The Lunar Observer

A Publication of the Lunar Section of ALPO

David Teske, editor
Coordinator, Lunar Topographic Studies Section Program

July 2023

In This Issue

Online readers, click on images for hyperlinks

Lunar Reflections

Hoping all of out readers have had a positive month. For much of the northern hemisphere, as the summer season has developed, so has smoke from wildfires in Canada. I see it in the southern USA and read about it in Europe. Canada and the northern USA have really had a time of it! Luckily, it hasn't affected lunar observations too much.

In the current issue of *The Lunar Observer*, we have outstanding articles about the lunar topography from Rik Hill, Alberto Anunziato and Guillermo Scheidereiter. Alberto, Rik and Robert H. Hays, Jr. contribute text and images to the Focus-On Mons Rümker. Again, contributors from across the globe helped make useful observations of this rather elusive object. Tony Cook has his great articles about Lunar Geologic Chane and Buried Basins and Craters. Please continue to contribute to his outstanding programs!

Please remember to follow the future Focus-On topics and gather observations of these features. Next up is the very interesting Floor-Fractured Craters. Observations are due to Alberto and myself by August 20, 2023.

Clear skies,

-David Teske

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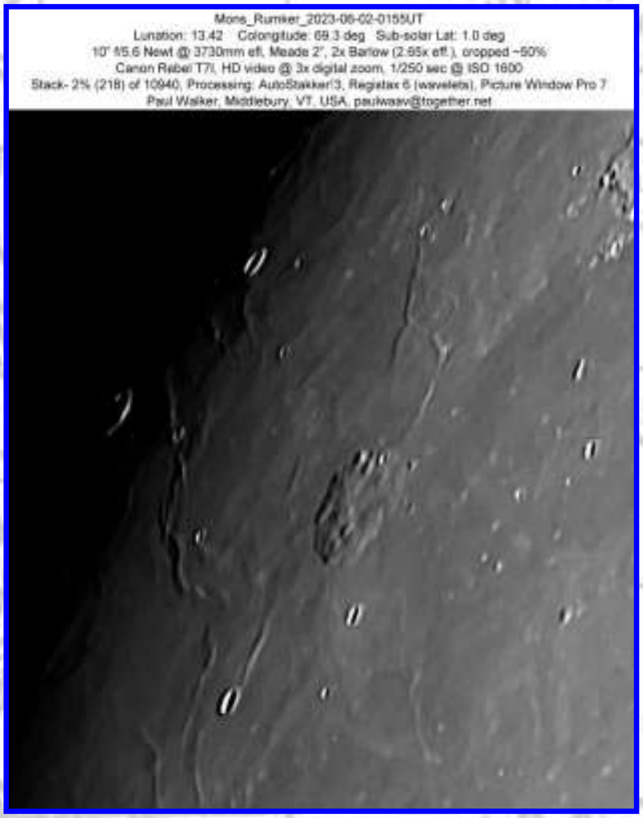

Lunar Topographic Studies

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Observations Received

Name	Location and Organization	Image/Article
Alberto Anunziato	Paraná, Argentina, SLA	Article *Focus-On Mons Rümker, Dorsum Higazy (and a Glimpse of Dorsa Stille and Dorsum Grabau), The Wrinkle Ridges on the Western Ridge of Mare Serenitatis*, drawing of Mons Rümker (4).
Juan Manuel Biagi	SLA, Oro Verde, Argentina	Images of Mons Rümker.
Maurice Collins	Palmerston North, New Zealand	Image of 7-day-old Moon.
Jef De Wit	Hove, Belgium	Drawing of Mons Rümker.
Massimo Dionisi	Sassari, Italy	Image of Mons Rümker.
István Zoltán Földvári	Budapest, Hungary	Drawings of Montes Pyrenaeus, Weinek, Davy, Krieger, Bayer, Poczobutt and McLaughlin.
Lawrence Garrett	Fairfax, Vermont, USA	Article *Visibility of Domes in Mare Undarum*.
Anthony Harding	Northeast Indiana, USA	Images on Mons Rümker (2) and 95% Waxing Gibbous Moon.
Robert H. Hays, Jr.	Worth, Illinois, USA	Article and drawing *Rümker*.
Rik Hill	Loudon Observatory, Tucson, Arizona, USA	Article and image *Straight Walls*, Mons Rümker, images of Mons Rümker (5).

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

Lunar Topographic Studies

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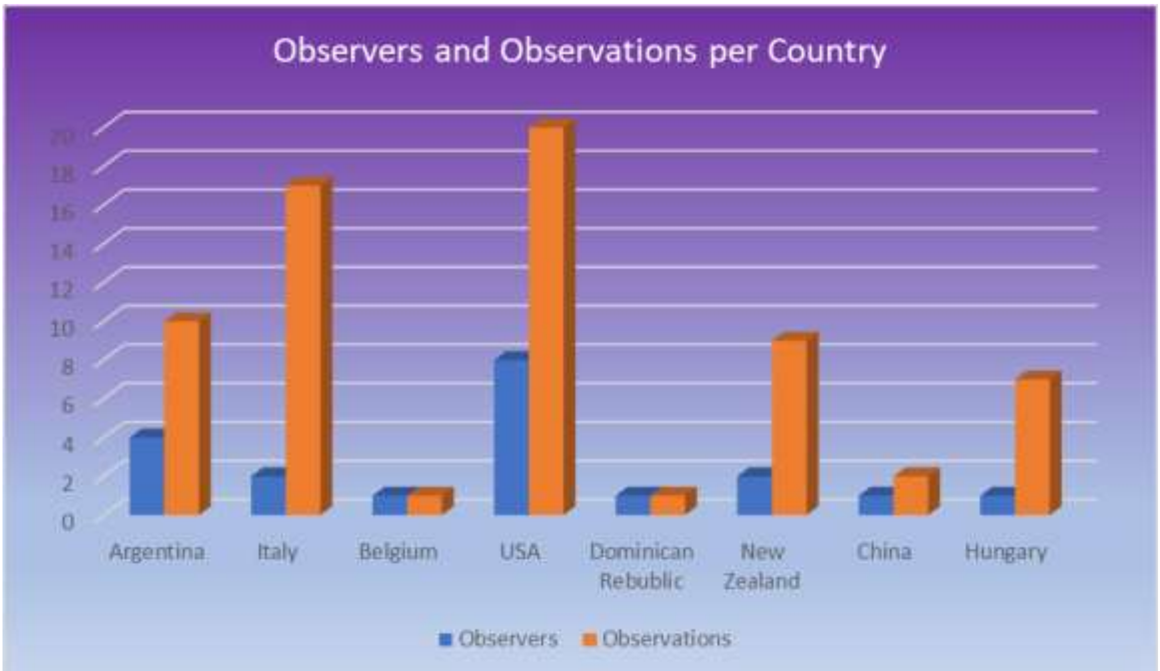
Observations Received

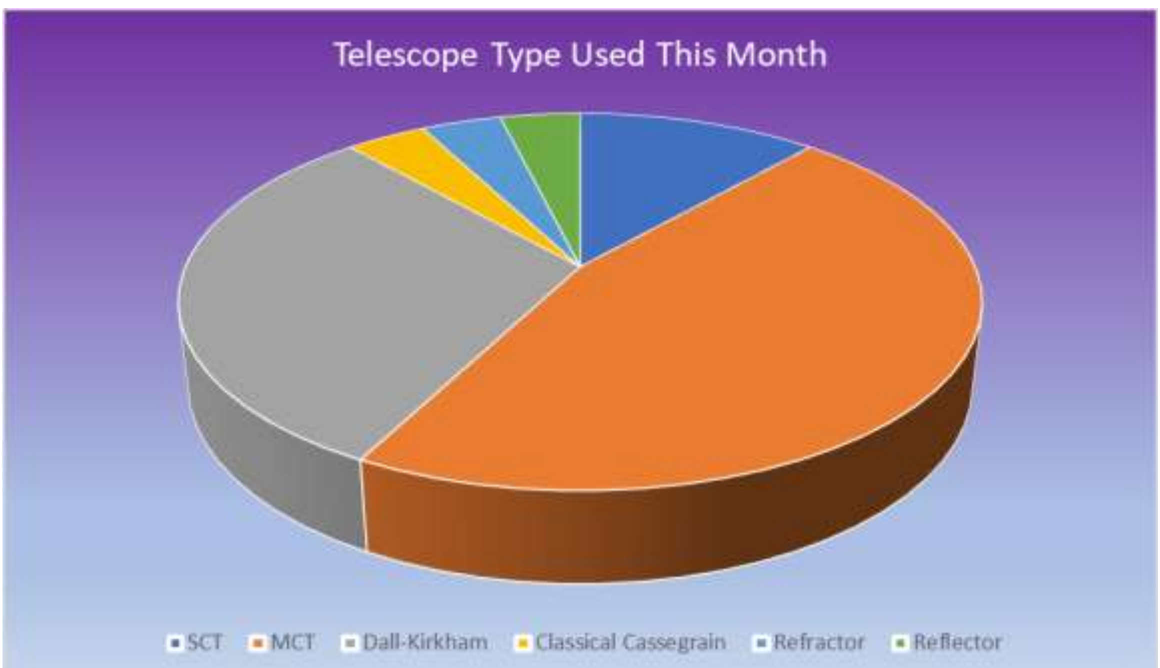
Name	Location and Organization	Image/Article
Felix León	Santo Domingo, República Dominicana, SLA	Images of Mons Rümker.
KC Pau	Hong Kong, China	Article and images Two New Rilles Found Near Crater Beer.
Guillermo Daniel Scheidereiter	LIADA, Rural Area, Concordia, Entre Ríos, Argentina	Article *The Moon of Men*.
Gregory Shanos	Sarasota, Florida, USA	Images of Mons Rümker (2).
Fernando Surá	San Nicolás de los Arroyos, Argentina	Images of Mons Rümker (2).
Michael Sweetman	Sky Crest Observatory, Tucson, Arizona, USA	Images of Theophilus and Bürg.
David Teske	Louisville, Mississippi, USA	Images of Mons Rümker (3).
Larry Todd	Dunedin, New Zealand	Images of Pythagoras, Hercules, Römer, Posidonius, Aristarchus, Mare Nectaris, Eddington and Hevelius.
Fabio Verza	SNdR, Milan, Italy	Images of Cleomedes, Endymion, Helmholtz, Mare Crisium, Langrenus, Petavius, Snellius, Taruntius, Gassendi, Aristarchus, Copernicus, Schickard, Plato, Schiller, Vieta and Sinus Iridum.
Paul Walker	Middlebury, Vermont, USA	Images on Mons Rümker (2).

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

July 2023 *The Lunar Observer*
By the Numbers

This month there were 67 observations by 20 contributors in 8 countries.





ALPO 2023 Conference: Call for Papers

Tim Robertson & Ken Poshedly,
ALPO Conference coordinators

Overview
Due to the success of attracting more and more viewers and participants to our online conferences, the 2023 Conference of the ALPO will once more be held online, this time on Friday and Saturday, July 28 and 29.
The ALPO conference times will be:

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

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

Conference Agenda
The conference will consist of initial welcoming remarks and general announcements at the beginning each day, followed by papers and research findings on astronomy-related topics presented by ALPO members.
Following a break after the last astronomy talk on Saturday will be presentation of the Walter Haas Observing Award. A Peggy Haas Service Award may also be awarded.
A keynote speaker will then follow the awards presentations on Saturday. The selection of a keynote speaker is in progress and the final decision will be announced in the summer issue of this Journal (JALPO65-3).

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

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

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

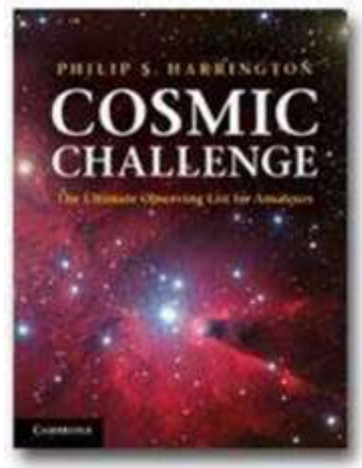
Information about paper presentations, the keynote speaker and other conference data will be published in this Journal and online as details are learned.

Lunar X and V Visibility 2023

Submitted by Greg Shanos

Table 4.3 Lunar X and Lunar V Visibility Timetable

	2023
Jan	29; 00:37
Feb	27; 15:02
Mar	29; 04:59
Apr	27; 18:10
May	27; 06:28
Jun	25; 18:02
Jul	25; 05:07
Aug	23; 16:07
Sep	22; 03:26
Oct	21; 15:27
Nov	20; 04:23
Dec	19; 18:16



Note: The dates and times listed are based on calculations made with the Lunar Terminator Visualization Tool (LTVT) by Jim Mosher and Henrik Bonda. This useful freeware program may be downloaded from https://github.com/fermigas/ltvt/wiki.

