The Lunar Observer

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

JANUARY 2025

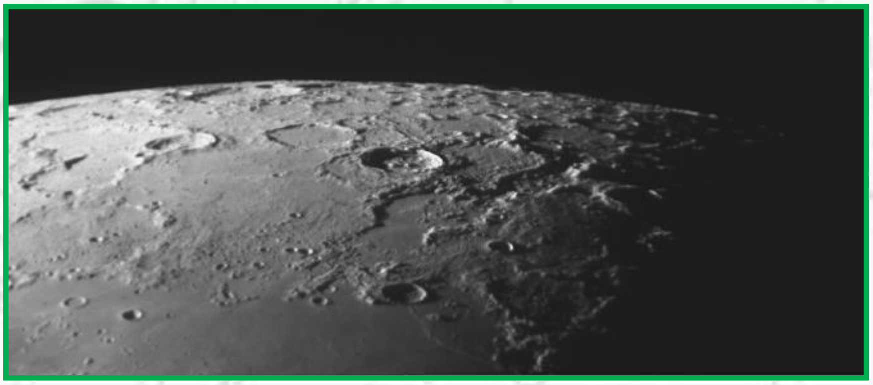
In This Issue

Lunar Reflections

Greetings to all. I hope that 2025 is a good and healthy year for you. Many thanks to all who have contributed to this issue of *The Lunar Observer*. I hope that you find this issue interesting. In this issue, there are short articles in Lunar Topographic Studies by:
Alberto Anunziato as he explores two different wrinkle ridges in Mare Serenitatis.
Michel Deconinck provides a spectacular drawing of the occultation of Saturn by the Moon back in August. You have never seen a lunar drawing like this one!
Marcelo Mojica Gundlach investigates Mare Vaporum and explains how best to view the Moon.
Rik Hill leads a tour of the Endymion and Mare Humboldtianum and the lunar features near them.
Greg Shanos in his quest of lunar ephemeral phenomenon captured the last lunar X and V of 2024 as well as a look at Sinus Iridum.
David Teske opens a new column Small Telescope Lunar Musings and focuses on Mare Fecunditatis.
Alberto Anunziato has an in-depth look at the far northern young crater Anaxagoras in the bi-monthly Focus On article. This has images from observers all over the world.
Several people contributed to the images and drawings to the Recent Topographic Studies. I welcome new contributors Sanjin Kovacic of Croatia, Steve Rifkin and Stanley M. Max and Thomas McCague all of the USA, provided fine lunar images and drawings.
As always, Tony Cook has provided in depth studies in Lunar Geologic Change.
Many thanks to all who contributed, and to all interested in *The Lunar Observer*!

Our next Focus-On article features the giant cráter Clavius. Please get images, drawings and articles to Alberto Anunziato and David Teske by February 20, 2025.

Clear skies,
-David Teske



Anaxagoras, *James Brunkella, Thousand Oaks, California, USA. 2024 December 23 14:40 UT. Intes 9 inch f/15 Maksutov-Cassegrain telescope, ZWO ASI678MM camera. Seeing 6/10, transparency 5/6.*

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

Online readers, click on images for hyperlinks

Lunar Topographic Studies

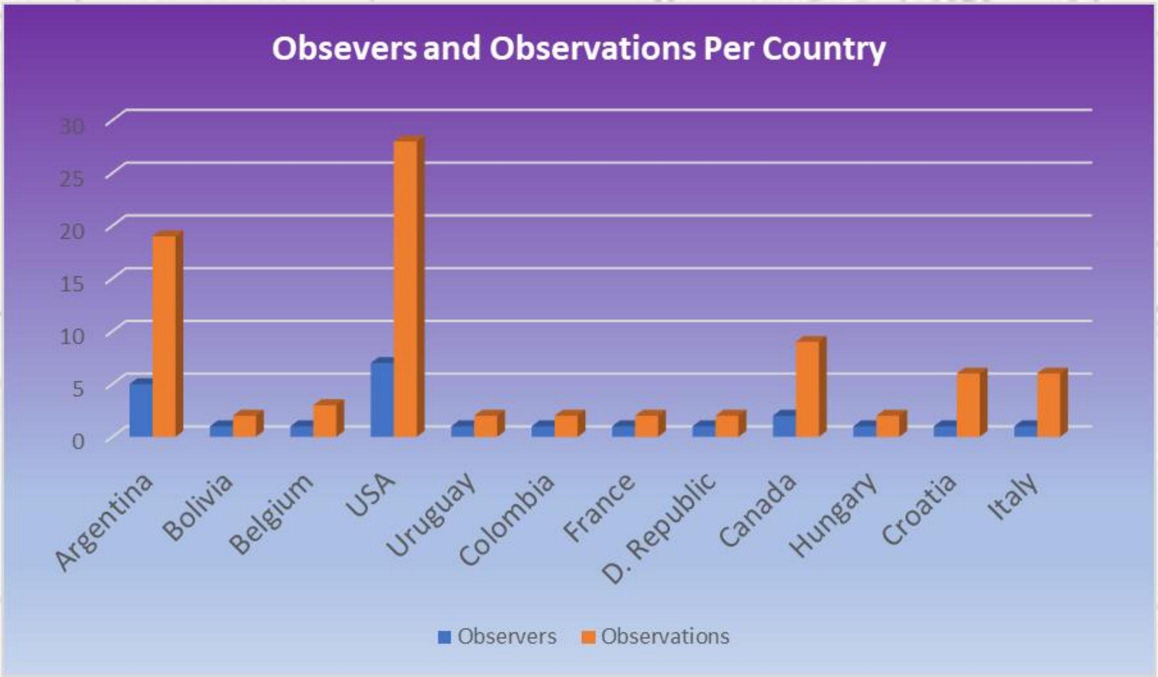
Coordinator – David Teske - david.teske@alpo-astronomy.org
Assistant Coordinator– Alberto Anunziato albertoanunziato@yahoo.com.ar
Assistant Coordinator-Wayne Bailey– wayne.bailey@alpo-astronomy.org
Website: http://www.alpo-astronomy.org/

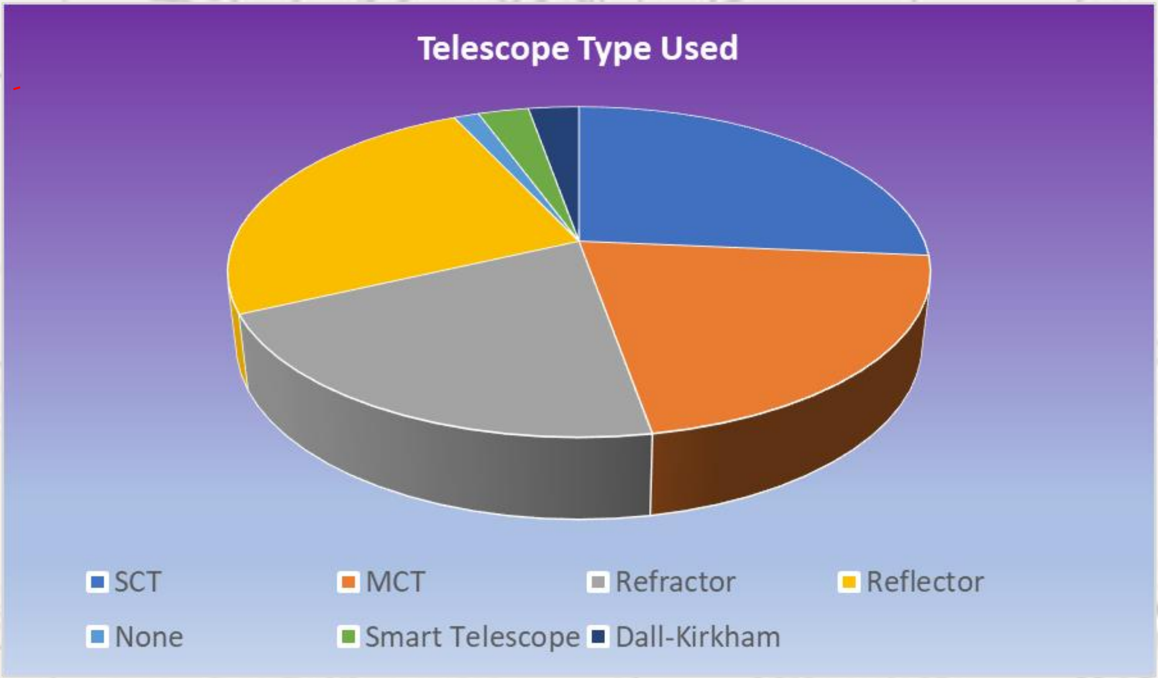
Observations Received

Name	Location and Organization	Image/Article
Alberto Anunziato	Paraná, Argentina	Article and two drawings *Two Examples of Wrinkle Ridges in Mare Serenitatis,* images of Anaxagoras (4), *Focus On article Anaxagoras, the "Tycho" of the North.*
Sergio Babino	Montevideo, Uruguay	Images of Anaxagoras (2).
James Brunkella	Thousand Oaks, California, USA	Images of Anaxagoras (4).
Francisco Alsina Cardinalli	Oro Verde, Argentina	Images of Anaxagoras (5).
Jairo Chavez	Popayán, Colombia	Images of Anaxagoras (2).
Michel Deconinck	Artignosc Provence, France	Drawings of Anaxagoras and drawing and article *Japanese Occultation of Saturn by the Moon*.
Jef de Wit	Hove, Belgium	Drawings or Anaxagoras (3).
Massimo Dionisi	Sassari, Italy	Images of Lamont, Aristoteles, Galle, Luther, Plinus
Howard Fink	New York, New York, USA	Model of Anaxagoras.
István Zoltán Földvári	Budapest, Hungary	Drawings of Tacitus and Alfraganus.
Desiré Godoy	Oro Verde, Argentina, SLA	Images of Anaxagoras (6).
Marcelo Mojica Gundlach	Cochabamba, Bolivia	Article and image *The Sea of Vapors: A Journey Into Lunar Mysteries* and image of Anaxagoras.
Rik Hill	Loudon Observatory, Tucson, Arizona, USA	Article and image *Endymion to Humboldtianum* and images of Anaxagoras (8).
Mike Karakas	Winnipeg, Manitoba, Canada	Image of Anaxagoras.
Sanjin Kovacic	Zagreb, Croatia	Images of Anaxagoras, Clavius, Mare Nectaris, Copernicus, Montes Apenninus and Southern Craters.
Felix León	Santo Domingo, República Dominicana	Images of Anaxagoras (2).
Thomas McCague	Oak Forest, Illinois, USA	Drawing of Anaxagoras.
Raúl Roberto Podestá	Formosa, Argentina	Image of Vallis Alpes.
Steve Rifkin and Stanley M. Max	Towson, Maryland, USA	Image of the Waxing Crescent Moon.
Greg Shanos	Sarasota, Florida, USA	Article and 4 images *The Last Lunar X and V of 2024* and *The Moon's Golden Handle* with 3 images.
David Teske	Louisville, Mississippi, USA	Article and image *In and Around the Sea of Fertility,* images of Anaxagoras (4).
Ken Vaughan	Cattle Point, Victoria, British Columbia, Canada.	Images of Albategnius, Alphonsus, Arzachel, Cassini, Clavius, North Pole, and Ptolemaeus (2).
Gonzalo Vega	Oro Verde, Argentina, AEA	Images of the Waxing Gibbous Moon and the Moon and Mars.

January 2025 *The Lunar Observer*
By the Numbers

This month there were 83 observations by 23 contributors in 12 countries.





Lunar X Predictions for 2024-2028

5 Year Lunar "X" and "V" Schedule * **

	2024	2025	2026	2027	2028
Jan	18: 0830	6: 1645	25: 1630	15: 0015	4: 0830
Feb	16: 2345	5: 0800	24: 0730	13: 1530	3: 0015
Mar	17: 1400	6: 2300	25: 2145	15: 0600	3: 1500
Apr	16: 0300	5: 1300	24: 1100	13: 1930	2: 0430
					1: 1700
May	15: 1600	5: 0130	23: 2245	13: 0730	31: 0400
Jun	14: 0400	3: 1330	22: 0945	11: 1830	29: 1430
Jul	13: 1430	3: 0015	21: 2000	11: 0500	29: 0030
		1: 1100			
Aug	12: 0130	30: 2130	20: 0630	9: 1530	27: 1100
Sep	10: 1230	29: 0900	18: 1730	8: 0200	25: 2245
Oct	10: 0015	28: 2115	18: 0530	7: 1400	25: 1130
Nov	8: 1245	27: 1045	16: 1900	6: 0300	24: 0145
Dec	8: 0230	27: 0115	16: 0930	5: 1730	23: 1645

* All times are listed as the day of the month and then the hour in **UT**

** All times are approximations based on LTVT calculations. They are accurate to ± 1 hour.

Submitted by Greg Shanos.

Small Telescope Lunar Musings
In and Around the Sea of Fertility

David Teske

It is really hard to say what is my favorite part of the Moon. They all are! But Mare Fecunditatis, the Sea of Fertility, is a beautiful region that is much less discussed than its companions such as Mares Nectaris, Tranquillitatis and Crisium. The southeastern shore of the Sea is the wonderful large crater Langrenus (132 km). Notice that with high Sun, its rays are visible, showing its young (relatively at least) age. Just northwest (upper right) of Langrenus are the three shallow craters Bilharz (43 km), Naonobu (25 km) and Atwood (29 km) between them. Note the fresher, deeper 13 km crater Acosta just east of this trio. Jumping to the northern shore of Fecunditatis, is the lovely floor-fractured crater Taruntius (56 km). You can see even at very modest apertures that the floor of this crater has been modified by volcanic activity below its surface. Like Langrenus, Taruntius shows rays at higher solar angles. Taruntius stands between Mare Fecunditatis and Mare Tranquillitatis. The southwestern shores of Mare Fecunditatis display a group of rather large, but shallow craters. Largest of them is a keyhole-shaped crater Gutenberg (74 km). Offshore of this is Goclenius, a crater (54x72 km) with a flatter western wall than the circular eastern wall. Just below that is a nice triplet of Magelhaens (41 km), Magelhaens A and (just cut off the lower left of the image) Colombo (76 km). The "elephant in the room" is the wonderful pair Messier (9x11 km) and Messier A (13x11 km) in Mare Fecunditatis. The comet-like rays coming out of Messier A indicate a very low angle asteroid impact from the east. The northern of the pair of rays clearly splits in two. I wonder how far these rays extend over the highlands?

Messier, *David Teske, Louisville, Mississippi, USA. 2024 September 19 03:05 UT, colongitude 100.8˚. FOA60Q refractor telescope, 2.5x Power mate, IR block filter, ZWO ASI120MM/S camera. Seeing 6/10.*

The Last Lunar X & V for 2024

Gregory T. Shanos

The Lunar X & V were visible on December 7, 2024 at 9:39pm local time or December 8, 2024 02h 39m Universal Time. The moon was at a 44% waxing gibbous phase and only 26°above the horizon. The seeing was rather good with perfectly clear skies. This was the orientation of the moon as it was setting. A Meade 60mm 260mm f/4 refractor was tracking the moon on an inexpensive Orion EQ equatorially mounted tripod. A ZWO ASI 178MM monochrome camera using Firecapture v2.7.14 to acquire the video using an MSI GF 65 gaming computer. The AVI video was processed using Autostakkert 3.1.4 and Registax 6.1.0.8. Further sharpening and processing in Photoshop CS4. Image by Gregory T. Shanos, Longboat Key, Sarasota, Florida.

Lunar Topographic Studies

The Last Lunar X and V of 2024

The Lunar X (also known as Werner X) is a claire-obscure effect in which light and shadow creates the appearance of a letter 'X' and 'V'. The Lunar X forms from 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.

Single snapshot of the Lunar X & V through the Seestar S50 at 2024-08-12 01h 38m UT- no post processing. Note the thinning clouds with haze are evident in this photograph. The "X" and "V" are visible along the terminator.

Lunar Topographic Studies
The Last Lunar X and V of 2024

Single snapshot at 2X digital enlargement of the Lunar X & V through the Seestar S50 at 2024-08-12 01h 39m UT- no post processing. The "X" and "V" are more readily visible along the terminator.

Single snapshot at 4X digital enlargement of the Lunar X & V through the Seestar S50 at 2024-08-12 01h 40m UT- no post processing. The “X” and “V” are easily visible along the terminator.

Lunar Topographic Studies

The Last Lunar X and V of 2024

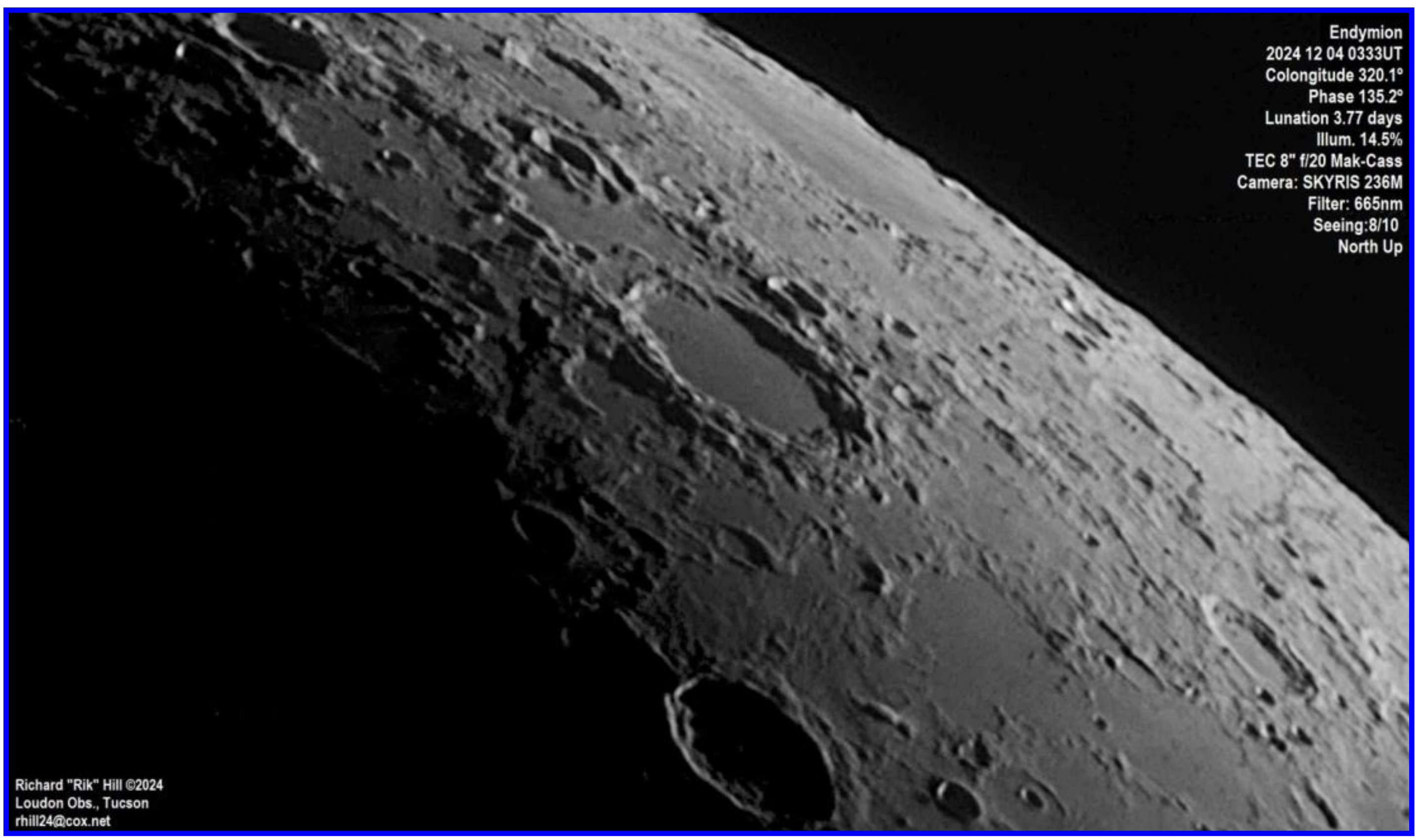
Endymion to Humboldtianum

Rik Hill

Only 3-4 days after new moon, a day before Atlas and Hercules are in full sunlight, you will see a prominent dark oval in the extreme NE (lunar) of the crescent moon. This is the 160km diameter crater Endymion formed during the Nectarian period (around 3.9 billion years ago). The floor looks featureless and smooth but there are three equal sized, ~2km dia. craters in a line in the upper left of the crater just barely discernable here. The shadow filled crater at the bottom of the image is Atlas. Between Atlas and Endymion and to the right is a flat mare region, Lacus Temporis that is Pre-Nectarian (as old as 4.5 b.y.) a truly ancient lake!

Above and to the left of Endymion are the remnants of a once great walled plain De La Rue (136km) with a small crater De La Rue J (14km) in the center. On the north wall of this crater is the mostly shadow filled Strabo (55km) on the upper edge of this image.

A line drawn from Atlas, through Endymion leads to another flat region, much larger than Lacus Temporis, this is Mare Humboldtianum (250km). Its extent can be seen varying depending on the libration the night you are observing. This basin is also Nectarian in age with much of the contained material being younger, of Upper Imbrian age (3.4-3.7 b.y.). The Lunar Prospector noted a mascon in the center of the Mare where there was higher gravity due to the greater mass of this Imbrian material. Look for a libration where this is tipped toward you for a good view.



Endymion to Humboldtianum, *Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2024 December 04 03:33 UT, colongitude 320.1˚. TEC 8 inch f/20 Maksutov-Cassegrain telescope, 665 nm filter, SKYRIS 236M camera. Seeing 8/10.*

Lunar Topographic Studies

Endymion to Humboldtianum

Japanese Occultation of Saturn by the Moon

Michel Deconinck

This morning of August 23, 2024, around 5am, I had a dream: to represent the occultation of Saturn "in the Japanese style".

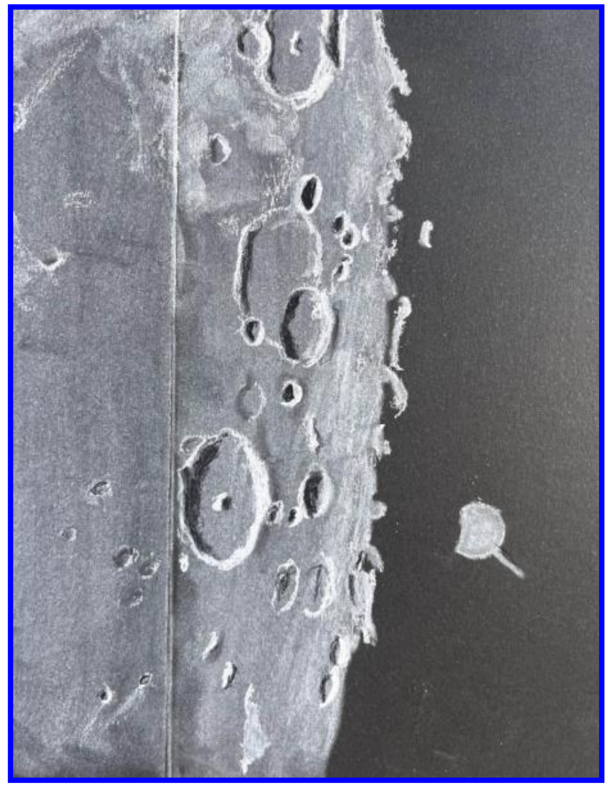
My Mewlon 250mm (made in Japan), allows me a significant magnification. I also have a black accordion notebook of the so-called "Japanese" type since a few months.

That was all it took to make my dream come true: to lay down on a single page the moon band behind which the planet Saturn slipped and immortalize sequences of its disappearance and reappearance.

And for once, I am not a little proud - let's be modest – of the creation of this giant pastel.

I obviously focused on two areas, that of the disappearance of the planet at the illuminated limb of our satellite, and the reappearance area at the opposite limb, more complex because beyond the thin shadow zone.

Lunar Topographic Studies
Japanese Occultation of Saturn by the Moon



The support is a Japanese album with black pages, 200 gr/m^2 "in accordion". The pastels used are dry gray, black and white ones. The telescope is a Mewlon 250mm here with an extender at f15, equipped with a 10mm Tele Vue Delos eyepiece for a magnification of 375x.

Here's a small souvenir video:
https://youtu.be/KNWchE4Y2oE?si=F9zdR_R9t3GQeUnL

Michel Deconinck www.aquarellia.com

The Moon's Golden Handle

Gregory T. Shanos

The interplay of light and shadow on the moon known as a claire-obscure effect can result in some interesting phenomenon. The Lunar X & V are an example. Another feature known as the Golden handle occurs 10 days after full moon, however, it is not always possible to observe the Golden Handle, as the Moon may be below the horizon or still in the daytime sky. The peaks of Montes Jura (2.7km or 1.68 miles in height) rise out of the shadows and become illuminated over a period of several hours. Simultaneously, the plains of Sinus Iridum are still in darkness. Sinus Iridum is a 249 km (155 mile) diameter impact crater that was flooded by the same basalts that filled Mare Imbrium to its east thus forming a rounded bay encircled on the north and west by the Montes Jura Mountain range.

Binoculars or a small telescope show a small bright arch extending into the unlit night side of the Moon. The sight was breathtaking since this was my first observation of the Golden Handle.

I started observing at sunset on December 10, 2024. The sky was overcast at sunset with clearing as the evening progressed. Thin clouds and fog rolled in throughout the night. There was a constant haze around the moon due to high clouds. The seeing however was very steady. An arc was beginning to form as the sunlight was illuminating the Jura mountains. The arc filled in as the evening progressed and just before midnight the arch was complete. (See Figures 1-3). I observed the entire event from 6:00 pm on December 10, 2024 thru 1:30 am on December 11, 2024 local time. At the close of my observations the weather conditions on December 11, 2024 at 1:50 am local time from my personal weather station were Temp: 68.9F Feels like: 68.9F Dew Pt: 66.2F Humidity: 91% Barometer: 29.79 in Hg and Wind: SE 0-5mph.

Throughout the night, I was busy handling three telescopes namely the Seestar S50, Meade 8-inch LX200GPS ACF and a Meade 60mm refractor which was piggybacked on an equatorial tracking Meade 8-inch LX6. I was seated between the two Meade telescopes with an MSI gaming computer as I took the images. See figure 4. Overall, the evening was an enormous success!

Figure 1: Close-up of the Golden Handle visible from Longboat Key Sarasota, Florida (27° 20' 58.64" N and 82° 36' 18.91" W) on December 11, 2024 at 12h 02 AM local time or 5h 02m Universal Time. The moon was a waning gibbous at 78% phase and only 40 degrees above the horizon. Telescope was a Meade LX200GPS 8-inch ACF 2000mm fl Schmidt-Cassegrain with an Optec 6.2 focal reducer and a ZWO ASI 178MM monochrome camera.

Figure 2: Binocular view of the Moon on December 11, 2024 at 12:05am local time or 5h 05m Universal Time. This was the orientation of the moon in the sky during this observation. Telescope was a Meade 60mm refractor 250mm fl at f/4 piggy-backed and tracked on a Meade LX6 8-inch SCT. A ZWO ASI462MM monochrome camera with a Baader CMOS optimized UV-IR cut filter and Firecapture v2.7.14 software was utilized to acquire the video. The apparatus was connected to an MSI GF65 gaming computer. Slight sharpening with Photoshop CS4. Image by Gregory T. Shanos.

Figure 3: Seestar S50 single photograph of the moon on December 10, 2024 at 11:28pm local time or December 11, 2024 4h 28m UT. This was the orientation of the moon in the sky during this observation. Color corrected and slightly sharpened in Photoshop CS4.

Figure 4: Equipment utilized. Right: Seestar S50 Smart Scope, center: Meade LX200GPS ACF 8-inch SCT, middle: MSI GF65 laptop computer Intel i7 with 6 cores 12 threads and 40GB of RAM, left: Meade 60mm refractor piggy-backed on a Meade LX6 8-inch SCT Ambient Weather WS8480 Falcon Weather Station.

References:

1) The Golden Handle on the Moon by Lampert Spix https//www:astroshop.edu
2) Cosmic Pursuits Newsletter- The Sky in Dec 2024 https://cosmicpursuits.com
3) Golden Handle Wikipedia www.wikipedia.org
4) Pleasures of Lunar Pareidolia by Robert King, March 29, 2023 https://skyandtelescope.org/

The Sea of Vapors: A Journey into Lunar Mysteries

Marcelo Mojica

The Moon, our natural satellite, has fascinated mankind for millennia. Its soft glow and detailed surface have captured the attention of amateur astronomers and observers. Among the various lunar regions, the Sea of Vapors (Mare Vaporum) is especially interesting, we might even say mesmerizing. Located near the lunar equator, this area offers a unique combination of geological formations that make observing the Moon a captivating experience. In this article we will explore the main features of this region, such as the Great Horseshoe, Hyginus Crater, Hyginus Rime, and Manilius Crater, and give recommendations on how to observe and photograph these wonderful details with the right equipment.

