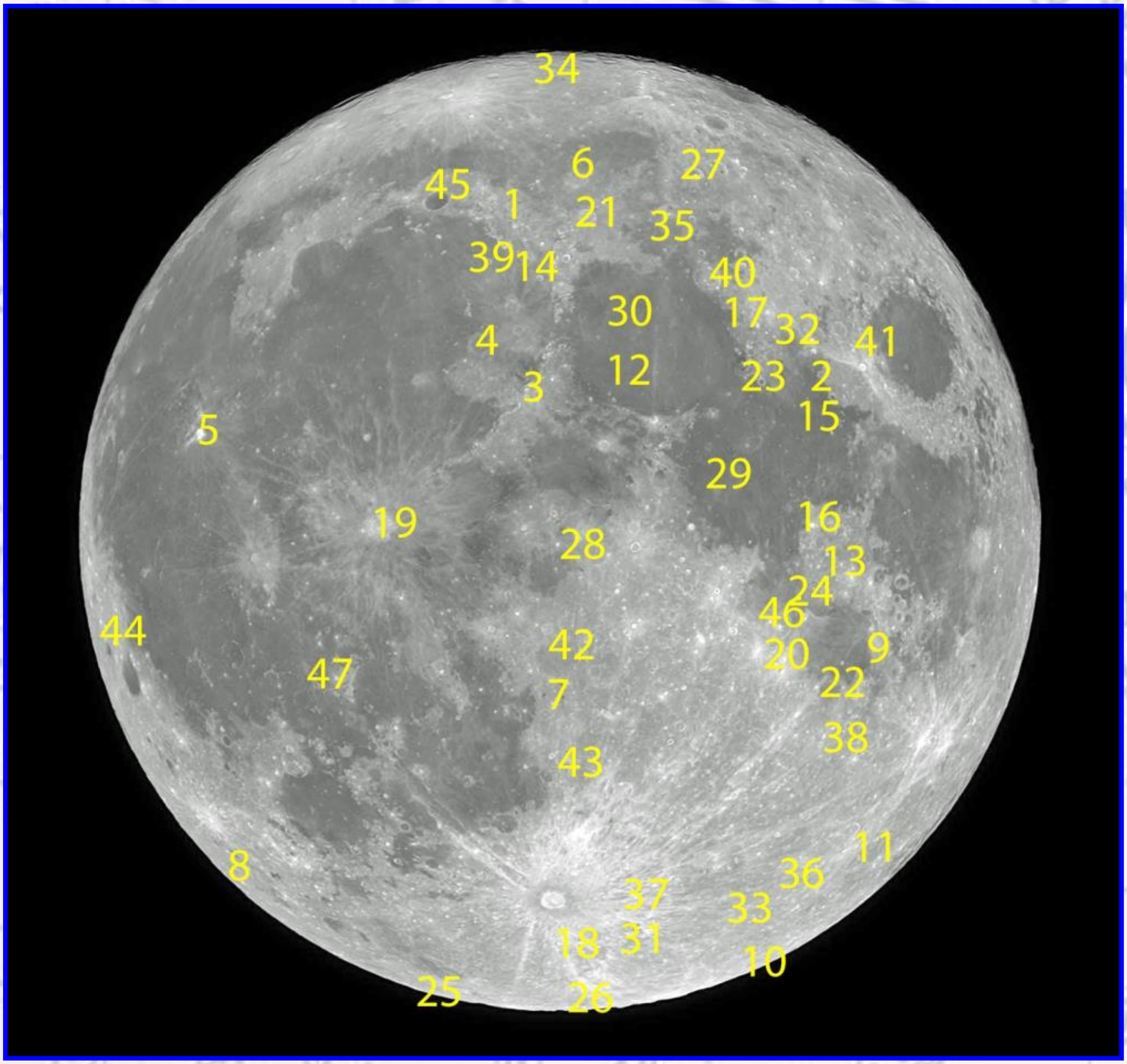
FOCUS ON JULY 2024: Due June 20, 2024: MARE NECTARIS

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

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

Francisco Alsina Cardinalli

Key to Lunar Images In This Issue



1. Alpes, Vallis
2. Amoris, Sinus
3. Apenninus, Montes
4. Archimedes
5. Aristarchus
6. Aristoteles
7. Arzachel
8. Baade
9. Bohnenberger
10. Boussingault
11. Brisbane
12. Buckland, Dorsum
13. Capella
14. Cassini
15. Cauchy
16. Censorinus
17. Chacornac
18. Clavius
19. Copernicus
20. Cyrillus
21. Eudoxus
22. Fracastorius
23. Gardner
24. Gaudibert
25. Hausen
26. Hédervári
27. Hercules
28. Hyginus
29. Lamont
30. Linné
31. Maginus
32. Maraldi
33. Metius
34. Meton
35. Mortis, Lacus
36. Nearch
37. Oronitus
38. Piccolomini
39. Piton, Mons
40. Posidonius
41. Proclus
42. Ptolemaeus
43. Regiomontanus
44. Riccioli
45. Plato
46. Theophilus
47. Zähringer