Straight Walls

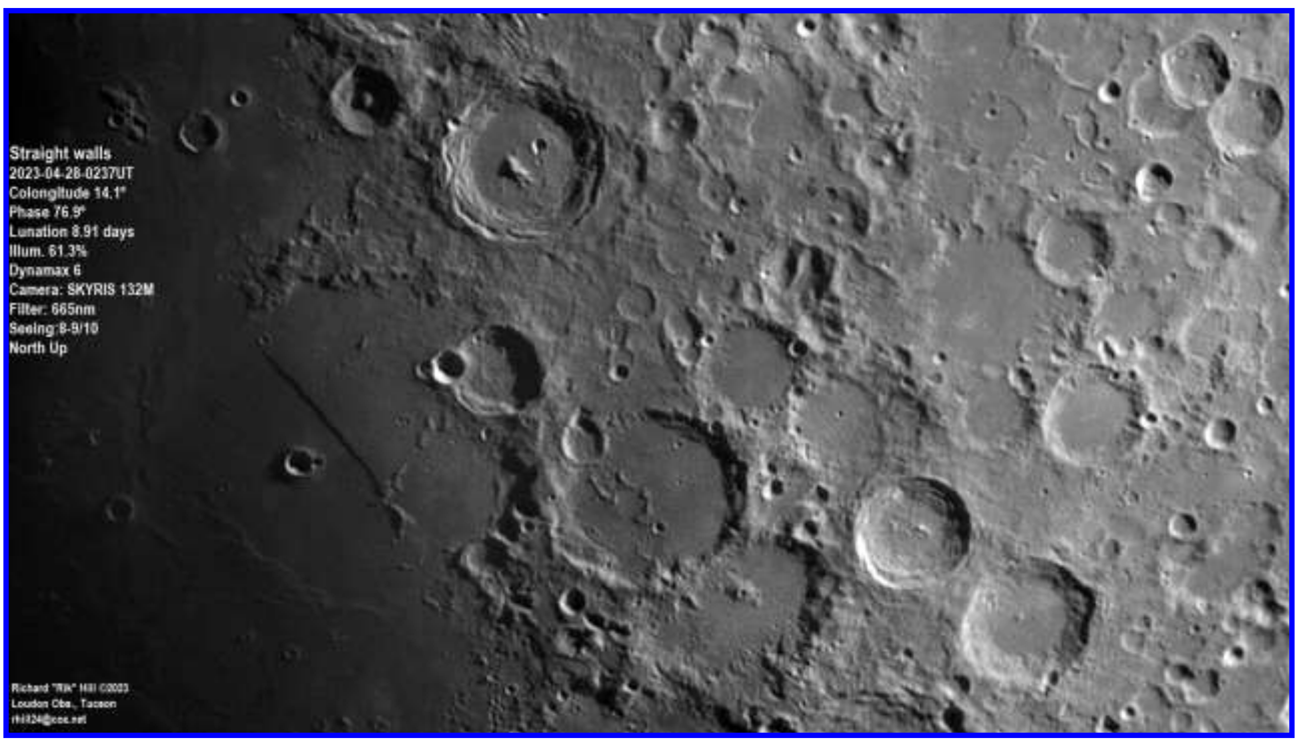
Rik Hill

This field is south of the great crater Arzachel (100km dia.) and well known to the versed lunar observer for its many and varied features. The first feature is Arzachel itself, the southernmost of the trio with Ptolemaeus, Alphonsus that dominates the center of the visible disk of the Moon. It is noted for its spectacular terracing and interior rimae one of which that arcs north-south just east of the oddly off-center peak on the floor and roughly concentric with Arzachel A (8 km). Below or south of Arzachel is the crater Thebit with the interesting configuration of Thebit A (19 km) on the northwestern portion of the wall and Thebit L (10 km) to the northwest of that. Then west of this is the iconic "Straight Wall" which is neither straight nor a wall per se. It is seen here as a dark diagonal slash on the eastern edge of Mare Nubium, running up from the curious set of peaks below Thebit northwest to the little crater Thebit D (5 km). The "wall" is made up of a number of small faults 8-50 km in length, with the cliffs being some 250-300 m high and 2.5-3 km in width, angled at less than 10°. The curious peaks are colloquially called "The Stag's Horn Mountains" and are the remnants of previous features destroyed in the massive Nubium impact event.

Just to the right of image center is a particularly well-defined, good-sized crater, Werner (70 km). Between it and Thebit is a larger crater, less well defined, Purbach (118 km) with remnants of now buried craters on its northwestern floor. Above Werner is a very poorly defined crater, more of an oval plain, Blanchinus and north of it is la Caille (both 68 km dia.). These are interesting because of their intersection. The raised terrain between the eastern wall of Purbach and the western walls of Blanchinus and la Caille form what is known as the "Lunar X" at low sun angles. Can you see it here? Those familiar with the feature when it is on the terminator probably can.

Before leaving this region notice the feature to the upper right of la Caille. It appears like a deer hoofprint in snow, more hoof-like than the popular Aries Hoofprint! In LROC images it appears to be the juxtaposition of two badly ruined craters that once shared a common straight wall. This is Delaunay (roughly 46 km) and a much-modified version of the two craters in the uppermost right corner of the image, Azophi (48 km) at bottom and Abenezra (41 km) above. You can see how the shared straight wall is flattened between them as in Delaunay thought these latter craters were not as ruined. This is truly a region of straight and not-so-straight walls!

Rupes Recta, *Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2023 April 28 02:37 UT, colongitude 14.1°. Dynamax 6 inch Schmidt-Cassegrain telescope, 665 nm filter, Skyris 132M camera. Seeing 8-9/10.*



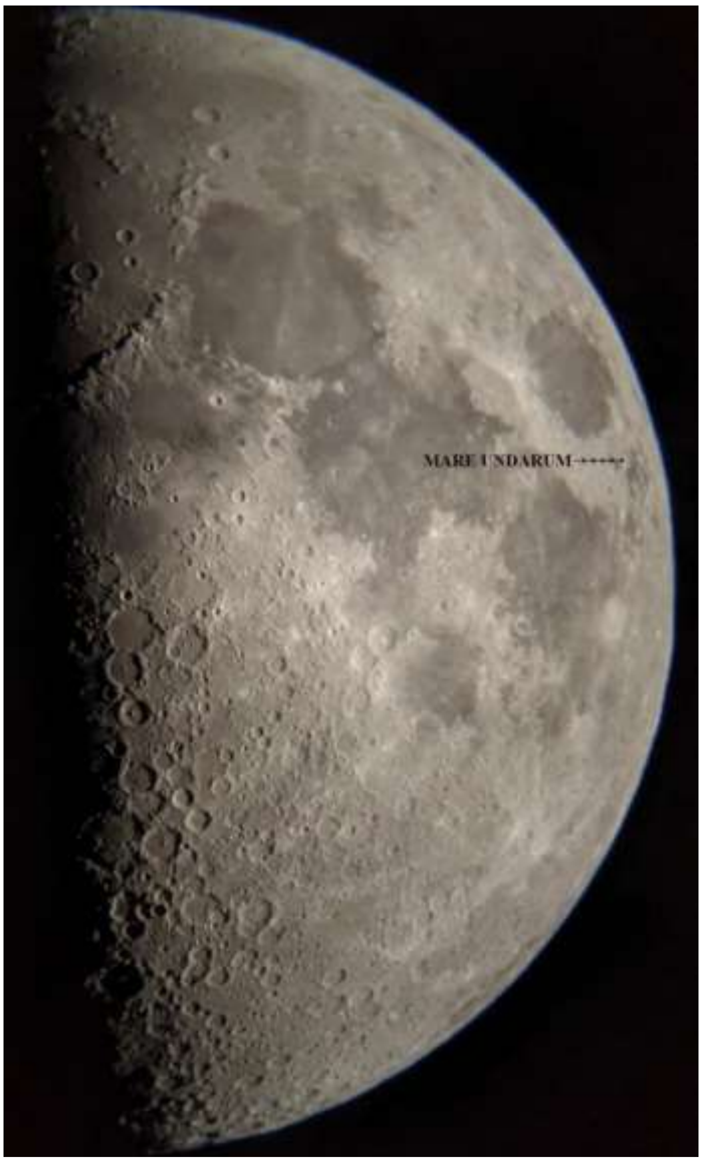
Lunar Topographic Studies
Straight Walls

Visibility of the Domes of Mare Undarum

Lawrence Garrett

In my personal observing program of lunar features, the elusive domes of Undarum were finally revealed in a manor unexpected as compared to success with other domes featured in our lunar domes section, http://lunardomeatlas.blogspot.com/

While observing at phases of similar illumination is the accepted method for success, the dome's location on the eastern lunar disk presents challenges to the observer. Image by Scott Turnbull, Essex Junction Vermont, using a Celestron NexStar Evolution 6.

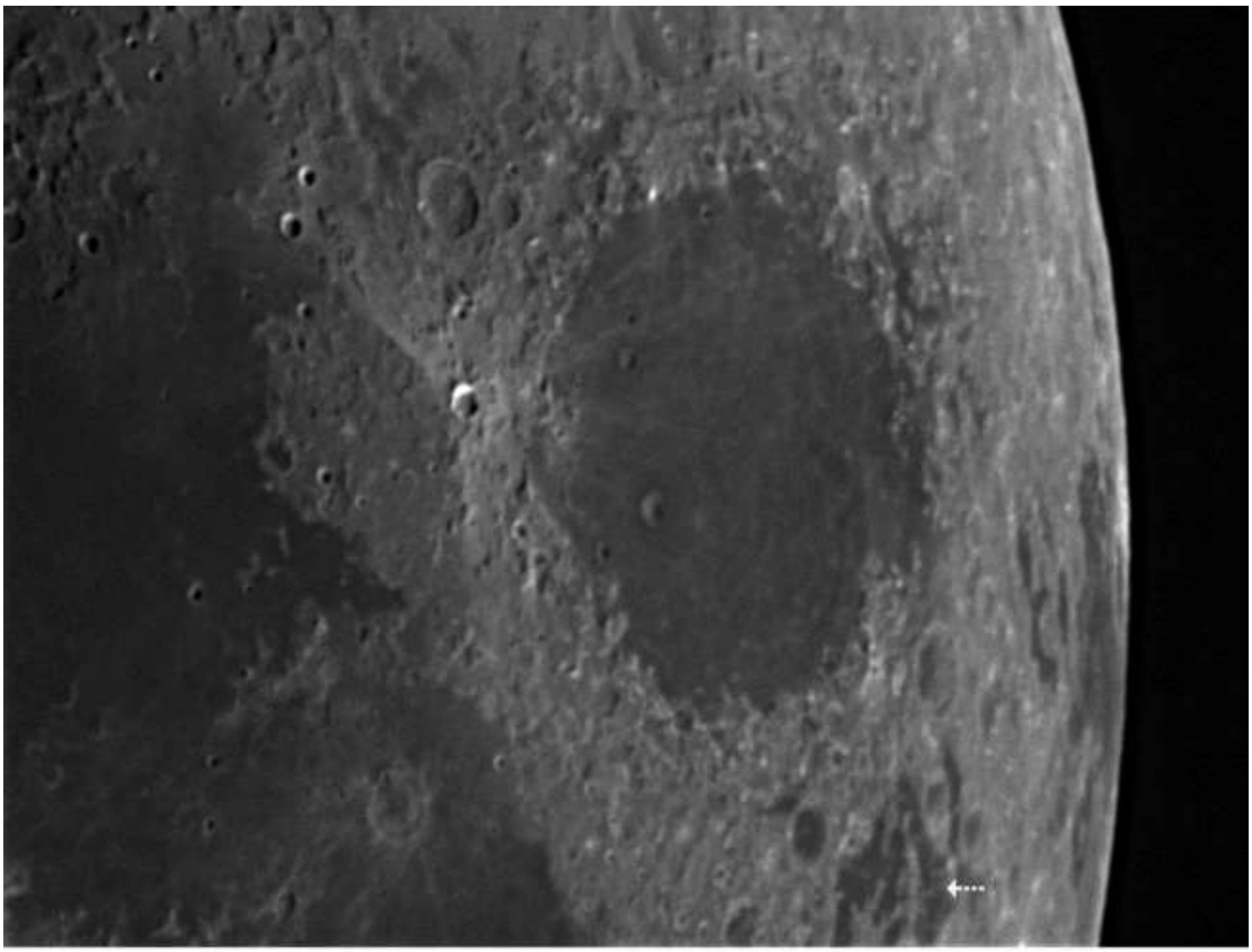


Using the program LunarPhase Pro, the projected dates of similar illumination usually fall every other month. Even this slim window is trimmed by the moons location on the ecliptic often being too low for the excellent seeing needed for visual and imagining success.

With the high declination of +40 and +52 degrees during two observing periods on May 27, 2023, I decided to reverse my observing methods, observing at phases far removed from the similar illumination dates.
My usual telescope of choice over two years near favorable dates was my 6" f/8 Newtonian reflector. This size telescope is recommended as a good match to New England seeing conditions.

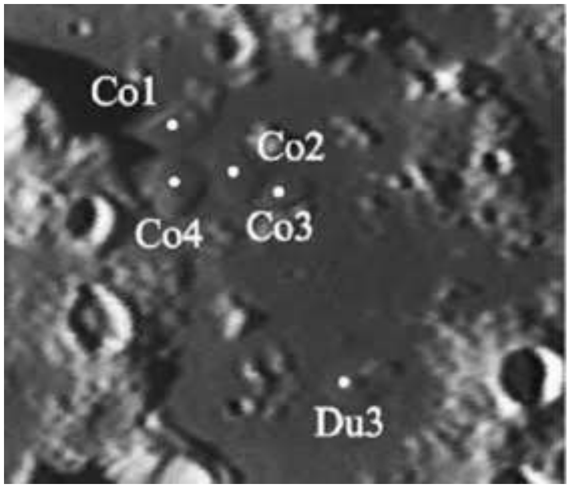
But on May 27 1h00-2h00 UT, I decided to observe the 44% illuminated phase (Co- longitude 355.60) with my 12.5" f/6 Newtonian reflector and 60% neutral density filter.