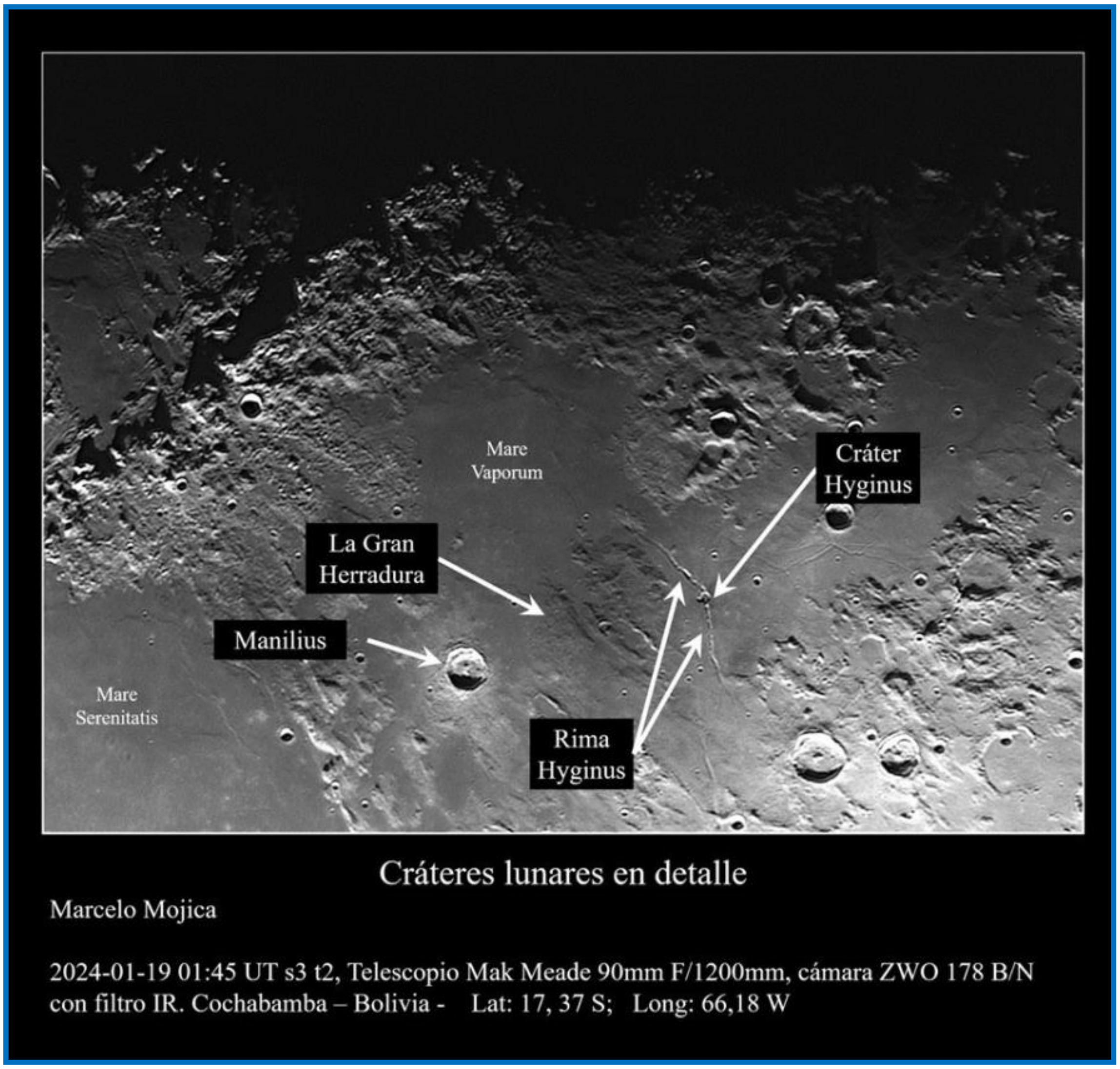


Fig. 1.- Mare Vaporum most notable features. It is interesting to observe the amount of detail obtained with a 90mm Mak. 2024 January 19 01:45 UT. Meade 90 mm Maksutov-Cassegrain telescope, 1200 mm, IR cut filter, ZWO ASI178B/N camera. Image by Marcelo Mojica Gundlach, Cochabamba, Bolivia. North is to the left, west is up.

Highlights of the Sea of Vapors

The Sea of Vapors is characterized by rugged and fascinating terrain, with several key geological formations that make this region a very satisfying target for lunar observers.

Hyginus Crater: With a diameter of about 20 km, Hyginus Crater is one of the most notable craters in the region. In addition to its well-defined shape, the crater is surrounded by a series of radial fissures that make it even more interesting. Observing it allows you to study the variability of the shadows on its walls, a fascinating feature for any observer. Hyginus has a diameter of approximately 11 km and according to Wikipedia, this is one of the few lunar craters that is not the result of an impact. It is believed to be of volcanic origin, as the shape of the crater, without an outer rim, does not correspond to what is expected for an impact crater [1].

Rima Hyginus: This lunar crack is one of the most visible in the Mare Vaporum area. It extends for several kilometers in a straight line, creating an impressive contrast with the surrounding terrain. Observing Hyginus Rim is ideal to see how the light changes the shape of this fissure, revealing subtle details as the position of the Sun varies and also more details are noticed if the equipment is 150 mm or larger, with the craters chained within it being noticeable. Its dimensions are 220 x 4 km and it can be observed from the 6th day after New Moon [2].

Manilius Crater: Although less well known than Hyginus, Manilius Crater is equally impressive. With its steep walls and relatively intact structure, this crater makes for a fascinating target when viewed during phases of the lunar cycle that cast dramatic shadows within. This 39 km (24 mi) diameter crater features a well-defined rim, with a sloping interior surface that extends directly to the ring-shaped rock mound at the base, and a small outer ramp. Because of its albedo, which is higher than the surroundings, it appears bright when the sun is high above the horizon. Manilius features a formation of several central peaks near the center. A notable feature is the system of radial markings that, originating in the crater, extend over 300 km (186 mi) [3].

Best lunar observing equipment

To explore Mare Vaporum and other lunar details, having the right equipment is essential. While the largest and most sophisticated telescopes offer the best resolution, even more modest equipment can allow you to enjoy the wonderful details of the Moon.

80mm or larger refractor telescopes: Refractor telescopes with an aperture of 80 mm or larger are perfect for lunar observation. Their excellent optical quality and resolution allow you to clearly distinguish craters, fissures, and other geological details of the Sea of Vapors. As the magnification is increased, lunar topography can be observed with great precision.

80mm or larger Maksutov telescopes: Maksutov telescopes are also an excellent choice for lunar observation. Their compact design and precise optics provide sharp, clear images, ideal for studying the craters and geological formations of the region.

Of course, lunar observation is not restricted to this type of equipment; amateurs can also enjoy it with reflector telescopes without any problem. Of course, if your telescope has an aperture of 200mm or larger, you should use a diaphragm to prevent too much lunar light from disturbing your eyes.

Lunar Photography: Capturing the Details with Commercial and Dedicated Cameras

Visual observing is only one part of the lunar experience; photography offers a wonderful way to document and share the wonders of the lunar surface. There are two main types of cameras that can be used to capture images of the Moon: commercial cameras and dedicated planetary cameras.

Commercial Cameras: Mid- to high-end DSLR or mirrorless cameras can also be used for lunar photography. With a good telescope adapter, these cameras can capture detailed images of the Moon. However, it is important to mention that commercial cameras are not specifically optimized for lunar astrophotography, so their performance might not be as high in terms of resolution and capturing fine details.

Dedicated Planetary Cameras: Planetary cameras, such as those in the ZWO or ASI series, are ideal for lunar astrophotography. These cameras are designed to capture high-resolution images and are optimized for observing bright objects like the Moon. Being equipped with smaller and faster sensors, these cameras are capable of taking highly detailed images, making them a perfect tool for capturing the Sea of Vapors and other lunar formations.

Importance of Monochrome Cameras for Improving Resolution

When it comes to lunar astrophotography, image quality is crucial. Monochrome cameras are one of the best options for obtaining high-resolution images. Unlike color cameras, which capture a color image by combining several images with filters, monochrome cameras take black and white images, allowing for capturing more details and increasing the resolution of the photos. Color filters (red, green, and blue) can then be applied to obtain color images with much greater precision.

The Image Capture and Processing Process

To obtain the best results in lunar photography, it is advisable to not only take photographs, but also record videos of the lunar surface. Using processing software such as RegiStax or Autostakkert, multiple frames of the video can be stacked to improve resolution and reduce noise, resulting in sharper, more detailed images. This process, known as stacking, is critical to obtaining high-quality images, especially when observing such fine details as the fissures in the Rima Hyginus or the shadows on craters.

Moonwatching without a telescope: Binoculars as an alternative

If you don't have a telescope, don't worry—moonwatching is still possible with binoculars. With binoculars of 20x or higher, you can enjoy a stunning view of the Moon and its larger features, such as major craters and large fissures. Although smaller details can be difficult to make out without a telescope, binoculars offer an excellent alternative for easy Moonwatching. However, binoculars should be mounted on a tripod to avoid movement due to fatigue in our arms when lifting the equipment.

Conclusion

Mare Vaporum is a fascinating region of the Moon that invites detailed observation. With its geological formations such as the Hyginus Crater, Rima Hyginus and Manilius Crater, it offers a wealth of detail that captivates both visual observers and astrophotographers. To capture these details, 80 mm or larger refractor and Maksutov telescopes are ideal choices, while dedicated monochromatic planetary cameras provide the best images. In addition, the use of processing software such as RegiStax and the stacking technique can further improve the resolution of the photographs. Whether with a telescope, binoculars or specialized cameras, the Sea of Vapors and its surroundings offer a unique spectacle that continues to attract amateur and professional astronomers. There is no better time to look up at the sky and explore the fascinating lunar surface!

Bibliography

1. https://es.wikipedia.org/wiki/Hyginus_(cr%C3%A1ter)
2. Virtual Moon Atlas V8.2
3. https://es.wikipedia.org/wiki/Manilius_(cr%C3%A1ter)

Two Examples of Wrinkle Ridges in Mare Serenitatis

Alberto Anunziato

On the night of December 7th, the illumination was ideal for observing the intricate network of wrinkle ridges that cross Mare Serenitatis in all directions near the terminator. The most impressive wrinkle ridge is undoubtedly Dorsa Smirnov (to which we dedicated a Focus On section not long ago), and that spectacularity overshadows the two parallel dorsa to the west: Dorsum Azara and, above all, the dorsum that crosses Bessel (which we analyzed topographically in a previous issue of TLO). The latter looked spectacular in its majestic complexity, but I was feeling tired and it seemed to me that the task of recording its different areas was too much. I regret not having drawn it and I intend to delve deeper into the structure of this ridge in the future. The truth is that I chose "a younger sister", less spectacular and simpler. The wrinkle ridge, also unnamed, that appears in IMAGE 1 is the one we marked in IMAGE 2 (taken from Antonin Rükl's Atlas, Chart 24).

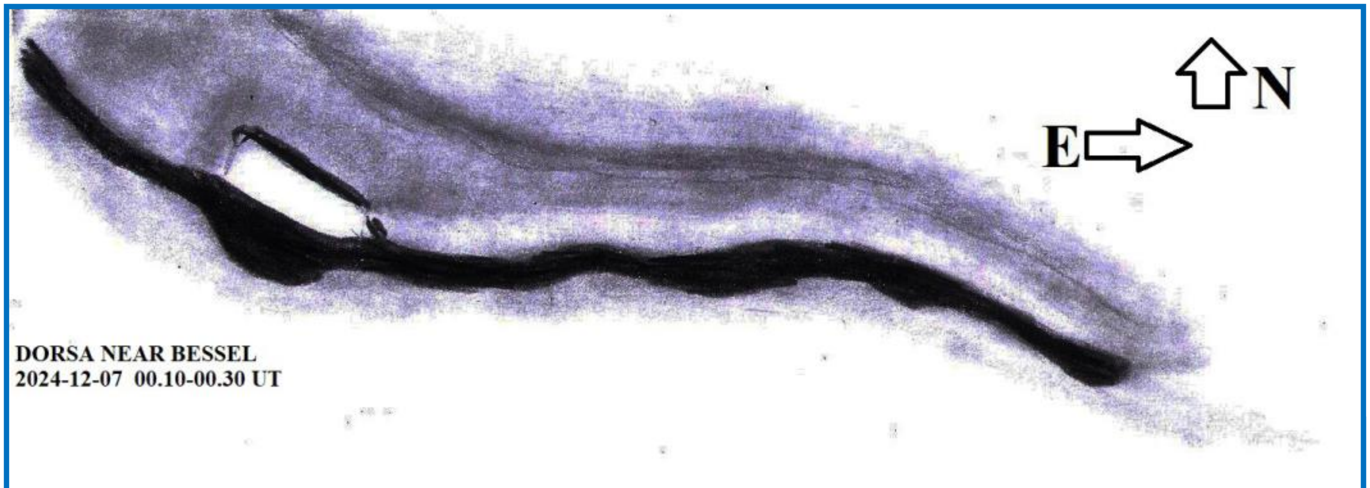


Image 1, Dorsa Near Bessel, *Alberto Anunziato, Paraná, Argentina. 2024 December 7 00:10-00:30 UT. Meade EX105 Maksutov-Cassegrain telescope, 154x.*

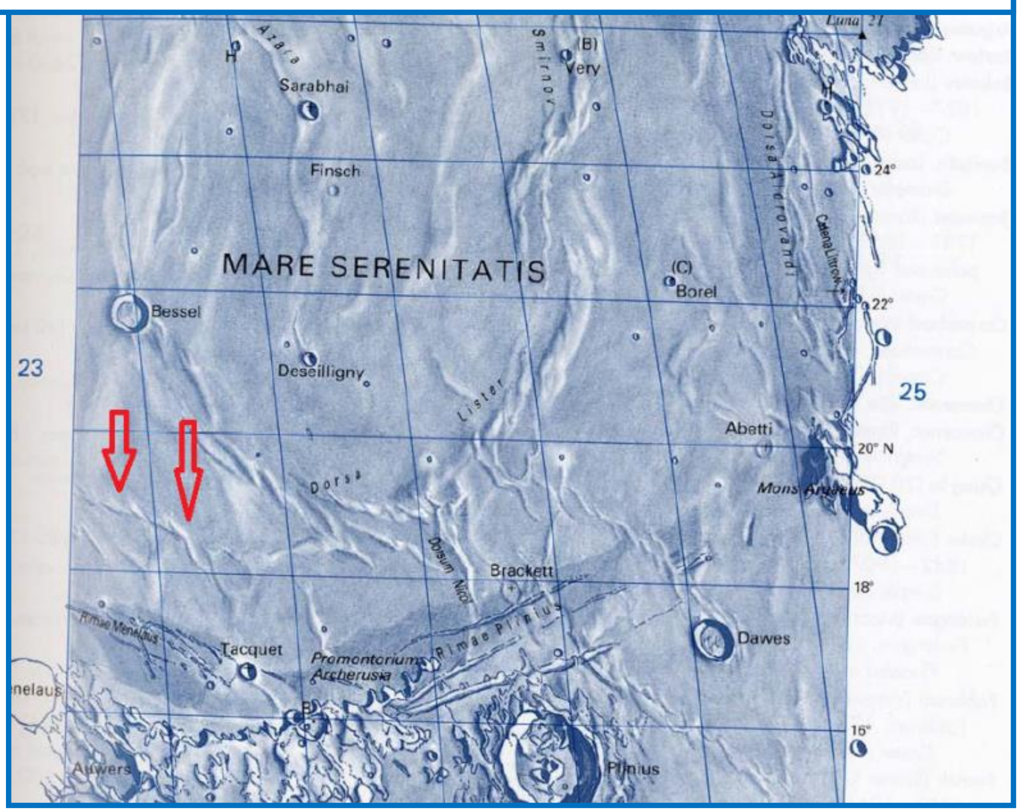


Image 2, *Chart 24 Rükl Atlas of the Moon.*

Lunar Topographic Studies
Two Examples of Wrinkle Ridges in Mare Serenitatis

I was attracted by the graceful lightness of the ridge, which did not look very high, but with great definition. As happens in the visual observation of these small elevations (at least with small telescopes like mine), the view behind the eyepiece is more simplified, we tend to see as a single structure what with more resolution is a complex structure of several segments. It seems to have a crest that runs along the southern margin and that looked like without interruptions, a very faint thin band on the edge of the arch. Let us remember that the two topographic elements of a dorsum are the lower one, the arch, not very high and wide, with slopes that are usually uneven: one gentle and the other steep, and the upper one, the crest, which is very thin and much higher and steeper. The crest runs over the arch in two possible ways: on one of its slopes (often alternating segments that run on alternate slopes) or in a staircase-like fashion (perpendicular to the arch), as parallel segments. It is much easier for the visual observer to distinguish the crest (a very narrow element and therefore difficult to see) when it runs over one of the margins. When the crest runs over the margins, its height is often added to the height of the steepest margin of the arch and, in addition, its shadow is projected outwards, helping observation. Very rarely have I been able to visually observe details of the crest (which can sometimes be captured photographically); generally, the crest is perceived as a bright area, illuminated by the oblique rays of the lunar sunrise or sunset (the wrinkle ridges disappear for us with frontal illumination). In the case of IMAGE 1, the crest has a much higher area, which is visually seen to be brighter and casting a shadow not only outwards (and this shadow is much more pronounced than the one cast by the rest of the crest, which is lower) but also inwards, that is, towards the surface of the arch. It is interesting to compare the shadows: that of the southern margin, where the crest passes, a very dark shadow (sign of height) that widens noticeably, drawing the shape of the highest part of the crest. It is rare to see shadows on both margins of the arch, as is the case of IMAGE 1; that of the northern margin is much less dark and more subtle, but the fact that it is seen may be an indication that this margin of the arch is quite steep.

The ridge in IMAGE 1 belongs to the system of wrinkle ridges concentric to the center of Mare Serenitatis, belonging to the innermost ring of the basin, the one in IMAGE 3 is a dorsum radial to the center, perhaps for this reason it is very different. It is located on the northern margin, west of Luther, on the edge of the steep lands south of Luther H.

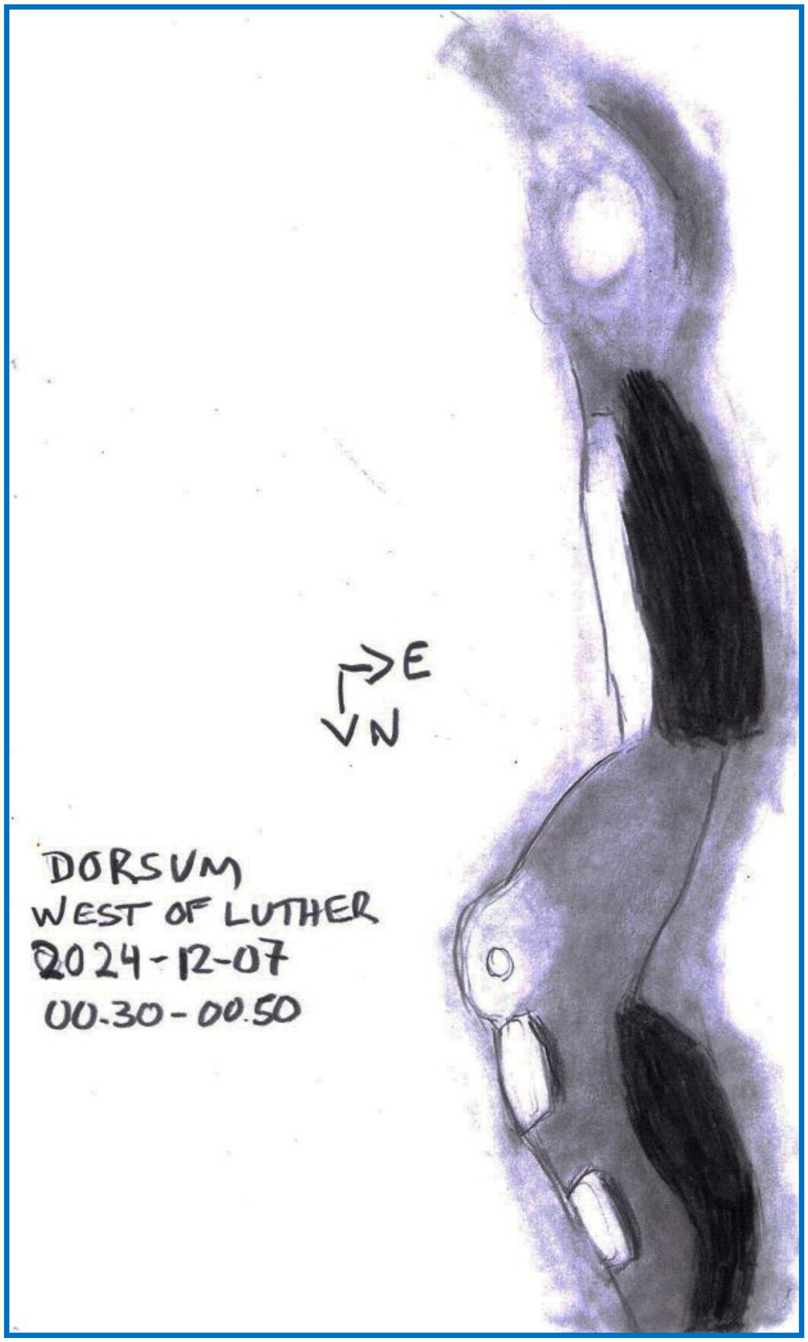


Image 3, Dorsum Near Bessel, *Alberto Anunziato, Paraná, Argentina. 2024 December 7 00:30-00:50 UT. Meade EX105 Maksutov-Cassegrain telescope, 154x.*

Lunar Topographic Studies
Two Examples of Wrinkle Ridges in Mare Serenitatis

If it were not for the fact that it is in the LROC Quickmap wrinkle ridges catalog it would not be easy to decide if it is a dorsum, given its strange shape, which is made more precise (obviously) in the photographic image (IMAGE 4), which is a detail from page 245 (lower left margin) of Volume 1 of the Photographic Lunar Atlas for Moon Observers by Kwok Pau. As we said before, visual observation of the wrinkle ridges tends to simplify the structure, so in IMAGE 3 the central area could be a huge widening of the arch, but the more precise IMAGE 4 shows what could be two segments of an arch joined by a raised area. From north to south, we find an arch segment with a very dense and thick shadow on the eastern margin, while the crest passes along the western margin. In IMAGE 3 we see two crest segments as bright areas, which in IMAGE 4 we see complete. Then, towards the south, there is that central area, perhaps too wide to be an arch. Visually, in IMAGE 3, we see that in the elbow that points towards the west there is a bright area in whose center there was a very bright point (in principle, greater brightness means greater height). In IMAGE 4 we see that this bright point is a peak that projects the typical triangular shadow of a small elevation. What is it? Submerged relief that emerges or a super high crest? It could be the latter option, since it coincides with the line of the crest further north. After this bend, the segment to the south is more typical: the crest occupies the western margin and the shadow to the east is a very dark and wide shadow. Further south, the wrinkle ridge curves to the west and loses height (visually, neither crests nor shadows are visible) and there seemed to be a kind of ghost crater, which we actually see is a crisscrossing of segments in IMAGE 4.

To conclude, it is interesting to note the extraordinary diversity of the wrinkle ridges, which merits an attempt at cataloging, which would be very difficult, because there are thousands around the Moon.

***Image 4**, Dorsum West of Luther, from Volume 1, page 245 Photographic Lunar Atlas for Moon Observers by KC Pau.*

Focus On: Anaxagoras: The “Tycho” of the North

Alberto Anunziato

1.-WHERE IS ANAXAGORAS?

We have all asked ourselves this question at some point, and surely the friends of ALPO who collaborated with their images of Anaxagoras have wondered where this elusive crater was. With oblique illumination it is a real challenge to locate it, since it is quite close to the northern limb, a location that has taken away its prominence among those who observe and photograph the Moon. To begin to situate ourselves, we have to go towards the north pole and stop at latitude 73º, more or less at the longitude of Plato (which is very easy to find), in **IMAGE 1** we mark it with an arrow. As we can see in **IMAGE 1**, it is a more recent crater than the neighboring craters, it is a crater from the Copernican period surrounded by worn Nectaric craters (like Barrow to the east and Epigenes to the south) or even pre-Nectaric craters like the neighboring Goldschmidt to the east. Can you find it in **IMAGE 2**?

Image 1, Plato, *Sergio Babino, Montevideo, Uruguay. 2019 December 08 00:32 UT. 203 mm catadrioptic telescope, ZWO ASI174 MM camera.*

Again, first locate Plato and then go up a little to the right, almost to the northern edge, it is the last prominent crater. If you move to the same latitude but to the west (left) you will reach another Copernican crater (also with terraced walls, deep and with a complex floor), it is Philolaus, precisely between Philolaus and Anaxagoras the twin GRAIL probes crashed on December 17th, 2012 (more precisely, in the area between Philolaus and Mouchez). Peter Grego characterizes Anaxagoras as “the most prominent landmark in the north polar region”, in **IMAGE 2** it does not appear so prominent, but you can slightly appreciate the bright rays that with more frontal illumination, around the full Moon will make Anaxagoras a kind of northern lighthouse, as Chuck Wood (2003) says: “Like a miniature version of Tycho, Anaxagoras has rays that radiate away like meridians of longitude on a globe. Because Anaxagoras is so close to the limb, its floor is virtually invisible, occasionally the bright top of its central peaks can be glimpsed in an otherwise shadow-filled cavity”.

Image 2, Anaxagoras, *David Teske, Louisville, Mississippi, USA. 2023 May 02 03:06 UT, colongitude 48.9˚. FOA60Q refractor telescope, IR block filter, ZWO ASI120MM/S camera. Seeing 8-9/10.*

Focus On: Lunar Topographic Studies

Anaxagoras, the “Tycho” of the North

2.- A COPERNICAN CRATER

Charles Wood (2007) has given us a review of the main characteristics of Anaxagoras: "is a typical Tycho-like complex crater with a central peak mass on the floor, and terraced walls beneath a steep scarp of 39°. Debris from the walls extend across the floor to the peaks, forming an X pattern of irregular topography. The areas between the various mountains and hills on the floor are smooth and may be impact melt". Tycho is not only similar to our crater because of its system of bright rays (which we will see later) but also because both are craters from the Copernican period (and the most recent ones).

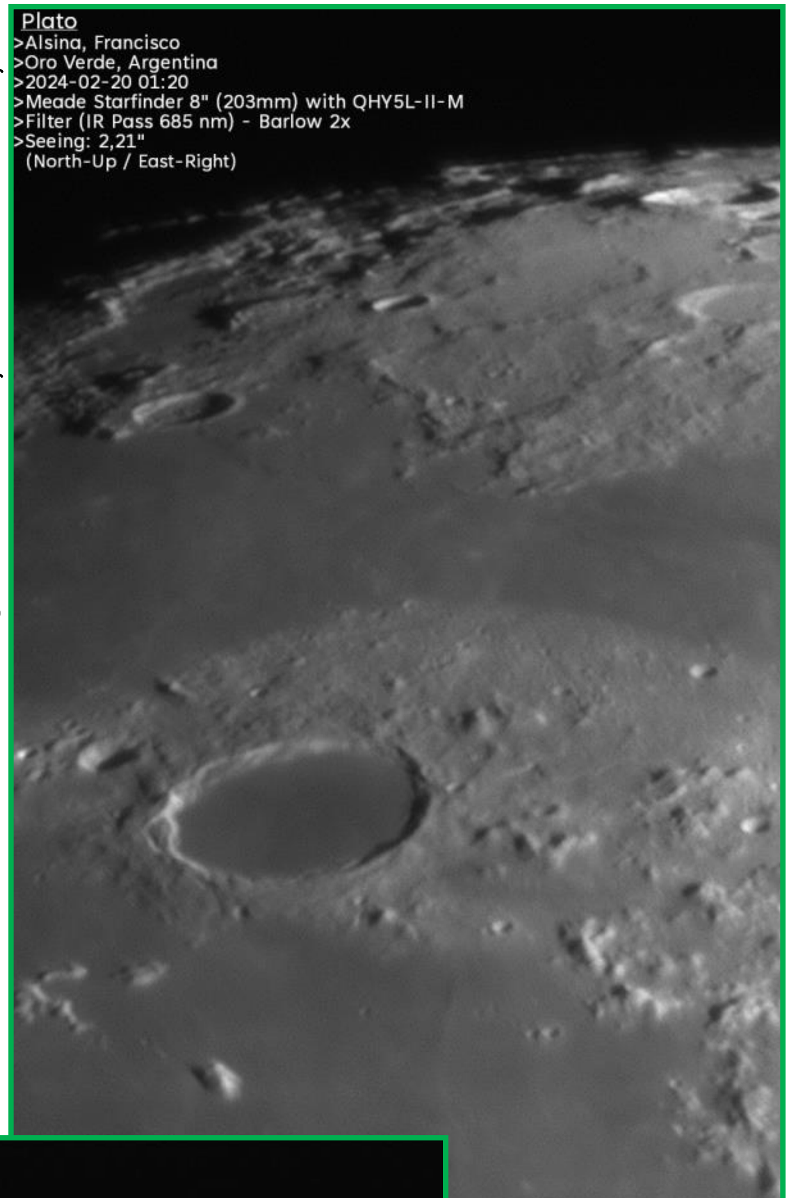


Image 3, Plato, *Francisco Alsina, Cardinalli, Oro Verde, Argentina. 2024 February 20 01:20 UT. 200 mm reflector telescope, IR pass 685 nm filter, QHY5-II camera.*

Anaxagoras is "a deep crater with a sharp circular rim. Its walls cast prominent shadows at a low illumination" (Grego). In **IMAGES 3 to 10** you can see these recent crater characteristics pointed out by Grego. According to the LRO QuickMap measurements, its maximum depth would be about 4.5 km. Another characteristic of Copernican craters is that their interior walls are strongly terraced.

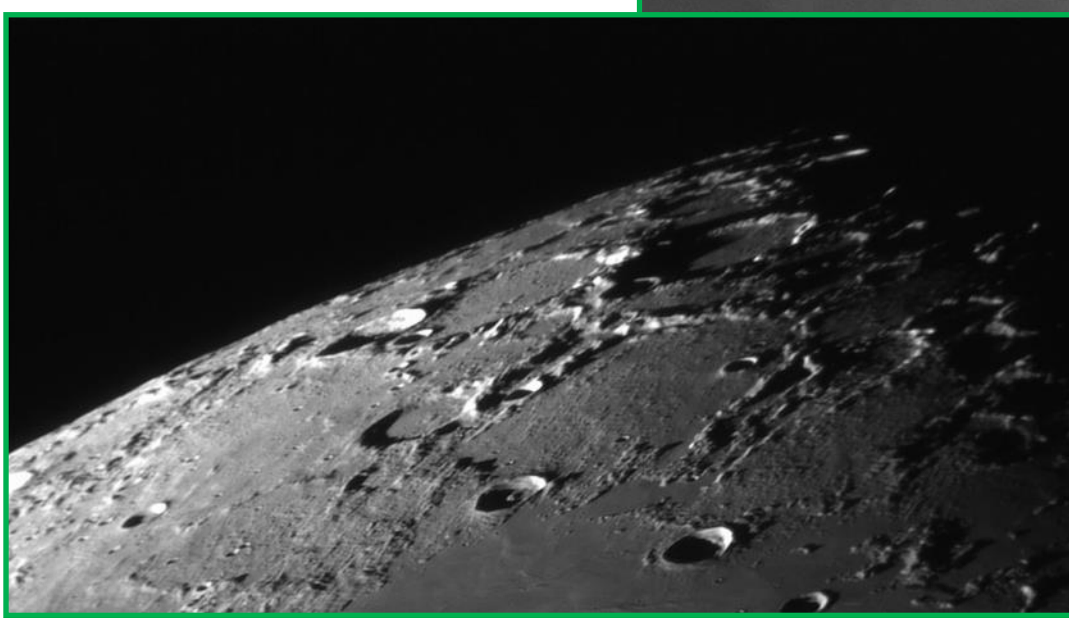


Image 4, Anaxagoras, *James Brunkella, Thousand Oaks, California, USA. 2024 October 22 13:24 UT. Intes 9 inch f/15 Maksutov-Cassegrain telescope, ZWO ASI678MM camera. Seeing 8/10, transparency 5/6.*

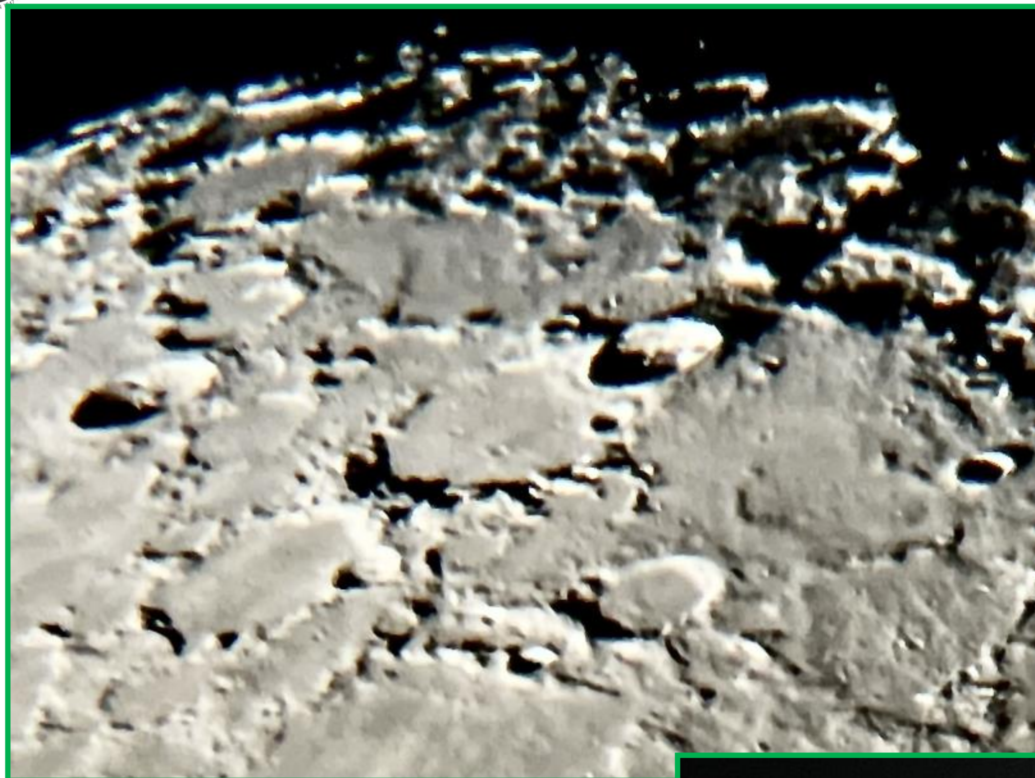


Image 5, Anaxagoras, *James Brunkella, Thousand Oaks, California, USA. 2024 October 04 02:48 UT. Intes 9 inch f/15 Maksutov-Cassegrain telescope, iPhone 12 with iOptron 12 mm eyepiece. Seeing 8/10, transparency 5/6.*

Image 6, Anaxagoras, *James Brunkella, Thousand Oaks, California, USA. 2024 November 09 04:12 UT. Intes 9 inch f/15 Maksutov-Cassegrain telescope, iPhone 12 with iOptron 12 mm eyepiece. Seeing 8/10, transparency 5/6.*

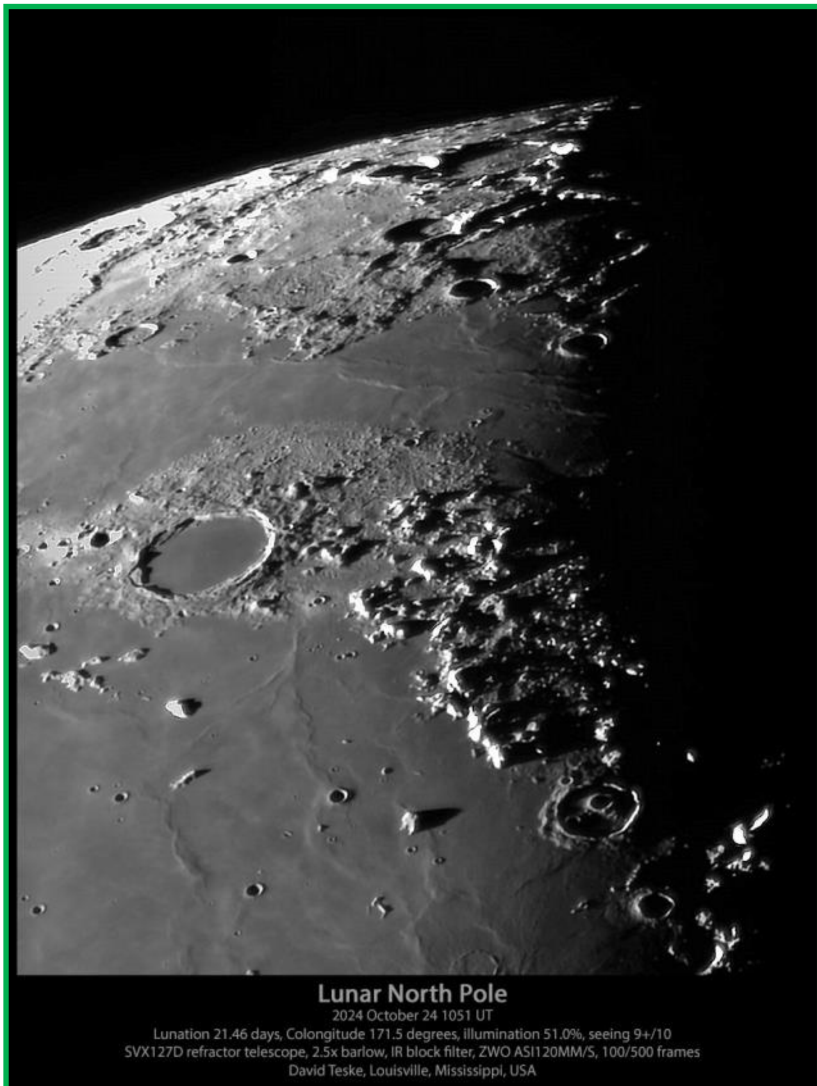


***Image 7, Anaxagoras**, David Teske, Louisville, Mississippi, USA. 2024 October 24 10:51 UT, colongitude 171.5˚. Stellarvue SVX127D refractor telescope, 2.5x Power Mate, IR block filter, ZWO ASI120MM/S camera. Seeing 9+/10.*

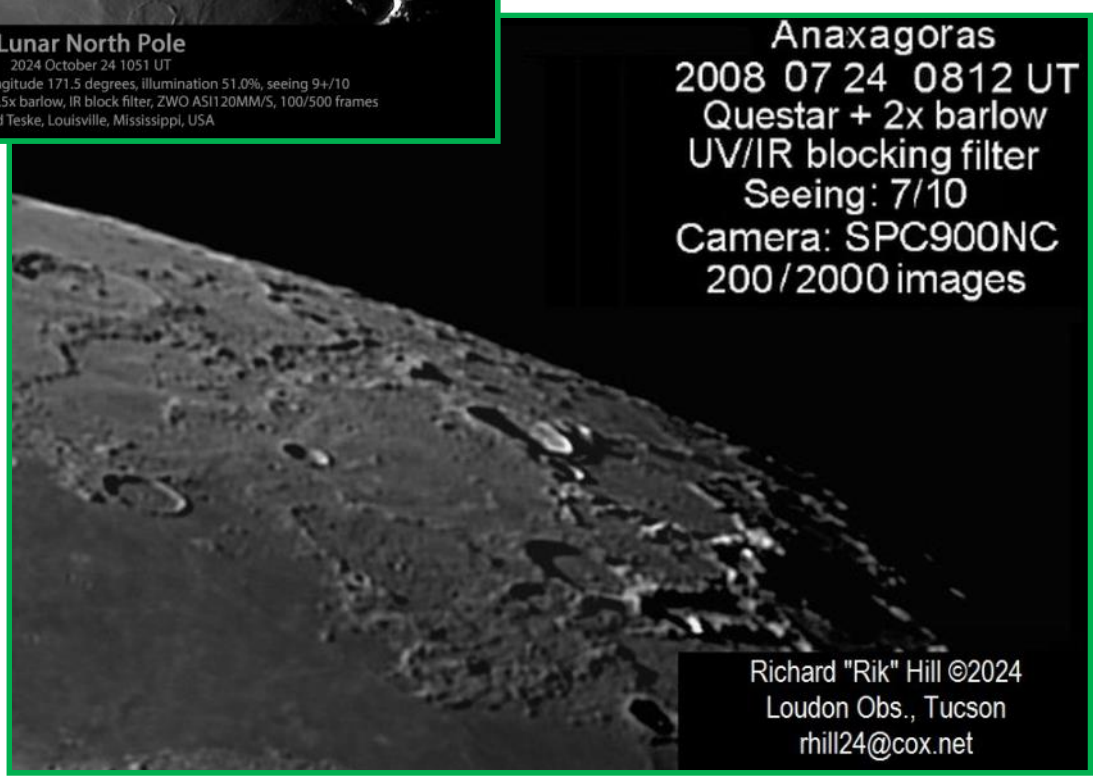


***Image 8, Anaxagoras,** Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2008 July 24 08:12 UT. 3.5 inch Questar Maksutov-Cassegrain telescope, 2x barlow, UV/IR block filter, SPC900NC camera. Seeing 7/10.*

Focus On: Lunar Topographic Studies
Anaxagoras, the “Tycho” of the North

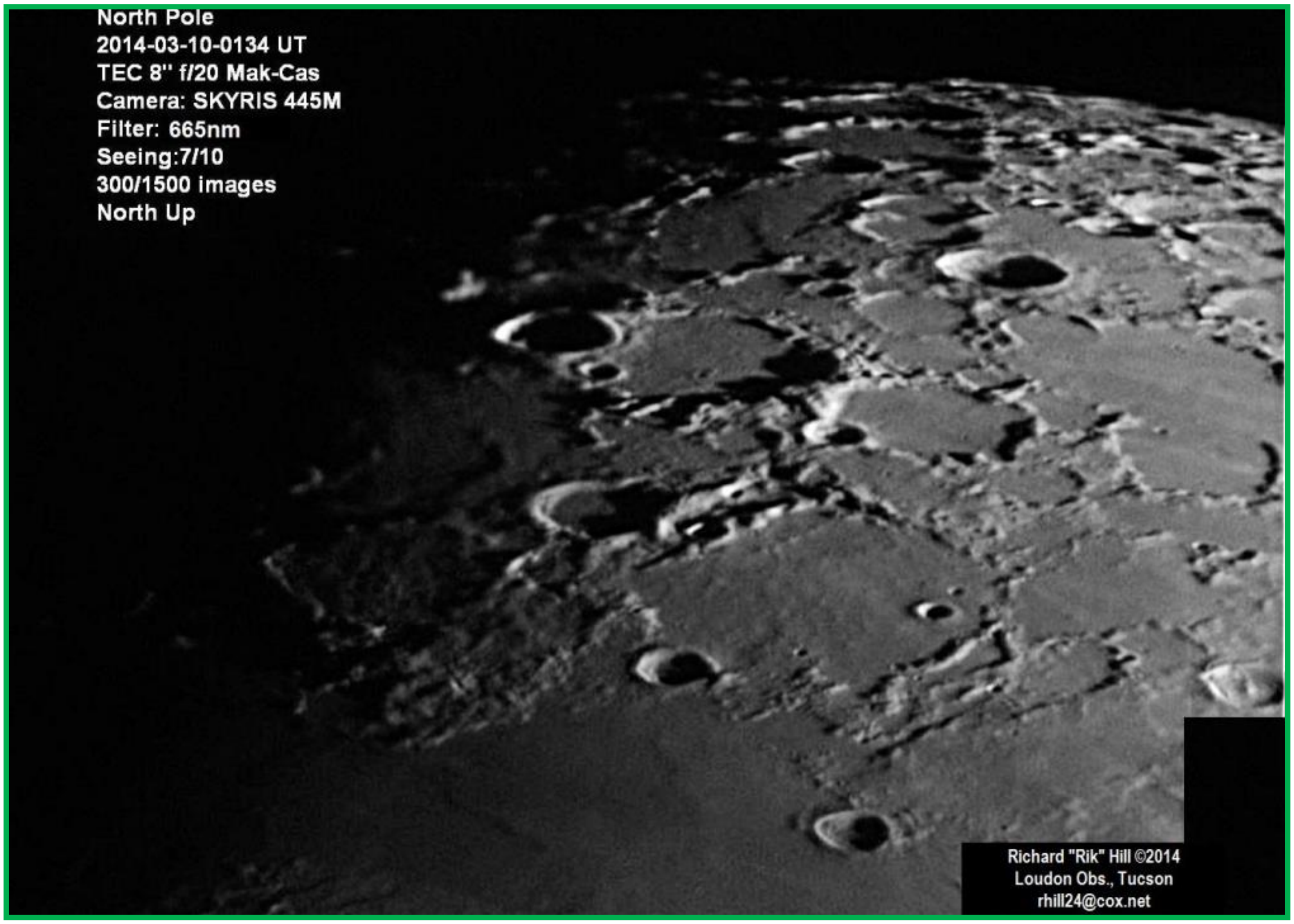
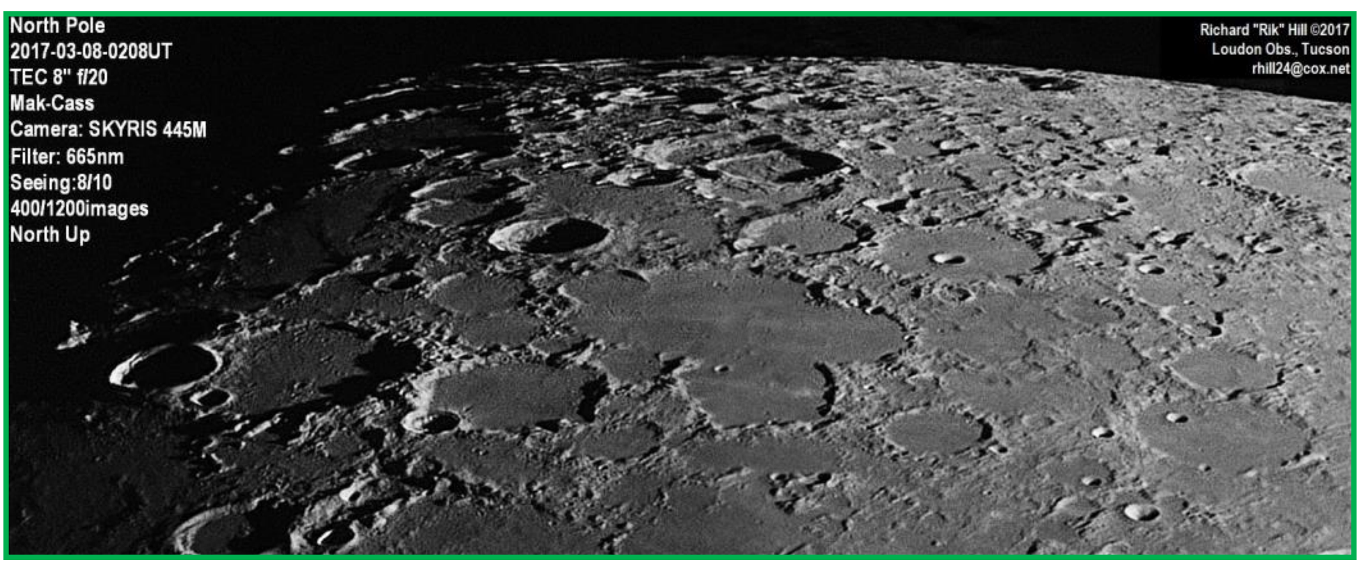


Image 9, Lunar North Pole, *Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2014 March 10 01:34 UT. 8 inch f/20 TEC Maksutov-Cassegrain telescope, 665 nm filter, SKYRIS445M camera. Seeing 7/10.*

Image 10, Lunar North Pole, *Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2017 March 08 02:08 UT. 8 inch f/20 TEC Maksutov-Cassegrain telescope, 665 nm filter, SKYRIS445M camera. Seeing 8/10.*



Focus On: Lunar Topographic Studies

Anaxagoras, the "Tycho" of the North

The location of Anaxagoras, unfortunate for earthlings, makes it difficult to appreciate its terraced walls; in **IMAGES 11 and 12** you can see that they are quite regular." The interior walls are heavily terraced and the rim crests are Sharp" (Garfinkle), as seen in the delineation of the outer edges in **IMAGE 13 and 14**.

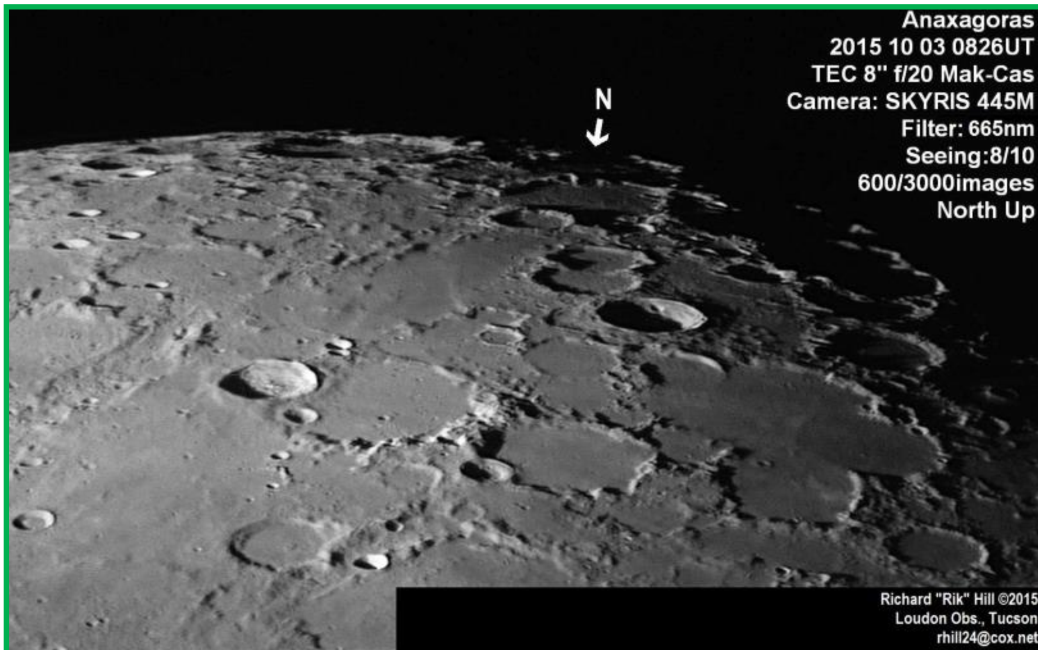


Image 11, Anaxagoras, *Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2015 October 03 08:26 UT. 8 inch f/20 TEC Maksutov-Cassegrain telescope, 665 nm filter, SKYRIS 445M camera. Seeing 8/10.*

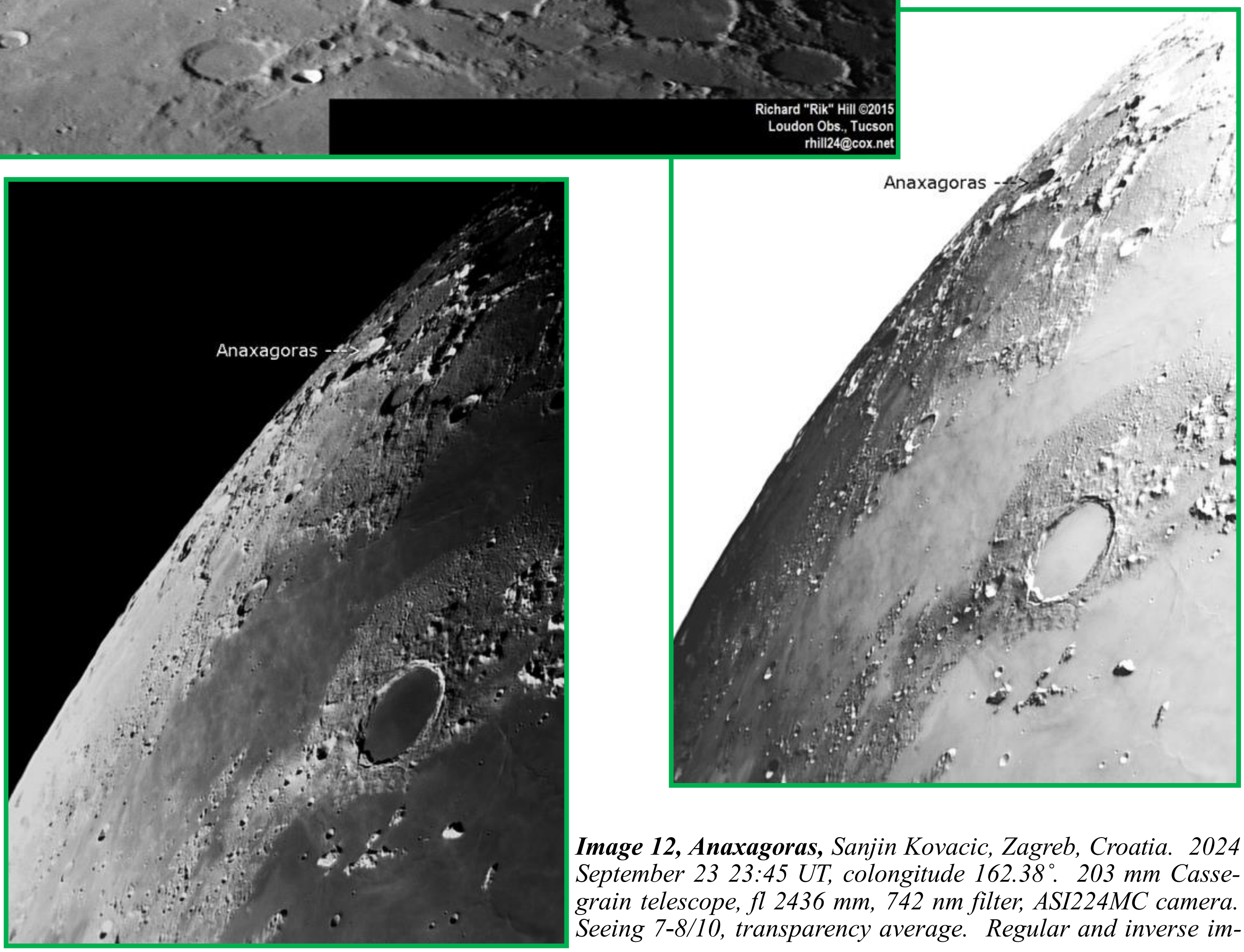
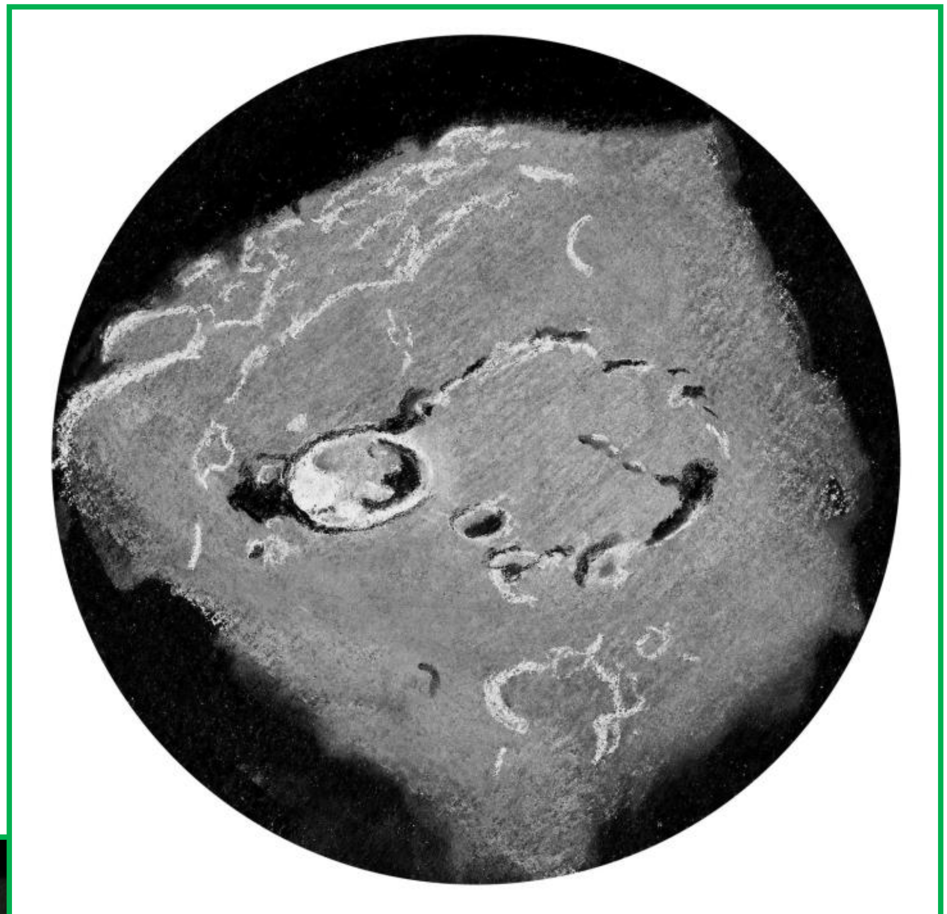


Image 12, Anaxagoras, *Sanjin Kovacic, Zagreb, Croatia. 2024 September 23 23:45 UT, colongitude 162.38˚. 203 mm Cassegrain telescope, fl 2436 mm, 742 nm filter, ASI224MC camera. Seeing 7-8/10, transparency average. Regular and inverse images.*

__Image 13,__ Anaxagoras, Michel Deconinck, Artignosc Provence, France. 2024 November 11 18:20 UT. Takahashi 250 mm Mewlon Dall-Kirkham telescope, f/10, 357 x.



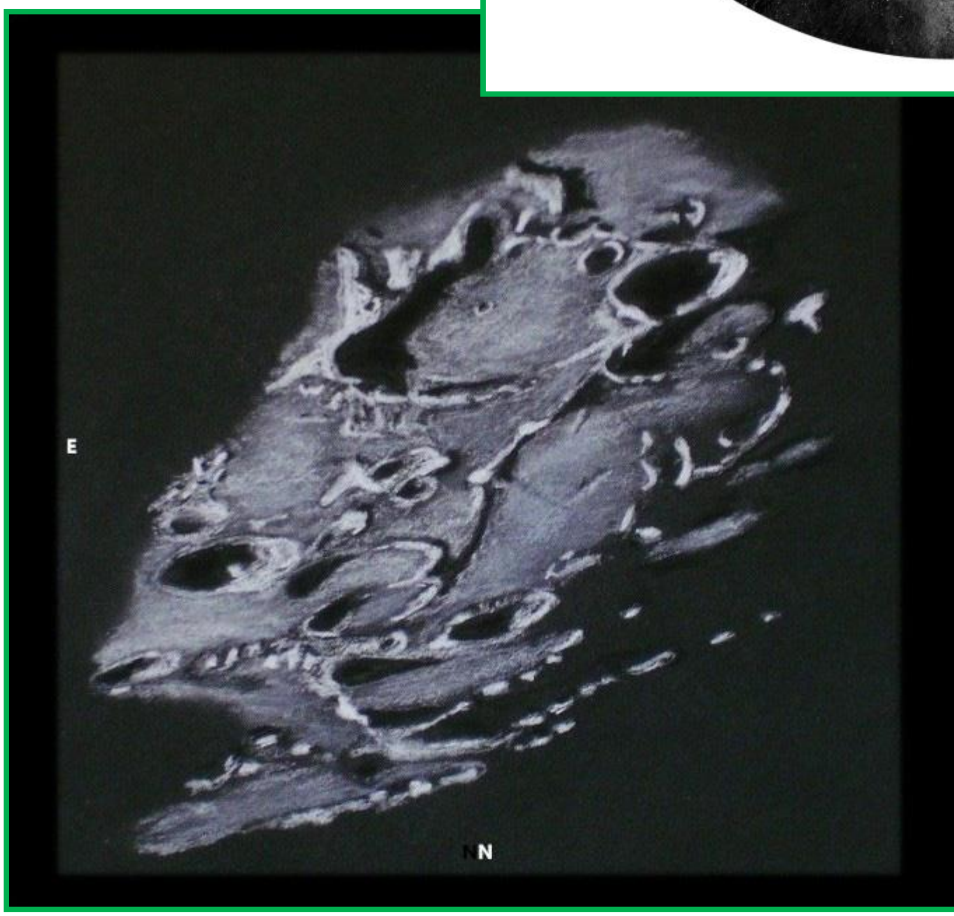


***Image 14, Anaxagoras,** Thomas McCague, Oak Forest, Illinois, USA. 2014 April 09 01:00-02:35 UT. 13.1 inch Dobsonian reflector telescope on an equatorial platform, 6 mm eyepiece, 333x. Thomas adds: "*For several nights this week the lunar North Pole has been tilted more towards earth due to favorable lunar libration in latitude. It has been a good opportunity to view craters such as Whipple, Peary, Byrd and others. I had a clear night with average seeing so I took advantage of the opportunity to sketch the illuminated region near the pole. At my location the Moon was at more than 60 degrees above the horizon which also helped with the time needed to complete a sketch."

And it is also difficult to appreciate the floor of Anaxagoras, both because of its location near the north pole and because of the depth of the crater. If we look at **IMAGES 15 and 16**, we observe a rather chaotic floor, which could be illustrated by the following description (made with orbital images from the Lunar Reconnaissance Orbiter and, therefore, of much higher resolution): “The floor of Anaxagoras is covered in impact melt that is riddled with cracks that probably formed during cooling (…) Much of the impact melt on the floor of Anaxagoras is smooth, but there are some places with cracks or negative-relief features. These cracks and pit-like features probably formed during cooling of the melt as the material fractured (…) there are several hills and bulges that are covered with clusters of boulders” (Ostrach, 2011).