At once I noticed an additional feature not seen before. This was an extension of light from one of Mare Undarum's mountain ridges into the normally dark mare floor.
An image from Wayne Baily in the June 2023 TLO imaged the position but not exact shape of the extension I observed.



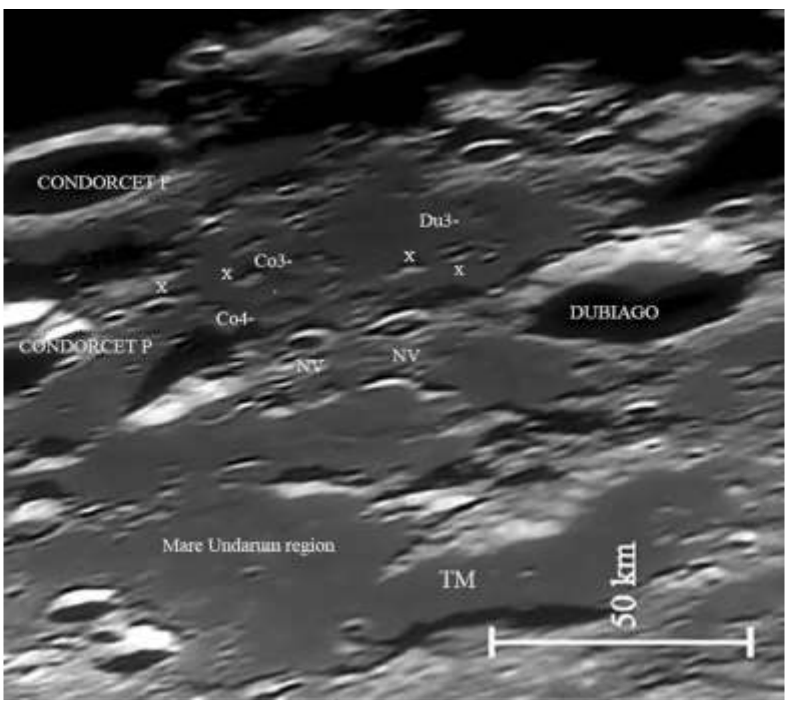
MARE CRISIUM. Wayne Bailey, Three Points, Arizona USA. February 8, 2022 02:10 UT, Seeig 7/10, Transparecy 6/6, Colongitude 350.0 deg. 8" f/12 Classical Cassegrain. W58 Green filter, Skynyxx_2-1M.

This bright extension matched the predicted position of domes Condorcet 2-3-4, but without resolution of individual features. Without possible imaging with my 12.5" telescope, I decided to review images published in the TLO. This image is from our Lunar Domes Atlas GLR group.



But before my review had begun, another observing period became available, on May 27 22h00m-23h50m UT, Colongitude 6.20°. This twilight period into darkness proved priceless with greater success on not only resolving 3 domes, but other small ridges and features as marked here.

Condorcet 4 and Condorcet 3—resolved as close double with shapes of each visible at 156x best
Dubiago 3-reflection visible as point of light.
X-defines features visible.
NV defines features without shadow visible.
Point dot defines not visible dome Condorcet 2.
Condorcet 1 is not marked.



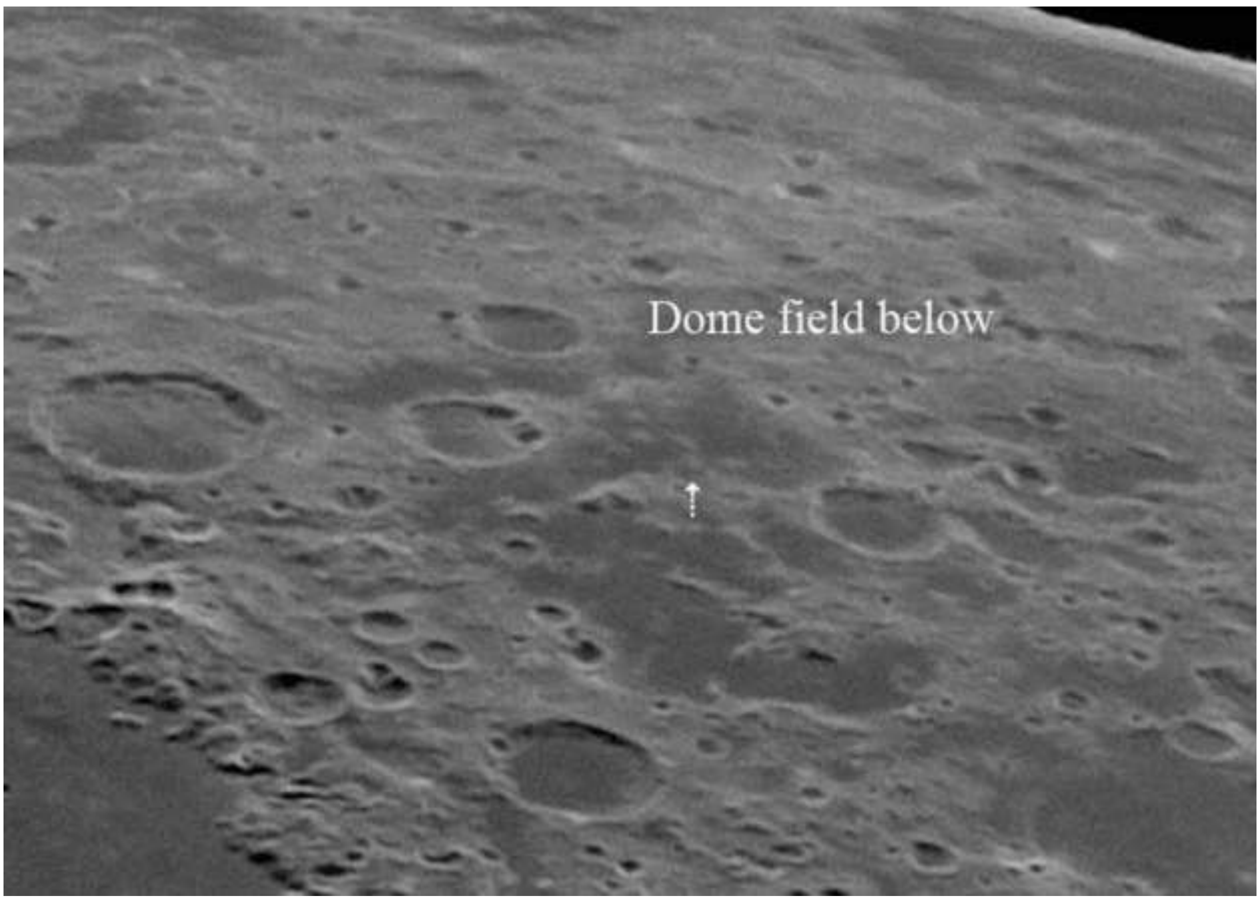
Lunar Topographic Studies
Visibility of the Domes of Mare Undarum

With intense lunar light muted during this period, details not seen in most images were visible. Of note was the soft texture of the marked TM mountain ridges. Very soft and detailed with perfect light, in which standard maps or impressions of this area would suggest none. Large contrast to the firm appearance in ridge near the domes.

TM merely stands for "textured mountains".

The resolution of domes Condorcet 3 and 4 in both position and shape presents positive evidence that the extension of light into the area seen 20 hours before was composed by Condorcet domes, 2-3-4. This suggests Condorcet 2 slope reflection declined in the 20 hours period from last observation.

The view was very similar to the image by Guillermo Scheidereiter seen here, with Condorcet 2 and 4 above the arrow as seen. From January 2023 TLO.



With the success of two observers in the year's TLO so far, observers are urged to review their images of this area. I believe review of colongitudes and images may reveal more information of the visibility of all the Condorcet and Dubiago 3 domes. Observers are welcome to forward their images to myself at lsginbox@outlook.com.

Or submit for their own articles and comments.

The review of the visibility of these domes cannot be complete without the following from our Domes section coordinator Raffaello Lena, in work in Planetary and Space Science, Volume 56, Issues 3-4, 2008.

Raffaello Lena, Christian Wöhler, Maria Teresa Bregante, Paolo Lazzarotti, Stefan Lammel, Lunar domes in Mare Undarum: Spectral and morphometric properties, eruption conditions, and mode of emplacement,

Planetary and Space Science, Volume 56, Issues 3–4,

2008,

Pages 553-569,

ISSN 0032-0633,

https://doi.org/10.1016/j.pss.2007.11.010. (https://www.sciencedirect.com/science/article/pii/S0032063307003431)

Abstract: In this study we examine five lunar domes in Mare Undarum. Four domes termed Condorcet 1–4 are located between the craters Condorcet P and Dubiago, immediately east of Dubiago V and W. The fifth dome, termed Dubiago 3, is located about 35 km further south. The region under study is situated in a major trough concentric to the Crisium basin. The domes Condorcet 1–3 are aligned radially with respect to the Crisium basin. Similar dome configurations aligned radial to major impact basins are known from other lunar mare dome fields. The spectral signature of the domes derived from Clementine UV/VIS imagery reveals that they consist of basaltic lava with a low TiO_2 content below 2wt% and with a FeO content around 10wt%. Three examined domes exhibit highland components in their soils, which we attribute to lateral mixing between the material in the mare ponds and the surrounding highland material due to random impacts. All five domes have moderate diameters between 10 and 12 km. Condorcet 1–3 are similar to effusive domes of intermediate flank slope between 1∘ and 2∘ like those situated in the Hortensius/Milichius/T. Mayer region, while Condorcet 4 has an exceptionally steep flank slope of 2.8∘ and a large volume. With its low flank slope of 0.9∘, the dome Dubiago 3 is morphometrically very similar to a known intrusive dome in the west of Mare Serenitatis. Hence, this structure is possibly of intrusive origin, but with the available data an effusive origin cannot be ruled out. Based on a rheologic model, we infer the physical conditions under which the domes were formed (lava viscosity, effusion rate, magma rise speed) as well as the geometries of the feeder dike.

Dorsum Higazy
(And a Glimpse of Dorsa Stille and Dorsum Grabau)
Alberto Anunziato

Identifying the net of wrinkle ridges illustrated in IMAGE 1 was very difficult. My help was the book "Luna Cognita", by Robert Garfinkle, especially its chapter 27: "Observing Lunar Wrinkle Ridges". It is a densely populated area of these gentle elevations that are so fascinating in the twilight of the vicinity of the terminator: "Even though Mare Imbrium is a circular basin, it contains wrinkle ridges that both conform to the general outline of the basin's shore and other ridges that are scattered across the middle of the mare". In IMAGE 1 we see both kinds of wrinkle ridges.

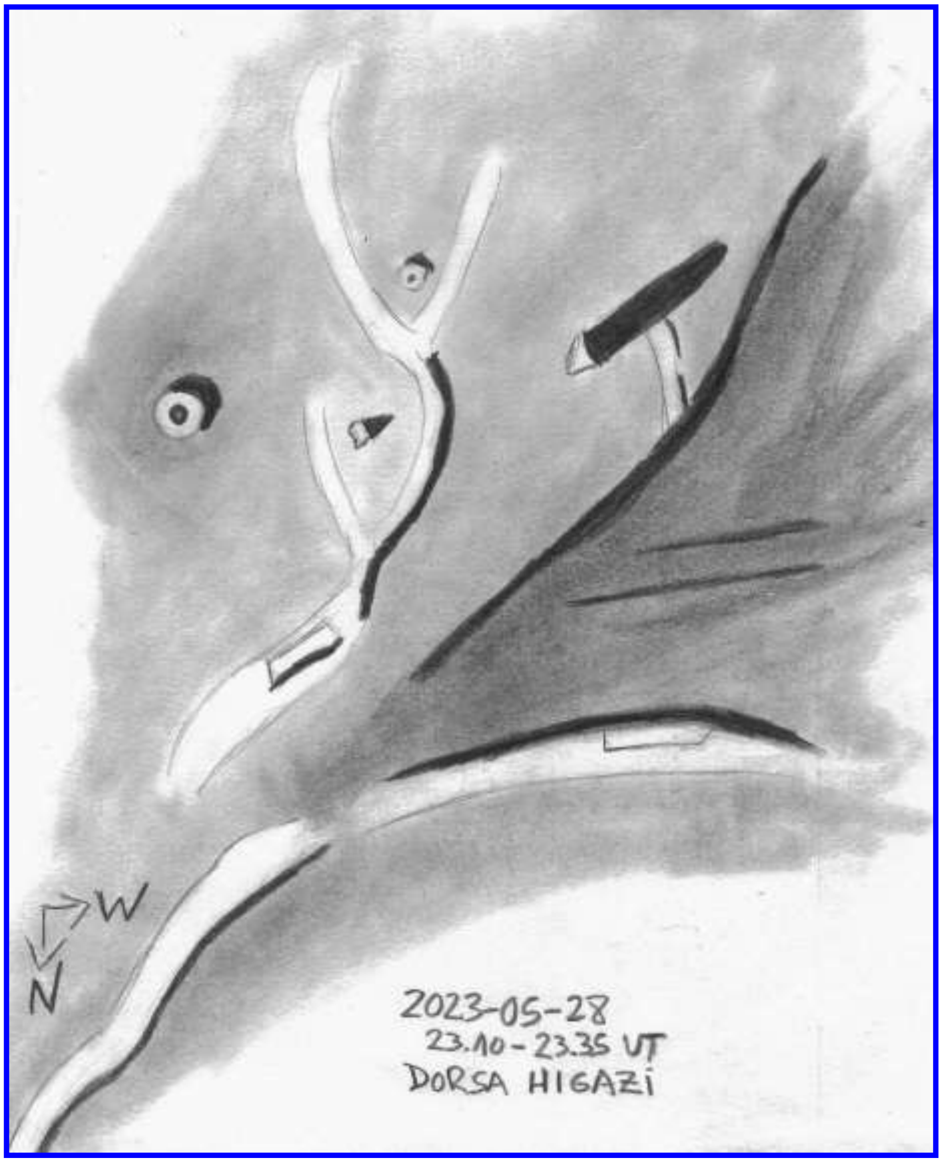


Image 1, Dorsum Higazy, *Alberto Anunziato, Paraná, Argentina, SLA. 2023 May 28 23:10-23:35 UT. Meade EX 105 mm Maksutov-Cassegrain telescope, 154x.*