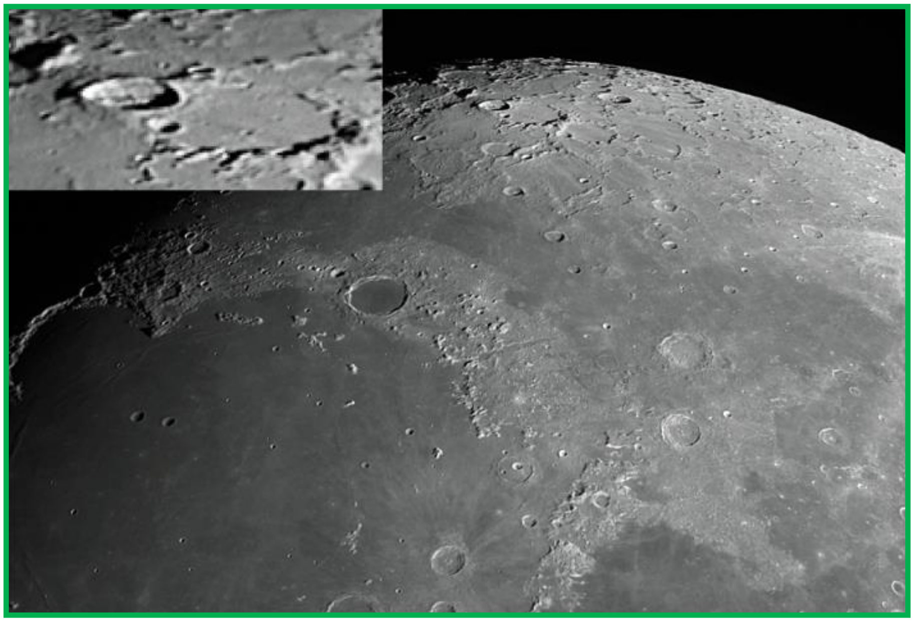
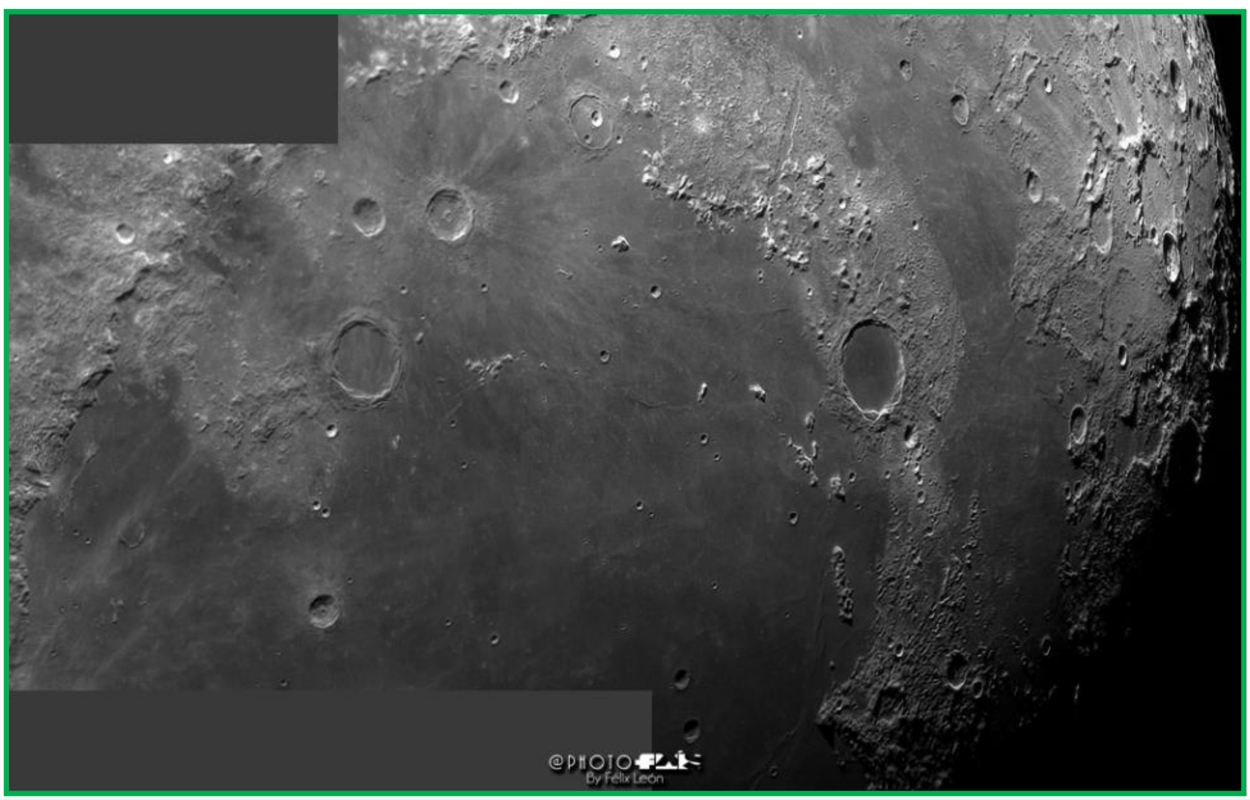


Image 15, Anaxagoras, Desiré Godoy, *Oro Verde, Argentina, SLA. 2020 August 28 23:45 UT. 200 mm refractor telescope, 742 nm filter, QHY5-II camera.*

Image 16, Anaxagoras, *Felix León, Santo Domingo, República Dominicana. 2021 January 23 23:35 UT. 127 mm Maksutov-Cassegrain telescope, DMK21618AU camera. North is to the right, west is up.*



From this chaos emerges the most obvious topographical element, as Elger (as a visual observer) highlights: “There is a long ridge on the floor, running from W. to E.”, visible in the previous images and also in visual observations such as **IMAGE 13** and those in **IMAGE 17**, as well as in **IMAGE 18 and 19** (where Anaxagoras is located in the upper right corner), and especially in **IMAGE 20**. Obviously, the elevation that Elger points out is the most visible feature of the chaotic floor of Anaxagoras. In **IMAGE 21** we also see another characteristic that we indicate with an arrow and that Garfinkle highlights: “An arc of ejecta materials is concentric with the eastern exterior walls”, more difficult to see, in the opposite side: “Chains of small secondary craters extend radially outward across the ejecta blanket on the western side of the crater” (Garfinkle) (**IMAGE 22**).

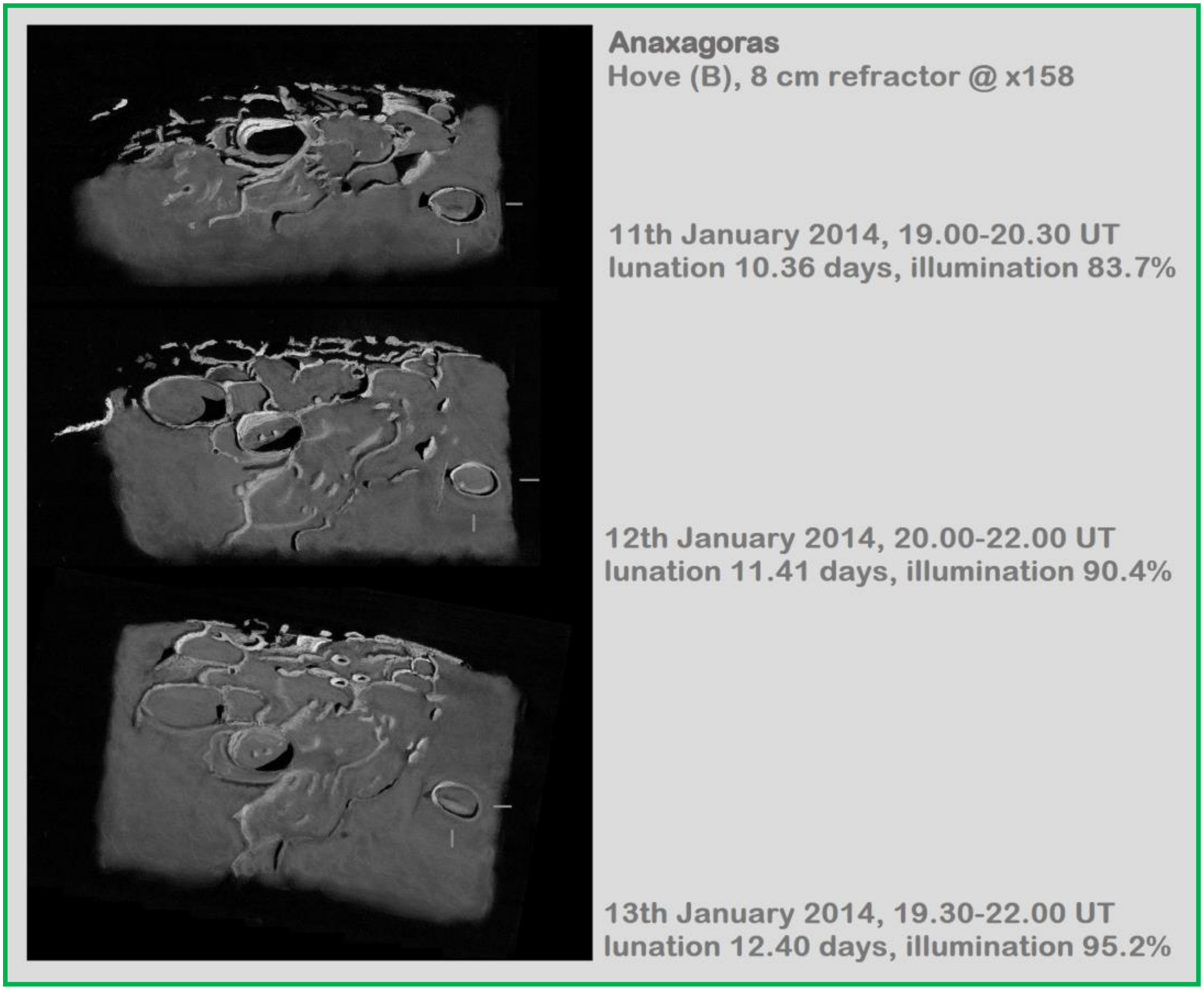


Image 17, Anaxagoras, *Jef de Wit, Hove, Belgium. 2014 January 11 19:00-2030 UT, 2014 January 12 20:00-22:00 UT and 20214 January 13 19:30-22:00 UT. 8 cm refractor, 158 x.*

Image 18, Anaxagoras, *Mike Karakas, Winnipeg, Manitoba, Canada. 2024 February 19 01:58 UT. Celestron 11 inch Schmidt-Cassegrain telescope, f/10, 1.8x Tele Vue barlow, 642 nm IR-pass filter, ZWO ASI174MM camera. Seeing 5-6/10.*

Image 19, Anaxagoras, *David Teske, Louisville, Mississippi, USA. 2024 October 14 03:10 UT, colongitude 45.3˚. FOA60Q refractor telescope, 2.5x Power mate, IR block filter, ZWO ASI120MM/S camera. Seeing 8/10.*

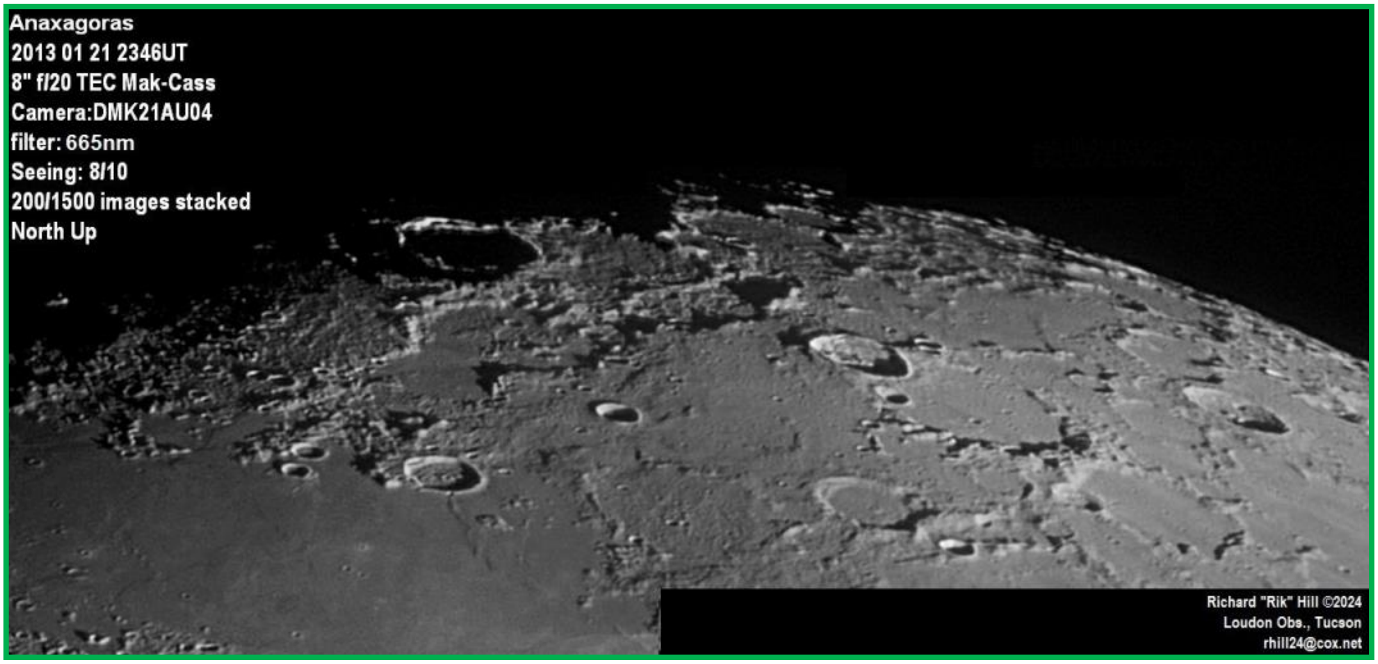


Image 20, Anaxagoras, *Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2013 January 21 23:46 UT. 8 inch f/20 TEC Maksutov-Cassegrain telescope, 665 nm filter, DMK21AU04 camera. Seeing 8/10.*

Image 21, Anaxagoras, *Francisco Alsina, Cardinalli, Oro Verde, Argentina. 2020 August 28 23:21 UT. 200 mm refractor telescope, 742 nm filter, QHY5-II camera.*

Focus On: Lunar Topographic Studies
Anaxagoras, the "Tycho" of the North

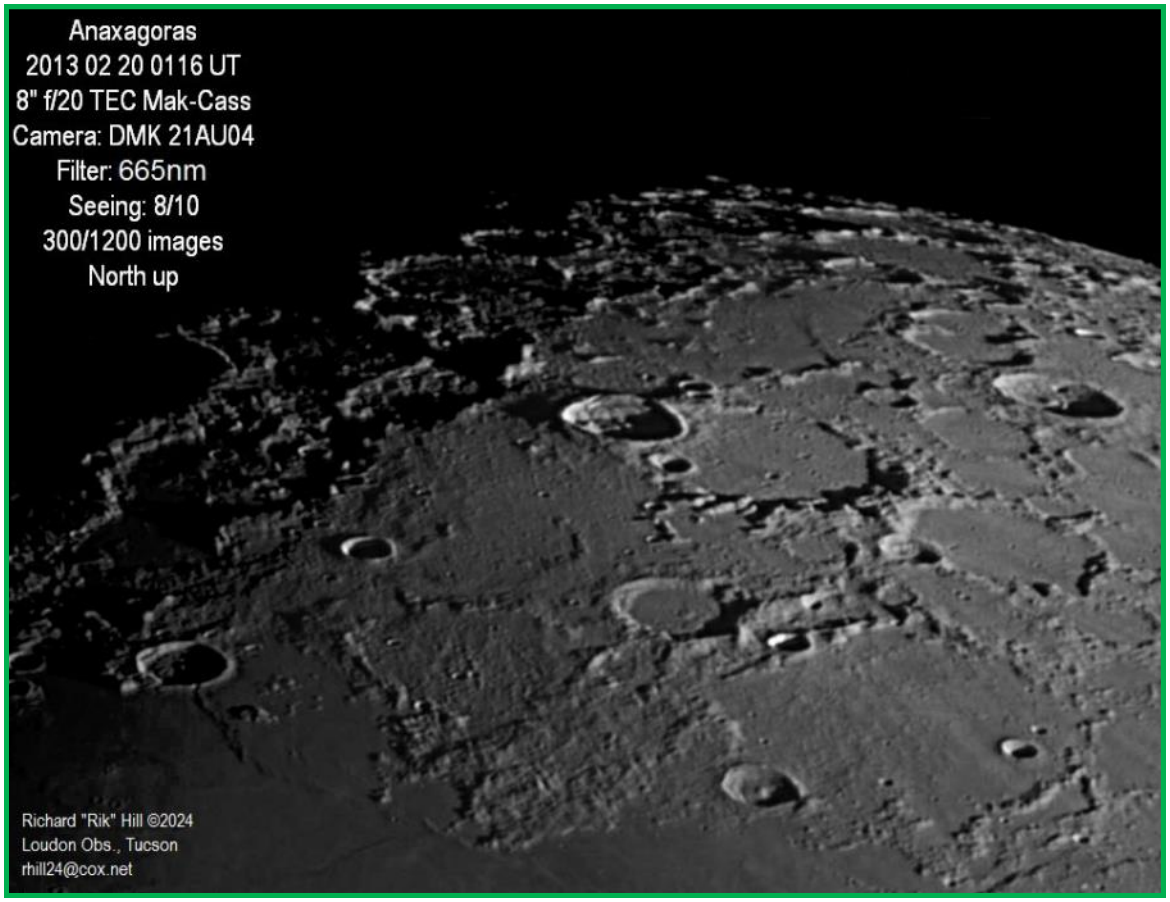


***Image 22, Anaxagoras,** Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2013 February 20 01:16 UT. 8 inch f/20 TEC Maksutov-Cassegrain telescope, 665 nm filter, DMK21AU04 camera. Seeing 8/10.*

In the images above, you can see the central peak of Anaxagoras, one of its main features: ("The central peak complex rises to a summit about 1000 m (3280 feet) above the hilly floor", Garfinkle). The material of the central peak of Anaxagoras is believed to be composed of pure anorthosite, "which, by definition, is a coarse-grained, mafic (**MA**gnesium + Iron **F**err**IC**) igneous plutonic rock - one that has formed at considerable depth within a planet or moon -approaching 98% volume in plagioclase (a feldspar mineral). The anorthosite presence is believed to be a signature of differentiation processes (its low density caused it to float to the top forming a thin crust) in a magma ocean that once encompassed the early-forming Moon. Recent reflectance spectral data obtained by the Japanese Kaguya/Selene spacecraft (…) points to the possibility of a global layer of pure anorthositic rocks in the upper crust of the Moon. Signatures of the anorthosite deposits, composed of nearly 100% volume plagioclase, particularly showed up in areas of crater central peaks, walls, ejecta and basin rings, and is suggested as being ubiquitously present within the depth range from 3 km to at least 30 km in a global perspective. Whether this latter finding is the case or that the pure anorthositic signatures are due to discrete intrusive bodies is still uncertain, however, further analyses around such regions are certain to provide a constraint on models of lunar magma ocean formation and formation of the Moon" (Moore, 2009). This extensive quote is the explanation of why an area very close to the central peak of Anaxagoras was selected as a "Region of interest" for a future lunar mission in the cancelled Constellation Program (2009), since The lunar highlands are thought to have formed as a result of a global melting event early in the Moon's history, during which plagioclase floated to the top of the ocean and solidified as an upper layer of anorthosite. The study of anorthosite occurrence is thus important for investigating the global magma ocean concept and the evolution/ development of the lunar crust" (Bray, 2010).

Not only is the central peak made of anorthosite but it is also "the material ejected and deposited onto the floor of Goldschmidt crater to the east, indicates that the Anaxagoras crater-forming impact excavated pure anorthosite" (Bray, 2010), which would be the reason why the nearby Goldschmidt crater is so bright with frontal illumination near the full Moon, as we can see in **IMAGE 23** "Pure anorthosite occurs in the Anaxagoras ejecta on the floor of Goldschmidt, but the crater's other ejecta are not pure anorthosite. (Does this explain why the floor of Goldschmidt is bright at full Moon?) Ray Hawke and colleagues account for the inconsistent ejecta compositions by proposing that anorthosite underlies a more mafic unit directly under Anaxagoras" (Wood, 2007).

Image 23 Anaxagoras, *Jairo Chavez, Popayán, Colombia. 2023 July 30 00:45 UT. 311 mm truss Dobsonian reflector telescope, MOTO E5 PLAY camera. North is right, west is up.*

3.-A BEAUTIFUL BRIGHT RAYS SYSTEM

"The north polar region of the Moon is blessed with two wonderful ray systems (…) that few observers pay attention to. (…) the bright rayed craters Anaxagoras and Thales are well seen - often they are so bright that they are difficult to identify" (Wood, 2004). In **IMAGE 24** we see both systems of bright rays, Anaxagoras on the left, much more extensive (its bright rays can cover distances of 900 kilometers from the crater) and Thales on the right, the bright rays of both crossing north of Aristoteles. Of course, we earthlings miss a good part of the bright rays of Anaxagoras, those that go so far north that they are on the far side (and we cannot see them in orbital images, the bright rays are a spectacle for distant observers). To the south we can see that they extend further to the southwest than to the southeast (they do not seem to cross Plato, but the bright rays on the left do go further south).

Image 24, Anaxagoras, *Alberto Anunziato, Panará, Argentina. 2019 September 15 04:28 UT. 180 mm reflector telescope.*

Focus On: Lunar Topographic Studies

Anaxagoras, the "Tycho" of the North

We cannot compare the bright rays that extend to the north (as we said, because a good part runs on the far side) and to the south, but we can compare those that run to the east and west. "The rays differ east and west of the crater. To the east there are many narrow filamentary rays, whereas on the west, there are fewer rays that are wider and more widely spaced. In fact, the crater Philolaus - due west of Anaxagoras - is straddled by rays, but none cross it" (Wood, march 2007). The field of view in **IMAGE 25** shows mainly the bright rays west of Anaxagoras, wide and separated, **IMAGE 26** is even more illustrative, we see only the bright western rays (Anaxagoras is on the very edge of the image) and how they do not cross Philolaus. In **IMAGE 27**, with a more frontal illumination, we can deduce that the western rays are less prominent than the eastern ones, which are much more clearly distinguished. If we paid attention to these two last images, we can see that the eastern rays would be shorter than the western ones. All this, according to the previous quote from Wood, "provides a slight suggestion that the projectile may have come from the west, but not at a very low angle" - **IMAGE 27** also shows the curious shape of two very prominent western rays: "It is peculiar that two of the western rays bend - I don't know why that happens". In **IMAGE 28** we mark these two bending rays with arrows.

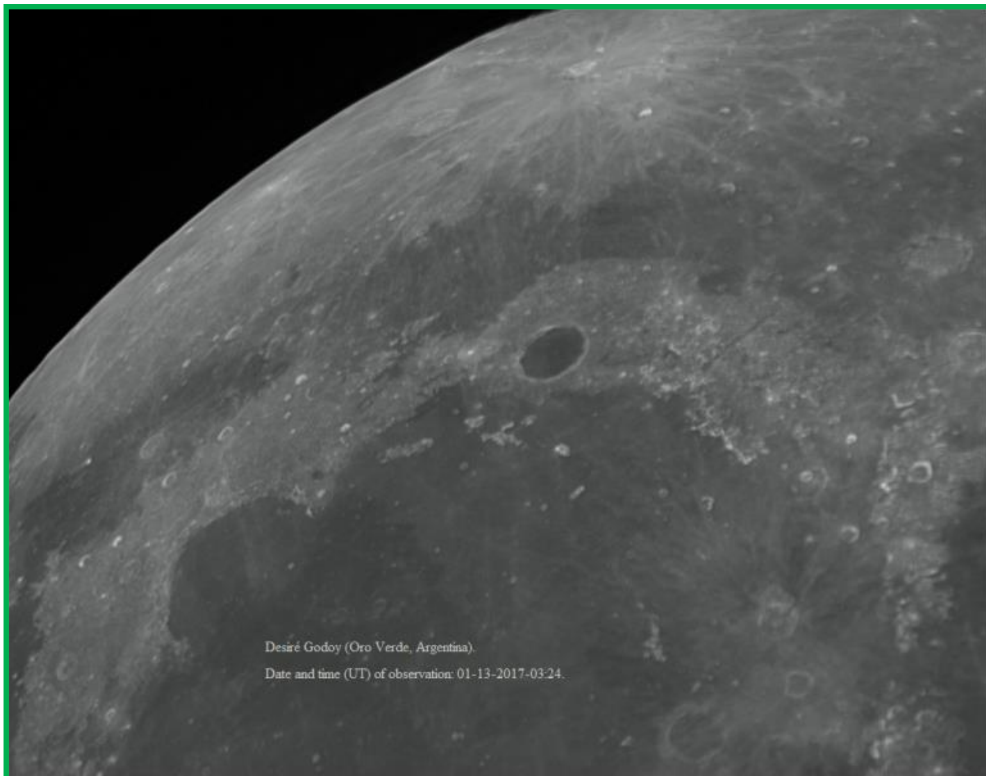


Image 25, Anaxagoras, Desiré Godoy, *Oro Verde, Argentina, SLA. 2017 January 13 03:24 UT. 200 mm refractor telescope (Meade Starfinder 8), QHY5-II camera.*

Image 26, Anaxagoras, Desiré Godoy, *Oro Verde, Argentina, SLA. 2017 January 13 03:31 UT. 200 mm refractor telescope (Meade Starfinder 8), QHY5-II camera.*

Image 27, Anaxagoras, *Francisco Alsina, Cardinalli, Oro Verde, Argentina. 2019 February 17 03:20 UT. 200 mm refractor telescope, QHY5-II camera.*

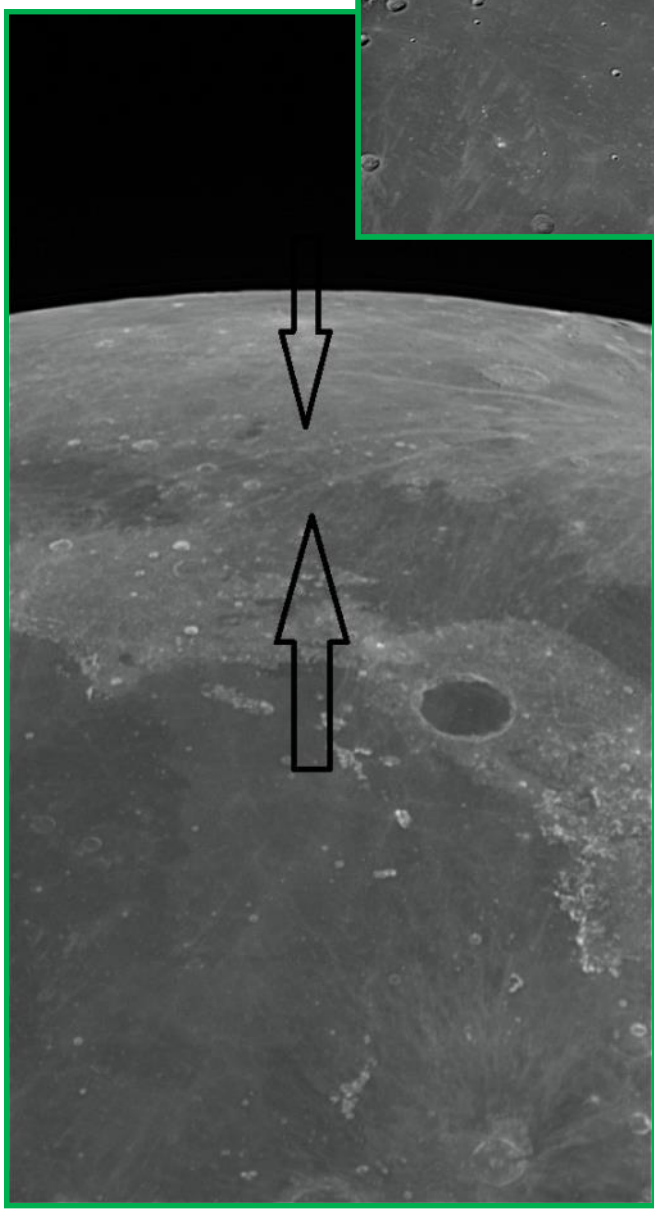


Image 28, Anaxagoras, Desiré Godoy, *Oro Verde, Argentina, SLA. 2017 January 13 02:57 UT. 200 mm refractor telescope (Meade Starfinder 8), QHY5-II camera.*

Anaxagoras' rays are so extremely bright that they cancel out all nearby features when they shine in frontal illumination as seen in **IMAGES 29 to 31**. In **IMAGE 32** (Anaxagoras is at the upper edge, to the right) we see another bright but smaller ray system to the southeast of Anaxagoras. This is Epigenes A, according to Charles Wood: “Also note the very narrow ray at an angle to most rays south of Anaxagoras. This, and a few others, actually come from the small bright crater Epigenes A”. I always thought that this crater, with a system of short, thick bright rays similar to Kepler's, was Timaeus, which appears farther from Anaxagoras than Epigenes A, but Timaeus is not in the ALPO BRC catalogue. The brightness of the rays from these combined systems is so strong that lunar features are very easily confused, and many disappear. I leave the question to the reader (Epigenes A or Timaeus?) with a more defined image such as **IMAGE 33**.

Image 29, Anaxagoras, *Jairo Chavez, Popayán, Colombia. 2021 January 15 02:53 UT. 311 mm truss Dobsonian reflector telescope, MOTO E5 PLAY camera.*

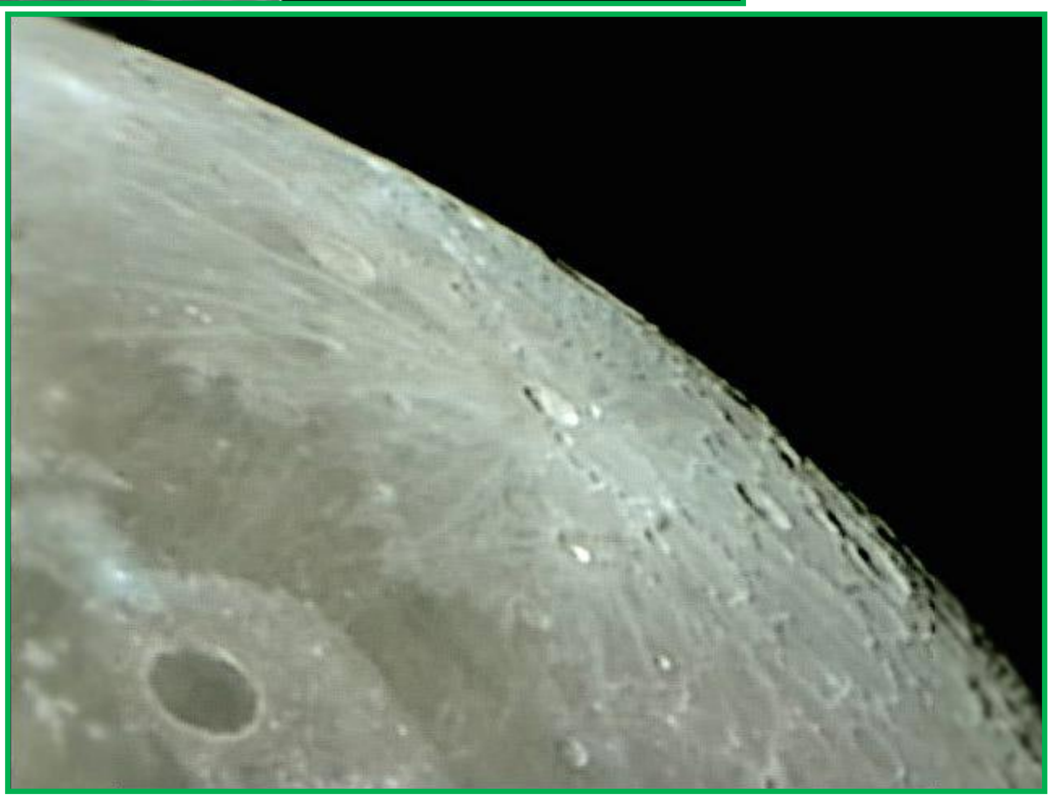


Image 30, Anaxagoras, *Alberto Anunziato, Oro Verde, Argentina. 2016 September 18 04:01 UT. Meade LX200 10 inch Schmidt-Cassegrain telescope, Phillips SPC900NC webcam. .*

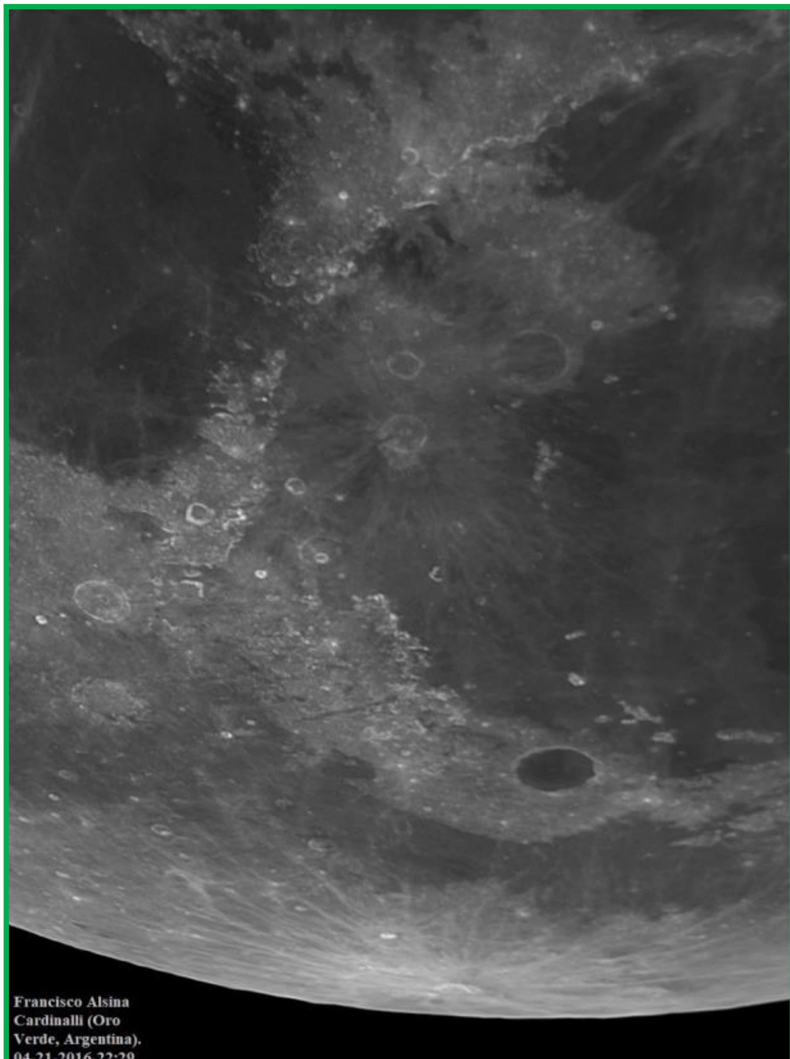


Image 31, Anaxagoras, *Francisco Alsina, Cardinalli, Oro Verde, Argentina. 2016 April 21 02:29 UT. Meade LX200 10 inch Schmidt-Cassegrain telescope, QHY5-II camera. North is down, west is to the right.*

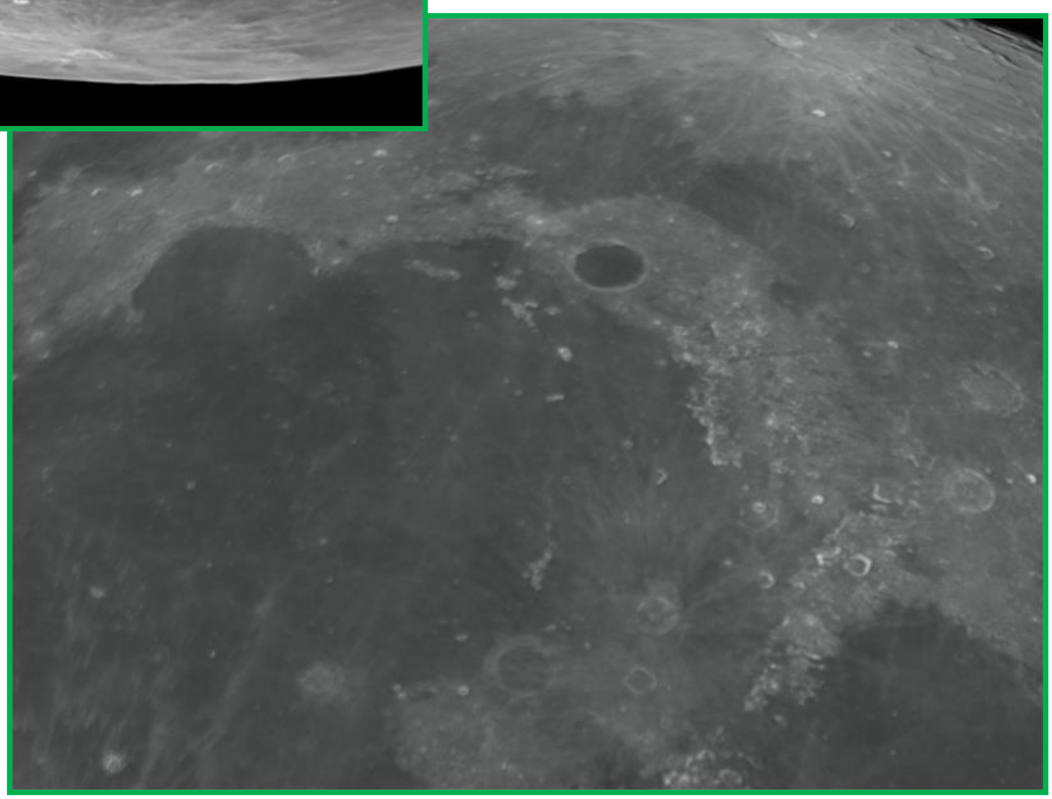


Image 32, Anaxagoras, Desiré Godoy, *Oro Verde, Argentina, SLA. 2017 January 13 03:13 UT. 200 mm refractor telescope (Meade Starfinder 8), QHY5-II camera.*

Focus On: Lunar Topographic Studies

Anaxagoras, the “Tycho” of the North

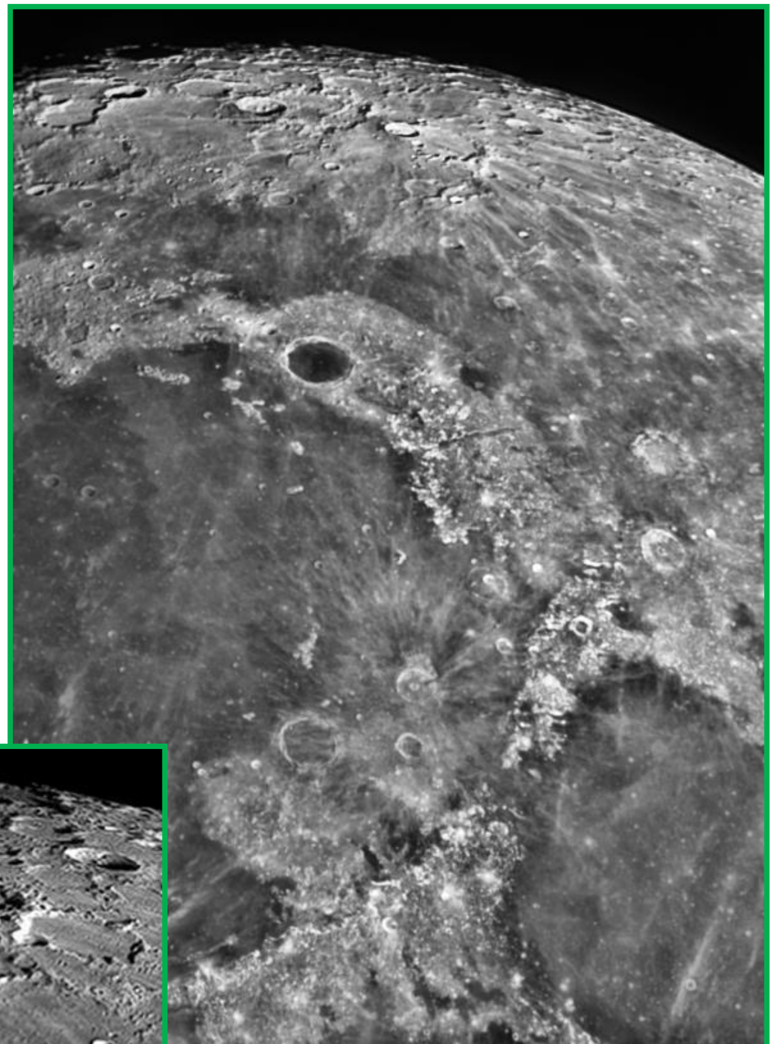


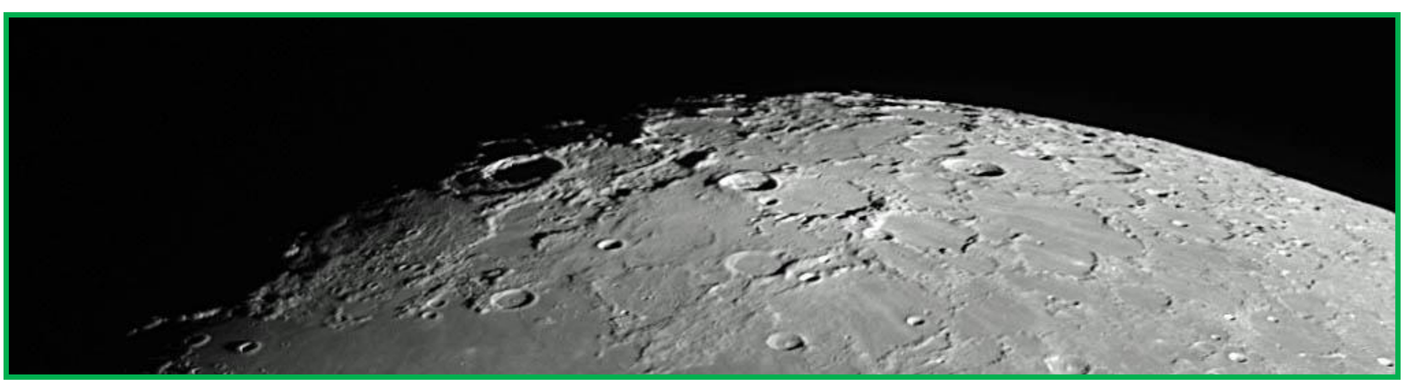
Image 33, Anaxagoras, *Sergio Babino, Montevideo, Uruguay. 2019 December 10 01:40 UT. 250 mm catadrioptic telescope, ZWO ASI174 MM camera.*

As happens with such bright ray systems (such as Tycho or Copernicus) the rays are distinguished, at least the brightest ones, even with oblique illumination, as we see in **IMAGES 34 to 37**.

Image 34, Anaxagoras, *Felix León, Santo Domingo, República Dominicana. 2021 January 23 23:25 UT. 127 mm Maksutov-Cassegrain telescope, DMK21618AU camera. North is to the right, west is up.*

Image 35, Anaxagoras, *Alberto Anunziato, Panará, Argentina. 2020 September 27 00:06 UT. 180 mm reflector telescope, QHY5-II.*

Image 36, Anaxagoras, *Francisco Alsina, Cardinalli, Oro Verde, Argentina. 2020 August 28 23:26 UT. 200 mm refractor telescope, 742 nm filter, QHY5-II camera.*



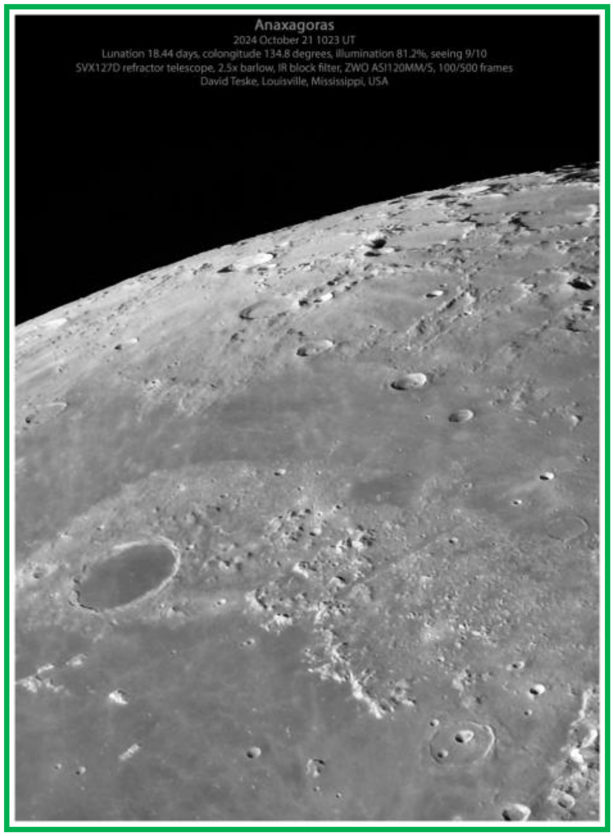


***Image 37, Anaxagoras**, David Teske, Louisville, Mississippi, USA. 2024 October 21 10:23 UT, colongitude 134.8˚. Stellarvue SVX127D refractor telescope, 2.5x Power Mate, IR block filter, ZWO ASI120MM/S camera. Seeing 9/10.*

4.-ANORTHOSITE RAYS

Despite the magnificence of Anaxagoras' bright rays, the most fascinating thing about Anaxagoras, in my opinion, are the bright rays (or bands) that emerge from the interior of the crater and seem to "climb" the walls and extend a few kilometers outside. I still remember the first time I saw them, when processing a photographic image obtained with my telescope, which is **IMAGE 38**. Two bright rays emerge from the center of the crater and extend outward in a westerly direction? My first thought was that they were an artifact of the image, but in the video used to the stacking they were perceived, albeit weakly. I searched and searched in my few books (fifty-somethings still look first in books) and found nothing. At that time, I did not have “The Modern Moon” in my library, which does refer to what we mentioned: “when the libration is good and it is near full moon, the inner wall of the crater can be seen to be crossed by two or more bright stripes of ray material”. It was not easy for me to find data on the Internet either, until I found a Lunar Picture of the Day (LPOD) from May 28, 2012 (we have already drawn a lot on those wonderful reviews by Chuck Wood in this text), in which one can see “Two broad zones of material on the western wall and continued beyond the rim crest down the outer wall”, in the words of Chuck Wood, “it seems most likely that the wall zones are bright (hence anorthosite) material ejected during formation of the crater”. Today I have not been able to find that text by Wood online, so I quote my text in *The Lunar Observer*, from where I extracted the quote. What I had considered to be bright material because it was pulverized material in the ejecta, was bright per se, being the oldest type of lunar rock, the material that formed the lunar crust and that is preserved on the surface of the highlands. Perhaps the brightness of these strange rays is due to both reasons: 1) intrinsically bright material, anorthosite ejected from the crust by a Copernican impact, and therefore recent (which Wood considers oblique), 2) material that has not yet been darkened by space weather, like all bright rays. That is why both inner rays appear brighter than the central peak, which we also know is pure anorthosite.

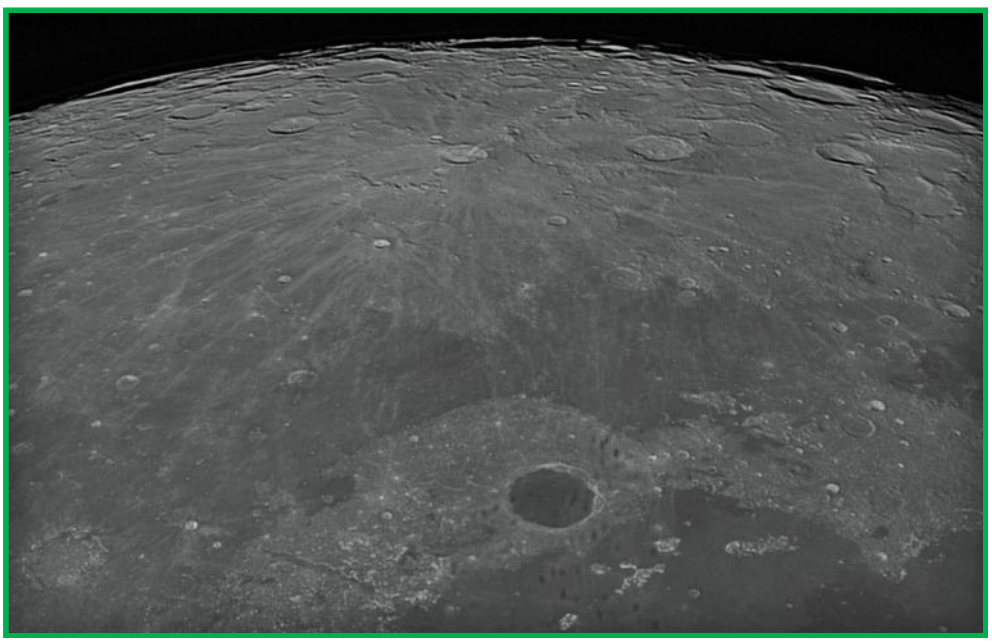
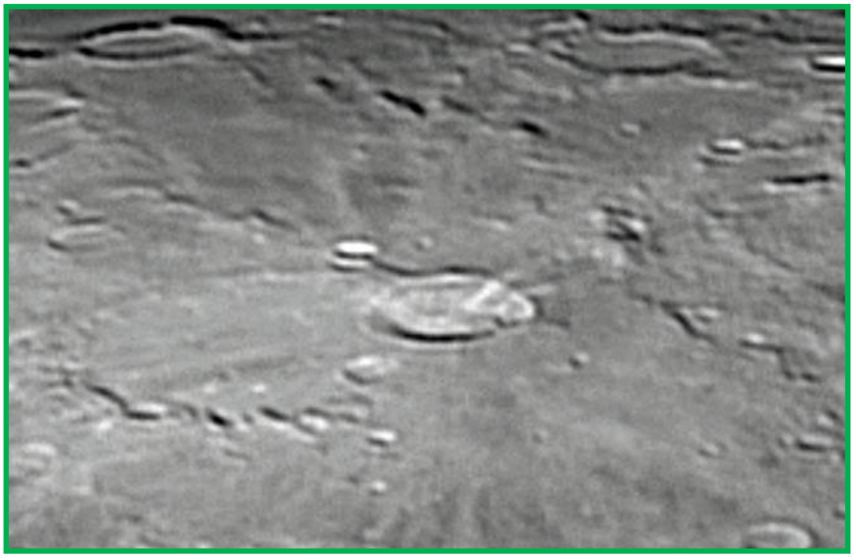


***Image 38, Anaxagoras,** Alberto Anunziato, Paraná, Argentina. 2017 December 03 04:14 UT. Meade EX105 Maksutov-Cassegrain telescope, QHY5-II camera. West is to the right.*

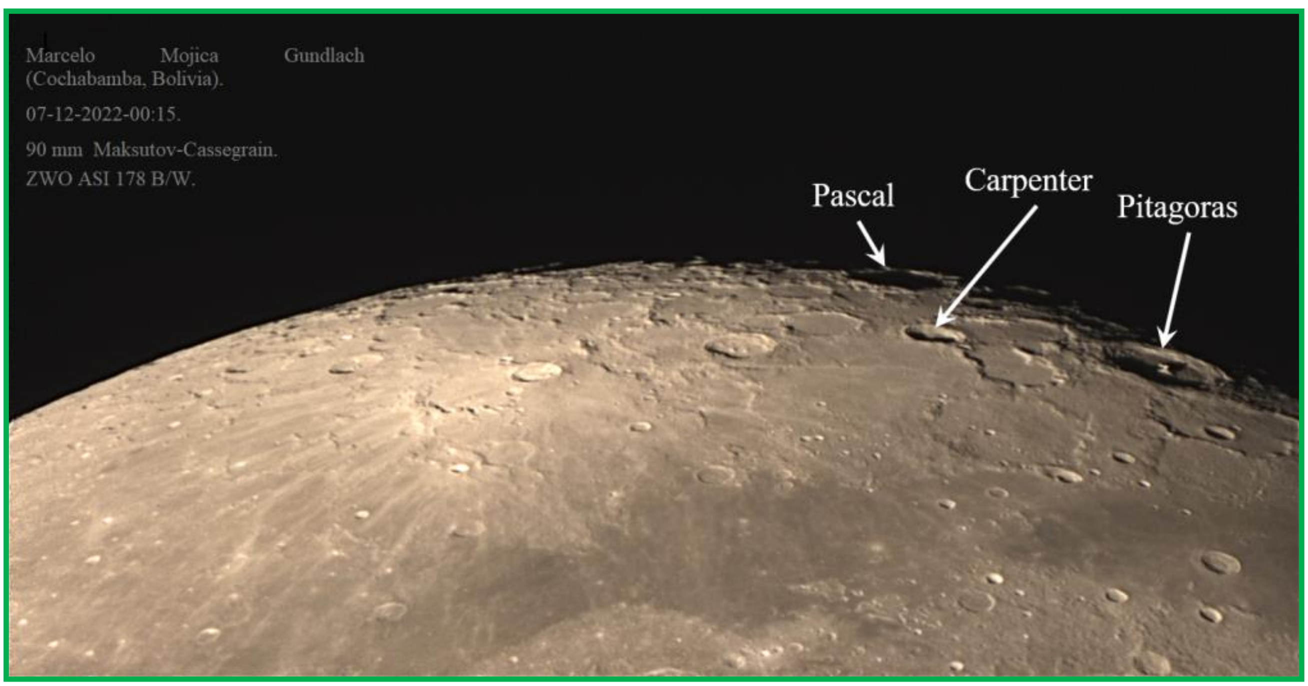


At the time of writing this text I was only observing the two western rays, but one also “climbs” up the eastern wall from the inside, although much less bright, as we see in **IMAGE 39**, which is a detail of **IMAGE 38**. The two western rays are parallel, of similar brightness and seem to join at the base, while the eastern ray is much thicker and more diffuse. We could think of the bright rays of Anaxagoras as the luminous counterpart of the dark bands that seem to climb its walls from the inside of Aristillus (another Copernican crater). Unfortunately, the bright rays inside Anaxagoras have not been observed as much as their dark twins in Aristillus (which have a long history of observation, with the ancient hypothesis that they could be channels).

Image 39, Anaxagoras, *Alberto Anunziato, Paraná, Argentina. 2017 December 03 04:14 UT. Meade EX105 Maksutov-Cassegrain telescope, QHY5-II camera. This is a close-up of image 38. West is to the right.*

It would be interesting to follow up on their “behavior”. If we look at **IMAGES 40 and 41**, the eastern ray is almost undetectable, while in **IMAGE 42** the eastern ray appears as bright as the western ones, and brighter than in **IMAGE 38**. If we zoom enough in **IMAGES 43 and 44**, it seems that the broader and more diffuse eastern band could match, as a continuation, the central ridge, which is the more prominent floor feature. It would be an interesting observational project to record the brightness of these regions under different illumination.

Image 40, Anaxagoras, *Marcelo Mojica Gundlach, Cochabamba, Bolivia. 2022 July 12 00:15 UT. Meade 90 mm Maksutov-Cassegrain telescope, 1200 mm, ZWO ASI178B/N camera. West is to the right.*



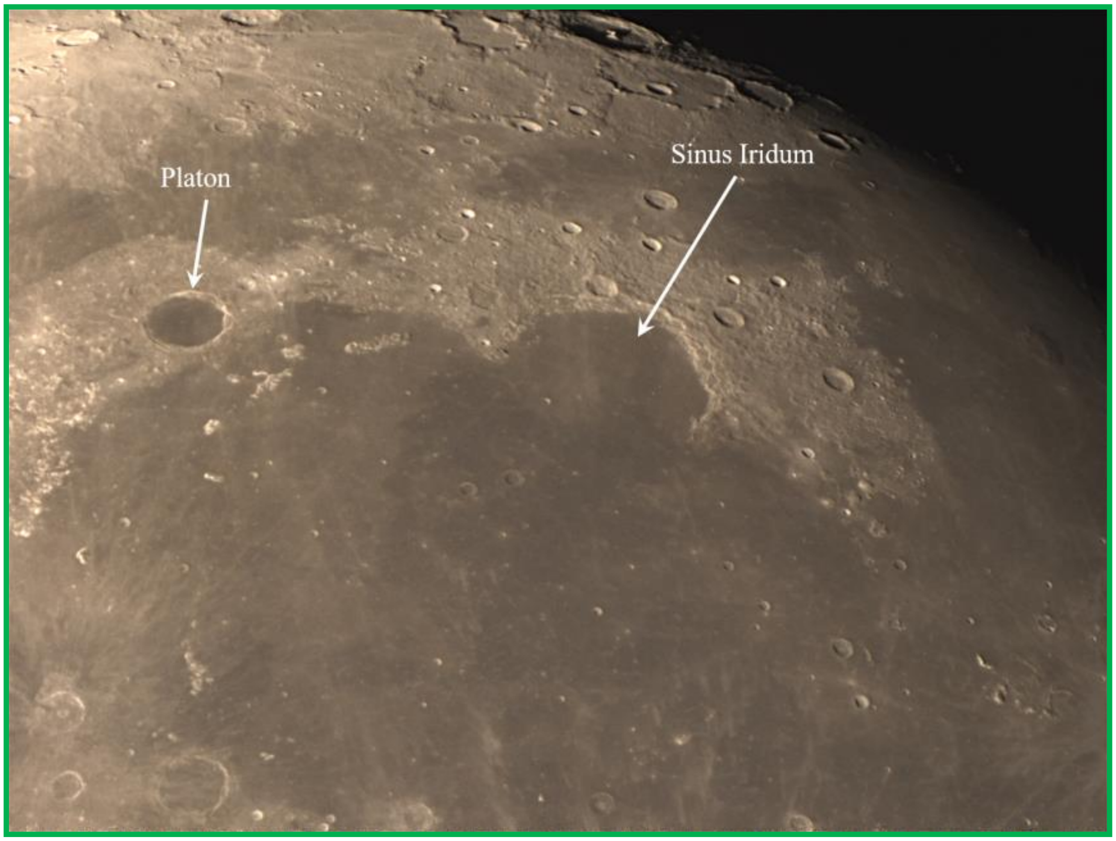


Image 41, Anaxagoras, *Marcelo Mojica Gundlach, Cochabamba, Bolivia. 2022 July 12 00:15 UT. Meade 90 mm Maksutov-Cassegrain telescope, 1200 mm, ZWO ASI178B/N camera. West is to the right.*

Image 42, Anaxagoras, Desiré Godoy, *Oro Verde, Argentina, SLA. 2017 January 13 03:25 UT. 200 mm refractor telescope (Meade Starfinder 8), QHY5-II camera.*

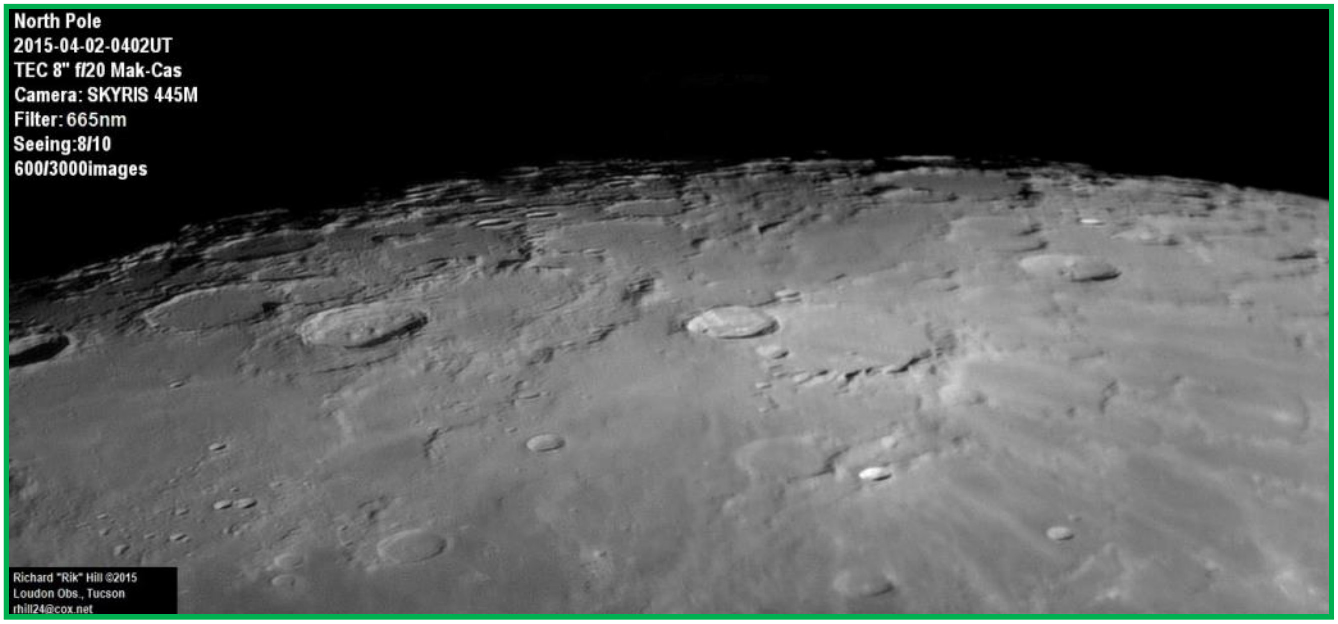


Image 43, Lunar North Pole, *Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2015 April 02 04:02 UT. 8 inch f/20 TEC Maksutov-Cassegrain telescope, 665 nm filter, SKYRIS445M camera. Seeing 8/10.*

Image 44, Lunar North Pole, *Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2015 September 26 05:02 UT. 8 inch f/20 TEC Maksutov-Cassegrain telescope, 665 nm filter, SKYRIS445M camera. Seeing 7/10.*

Focus On: Lunar Topographic Studies

Anaxagoras, the "Tycho" of the North

We close with a 3D model of our crater generated by Howard Fink (**IMAGE 45**): "I generated a 3D model of the LAC charts using LOLA data with WAC image overlays, and took snapshots of the models at various angles. Only one of each chart was published. Here is a very low view of Lunar Astronautical Chart 3. If you zoom in, you can see some grey bands where the WAC image was interpolated". Can you distinguish any relief anomaly that coincides with the bright interior rays?

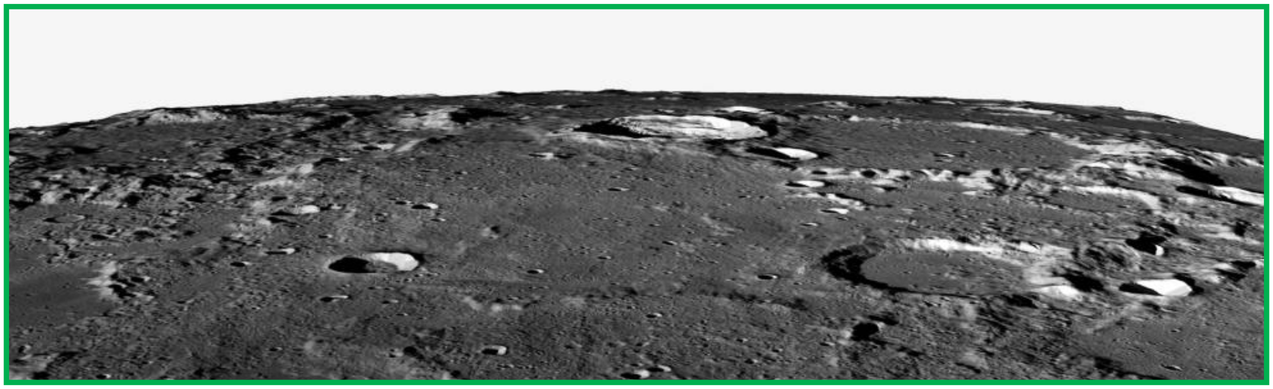


Image 45, Anaxagoras, *Howard Fink, New York, New York, USA. A 3D model of LAC (Lunar Astronautical Chart) 003 WAC at very low angle.*

REFERENCES:

Anunziato, Alberto (2018), Anorthosite Rays on Anaxagoras Wall, February 2018 issue of The Lunar Observer.