Lunar Topographic Studies
Dorsum Higazy

The two northern (bottom) segments, running from east to west, belong to Dorsum Grabau, the westernmost segment having a nice crest (upper component of dorsum, superimposed on lower component, arch). These two segments are located in the contour of the Imbrium, while the other segments are radial to the Imbrium basin. The ridge in the center, the most conspicuous, is Dorsum Higazy: "To the west of Timocharis is the gentle arc (facing toward the west) of Dorsum Higazy. The ridge loops to the west of the solitary massif Lambert δ (lat. 27.00°N, long 17.00°W). Portions of this ridge are lost in the whiteness of a Copernicus ray that overlies it". Observing near the terminator, that Copernicus bright ray did not obstruct Dorsum Higazy's vision, as happens in IMAGE 2, which is image 14.61 of the cited book and belongs to Paolo Lazarotti. This image, and IMAGE 3 (from the LROC Quickmap), help us locate ourselves on the ground. In IMAGE 1 Timocharis and Lambert are outside the field (to the left and right respectively), while in IMAGE 2 they are to the right and left. The "solitary massif" referred to by Garfinkle (Lambert δ) is the smallest, to the right of which Dorsum Higazy casts a shadow. Here the picture is complicated. If we look at the orange markings indicating the wrinkle ridges cataloged on the LROC Quickmap, we realize that in IMAGE 1 Dorsum Higazy extends well south of Timocharis E, which is the 4 km craterlet in diameter that the ridge seems to embrace (the crater on the left is Heinrich, 8 km in diameter, which we locate further north of its actual location). Luckily Garfinkle confirms our observation: "Though unnamed, a weak ridge that appears to be a part of Dorsum Higazy twists and curves its way farther south and ends at the northern foot of Montes Carpatus. Portions of this ridge are broad and high and others are very low and tend to disappear into the mare".

I say fortunately, since in the LROC Quickmap this segment does not appear south of the Lambert γ massif (which is the largest bright triangle and casts a longest shadow). Nor does the segment that seems to embrace Lambert δ to the east appear on said map (parallel to the segment that embraces said massif to the west, which is included in the LROC Quickmap). An interesting case of ghost segments. Conversely, I could not observe the segment that runs from east to west, joining Lambert δ and Lambert γ. To the west of Lambert γ, the shadows of the terminator only allowed us to presume the existence of elevations due to the darker shadows that projected what seemed to be another wrinkle ridge and that Garfinkle's text helped us to identify: it is "Dorsa Stille, on Mare Imbrium, consists of very low flat ridges that appear to almost touch the northeast base of the massif Lambert γ. These ridges gently arc toward the east and run generally north to south for about 80 km (50 miles)".

Image 2, Dorsum Higazy*, Paulo Lizaratti image 14.61.*

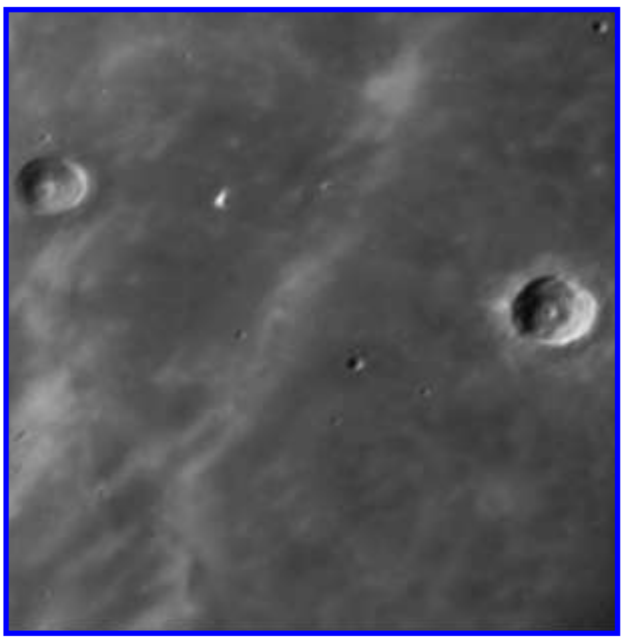


Image 3, Dorsum Higazy, *LROC Quickmap.*

Lunar Topographic Studies
Dorsum Higazy

Two New Rilles are Found Near Crater Beer

KC Pau

Recently, when I browse through the area around Montes Archimedes in LROC-QuickMap WAC Mosaic + NACs mode (evening view), the tiny crater Beer catch my attention. Beer is located west of Montes Archimedes with a diameter of only 9 km and is paired with the similar sized crater Feuillée. Beer is well-known to amateur moon observers with its small crater chain. This chain has not been designated any name by IAU but Belgium amateur Danny Caes nicknamed it as Catena Beer. To my great surprise, I notice a long and narrow rille adjoining the eastern end of the crater chain. The rille extends eastwards for more than 44 km to the western base of Montes Archimedes. Its average width is about 1.1 km with a depth of only 96 m. To my knowledge, this rille is seldom discussed in many moon books. Then I check with other moon maps if the rille has a formal name. It is known as Rima Archimedes I in LAC 41 chart. Unfortunately, this name has been abandoned by IAU. For convenient communication, I call it Rima Beer I (not IAU official name). Not far away and north of Rima Beer I, I notice another narrow rille emerging from somewhere east of Beer E. It also runs towards the western base of Montes Archimedes and passes through two tiny craters on its way. It also cuts across the formerly called Rima Archimedes II. Parts of the rille are not prominently displayed as if they have been missing. The whole length is about 35 km. I name it Rima Beer E (not IAU official name). Both Rima Beer I and Beer E are running parallel to each other (fig. 1). When I switch the WAC Mosaic + NACs mode (evening view) to WAC Nearside (big shadows) mode (morning view), both Rima Beer I and Beer E cannot be detected (fig. 2). The reason may be these two rilles are oriented in the E-W direction, like the Rima Sheepshanks, the morning sunlight may not favor their visibility. It is quite an interesting phenomenon indeed.

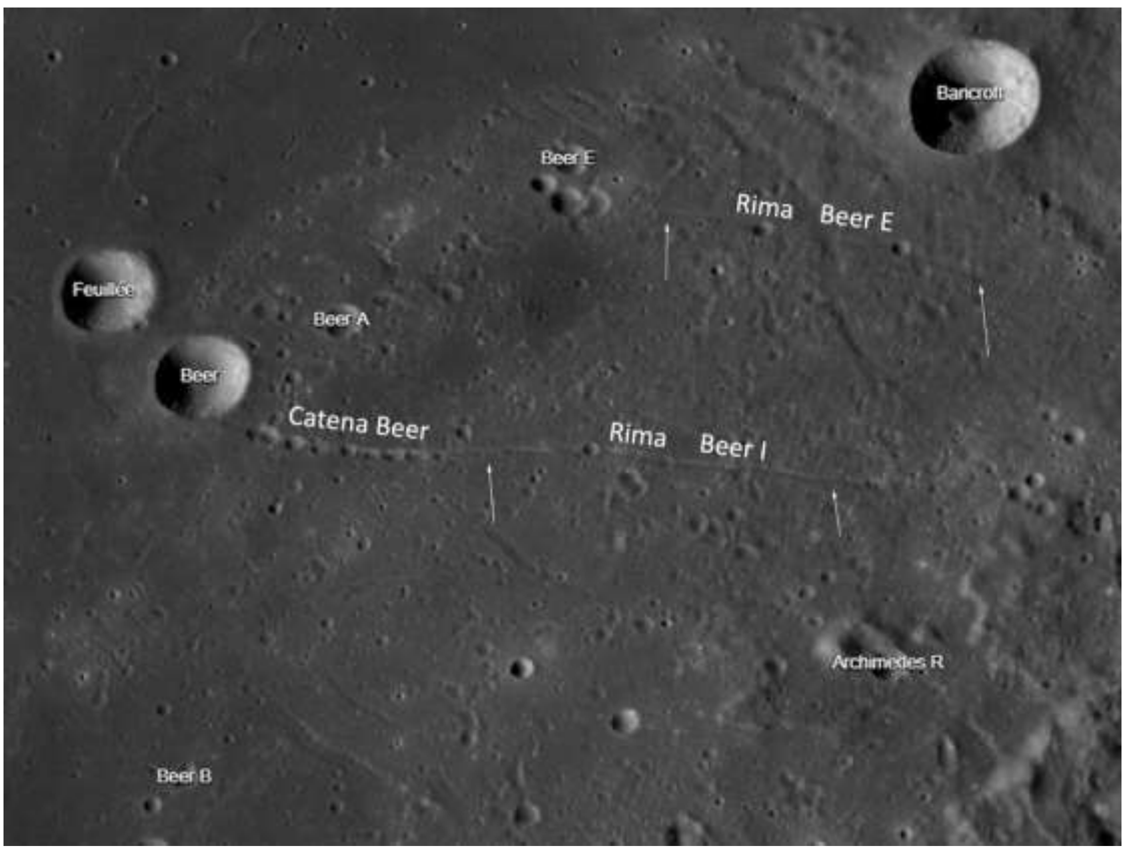


***Fig. 1** under QuickMap WAC Mosaic + NACs mode (evening view), both Rima Beer I and Rima Beer E are clearly shown.*

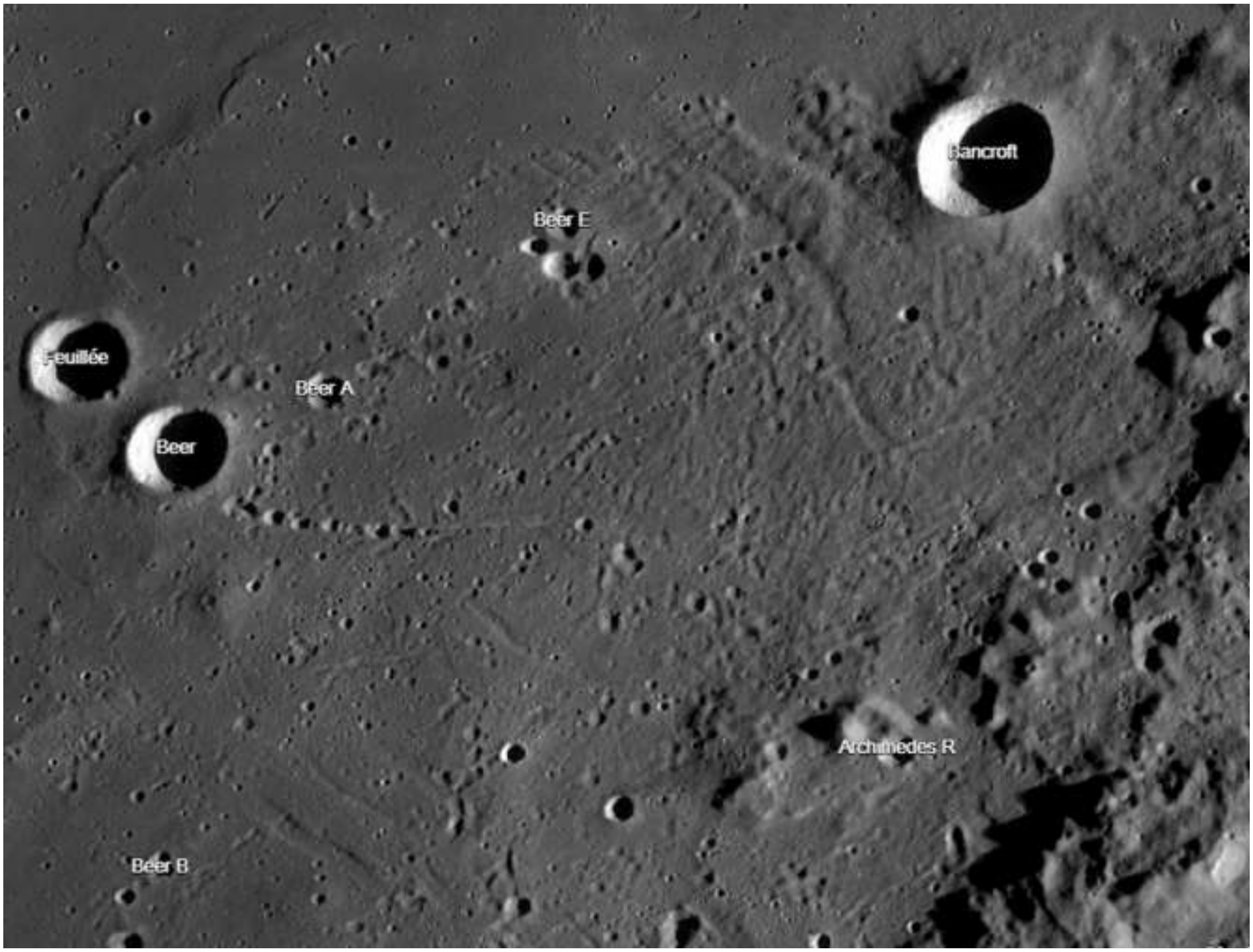


Fig. 2 *under QuickMap WAC Nearside (big shadows) mode (morning view), both Rima Beer I and Rima Beer E cannot be detected.*

As usual, I search through my moon photo archives to check if there is any photo that had recorded these two tiny rilles. I am very disappointed that I could only find one photo that showed a vague trace of the rilles only if you know where they are (fig. 3). This photo is taken on 14 August 2017 with my 10-inch Newtonian reflector under evening illumination.