Bray, Veronica (2010), Exposed Fracture Bedrock in the Central Peak of Anaxagoras Crater, available on: https://www.lroc.asu.edu/images/155

Elger, Thomas G. (1895), The Moon, George Philip & son, London, (disponible en: https://archive.org/details/moonfulldescript00elgerich)

Garfinkle, Robert (2020), Luna Cognita, Springer, New York.

Grego, Peter (2005), The Moon and How to Observe It, Springer.

Moore, John (2009), Region of Interest Crater Anaxagoras, available on: https://the-moon.us/wiki/RoI_-_Anaxagoras_Crater

Ostrach, Lilian (2011), Impact melt in Anaxagoras crater, available on: https://www.lroc.asu.edu/images/406

Wood, Charles A. (2003), The Modern Moon. A Personal View, Sky and Telescope, Cambridge.

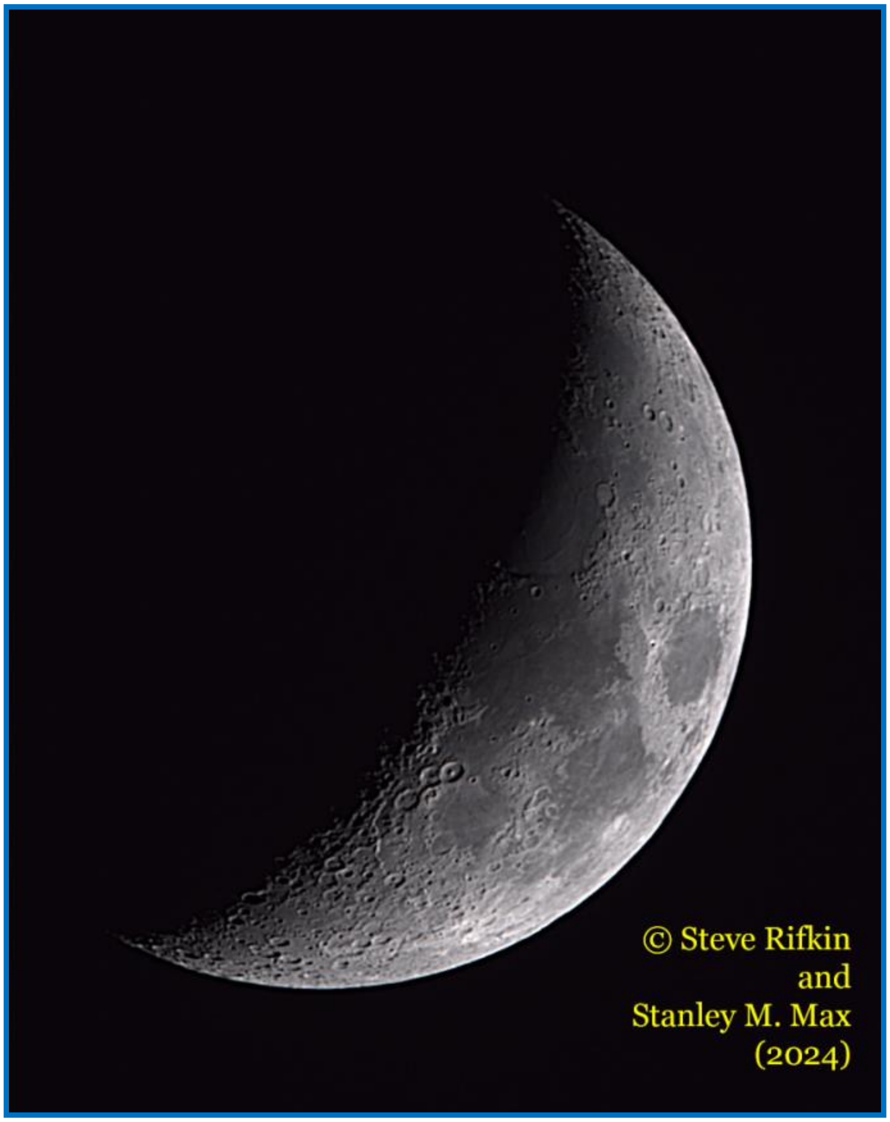
Wood, Charles (2004), North Polar Rays, available on: https://www2.lpod.org/wiki/May_14,_2004

Wood, Charles (2007), Was Anaxagoras an oblique impact, available on:

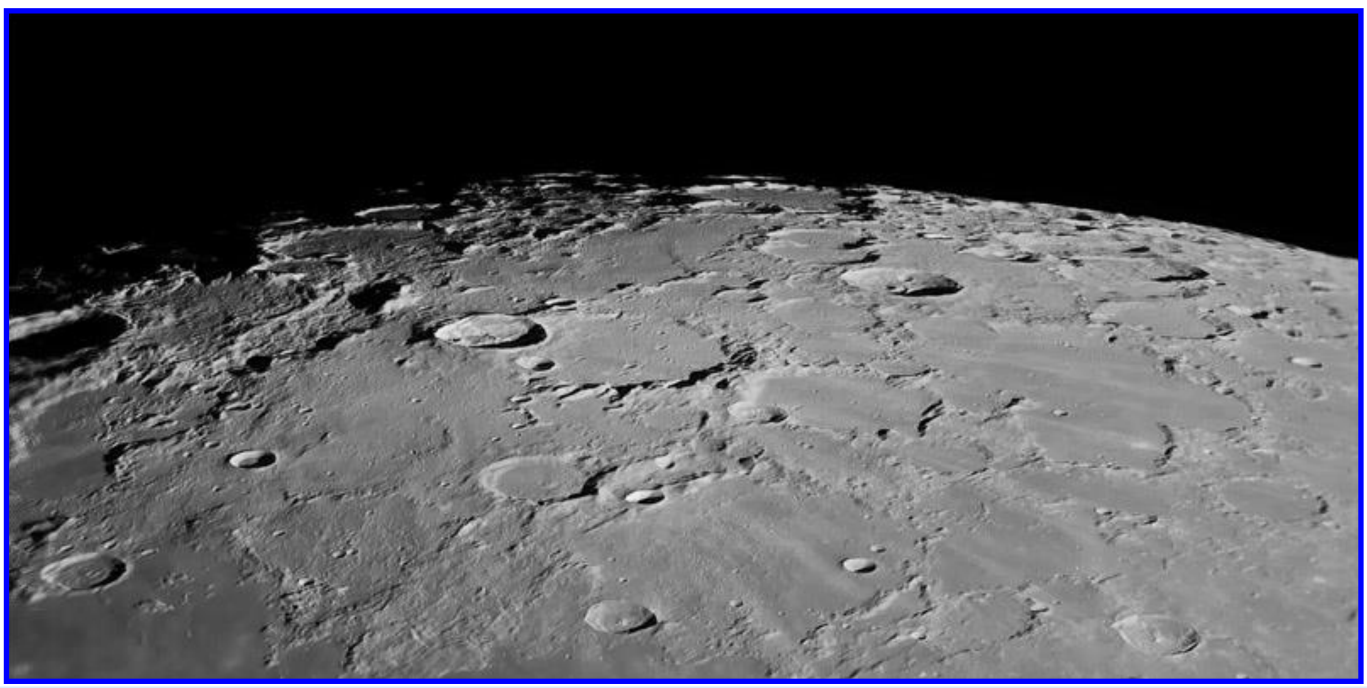
https://www2.lpod.org/wiki/March_9,_2007

Wood, Charles (2007), Page of a Book, available on: https://www2.lpod.org/wiki/March_8,_2007

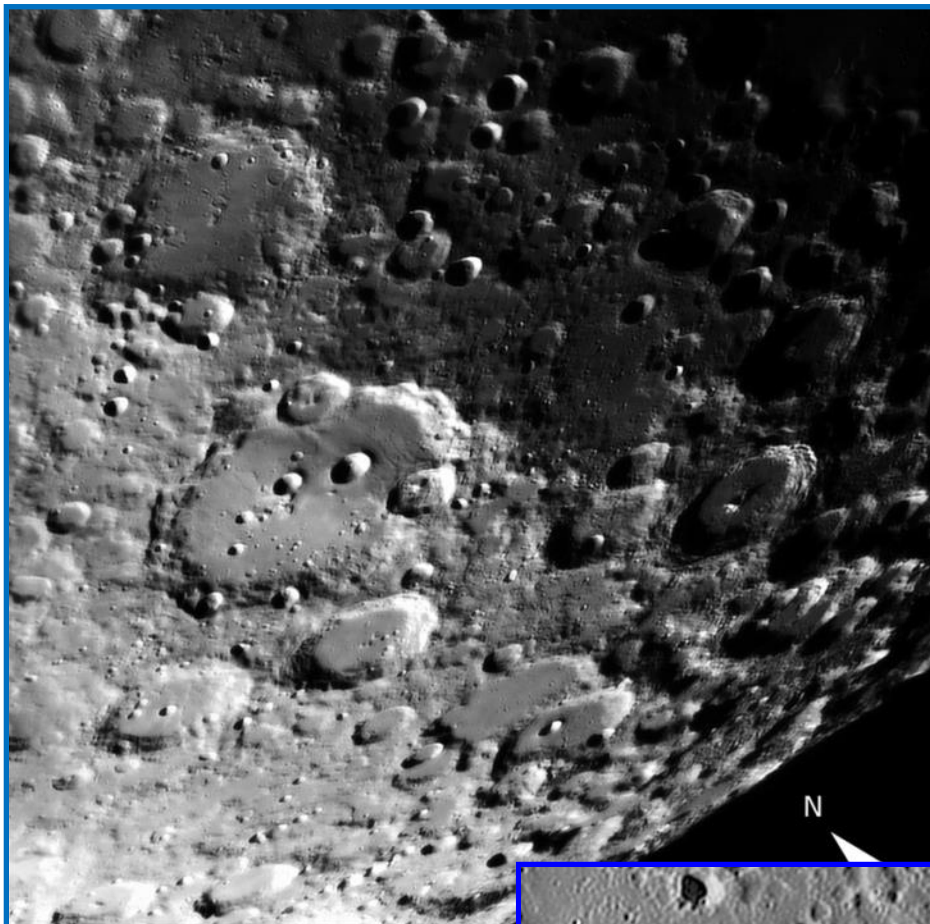
Waxing Gibbous Moon, *Steve Rifkin and Stanley M. Max, Towson, Maryland, USA. 2024 December 06 22:52 UT. SeeStar 50 smart telescope.*



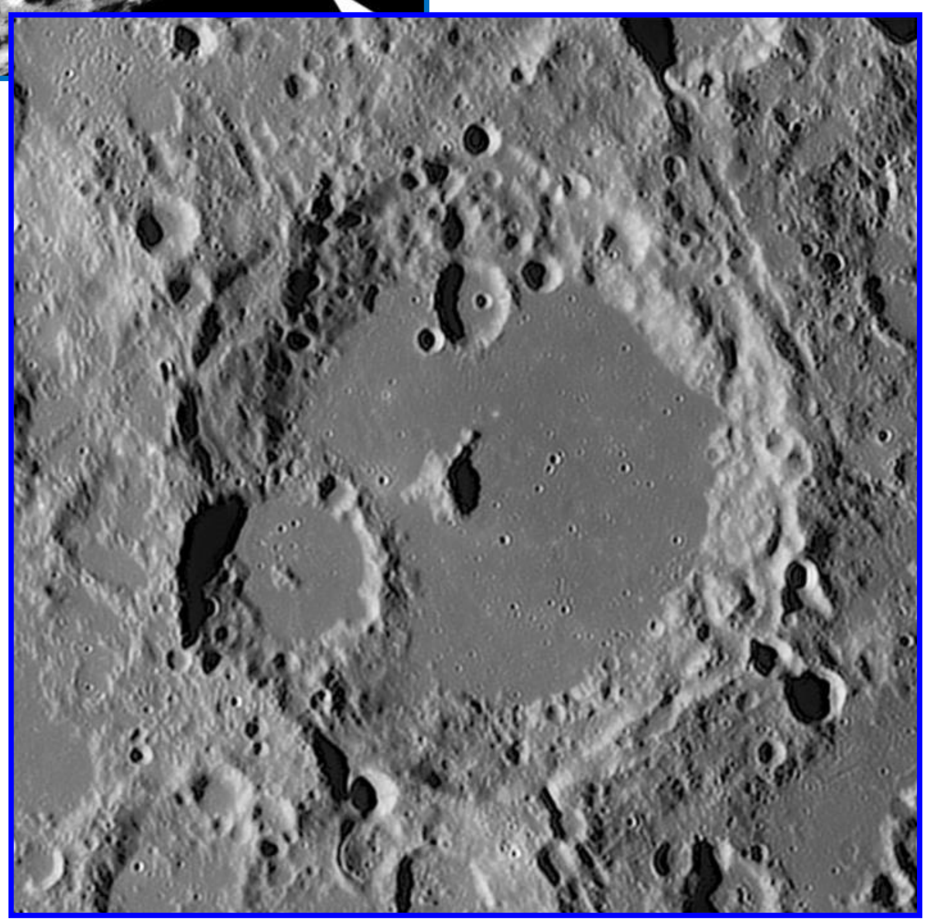
Lunar North Pole, *Ken Vaughan, Cattle Point, Victoria, British Columbia, Canada. 2024 November 24 04:48 UT. Meade 12 inch LX200 GPS Schmidt-Cassegrain telescope, Astronomik 642 R-IR filter, ZWO ASI178MM camera.*



Recent Topographic Studies

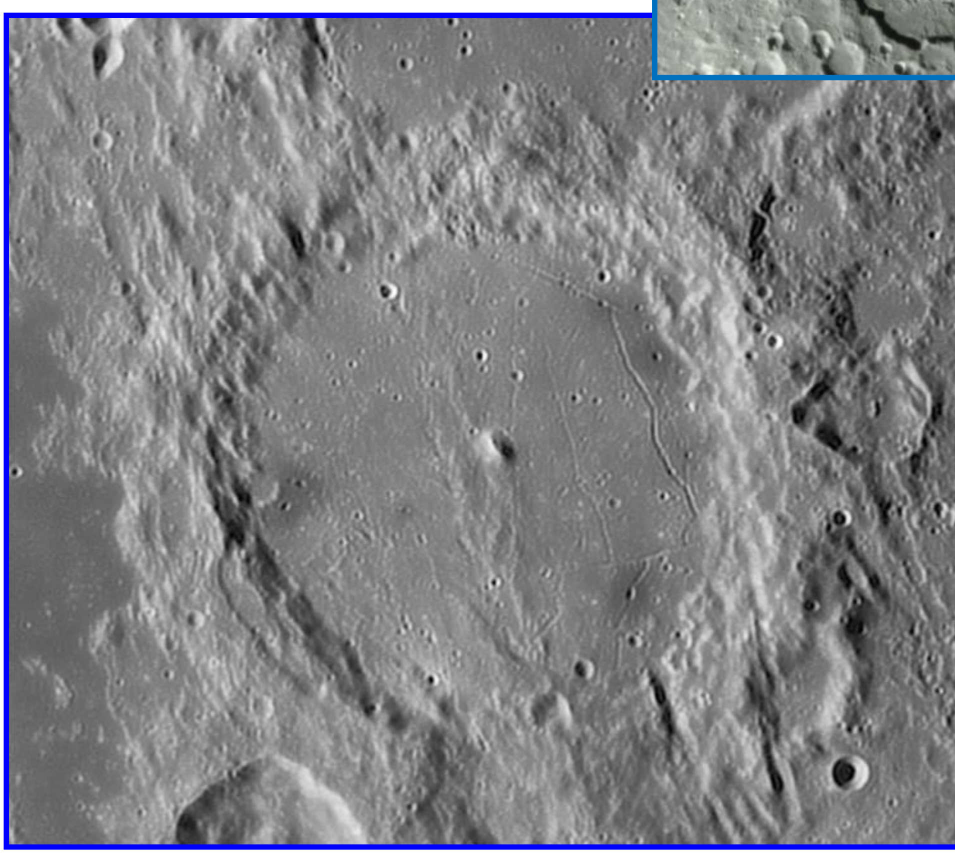


Clavius, *Sanjin Kovacic, Zagreb, Croatia. 2024 September 24 00:03 UT, colongitude 162.53˚. 203 mm Cassegrain telescope, fl 2436 mm, 742 nm filter, ASI224MC camera. Seeing 7-8/10, transparency average.*



Albategnius, *Ken Vaughan, Cattle Point, Victoria, British Columbia, Canada. 2024 October 23 10:45 UT. Meade 12 inch LX200 GPS Schmidt-Cassegrain telescope, Astronomik 642 R-IR filter, ZWO ASI178MM camera.*

Mare Nectaris, *Sanjin Kovacic, Zagreb, Croatia. 2024 October 21 23:34 UT, colongitude 143.61˚. 203 mm Cassegrain telescope, fl 2436 mm, 742 nm filter, ASI224MC camera. Seeing 8/10, transparency good.*



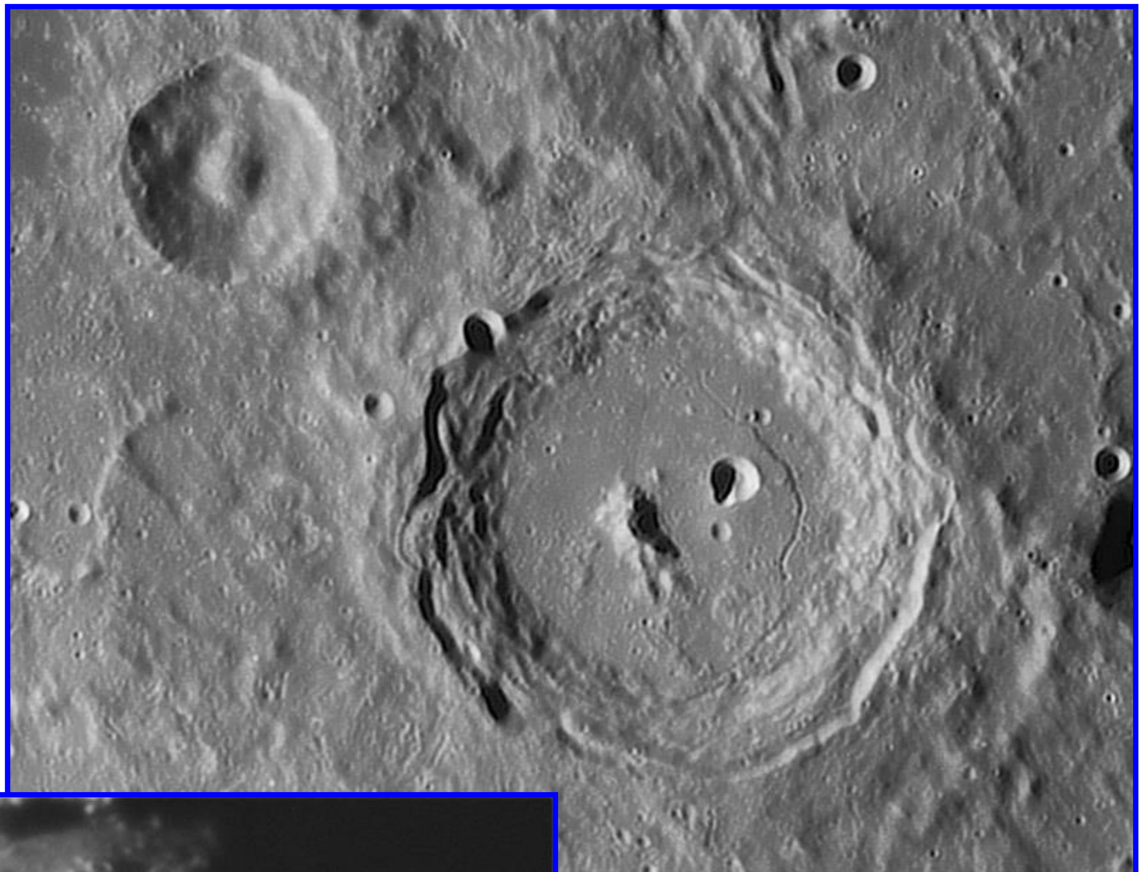
Alphonsus, *Ken Vaughan, Cattle Point, Victoria, British Columbia, Canada. 2024 October 23 10:45 UT. Meade 12 inch LX200 GPS Schmidt-Cassegrain telescope, Astronomik 642 R-IR filter, ZWO ASI178MM camera.*

Recent Topographic Studies

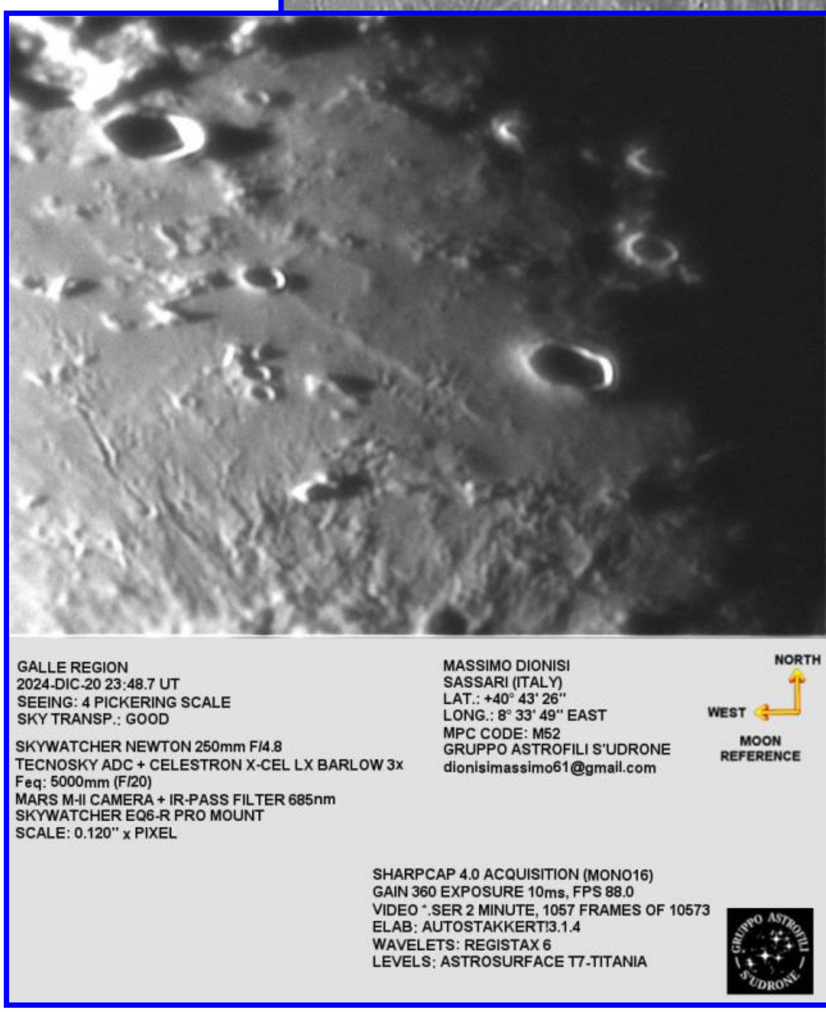
Aristoteles, *Massimo Dionisi, Sassari, Italy. 2024 December 20 23:29 UT. SkyWatcher 250 mm f/4.8 Newtonian reflector telescope, Technosky ADC, 3x barlow, 5000 mm effective focal length, IR pass filter 685 nm, Mars M-II camera. Seeing 4 on Pickering scale, sky transparency good.*

Alfraganus, *István Zoltán Földvári, Budapest, Hungary. 2024 October 23 03:00-03:19 UT, colongitude 157.7º. 70 mm refractor telescope, 500 mm focal length, 125x. Seeing 7/10, transparency 4/6.*

Recent Topographic Studies



***Arzachel,** Ken Vaughan, Cattle Point, Victoria, British Columbia, Canada. 2024 October 23 10:45 UT. Meade 12 inch LX200 GPS Schmidt-Cassegrain telescope, Astronomik 642 R-IR filter, ZWO ASI178MM camera.*



***Galle,** Massimo Dionisi, Sassari, Italy. 2024 December 20 23:48 UT. SkyWatcher 250 mm f/4.8 Newtonian reflector telescope, Technosky ADC, 3x barlow, 5000 mm effective focal length, IR pass filter 685 nm, Mars M-II camera. Seeing 4 on Pickering scale, sky transparency good.*

Recent Topographic Studies

Cassini, *Ken Vaughan, Cattle Point, Victoria, British Columbia, Canada. 2024 December 09 02:47 UT. Meade 12 inch LX200 GPS Schmidt-Cassegrain telescope, Astronomik 642 R-IR filter, ZWO ASI178MM camera.*

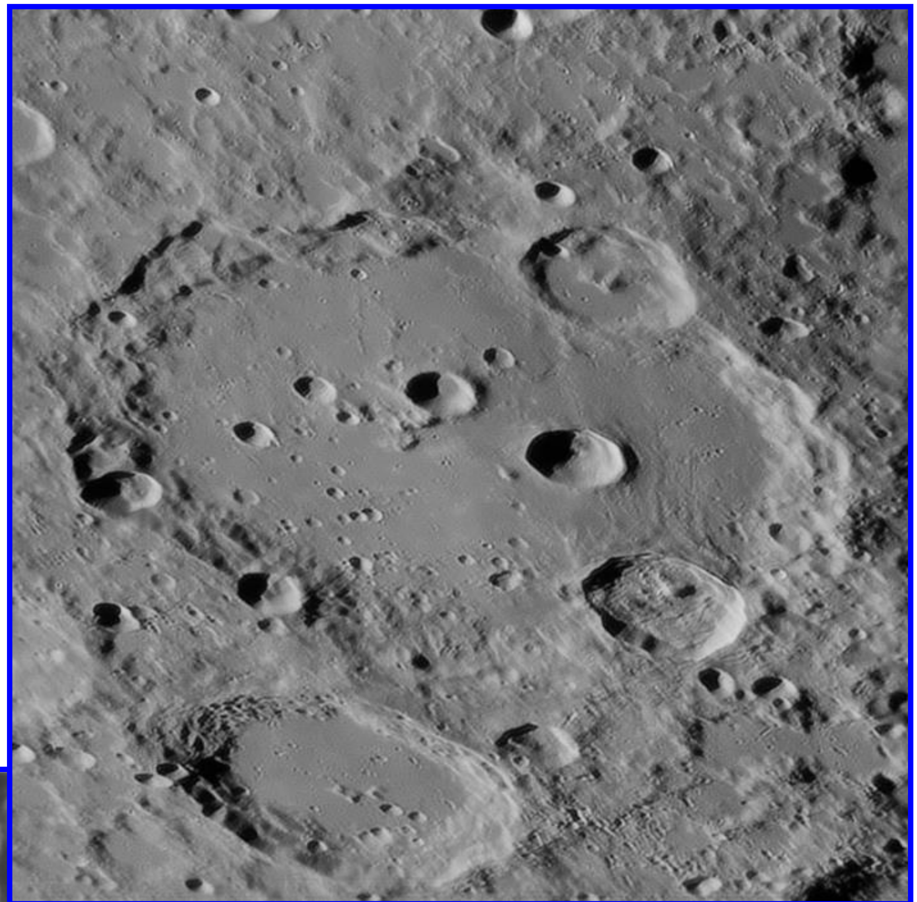
Vallis Alpes, Raúl Roberto Podestá, Formosa, Argentina. 2024 November 10 01:15 UT. 127 mm Maksutov-Cassegrain telescope, UV/IR cut filter, ZWO ASI179MC camera.