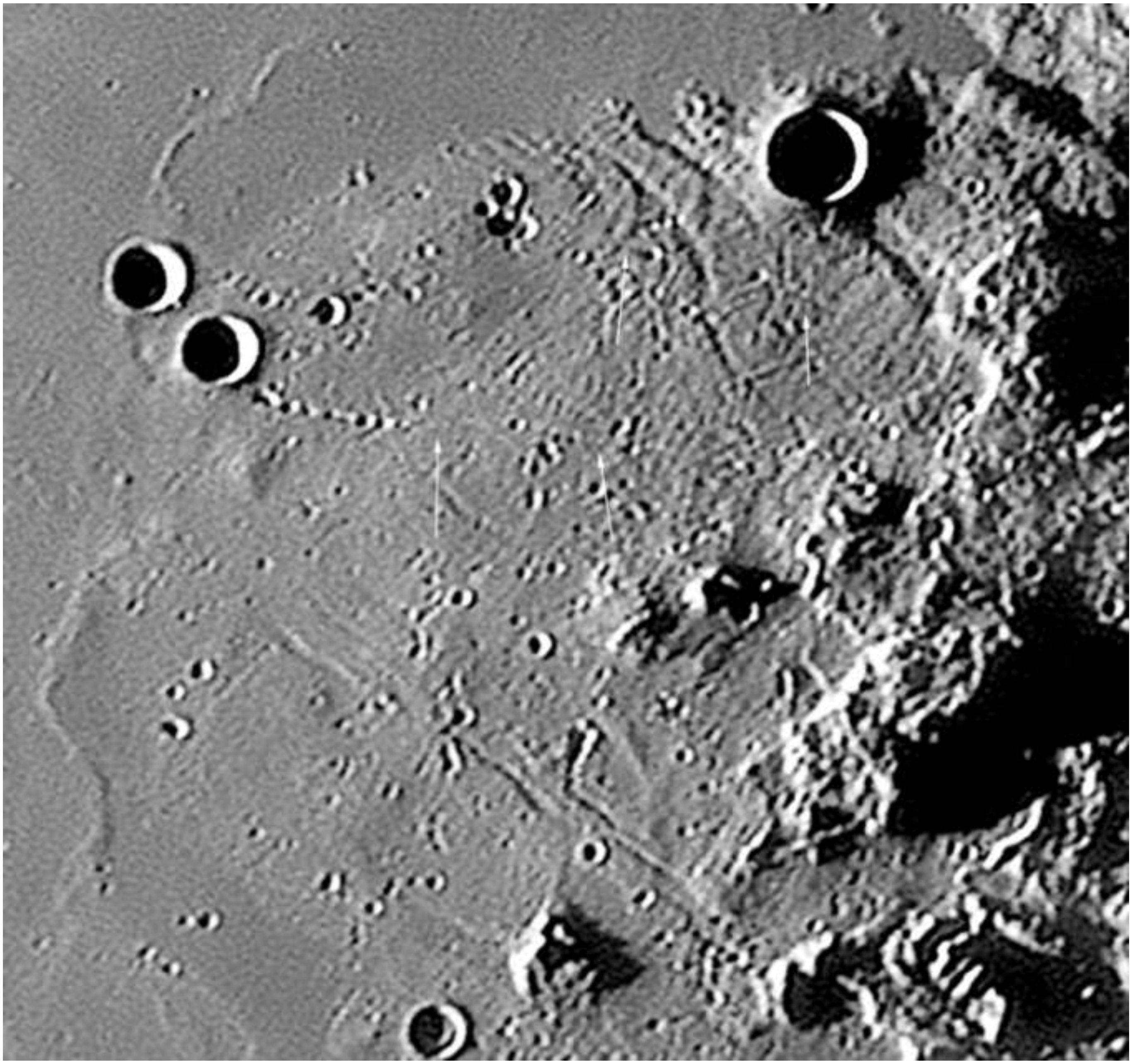


Fig. 3 *this photo is taken on 14 August 2017 with 10-inch Newtonian reflector under evening illumination. Both Rima Beer I and Rima Beer E are vaguely detected if you know where they are.*

I give up my photo searching and begin to process piles of avi files which have been captured in the past two years. After a long period of processing, I come across a photo that shows a distinct rille adjoining Catena Beer (fig. 4). This photo is taken on 31 December 2022. At that moment, I really wonder if my reflector has done the magical job. Then I check it with the QuickMap. The rille shown on the photo is not on the right track of Rima Beer I where it should run eastwards but it deviates to the north. Certainly, it must not be Rima Beer I. May be, it is another new rille! Unfortunately, no sign of a rille can be detected on QuickMap at that location but a chain of craterlets. My mind is filled with puzzles. I decide to switch the QuickMap to its ACT layers/Terrain-Hillshade mode to see what the actual picture is. By adjusting both the Zenith and the Azimuth readings patiently to 81.5 degree and 321 degrees respectively, an astonished screen pops out. The "new rille" is not a rille at all but really a line of craterlets only. The resolving power of my telescopes is not powerful enough to split them into individual craterlets, as well as due to the Clair-Obscure effect, so these craterlets look like a rille or a dark line in the photo. When my eyes focus on the real Rima Beer I, magical thing happens. A delicate linear rille appears just north of Rima Beer I and runs side by side with it towards the western base of Montes Archimedes. This new rille is originated from the east side of a pair of tiny craters which are located about 21 km east of Beer. The total length is about 39 km and with average width about 1.3 km. I nickname it Rima Beer II (not IAU official name). Rima Beer II seems to be a heavy degraded structure and is composed of many craterlets coalesced together.

Fig. 4 *this photo is taken on 31 December 2022 and the "new rille" adjoining Catena Beer is clearly shown (see arrows). It is neither Rima Beer I nor a real new rille but only a chain of craterlets.*

Not so far away south of Beer and close to a dome that has a summit pit, another delicate rille is found. It also runs parallel with Rima Beer I towards the base of Montes Archimedes. I call it Rima Beer III (not IAU official name) (Fig. 5). The total length is about 48 km. Both these new rilles cannot be identified under WAC Mosaic + NACs mode or WAC Nearside (big shadows) mode. However, a small part of the eastern portion of Rima Beer III can be identified in WAC Nearside mode but it is easily neglected by observers.

What a wonderful day it is. I have found two elusive rilles in the same location on the Moon. Conclusively, amateur moon observers still have great opportunity to discover some elusive features on the Moon if a good tactical plan is employed and with the aid of the LROC QuickMap.

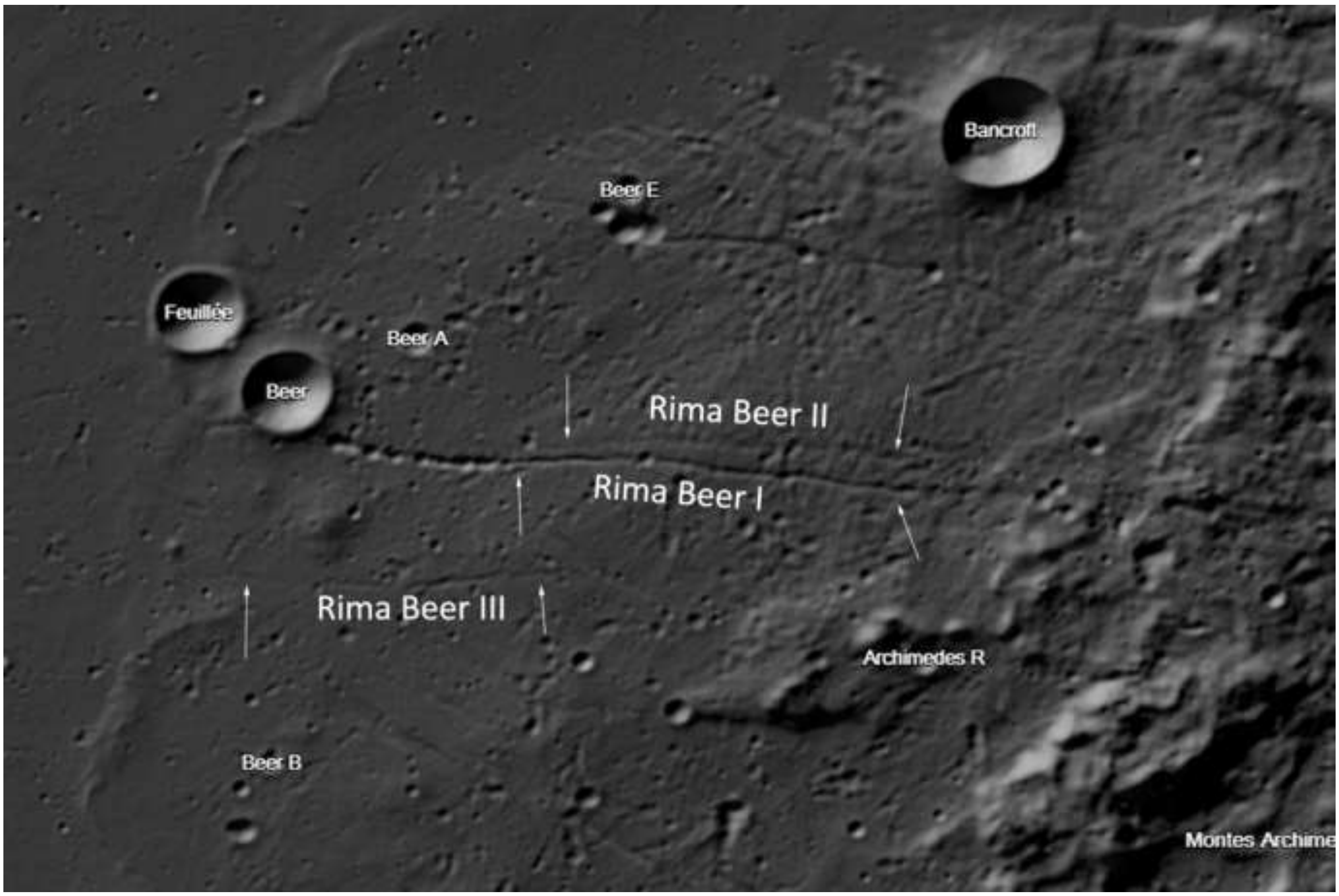


***Fig. 5** under ACT layers/Terrain-Hillshade mode, two new rilles are found. Unofficially, author name these rilles as Rima Beer II and Rima Beer III.*

The Moon of Men
Guillermo Scheidereiter

Starting a day of photography and observation of the Moon is a ritual worthy of a method: find a quiet and dark place, level the telescope mount and balance the whole, order the cables that will make everything mechanical magically become electronic and digital, put the mount in station, turn on the notebook and start the software that, with our guideline, will do the magic.

On the night of the first day of June, the Moon rose after sunset showing its pristine clothing, inspiring and inviting to spy on its details with a camera and an eyepiece. So, with the witness stars, I began the long process of capturing pieces of the Moon that could later be joined to form the entire disk. The Moon represents a disturbing figure, influential in our psyche, eternal and ephemeral at the same time, captivating, where light and darkness dispute a battle of egos in a constant dance, giving mystery to its reliefs and forms. I was concentrated, restless, careful, cautious, impatient, millimetric, mathematical, almost irritated. Imagining fragments, taking care that there are no missing pieces of the puzzle, busy not making mistakes; I remembered a sentence that I read one afternoon:

“Don't even try to talk to me when I'm watching the moon.” (Wendelin Van Draanen)

That's how I felt; This is how I understood and accepted my relationship with that Moon. A persistent dew began to bathe the night and the yellow eyes of the black cat disturbed the attentive and nervous owl. In one frame Tycho was gleaming white on the sphere, and in the next, Aristarchus and Reiner Gamma shimmered in a dark geometric pattern in the shadows.

In the blink of an eye, I could see the light spilling over the leaves of a palm tree; a slight breeze stirred them and the filaments randomly distributed the silver sparkles. As if it were a shape without a body, the light moved through the trees, breaking through the darkness; it formed and distorted openings in the grass and the dead autumn leaves radiated silver sparkles as if they had come to new life. I wondered what intelligence is hidden behind the light of the Moon, and I knew that it was much more than the reflection of the light of the Sun. The magical pen of the Polish writer Joseph Conrad (who wrote the fabulous work "Heart of Darkness") came to my mind, and I remembered:

"There's something unsettling about moonlight. It has all the passion of a disembodied soul, and something of its inconceivable mystery." (Joseph Conrad)

He was acting methodically, and now, on the computer screen, Copernicus was entangling Eratosthenes in an intricate system of beams made up of deposits of material ejected after impacts, which reminded me of mathematical curves associated with vector fields; in my mind, I drew an outline and a flat figure; I thought of tangents and perpendicular vectors; in lines of forces and equipotential curves; I wrote a Laplacian in a tangled differential equation; I found a real potential and a complex one; I plotted a contour and a line integral on it; I calculated the measure of the net flow and the circulation; I perceived a finite and an infinite mathematical form; I saw the circumference of the Moon without beginning or end.

Suddenly, the cry of a wild fox brought me back to reality and the picture on the computer screen reminded me of a writing by Paul Brandt:

"Don't tell me that the sky is the limit, when there are footprints on the moon." (Paul Brandt)

After having passed the Caucasus, leaving the Sea of Tranquillity on my right, I was in the Sea of Serenity; In the still waters that observers of old imagined. I noticed that to the extent that the pictures followed one another on the computer, in my mind, the Moon was taking shape. I could imagine Apollo 11 landing on an ocean of ancient lava and a man's foot marking parallel segments in the lunar soil.

"*It's one small step for [a] man, one giant leap for mankind*" *(Neil Armstrong)*

Despite the desolation of the lunar surface (Buzz Aldrin pronounced: *"Magnificent desolation"*), the Moon would never be alone again.

Maybe a coffee would do me good at the time, but that didn't happen. The motors of the equatorial mount had been silently doing their work behind my musings, and my Maksutov-Cassegrain telescope was upright following a capricious Moon in its zenithal course. Above the Sea of Fertility, the Messier craters and their contrails reminded me of a comet streaking across the sky. Beyond Langrenus and past the edges of Petavius, a playful sunbeam slid over the curves of the Moon like they were a slide at an amusement park. Then the rugged south showed me that I was almost where I had started. I followed the silver chains of the lunar arc, formed of craters that seem to be girded in tight circular links that the effect of foreshortening turns into sparkling ovals. I admired the arrival of sunlight on the steep tops of the curbs and the dark soil behind the shadows. I decided it was time to conclude.

A new methodical action awaited me: put away all my equipment. The session was over. Now he had to think about the arduous task of processing twenty-two videos and extracting from them the photographs that would form the final image.

Already on the computer, the photographs began to shape the silver medal. The fragments of Luna were assembled piece by piece, frame by frame, forming the body of the Moon... And I remembered:

"It is a beautiful and dazzling spectacle to contemplate the body of the moon." (Galileo Galilei)

Seeing the result in the final image, I thought that the Moon, perhaps, could have lit up and surrounded by flames, like those mysterious objects that wizards and elves carry in the magical scenes of a work of fantastic literature.

As our natural satellite, the Moon witnessed the evolution of the Earth and the birth of life. He witnessed the changes of eras and continental drift, the birth, heyday and extinction of great species, asteroid impacts, the rise of great mountain ranges, long glacial periods and had fun for eons stirring up the seas.

But also, this Moon saw the struggle of Michael and Lucifer throughout the centuries, the birth of the Sumerian language and the pyramids of Egypt, saw the flames in the fall of Troy, saw Homer narrating the Iliad, saw the birth of the Pythagoras' theorem in the sands of Samos, the construction of the Chinese Wall, the conquests of Alexander the Great, Plato's Academy and Aristotle's Lyceum, the love of Cleopatra and Mark Antony, the crucifixion of Christ, the decline of the Roman Empire , saw books burn in Alexandria; saw Marco Polo's travels, the discovery of America, the coronation of Henry VIII, the Renaissance, saw Michelangelo in the Sistine Chapel, the apple on Isaac Newton's head, the construction of the telescope, immoral slavery, saw the storming of the Bastille, Goya's brushstrokes, the independence of the US and also of Argentina, the construction of the Eiffel Tower and the Empire State, the world wars, the wounds that men left on the ground after landing on the moon in July 1969, the dissolution of the Soviet Union, the fall of the Berlin Wall, the attack on the Twin Towers; saw man throughout the centuries in his finitude and contingency. I understood that the Moon is beyond what humans can ever comprehend.

I thought that the Moon has a much more momentous purpose in the delicate and exacting balance of our solar system. Perhaps, the Moon is much more than the natural satellite of our planet. Would life have developed the same without the Moon? Would man be the same on an Earth without a moon? Would he have the same gods? Would it have the same timetable? The same math? The same literature? Agriculture itself? The same economy? The same culture?

I looked at the photograph again and remembered that mysterious Moon in the night sky. My Moon made of fragments is the same Moon of all corners, of all continents, of all coasts and all seas. The Moon of always, of any time. The Moon of the Earth, the Moon of men.

Moon made of fragments.

The Wrinkle Ridges on the West Ridge of Mare Serenitatis

Alberto Anunziato

One of the most attractive areas is the separation between two beautiful mountain ranges like Montes Apenninus to the south and Montes Caucasus to the north and between Mare Serenitatis to the east and Mare Imbrium to the west. The peaks that form one of the rings of the Imbrium basin are a beautiful and dreamy landscape of delicate brightness and elongated shadows... but difficult to draw, so I concentrated on what was fleeting and within reach of a schematic sketch, so that I decided to add to my small collection of lunar dorsa the two found on the west shore of Mare Serenitatis and that run between a rocky outcrop at the southern tip of Montes Caucasus (bottom of drawing) and the highlands east of Promontorium Fresnel. I drew two wrinkle ridges. The one on the right is the longest, there are two segments. The first of them runs between two rocky outcrops (very bright and with long shadows near the terminator). There were two clear indicators of the presence of two ridge segments on the broad, bright arc: the segments were brighter than the arch they stood on (I resorted to drawing them in solid strokes rather than attempting differences in hue) and they cast shadows which corresponded to the elevations. That first segment ends in a rocky outcrop that also presents a higher zone (also brighter and with longer shadow). The second segment is blander and without details. A second dorsum arises from the aforementioned mountainous segment, which ends in a very bright massif.

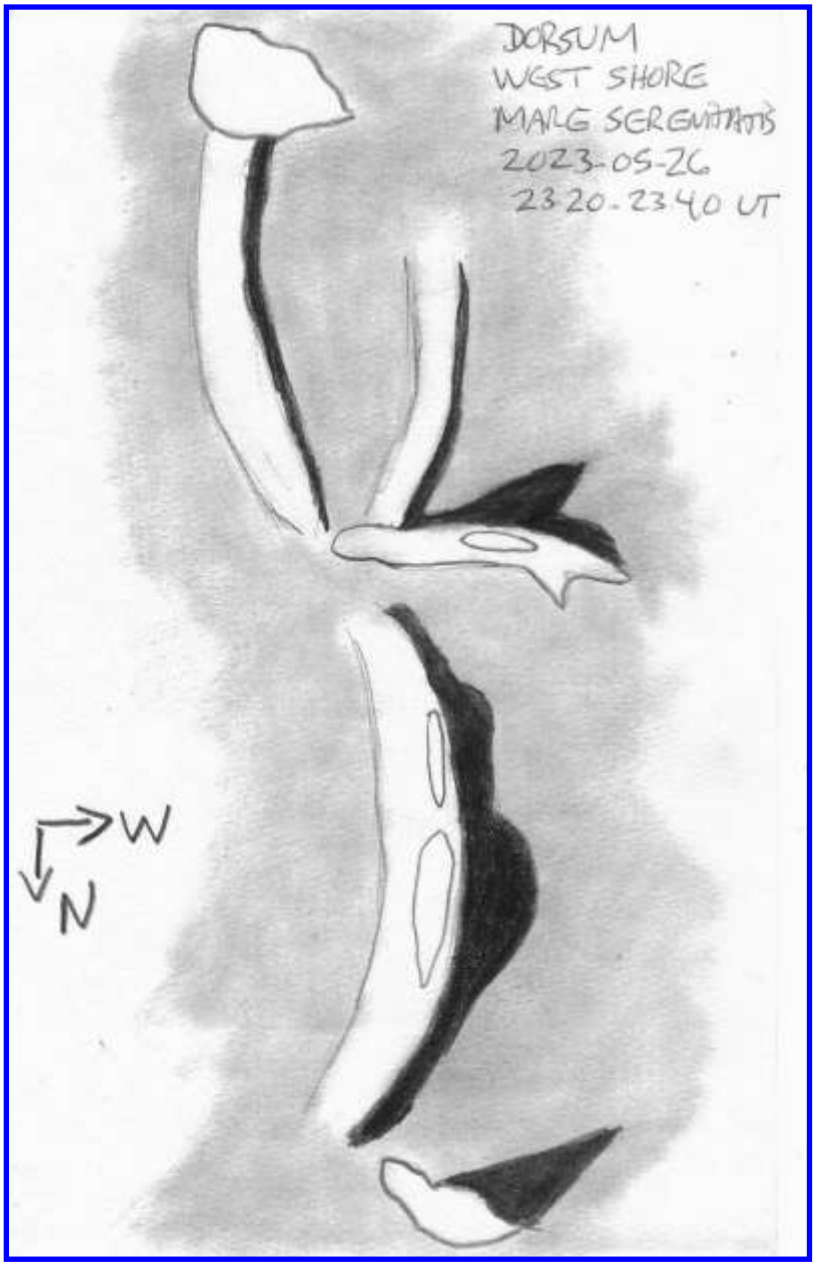


Image 1, Dorsum on the West Shore of Mare Serenitatis, *Alberto Anunziato, Paraná, Argentina, SLA. 2023 May 26 23:20-23:40 UT. Meade EX 105 mm Maksutov-Cassegrain telescope, 154x.*

Once drawn, I resorted to a confirmation of what was observed (not without some anxiety). I did it with the wonderful ATLAS VER by KC Pau, which has the enormous virtue of offering the closest images to what can be observed visually, it is as they gave you super visual powers to see the Moon. On page 449 of the first volume is IMAGE 2, the general landscape of the area, and IMAGE 3 is a detail of the observed ridges. Luckily, the verification went quite well (otherwise, I would not have published the drawing), only the start of the dorsum on the left does not match, it really does not arise from the mountainous massif that is crossed by the ridge on the right, but more to the east. In Pau's image, the most intense shadows coincide with the ridges (which can also be seen, although not as clearly), but they are less long, because the lighting is different. Of course, having more resolution, the division given by the other crests on the arch of each segment is perceived, which visually and with a small telescope are seen as an indefinite whole.

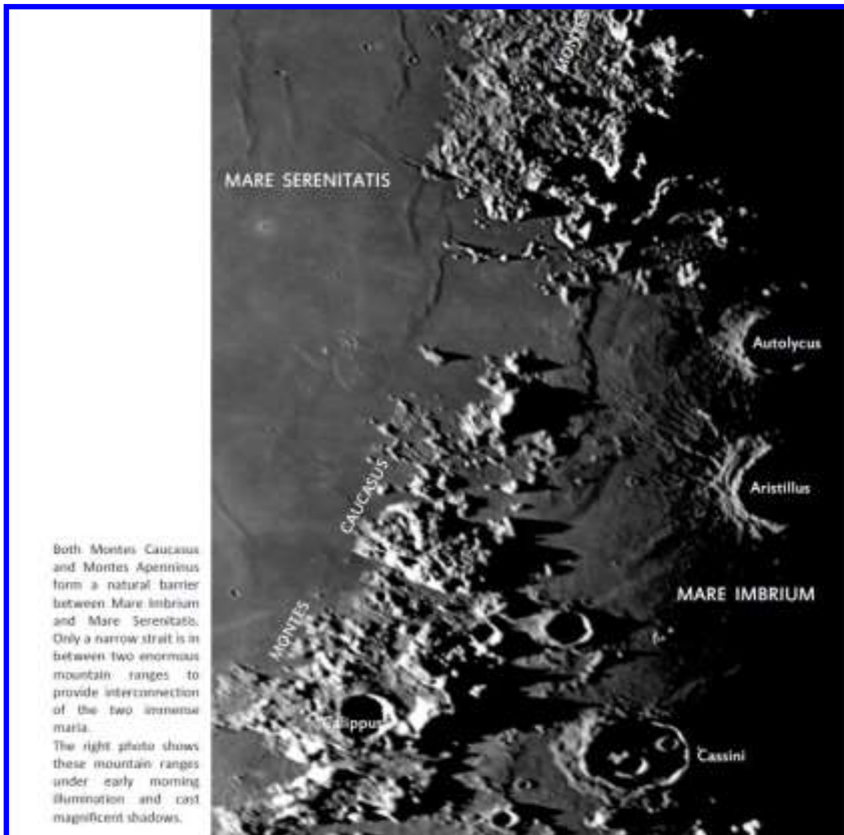
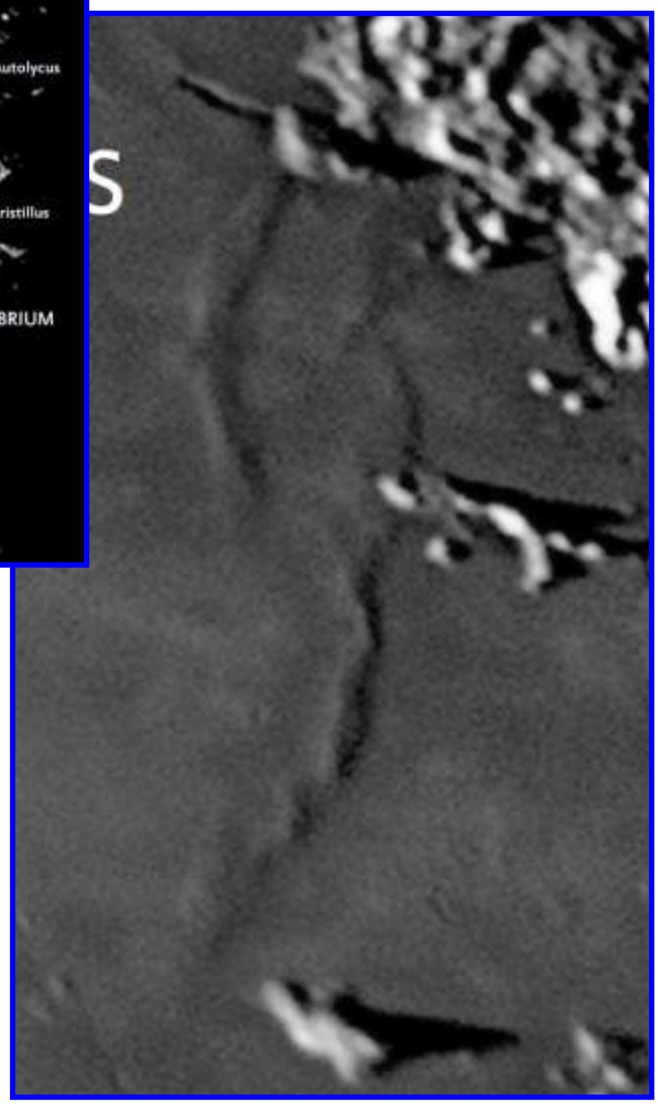


Image 2 Dorsum of Western Mare Serenitatis, *from ATLAS VER by KC Pau, volume 1, page 449. Below, image 3, a close-up of image 2.*



A Changing Name

Alberto Anunziato

The lunar feature that is the subject of this Focus On has changed its name over the years, its nature has also been uncertain until recently. Today we know it as Mons Rümker, the Moon's largest dome. Before it was known as Promontorium Rümker or Rümker Hills or just Rümker, as Julius Schmidt named it on his 1878 map. It is very easy to confuse it with a ruined crater, and I can personally say this, having observed the area without knowing that it was a complex volcanic system. Proof of this is IMAGE 1, a 1-second shot taken with a very primitive camera many years ago. At that time, we simply took images of the area, not realizing that we had obtained an image of the elusive Mons Rümker at the exact moment of the lunation in which its full shape is visible.