Recent Topographic Studies

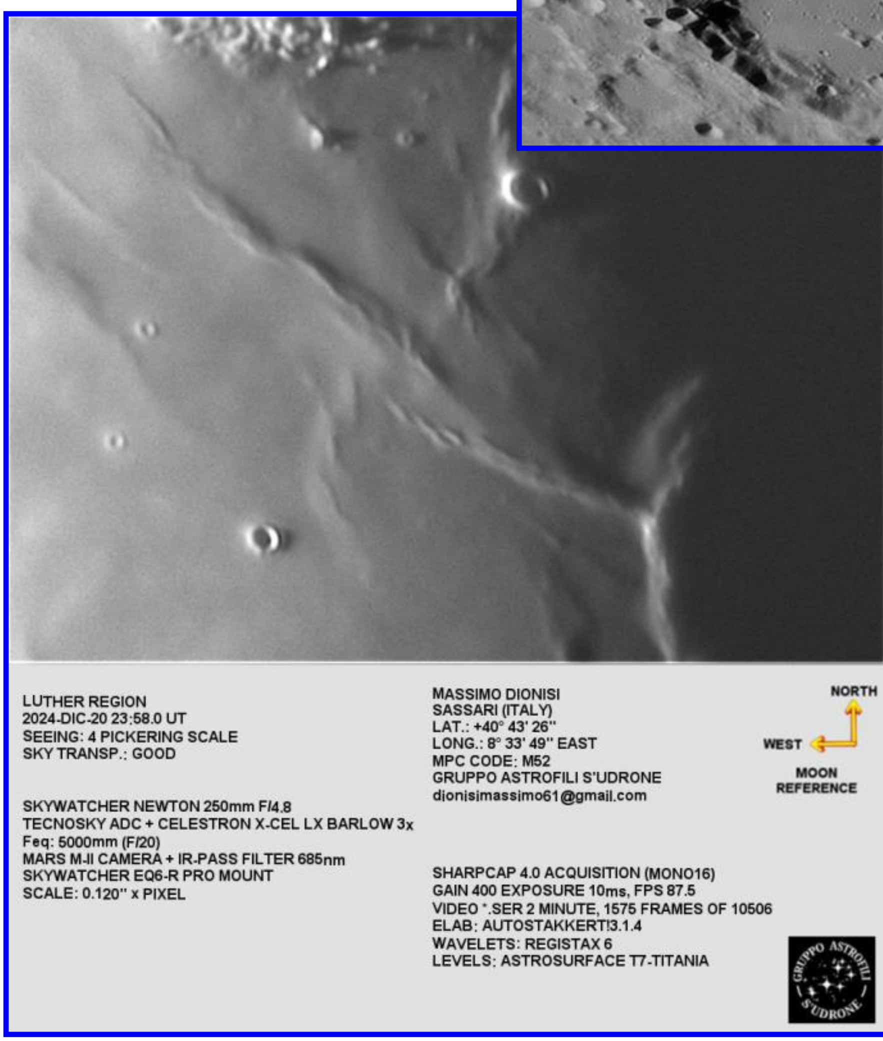
Lamont, *Massimo Dionisi, Sassari, Italy. 2024 December 21 00:16 UT. SkyWatcher 250 mm f/4.8 Newtonian reflector telescope, Technosky ADC, 3x barlow, 5000 mm effective focal length, IR pass filter 685 nm, Mars M-II camera. Seeing 4 on Pickering scale, sky transparency good.*

Waxing Gibbous Moon, *Gonzalo Vega, Oro Verde, Argentina. 2024 December 13 00:46 UT. 150 mm Sky Watcher reflector telescope, EQ5 goto mount, UV/IR filter, Player One camera.*

Recent Topographic Studies

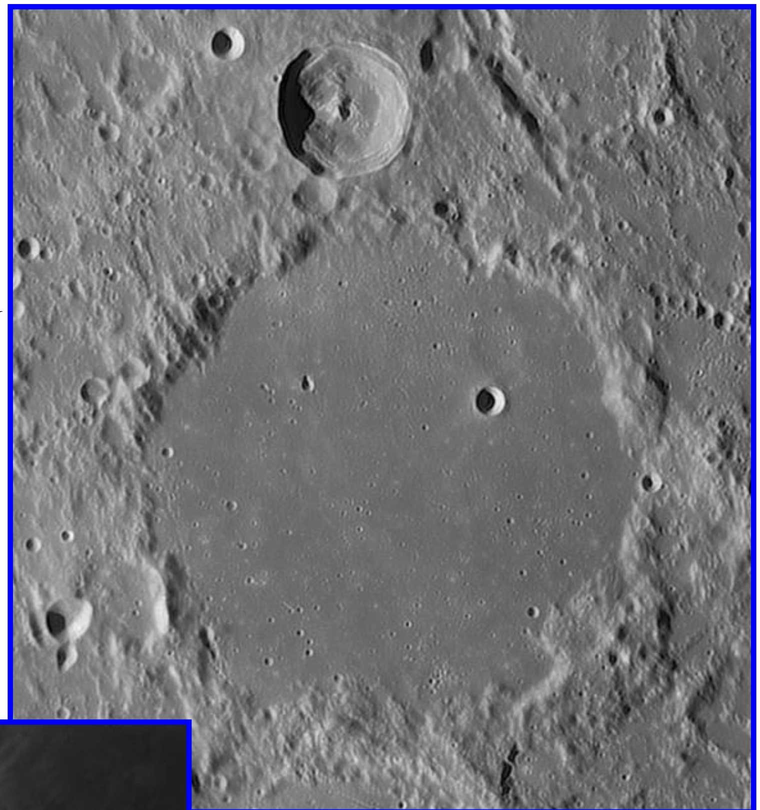


Clavius, *Ken Vaughan, Cattle Point, Victoria, British Columbia, Canada. 2024 October 23 10:49 UT. Meade 12 inch LX200 GPS Schmidt-Cassegrain telescope, Astronomik 642 R-IR filter, ZWO ASI178MM camera.*

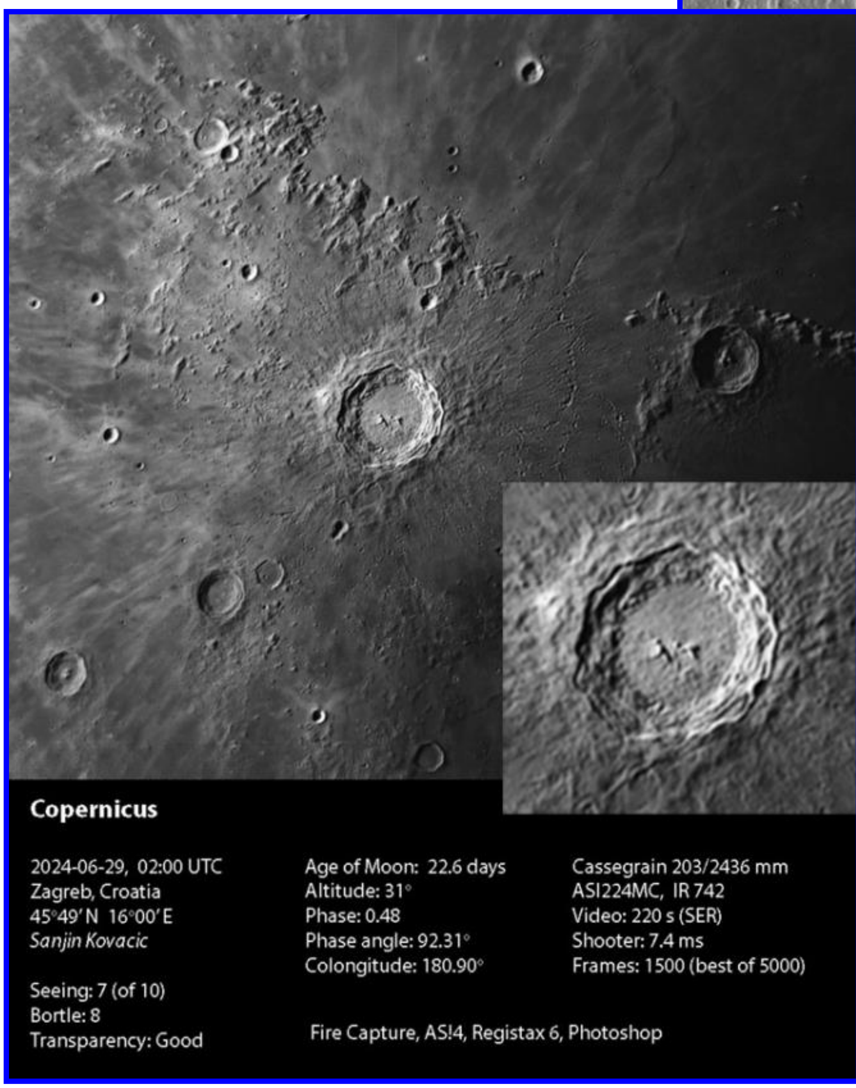


Luther, *Massimo Dionisi, Sassari, Italy. 2024 December 20 23:58 UT. SkyWatcher 250 mm f/4.8 Newtonian reflector telescope, Technosky ADC, 3x barlow, 5000 mm effective focal length, IR pass filter 685 nm, Mars M-II camera. Seeing 4 on Pickering scale, sky transparency good.*

Recent Topographic Studies

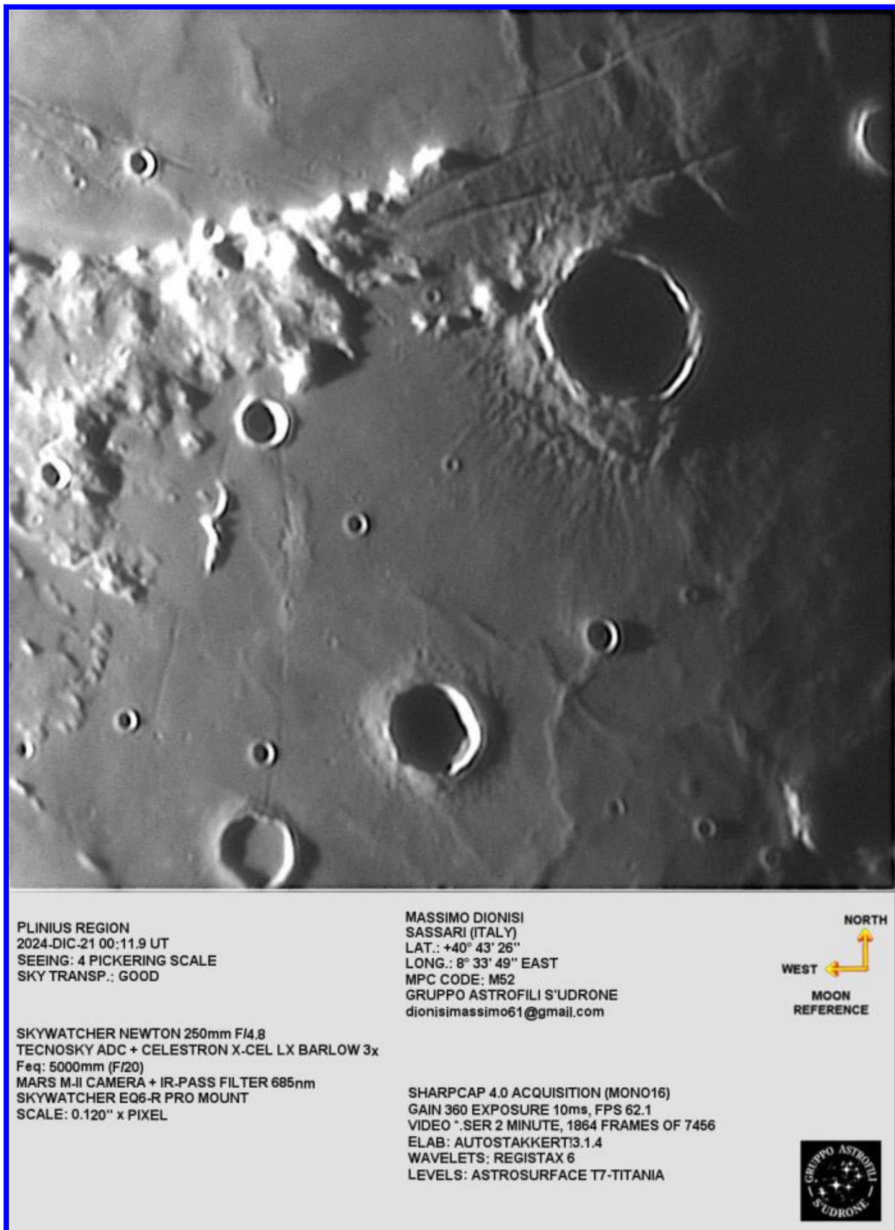


Ptolemaeus, *Ken Vaughan, Cattle Point, Victoria, British Columbia, Canada. 2024 October 23 10:45 UT. Meade 12 inch LX200 GPS Schmidt-Cassegrain telescope, Astronomik 642 R-IR filter, ZWO ASI178MM camera.*



Copernicus, *Sanjin Kovacic, Zagreb, Croatia. 2024 June 29 22:00 UT, colongitude 180.90˚. 203 mm Cassegrain telescope, fl 2436 mm, 742 nm filter, ASI224MC camera. Seeing 7/10, transparency good.*

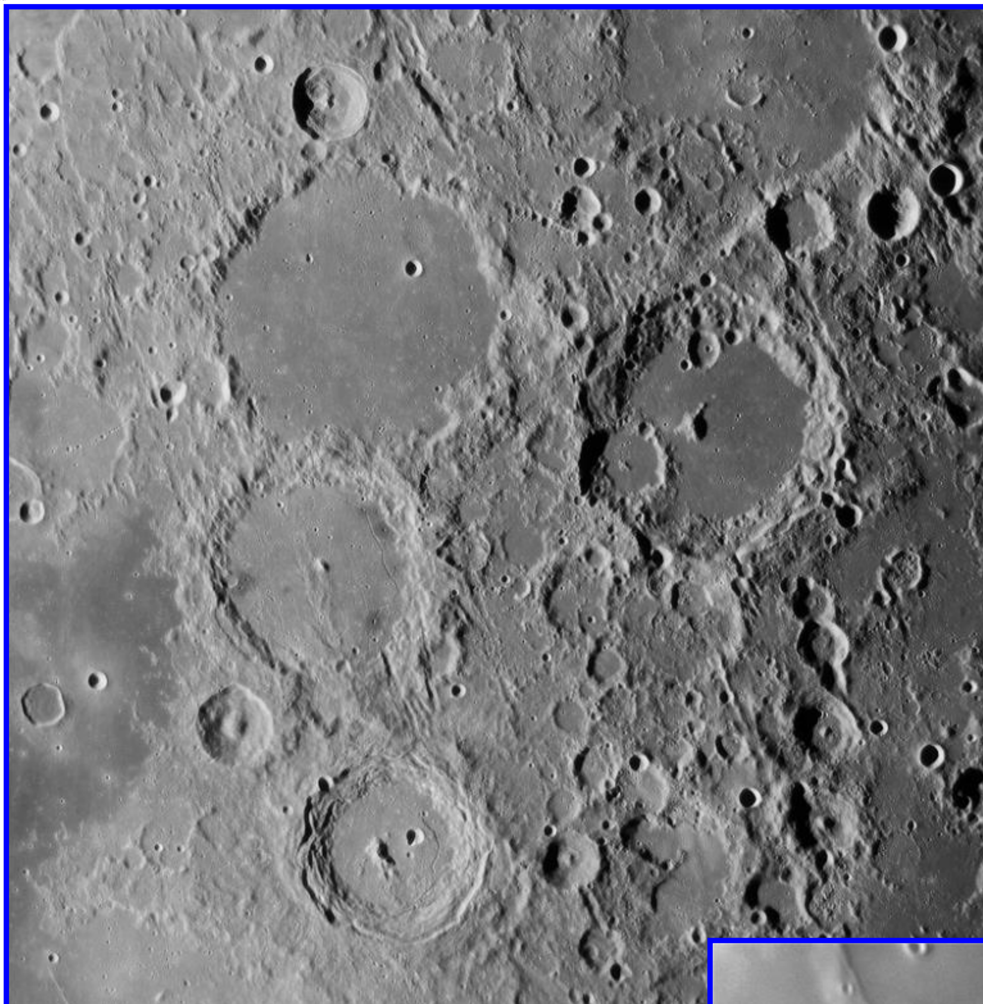
Recent Topographic Studies



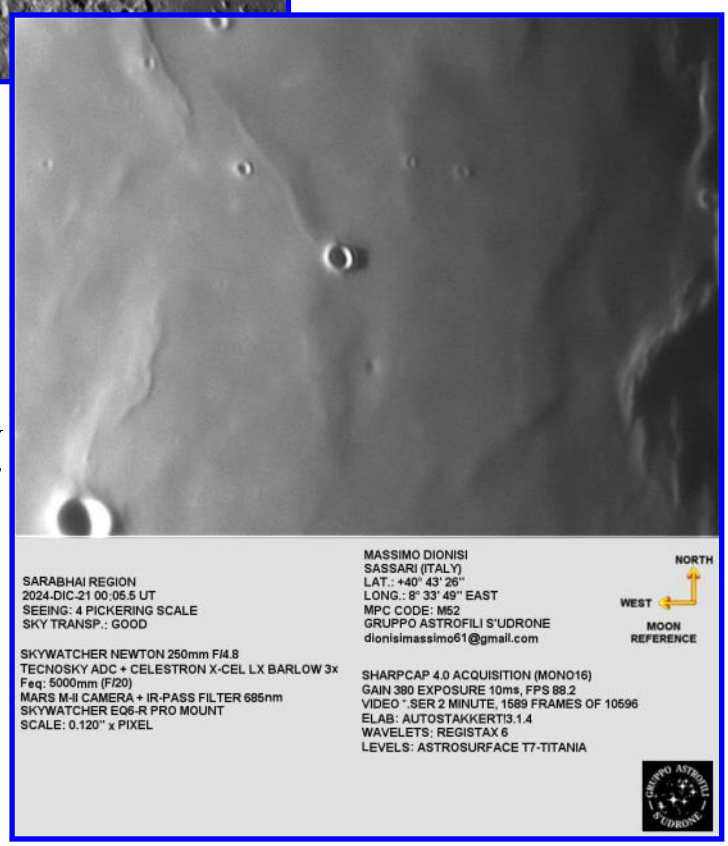
Plinius, *Massimo Dionisi, Sassari, Italy. 2024 December 21 00:11 UT. SkyWatcher 250 mm f/4.8 Newtonian reflector telescope, Technosky ADC, 3x barlow, 5000 mm effective focal length, IR pass filter 685 nm, Mars M-II camera. Seeing 4 on Pickering scale, sky transparency good.*

The Moon and Mars, *Gonzalo Vega, Oro Verde, Argentina. 2024 December 18 21:50 UT. Panasonic luminx telephoto lens, 1200 mm focal length. North is down.*

Recent Topographic Studies

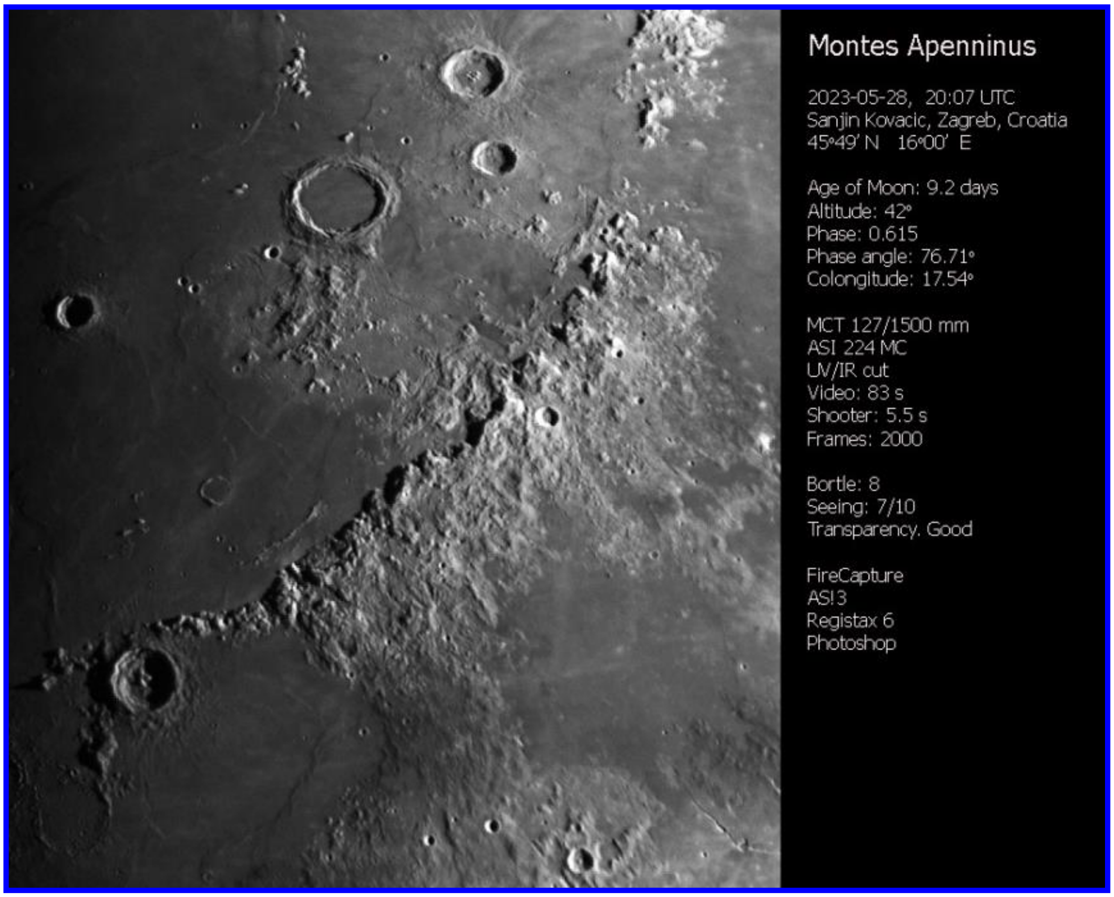


Ptolemaeus Chain, *Ken Vaughan, Cattle Point, Victoria, British Columbia, Canada. 2024 October 23 10:45 UT. Meade 12 inch LX200 GPS Schmidt-Cassegrain telescope, Astronomik 642 R-IR filter, ZWO ASI178MM camera.*

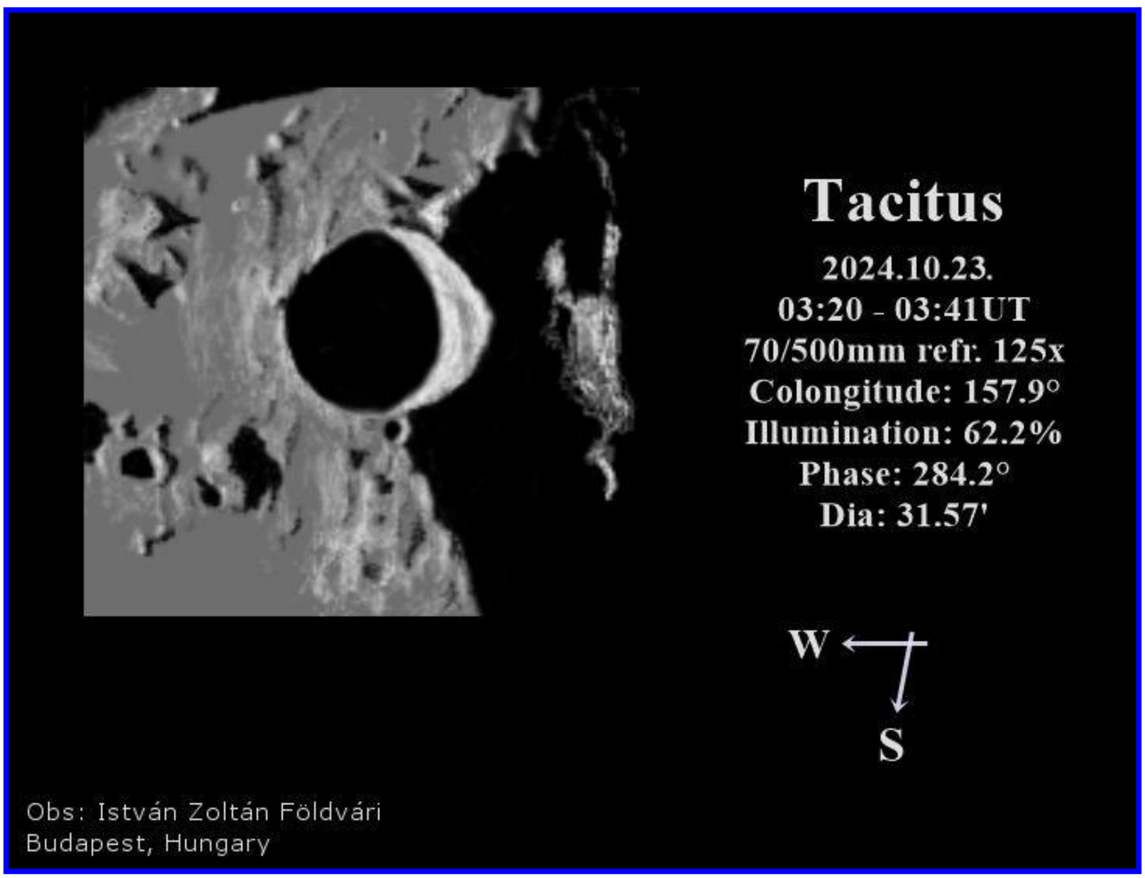


Sarabhai, *Massimo Dionisi, Sassari, Italy. 2024 December 21 00:05 UT. SkyWatcher 250 mm f/4.8 Newtonian reflector telescope, Technosky ADC, 3x barlow, 5000 mm effective focal length, IR pass filter 685 nm, Mars M-II camera. Seeing 4 on Pickering scale, sky transparency good.*

Recent Topographic Studies

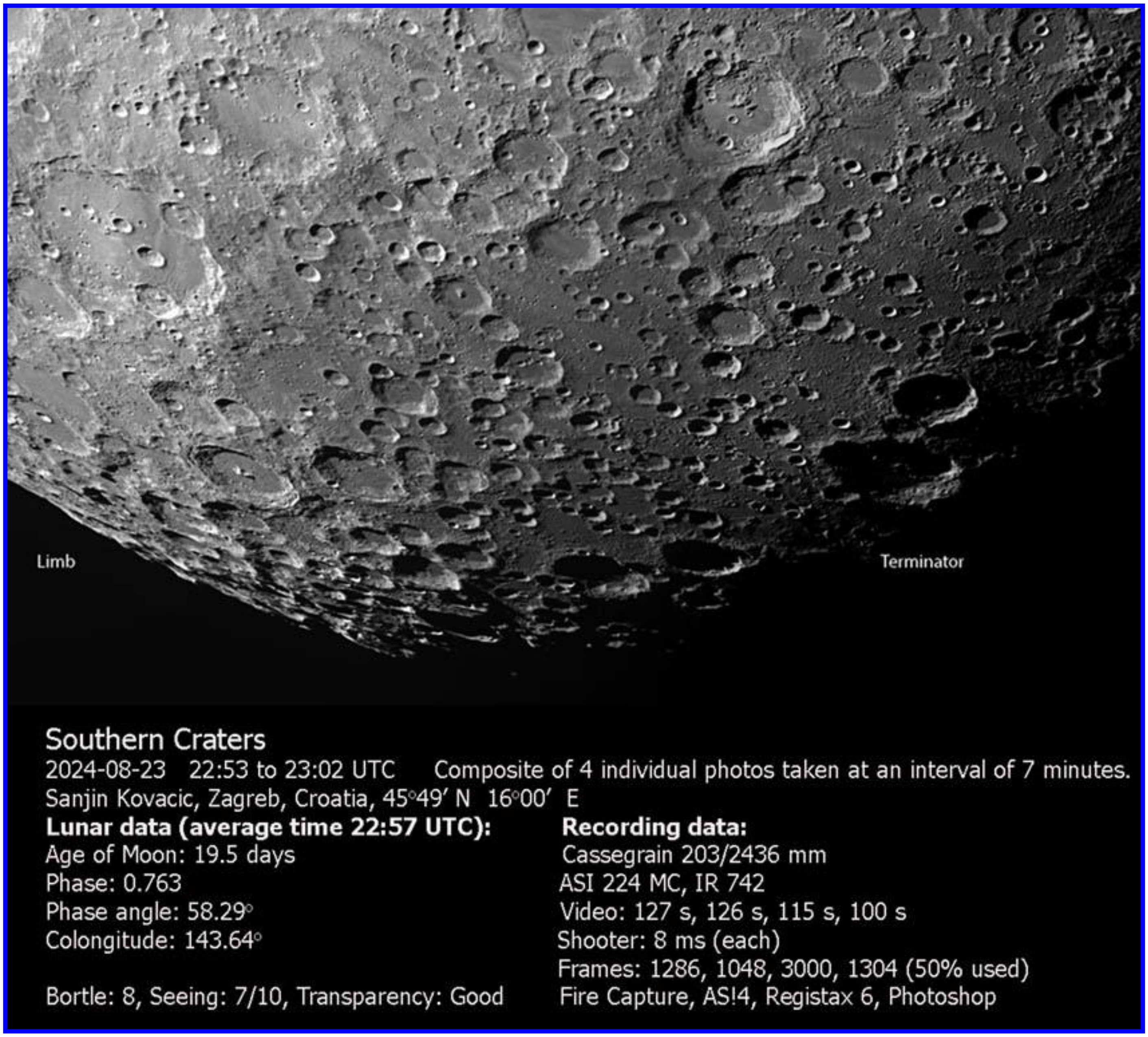


Montes Apenninus, *Sanjin Kovacic, Zagreb, Croatia. 2023 May 28 20:07 UT, colongitude 17.54˚. 127 mm Maksutov-Cassegrain telescope, fl 1500 mm, UV/IR cut filter, ASI224MC camera. Seeing 7/10, transparency good.*



Tacitus, *István Zoltán Földvári, Budapest, Hungary. 2024 October 23 03:20-03:41 UT, colongitude 157.9º. 70 mm refractor telescope, 500 mm focal length, 125x. Seeing 7/10, transparency 4/6.*

Recent Topographic Studies



Southern Craters, *Sanjin Kovacic, Zagreb, Croatia. 2024 August 23 22:53-23:02 UT, colongitude 143.64˚. 203 mm Cassegrain telescope, fl 2436 mm, 742 nm filter, ASI224MC camera. Seeing 7/10, transparency good.*

Recent Topographic Studies

Lunar Geologic Change Detection Program

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

2025 January

Figure 1. *The Moon on 2024 Dec 17 UT 00:16 taken by Tony Cook at Newtonian focus of an 8" reflector, and orientated with north towards the top.* ***(Left)*** *Angle of Polarization Image – contrast stretched and slight Gaussian blurring applied to reduce image noise.* ***(Center)*** *White light image.* ***(Right)*** *Degree of Polarization image – black indicates areas of saturation in the white light image. Image contrast stretching applied as well as slight Gaussian blurring to reduce image noise.*

The Moon in Polarized light: Following a lecture by Wayne Bailly (a past ALPO Lunar Section director) at the ALPO on-line Conference (youtube video starts at: 0h47m41s), in 2024, I was very curious to see if the technique could be applied to LTP observing? This was especially so as Wayne mentioned that there were new CMOS cameras, on sale using a chip made by Sony that utilized a grid of polarizing filters over mosaics of 2x2 pixels. This was akin to color cameras that use a mosaic of RGB filters. Alas Wayne mentioned that the cameras were expensive, so he had used a normal monochrome camera with polaroid filter that could be changed in orientation. I seem to recall that earlier work on telescope polarimetric imaging had been published in the Icarus Journal, back in 2016 by BAA Lunar Section members: Andrew Fearnside, Philip Masding and Chris Hooker, where they investigated the refractive index properties of the lunar surface. Although they were partly contradicted on their findings, a year later, in a paper by Ukrainian astronomer, Yuriy Shkuratov, it definitely seems like the technique would is worth investigating.

I am a newcomer to the technique of polarimetry, and Fig 1 is my first light attempt, with a LUCID Vision Labs TritonTM TRI050S1-PC, Sony IMC264MZR monochrome 5.0 MP Polarsens Ethernet camera. The cost has fallen since Wayne's talk and is now in the range of high-end amateur astronomy cameras, though the software they provide is very basic and not easy to use out at the telescope, and there was no analysis software. So, I had to write my own, based upon the method outlined in Wayne's talk. So, the basic idea is to separate out the pixels with 0˚, 45 ˚, 90 ˚, and 135 ˚ polarizing filters into 4 separate images, and then use these to generate Stoke's Parameters images, S0, S1, S2, and S3, from which one can derive angle of polarization (i.e. the angle in the image in which polarization is maximum), and the degree of polarization (i.e. the proportion of light that is polarized).

The angle of polarization image clearly shows up sunlit slopes well and can be used to differentiate rays, highland and mare material. The degree of polarization image is rather good at highlighting ray material – I was interested though how ray crater Censorinus comes out elongated in a northerly direction, and this does not show up on the ordinary white light image. I will investigate the cause. As this is my first attempt – please do not read too much into the image – I am wondering if the edge effects might be more to do with lateral displacement of the pixels within the 2x2 cells when image subtraction is done for the S1 Stoke parameter. I will do some further tests and report back next month.

Anyway, the main use I will apply this camera to is trying to detect dust cloud related LTP. A very famous, and believed to be authentic LTP was when the French Planetary astronomer Dolffus, imaged, using a CCD camera a polarization anomaly in Langrenus crater on three separate occasions. The two explanations were either a dust cloud or a very unusual specular refection from the surface that he had never encountered before anywhere else on the Moon. Whatever you think about this, the point to bear in mind is that his contact time with the Moon with the polarization measuring CCD camera was a relatively small number of hours, which implies a strong detection rate for LTPs, or false effects in polarized light that tricked him into thinking he had detected a LTP? Either way it will be useful to monitor the Moon over lengthy time scales to see if we can replicate his results either in Langrenus or elsewhere and help solve this issue of whether polarized light LTP are real or effects due to our atmosphere or scattering inside the optics. I will keep you posted.