Image 1, Mons Rümker, *Juan Maneul Biagi, SLA, Oro Verde, Argentina. 2014 September 21 05:59 UT. Meade LX200 10 inch Schmidt-Cassegrain telescope, Canon EOS 400 Rebel camera.*

FOCUS ON: Mons Rümker, A Changing Name

As in the case of our previous Focus on, Reiner Gamma, knowing what can be observed increases the potential of our observation, both Reiner Gamma and Mons Rümker are easily confused with craters for the novice observer. That is why it is important to highlight that even before the lunar images in orbit, there were observers who were close to their true nature. Previous authors observing the Rümker Hills through telescopes and on Earth- based photographs interpreted the plateau as a laccolithic uplift (Herring, 1960), and a dome complex (Westfall, 1964; Kopal, 1966). Wilkens and Moore (1955) indicated that Rümker was observed as a ruined ring by Goodacre" (Eugene Smith). Peter Grego defines it as "a large plateau made up of a collection of domelike swellings", a dome made of domes, it could be a nice definition, close to reality but not exact like Robert Garfinkle's: "oval-shaped, Eratosthenian-age plateau is about 73.25 km (45.51 miles) in diameter located near the center of Sinus Roris. The low-albedo mons is considered to be a mass of domes with clusterings of secondary craters (…) The mons was created by volcanic flows and pyroclastic layering. After its creation, the area around it was covered by mare basalts", or Don Wilhelms ("The Rümker hills apparently consist of several domes and other mare-related units partly burying Imbrium-radial terra"). The most recent definition (in Wöhler, Lena and Pau) is based on the classic and current study by Eugene I. Smith "Rümker Hills: a lunar volcanic dome complex": "it is the largest known contiguous volcanic edifice on the Moon (…) the plateau is composed of a series of overlapping lava flows interrupted by local extrusions related to domes and to a ring surrounding the central portion".

Image 2, Mons Rümker, *Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2021 February 25 05:31 UT, colongitude 69.1°. TEC 8 inch f/20 Maksutov-Cassegrain telescope, 61 nm filter, SKYRIS 132M camera. Seeing 8/10.*

FOCUS ON: Mons Rümker, A Changing Name

A Volcano?

Is it similar to volcanoes on Earth or not? For Wilhelms' pioneering study: "None of the positive lunar volcanic landforms remotely approaches a terrestrial or Martian shield volcano or stratovolcano in size", but Charles Wood (in The Modern Moon) points out a very interesting fact: "The most noticeably feature of Rümker is a diamond-shaped depression on its eastern flank. Besides being lower, this area is smoother. The relatively high-Sun Lunar Orbiter images don't emphasize this aspect, and isn't mentioned in any of the scientific literature I've read. The depression mislead early selenographers into mistaking Rümker for an old battered crater, but to a geologist a depression on the flank of an obvious volcanic mound immediately suggests a caldera or volcanic collapse crater. If it is a caldera (and there really is no other evidence to support this speculation), it would be one of the largest on the Moon". In IMAGE 3, and its detail IMAGE 4, we clearly see Wood's marked dark diamond-shaped area.

Image 3, Mons Rümker, *Gregory Shanos, Sarasota, Florida, USA. 2023 January 05 01:22 UT. Meade 10 inch LX200 f/10 Schmidt-Cassegrain telescope, UV-IR cut filter, ZWO ASI290mm camera.*

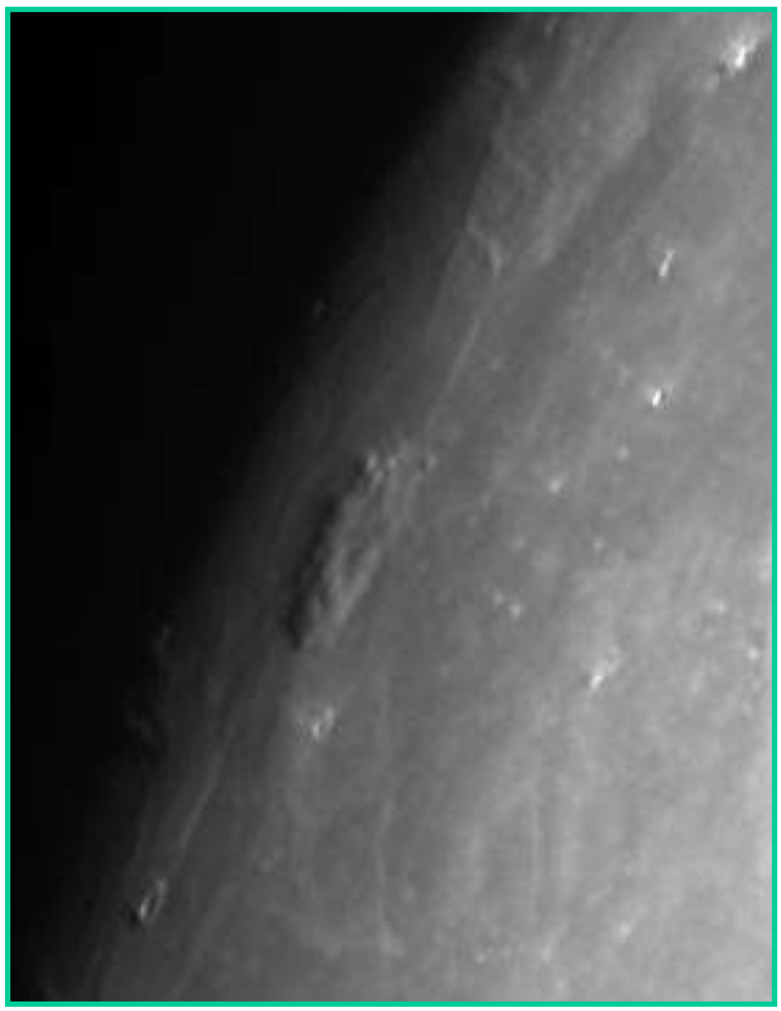


Image 4, Mons Rümker, *Gregory Shanos, Sarasota, Florida, USA. 2023 January 05 01:21 UT. Meade 10 inch LX200 f/10 Schmidt-Cassegrain telescope, UV-IR cut filter, ZWO ASI290mm camera. Greg adds: "*Mons Rümker on January 5, 2023 at 1h 22.5m UT taken by Gregory Shanos from Sarasota, Florida. The moon was at an altitude of 67 degrees above the horizon and almost full at 97% phase. The seeing and transparency were both above average. Greg used a Meade LX200GPS 10-inch f/10 with an ZWO ASI 290MM monochrome camera and a Baader CMOS optimized UV-IR cut filter. The image was Aligned and Stacked with Autostakkert 3.14 and Sharpened with Registax 6.1 Further processing in Photoshop CS4. The image is cropped to highlight Mons Rümker."

If what Wood says leads us to compare Mons Rümker to a “bursted” caldera, it is also true that Eugene Smith analyzed the similarities and differences with volcanic structures on Mars: “There are many resemblances between the Rümker Hills and the large shield structures revealed on the Mariner 9 photographs of Mars. Both represent large accumulations of volcanic materials in sparsely cratered volcanic plains and both belong to aligned volcanic systems. Most of the volcanic shields on Mars are aligned on a broad northeast trending ridge (…) the Rümker Hills is the northernmost of a series of volcanic plateau including the Aristarchus Plateau and the Marius Hills, which are aligned along the axis of the Oceanus Procellarum (…) The Rümker Hills is the closest lunar analog to the Martian shield volcanoes”. Spudis directly argues, according to Zhao et al., that it is "a large shield volcano". Although it is also true that according to Smith himself "it lacks the shield shape and large summit crater which are characteristic of the Martian features".

The truth is that Mons Rümker is a unique selenographic feature of its kind: “the real question is why is Rümker such an odd formation? There are no other piles of domes on the Moon, and in fact they are rare on Earth. What the concentration means is that a lot of magma erupted from a single source. But what we don’t know is why that happened here but not elsewhere” (Wood, May 2006). The study by Jiannan Zhao et al., the most up-to-date that I could read, follows the same line: “Mons Rümker is still poorly understood. The formation mechanism of some geologic features (e.g., domes) in this region is poorly constrained, and the geological evolutionary history of Mons Rümker is still unclear”.

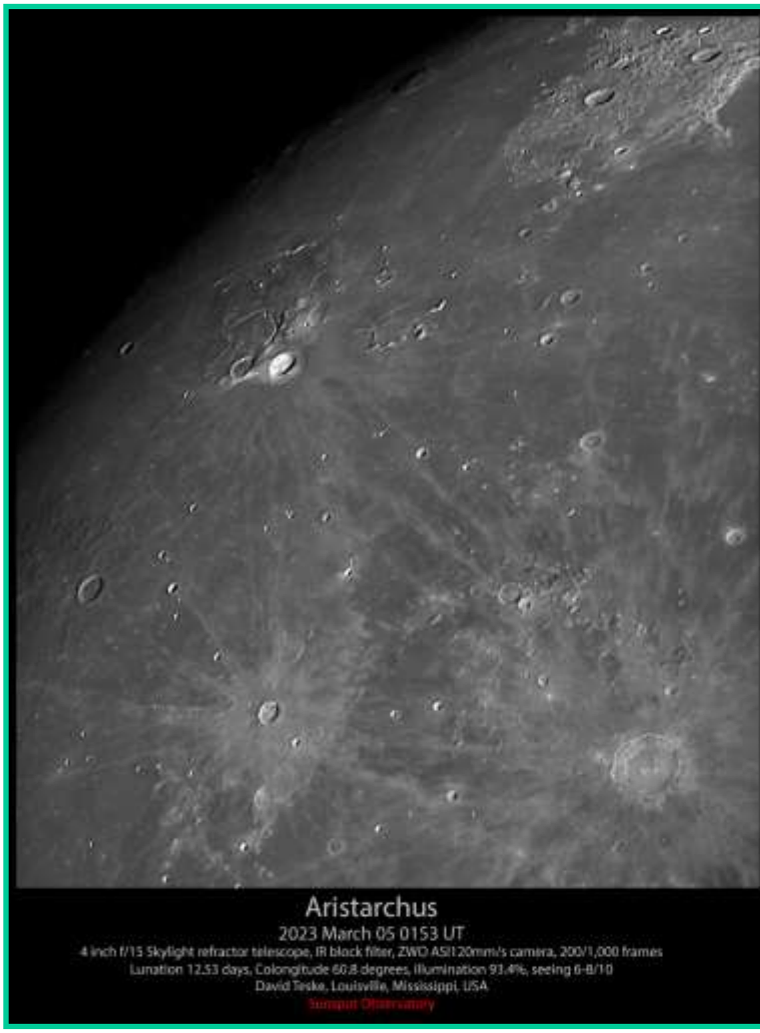
A true gem, but unfortunate in its location, being so close to the western limb makes its observation very elusive. Says Peter Grego: “Mons Rümker is best seen when it has just emerged into the lunar morning Sun; it is completely untraceable under a high Sun (…) When illuminated by a low morning Sun, Mons Rümker takes on a broad, closed crescent appearance, widest in the west. The horns of the crescent in the northeast enclose an area of lower ground (…) Mons Rümker may appear large and impressive when it is illuminated by a low Sun, but its slopes rise a gentle average of just 5° from the mare”.

The problem is that with adequate illumination, and fleeting, it seems high, but as Wood says (November 2006): “It has low slopes and thus is invisible most of the time, and generally only inconspicuous when visible”. The correct illumination window to observe Mons Rümker is very narrow. It is not very easy to recognize the topography of our selenographic accident when it is in the terminator, for example IMAGE 5. When Mons Rümker is illuminated a little more frontally (IMAGE 6) the observation is already more valuable, as we see in the detail of said image (IMAGE 7). If we see IMAGE 8, with front light it is practically invisible, we have to draw a straight line from some conspicuous point, like the Mairan crater. IMAGE 9, detail of 8, shows why Mons Rümker is so difficult to observe, except for 1 day a month.