News: Please keep a look out for Quadrantid meteors impacting the earthshine part of the northern hemisphere of the Moon on 2024 Jan 02-05. Although the peak will be on Jan 03 UT 11:00-14:00, the shower will still be spread around those days given and as they are travelling at 41 km/s, and so pack quite a punch! In particular monitor the northern hemisphere. Note that peak rate, here on Earth, and presumably at the Moon, has a ZHR=120, so there may be a good chance of detecting at least some flashes. Observers in the US and Americas should report their observations to ALPO's Brian Cudnik (bmcudnik @ gmail.com).

LTP Reports:

Aristarchus 2024 Mar 22 - I have received further information concerning the image for Aristarchus discussed last month. Gonzalo Vega (AEA) kindly emailed answers to my questions about his report where there was some unusual blue color between Herodotus and Aristarchus:

"The capture was made with Firecapture, which takes the time from the computer (I think it's unlikely, but maybe there was some error with the computer's time that day). The planetary camera I used was a Player One Ceres C, but it was set to capture in monochrome mode.

The color is extracted from a capture made with a DSLR camera, because it seems much more faithful for capturing the mineral moon (which I later combine with the capture made with the planetary camera).

While I did use a Barlow lens, it shouldn't affect the result because, firstly, it's an apochromatic Barlow, and secondly, I captured in black and white with the planetary camera. The color is 100% from the Nikon D5100

I'm wondering if perhaps I overdid the mineral saturation process, but in any case, if a color shows up, it's because that color is actually there (since I usually do it for specific colors, not by saturating the entire luminance of the photo). In other words, what appears "saturated" are colors that are present on the surface."

So, I am grateful to Gonzalo for explaining this and now we might have an explanation for the time discrepancy that I queried in a past newsletter. It's always good to have some ancillary information for any LTP report in order to better interpret what may have occurred. I also wish to correct a typo from last month's newsletter – Gonzalo is affiliated with AEA.

Several Mare Regions: Another report was received from Brazil via Alexandre Amorim: On 2024 Nov 10, S., N., and M.F. da Rocha (Rio do Sul, Brazil, 115mm F/6 Newtonian, 23 and 32mm eyepieces) detected an unusual greenish illumination in Mare Tranquillitatis, Mare Vaporum, Sinus Aestuum, Sinus Medii, Mare Nubium and Mare Vaporum. The three observers were able to see the color and changed eyepieces and the color remained. An attempt to take an image with a Samsung A15 smart phone failed to detect any green color. I suspect what they may have seen here is natural surface color, though according to mineral map images of the Moon it should be more of a blueish color though. Why it was not detected in the phone image I am not too sure, but as I have not seen the image I cannot really comment. Anway as this report covers such a large area of the Moon it cannot be a LTP, but am grateful for the observers reporting it anyway.

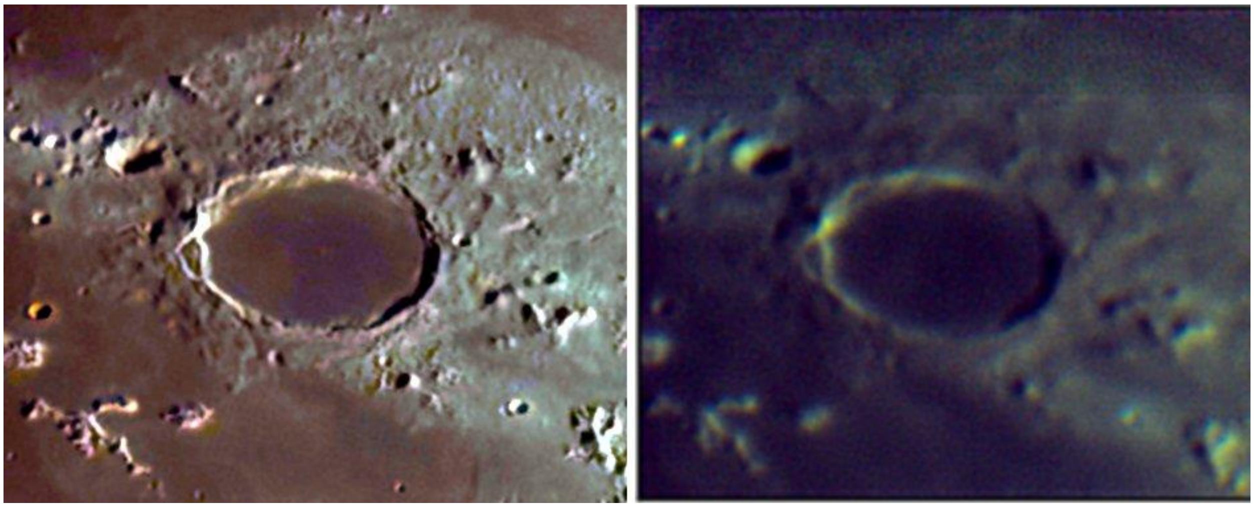


Figure 2. *Color image of Plato taken on 2024 Nov 11 – both images have been color normalized and then had their color saturation increased.* ***(Left)*** *An image by Chris Longthorn taken at 20:14UT.* ***(Right)*** *An image by Tony Cook (BAA) taken at 20:54UT but imaged through cloud and taken under very poor seeing conditions.*

Plato: On 2024 Nov 11 UT 20:33-20:52 Trevor Smith (BAA), observed visually through a 16 inch Newtonian at x247 under Antoniadi IV conditions. He noted that the interior of the north rim, where it met the floor, was orange/white in color. The central spot/craterlet was easily seen as a white spot, but the rest of the floor was bland. No color had been seen earlier that evening (17:49-18:04UT), nor were other nearby features exhibiting this effect. The color was fading by 20:44 and not present after 20:52 until he stopped monitoring the crater at 20:56. He checked again during 23:14-23:24UT but the crater was normal. Just by chance I was videoing the area at 20:54UT, i.e. after Trevor said the effect had died away and you can see the result in Fig 2 (Right) with no obvious sign of color. Please do bear in mind that I was imaging through variable thickness cloud, and seeing was Antoniadi V. Another image of the area, but before Trevor noticed the color in Plato, was taken by Chris Longthorn (BAA) and can be seen in Fig 2 (Left). Neither images exhibit orange/white on the inner edge of the northern rim, though there is a hint of some pinks and orange colors elsewhere in Chris' image. We shall give Trevor's report a weight of 1.

Routine reports received for November included: Alexandre Amorim (Brazil – REA/UBA/NEOA-JBS) imaged: Mersenius C and Ptolemaeus. Tony Cook (Newtown, Wales – BAA/NAS): imaged the Moon in color and videoed for impact flashes in the SWIR. The da Rocha family (Brazil) observed/imaged: Mersenius C and several features. Walter Elias (Argentina – AEA) imaged: Aristarchus. Dave Finnigan (Halesowen, UK – BAA) imaged: Bailly, Byrgius, Cardanus, Cavalerius, Grimaldi, Hevelius, Lagrange, Lohrmann, and Vieta. Valerio Fontani (Italy – UAI) imaged: several features. Ken Kennedy (Dundee, Scotland – BAA) imaged: Copernicus. Bill Leatherbarrow (Sheffield, UK – BAA) imaged: Aristarchus, Balmer, Langrenus, Mare Crisium, Messala, and Petavius. Chris Longthorn (Rugby, UK - BAA) imaged: several features. Eugene Polito (Italy – UAI) imaged: Sulpicius Gallus M. Trevor Smith (Codnor, UK – BAA) observed: Aristarchus, Censorinus, Daniell, Eimmart, Eratosthenes, Plato, Posidonius, Ramsden and Torricelli B. Aldo Tonon (Italy – UAI) imaged: Riccioli, and several features. Luigi Zanatta (Italy – UAI) imaged: Riccioli.

Analysis of Reports Received (November):

Sulpicius Gallus M: On 2024 Nov 09 UT 18:35 Eugenio Polito (UAI) imaged this crater under similar illumination to the following report:

Sulpicius Gallus M 2022 Dec 31 UT 17:00-18:00 F Taccogna (UAI - Italy) imaged this area and recorded this crater as extremely and unusually bright (compared to other features). A. Amorin (Brazil) observing a few hours later commented that the crater was brighter than it was in the Hatfield Atlas plates. However analysis of past imagery of this area under similar illumination (albeit with the crater on the edge of the image or at lower resolution) also shows a similar brilliance. One more image confirming this will be enough to remove it from a ALPO/BAA weight of 1.

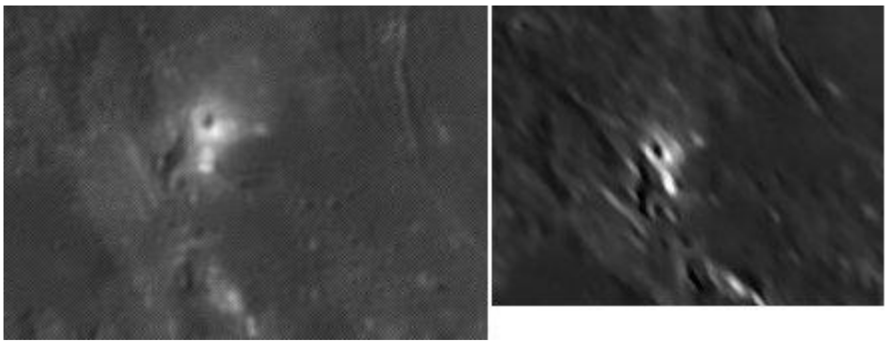


Figure 3. *Sulpicius Galus M orientated with north towards the top.* ***(Left)*** *As imaged by Franco Taccogna (UAI) on 2022 Dec 31 between 17:00 and 18:00.* ***(Right)*** *As imaged by Eugenio Polito (UAI) on 2024 Nov 09 UT 18:35.*

As the effect has repeated in Fig 3, we can safely remove this from the ALPO/ABA LTP list by assigning a weight of 0. It is simply just a ray crater that is very bright at this colongitude and the effect is repeatable.

Eratosthenes: On 2024 Nov 11 UT 19:10-19:30 Trevor Smith (BAA) observed visually and at 19:30 Ken Kennedy (BAA) imaged this crater for the following repeat illumination report:

Eratosthenes 1968 Nov 01 UT 01:50-02:06 Observed by Chilton (Hamilton, Canada, 12" reflector, 300x) "Red glow in the crater. Weak blink beyond ESE (IAU?) wall. Visually, area would not focus & gave impression of fog cascading down slope, but no motion was vis. (Moore has misprint in time in his cat. extension -- should be 0150-0206)." NASA catalog weight=3. NASA catalog ID 1106. ALPO/BAA weight=3.

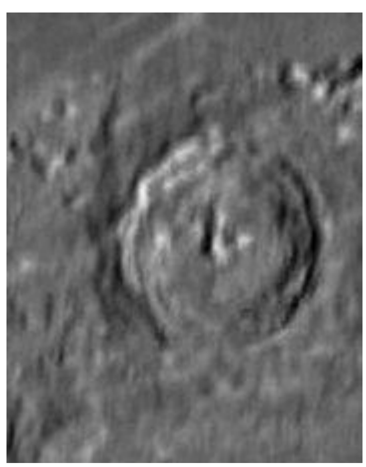


Figure 4. *Monochrome image of Eratosthenes taken by Ken Kennedy (BAA) on 2024 Nov 11 UT 20:30 using a 20cm SCT and an Altair GPCAM. North is towards the top.*

Trevor Smith was observing visually with his 16-inch Newtonian telescope and although did not see any red color, he did find that the north/west slope of the rim appeared misty, perhaps even like "fog or cloud cascading down the rim onto the crater floor". He obviously did not believe this was a LTP just the natural appearance of the area under the observing conditions present at the time. Luckily, we do have an image (Fig 4) taken by Ken Kennedy at the same time and although you do not get a sense of live appearance through the telescope, you can at least get an impression that it might have looked like mist or fog. We shall lower the weight of this 1968 report from 3 to 2 as we still cannot explain the red color seen.

Mersenius C: On 2024 Nov 12 UT 21:30-22:30 the da Rocha family and at 22:20-22:30 Alexandre Amorim (REA/UBA/NEOA-JBS) observed this crater visually at the same illumination to the following report:

Mersenius C: 2005 Nov 13 G. Ward (a lunar observer for 15 years) observed an area just south west of Mersenius C to be blurred and in a greenish cloud. The green color was more like that of dead grass than one gets from a neon bulb. The effect was seen from 04:50-04:57UT, but could have been going on before it was first noted at 04:50-UT. Seeing was 6-7/10 4" Refractor (2 element). refractor had been used hundreds of hours before (over a 10 year period) with no similar color was seen. The observer checked other areas but did not see any similar effects. They also rotated and changed eyepieces, but this made no difference to the LTP. The LTP site seen was picked up on an image taken earlier at 04:47UT by W. Bailley, from Sewell, NJ, USA. Unfortunately, the area concerned, a mountain on the image, was saturated and so we cannot tell if a color was present there and the seeing was poor. ALPO/BAA weight=3.

Alexandre could not detect any color visually in the area. Nicholas da Rocha took some photos through a 115mm Newtonian with 4mm eyepiece, via a Samsung A15 phone, and detected some color inside mare Humorum, but it could easily be JPEG compression artefacts according to the email from Alexandre. We shall leave the weight at 3 for now. We have covered this report before in the 2020 Apr and Jun newsletters.

Riccioli: On 2024 Nov 14 Luigi Zanatta (UAI) at 22:27-22:29UT, Aldo Tonon (UAI) at 22:35, 22:37 & 22:42UT, and Bill Leatherbarrow (BAA) at 23:01 UT imaged this crater for the following Lunar Schedule request:

ALPO Request: Either visually observe or obtain a color image of this crater shortly after it has emerged from the sunrise terminator. Minimum sized aperture scope needed: 5". Any observations or images should be emailed to: a t c @ a b e r . a c . u k

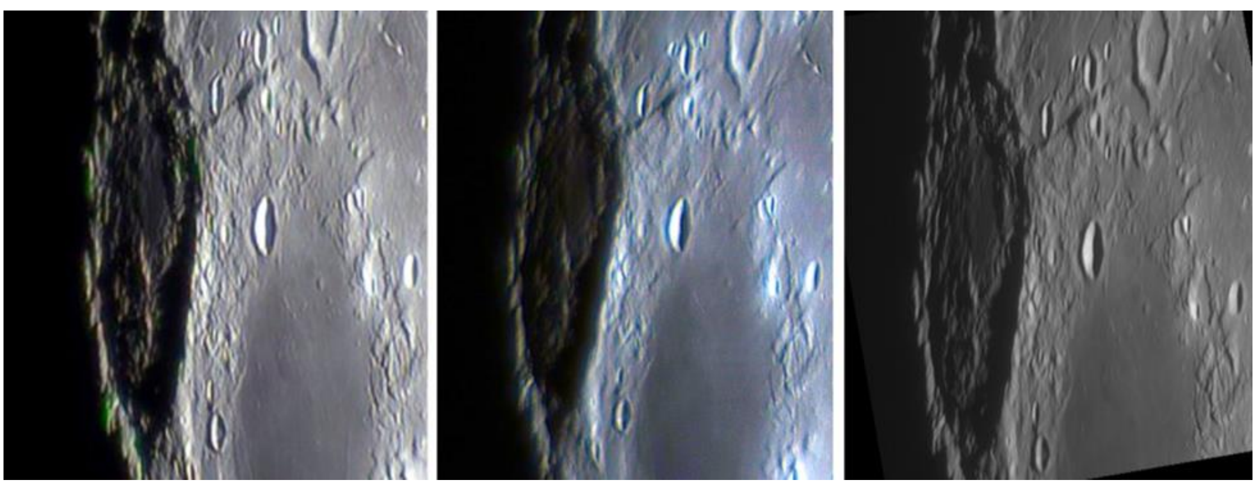


Figure 5. Riccioli on 2024 Nov 14 orientated with north towards the top. **(Left)** a color image by Luigi Zanatta with color saturation enhanced, taken at 22:27-22:29UT. **(Center)** An image by Aldo Tonon (UAI) with color saturation enhanced, taken at 22:27UT. **(Right)** An image by Bill Leatherbarrow (BAA) in monochrome, taken at 23:01 UT.

The purpose behind this was to check out a sketch made by an observe called "Darren" on the Cloudy Nights web site back in 2020: https://www.cloudynights.com/topic/701248-lunar-sketch-4-of-12-riccioli/ at the request of Jonathan Doupe of Edmonton, Albera Canada, in an email to me on 2020 Apr 14 wondering if the cloudy nights sketched overlapped with when previous observers had reported color in the crater? There is perhaps a hint of yellow in Luigi's image (Fig 5 – Left) but I would not like to say for certain that it's there and maybe an artifact of the camera and processing?

Aristarchus: On 2024 Nov 15 UT 00:00 Walter Elias imaged the crater, in color, just 10 minutes outside the repeat illumination window for the following repeat illumination event:

1971 Sep 03 Aristarchus and Herodotus UT 20:00? Observed by Areau (Paris, France, 12" reflector x100) "Maroon color covering the ridge(?) E (ast. ?) & the ridge(?) S. of Herod. In 3 or 5 secs. Cloud disappeared after 10 min." NASA catalog weight=3 NASA catalog ID #1312. ALPO/BAA weight=3.

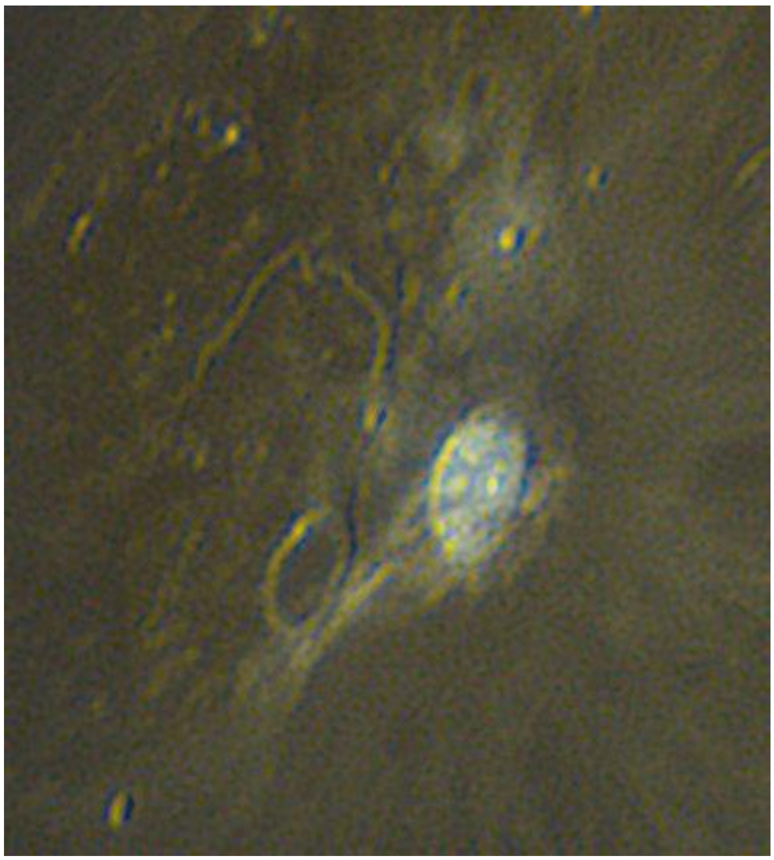


Figure 6. *Aristarchus as imaged by Walter Elias on 2024 Nov 15 UT 00:00. The image has been sharpened slightly, re-orientated with north towards the top and had its color saturation increased.*

No maroon color can be seen in the region between Herodotus and Aristarchus, in Fig 6, and due to the short duration nature of the event seen in 1968, I think we shall leave the ALPO/BAA weight at 3 for now.

Censorinus: On 2024 Nov 15 UT 21:36 Valerio Fontani (UAI) imaged this area under similar illumination and topocentric libration (both to within ±1.0˚) to the following report:

Near Censorinus 1964 Apr 26 UT 20:00? Observed by Hopmann (Czechoslovakia?) "Surface brightening somewhat similar to Kopal and Rackham in #779" NASA catalog weight=3 (average). NASA catalog ID #810.

Figure 7. *The Censorinus area as imaged by Valerio Fontani on 2024 Nov 15 UT 21:36.*

As you can see from Valerio's image (Fig 7), which would have matched Hopmann's view of the Moon if everything had been normal back in 1964, there is absolutely no sign of any surface brightening near to Censorinus. Therefore we shall leave the ALPO/BAA weight at 3 for now. We have discussed this event before in the 2024 Apr newsletter.

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

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

Lunar Calendar January 2025

Date	Time	Event
3	1500	Venus 1.4˚ north of Moon
4	1700	Saturn 0.7˚ south of the Moon, occultation Americas, Europe
5	1500	Neptune 1.1˚south of Moon, occultation Europe, Africa
5	1946	Moon at ascending node
6	2356	First Quarter
8	00	Moon at perigee 370, 171 km
9	1600	Uranus 4˚ south of Moon
10	0200	Moon in Pleiades
10	2300	Jupiter 5˚ south of Moon
12		Greatest northern declination +28.4˚
12		South limb most exposed -6.6˚
13	2227	Full Moon
14	0400	Mars 0.2˚ south of Moon, occultation N. America, Africa
15		East limb most exposed +5.2˚
19	0149	Moon at descending node
21	0500	Spica 0.1˚ north of Moon, occultation Africa
21	0500	Moon at apogee 404,298 km
21	2031	Last Quarter
25	0000	Antares 0.3˚ north of Moon, occultation Australia
26		North limb most exposed +6.6˚
27		Greatest southern declination -28.4˚
27		West limb most exposed -5.6˚
29	1236	New Moon, lunation 1263

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

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

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

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

CONTRIBUTION GUIDELINES

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 or lunar@alpo-astronomy.org

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.

drteske@yahoo.com

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: Clavius

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 March 2025, will be Clavius. 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 Clavius Focus-On article is February 20, 2025

FUTURE FOCUS ON ARTICLES:

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

Subject	TLO Issue	Deadline
Clavius	**March 2025**	**February 2025**
Volcanic Features	**May 2025**	**April 20, 2025**
Rupes Recta	**July 2025**	**June 20, 2025**
Mare Humorum	**September 2025**	**August 20, 2025**

Focus On Announcement:
Lunar Base Clavius

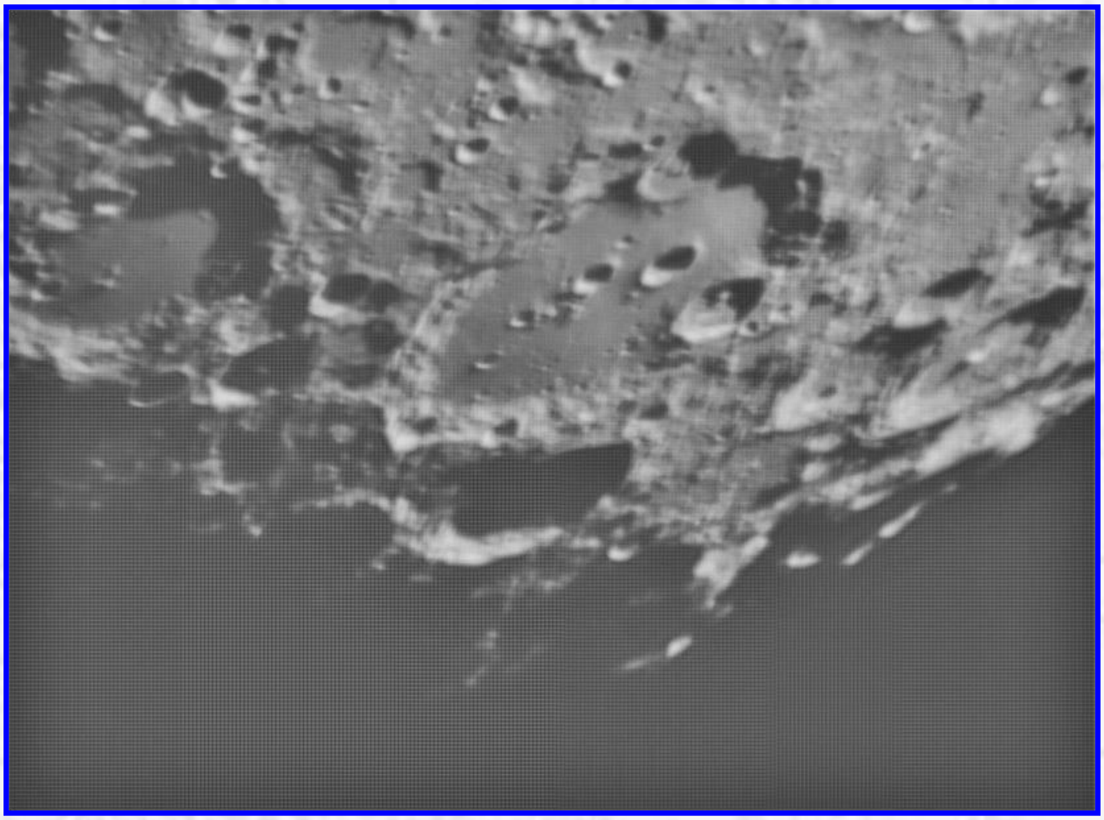
Clavius has literary and cinematic reminiscences, at least for those of us who dream of 2001: A Space Odyssey, in which a gigantic underground base was located in this crater. Due to its size and peculiar structure, it is a very recognizable place among the somewhat monotonous southern lands. In this Focus On we will have the opportunity to study a giant from the most remote times of the Moon, the Nectarian period. In addition, Clavius may be a place of importance in the future of lunar exploration, since in 2020 the presence of water (or rather the trace of hydrated minerals) was detected in this crater. Will the literary Clavius Base become a reality?

MARCH 2025 ISSUE-Due February 20 2025: CLAVIUS

MAY 2025 ISSUE-Due April 20 2025: VOLCANIC FEATURES

JULY 2025 ISSUE-Due June 20, 2025: RUPES RECTA

SEPTEMBER 2025 ISSUE-Due August 20, 2025: MARE HUMORUM



Fernando Sura

Focus On Announcement:
Volcanic Features: An Inventory of Past Chaos

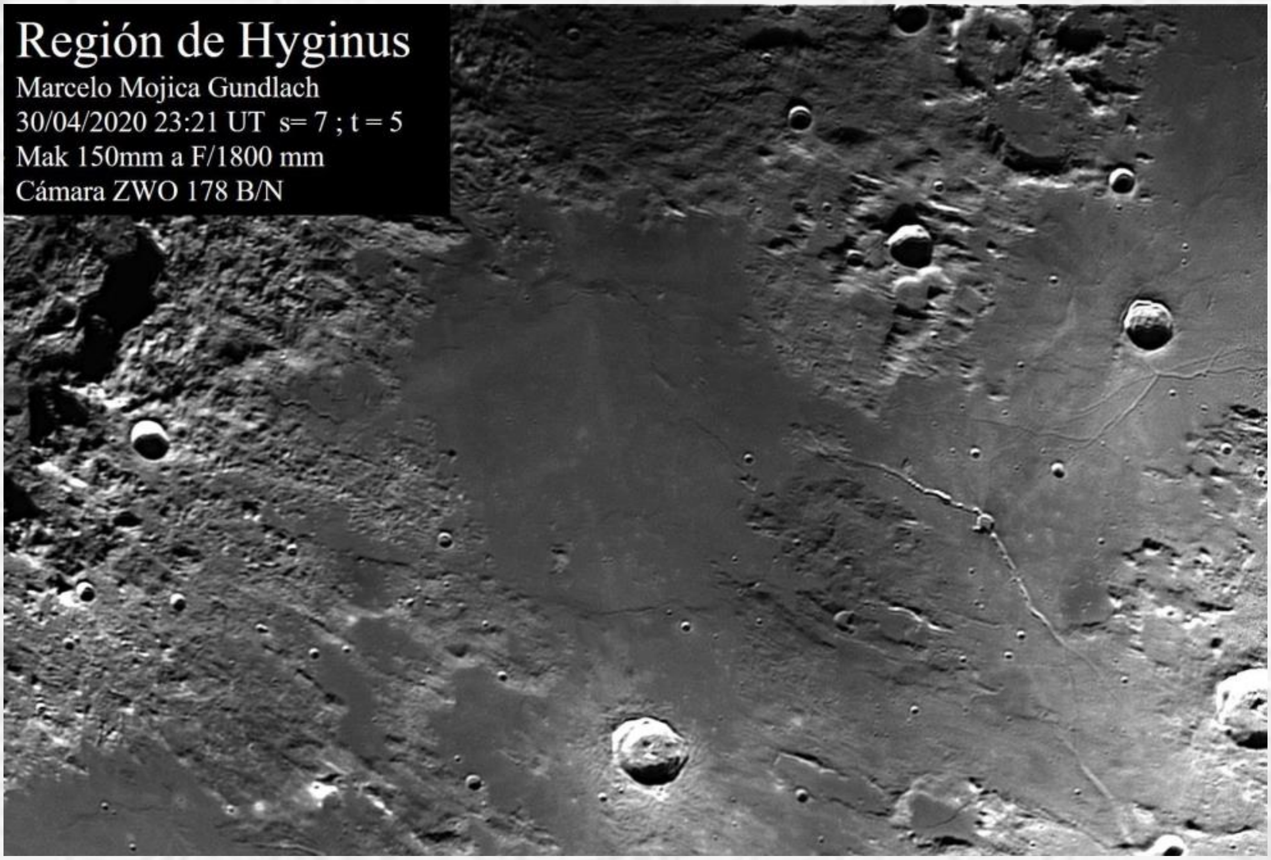
There was a (geological) time when the Moon was a real chaos, a new chaos, after the chaos of the great meteorite impacts that formed the basins. A volcanic chaos. We invite our observer friends to send their favorite images of the entire selenographic spectrum of volcanic features, from maria (including cryptomaria) to the smallest and most elusive, such as domes, passing through rilles, faults, volcanic craters, dark mantle deposits, fractured floor craters, including those of possible volcanic origin, such as wrinkle ridges and irregular mare patches. **We also invite you to share the reasons why you have sent images of your favorite volcanic features, to give a more personal touch to our Focus On.**

MARCH 2025 ISSUE-Due February 20 2025: CLAVIUS

MAY 2025 ISSUE-Due April 20 2025: VOLCANIC FEATURES

JULY 2025 ISSUE-Due June 20, 2025: RUPES RECTA

SEPTEMBER 2025 ISSUE-Due August 20, 2025: MARE HUMORUM



Marcelo Mojica Gundlach

Key to Lunar Images In This Issue

1. Albategnius
2. Alfraganus
3. Alpes, Montes
4. Alphonsus
5. Anaxagoras
6. Apenninus, Montes
7. Aristoteles
8. Arzachel
9. Cassini
10. Clavius
11. Copernicus
12. Endymion
13. Fecunditatis, Mare
14. Galle
15. Iridium, Sinus
16. Lamont
17. Luther
18. Nectaris, Mare
19. Plinius
20. Ptolemaeus
21. Sarabhai
22. Serenitatis, Mare
23. Tacitus
24. Vaporum, Mare