Image 5, Mons Rümker, *Felix León, Santo Domingo, República Dominicana, SLA. 2021 March 27 00:15 UT. 127 mm Maksutov-Cassegrain telescope, DMK21618AU camera.*

FOCUS ON: Mons Rümker, A Changing Name

__Image 6, Mons Rümker,__ David Teske, Louisville, Mississippi, USA. 2023 March 05 01:53 UT, colongitude 60.8°. 4 inch f/15 refractor telescope, IR block filter, ZWO ASI120mm/s camera. Seeing 6-8/10.



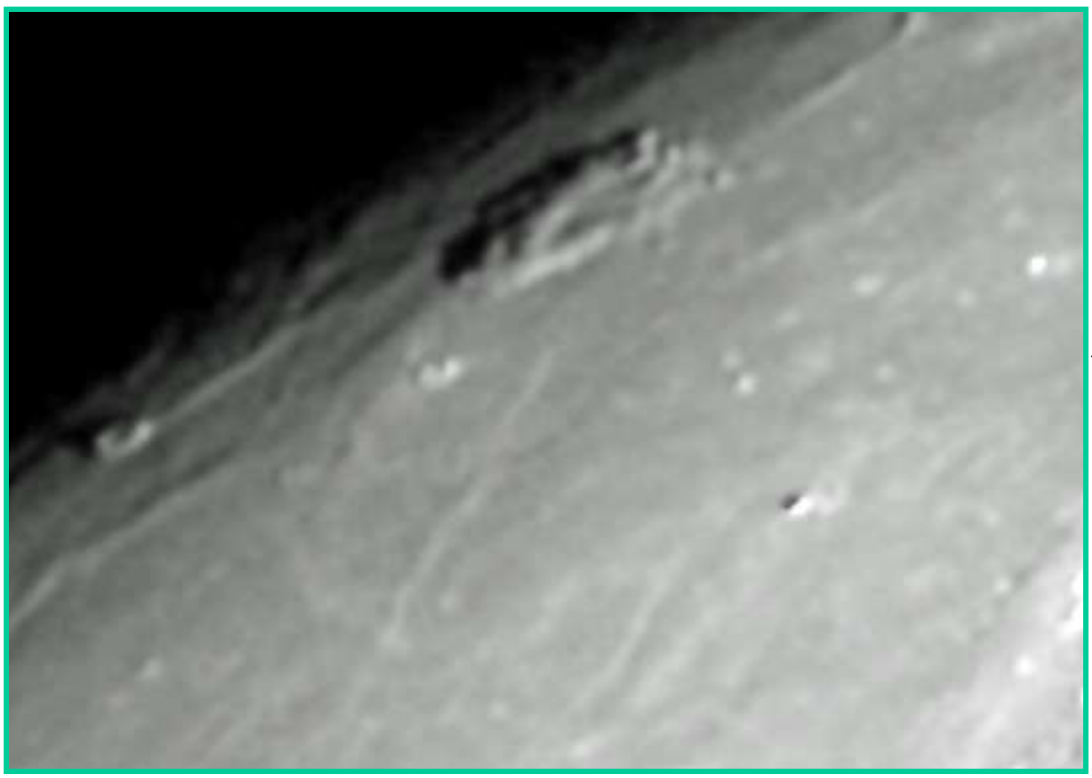
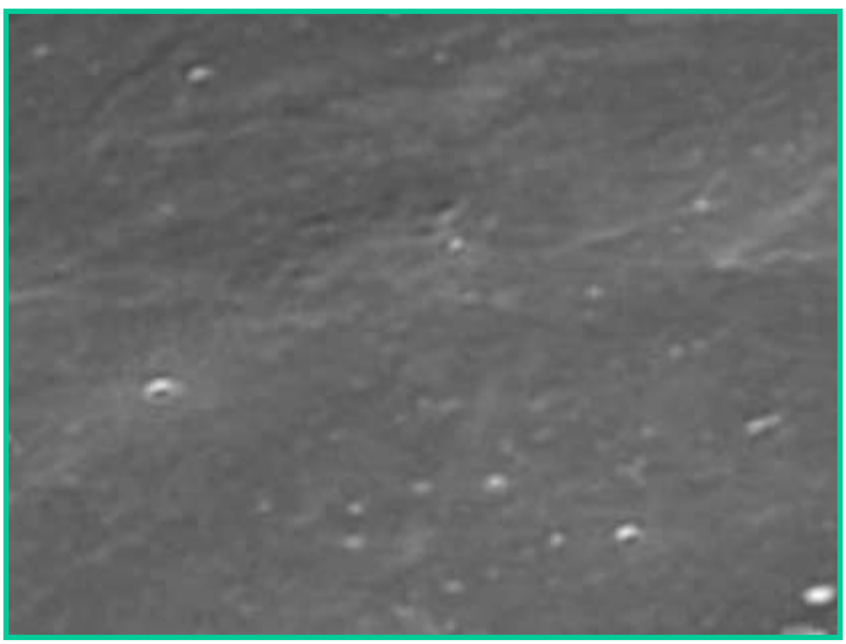


__Image 7, Mons Rümker,__ David Teske, Louisville, Mississippi, USA. 2023 March 05 01:53 UT, colongitude 60.8°. 4 inch f/15 refractor telescope, IR block filter, ZWO ASI120mm/s camera. Seeing 6-8/10. Close-up of image 6.

FOCUS ON: Mons Rümker, A Changing Name

Image 8, Mons Rümker, *David Teske, Louisville, Mississippi, USA. 2020 October 01 03:47 UT, colongitude 77.0º. 4 inch f/15 refractor telescope, IR block filter, ZWO ASI120mm/s camera. Seeing 7/10.*

Image 9, Mons Rümker, *David Teske, Louisville, Mississippi, USA. 2020 October 01 03:47 UT, colongitude 77.0º. 4 inch f/15 refractor telescope, IR block filter, ZWO ASI120mm/s camera. Seeing 7/10. Close-up of image 8.*



FOCUS ON: Mons Rümker, A Changing Name

Topography

Despite the observational difficulties, the images that follow allow an analysis of Mons Rümker, following Zhao et al. ("The Mons Rümker volcanic complex of the Moon: a candidate landing site for the Chang'E-5 mission"), an area of about 4000 square kilometers, in which we find a series of volcanic features such as domes, sinuous rilles, and lava flows. "The height of the plateau amounts to about 900 m in its western and northwestern part, 1100 m in its southern part, and 650 m in its eastern and northeastern part" (Wöhler et al.). There are two main geologic units on Mons Rümker: "the lineated terrain in the north and the plateau -forming materials occupying the main part of Mons Rümker. The lineated terrain is considered to be part of the Fra Mauro Formation, which is the ejecta blanket from the giant impact that formed the Imbrium basin" (Zhao).

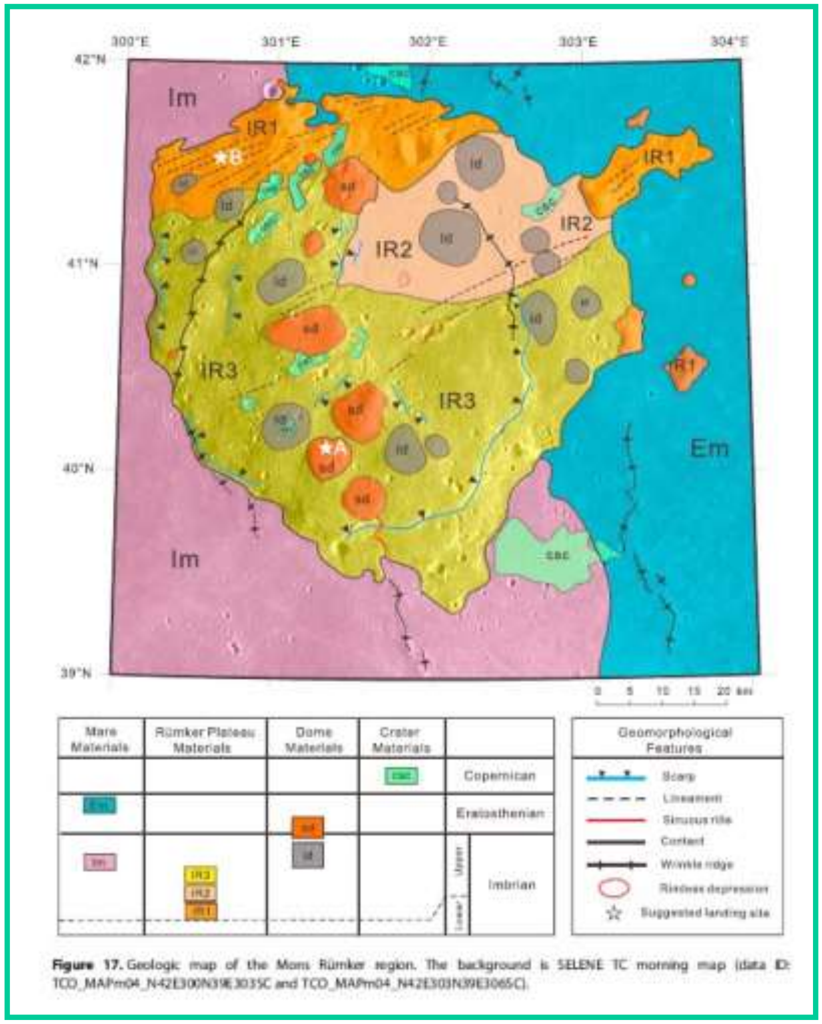
Domes

Whether or not Mons Rümker is an extinct and collapsed volcano, the truth is that it is an elevation that houses a series of domes on its surface, which are "the most prominent volcanic landforms on the Rümker plateau" (Zhao et al.). In his pioneering 1974 study, using Lunar Orbiter images, Eugene Smith detected more than 30 domes. The study by Zhao et al. it is more precise in numbers: 22 domes. The reduction is because the researchers found that "some of them have no obvious topographic uplift which is the most important criterion to confirm a dome. In addition, some topographic rises controlled by local structures may be mistakenly identified as domes. We ruled out these domes and also identified some new domes in the study area". And how are these domes: "The domes are mostly near elliptical in shape and have relatively smooth surfaces. Their sizes vary from ~1.8 × 2.2 km to ~8.1 × 13.6 km with a median of 3.9 × 4.5 km, and their heights are up to 400 m with a median of 130 m above the plateau surface. We obtained an average flank slope for each dome by averaging four measurements in different directions. These domes have average flank slopes of 1.9°–10.8°, and we divided them into two groups based on their flank slopes: steep-sided domes and shallow domes. Steep- sided domes are characterized by relatively steep flank slopes (>5°), and their heights are usually larger than 150 m. These domes always have some associated volcanic features such as possible summit pits and flow features (…) Shallow domes have gentle flank slopes (<5°) and are all lower than 200 m. Only 2 of the 15 shallow domes have associated volcanic features".

So, we have 22 domes at Mons Rümker, 15 shallow domes and 7 steep-sided domes. How many domes do we see in IMAGE 10? Take the geological map produced by Zhao et al. (IMAGE 11), which we will return to several times in this writing, and IMAGE 12, which is a detail of IMAGE 10. In IMAGE 12 we mark what appear to us to be the identifiable domes.

Image 10, Mons Rümker, *Massimo Dionisi, Sassari, Italy. 2023 May 03 19:33 UT. Sky Watcher 250 mm f/5 Newtonian reflector telescope, 3x barlow, IR Pass Filter 685 nm, Uranus C-camera. Seeing III Antoniadi scale.*

***Image 11, Mons Rümker,** Zhao, et al.*



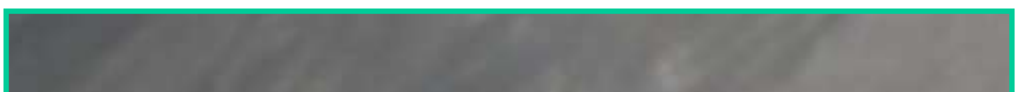


***Image 12, Mons Rümker,** Massimo Dionisi, Sassari, Italy. 2023 May 03 19:33 UT. Sky Watcher 250 mm f/5 Newtonian reflector telescope, 3x barlow, IR Pass Filter 685 nm, Uranus C-camera. Seeing III Antoniadi scale. Close-up of image 10.*

FOCUS ON: Mons Rümker, A Changing Name

Taking into account that: “Lunar domes have been classified into extrusive and intrusive domes based on their origins (…) An extrusive dome usually forms when magma with high-viscosity and/or low effusion rate erupts and accumulates around the effusive vent, while intrusive domes are usually formed by flexure and lifting of surface strata resulting from a near-surface magmatic intrusion”, the steep-sided domes in the Mons Rümker region “have distinct contacts with the surrounding plains and all of them have volcanic features, indicating that they are extrusive domes formed by higher-viscosity magma and/or low effusion rates”. These extrusive domes are similar to those found in the boundaries mare/Highland of Mare Imbrium (Gruithuisen Domes and Mairan Domes), in Mare Cognitum (Hansteen α) and on the other volcanic plateau of Oceanus Procellarum, Marius Hills. “Therefore, steep-sided domes in Mons Rümker are most similar as the domes in Marius Hills and lower eruption temperature and higher crystal content could be the main factors increasing the viscosity of magma. Moreover, absolute model ages of these steep-sided domes show that they are younger than the plateau-forming materials. Taking these factors into consideration, the steep-sided domes could be formed by relatively cool, high-viscosity magma in the terminal stage of volcanic activity when the effusion rate was low”. On the contrary, the shallow domes “with flank slopes less than 5° are more common and most of them are effusive domes formed when the viscosity of magma increases and the effusion rate decreases. On the Rümker plateau, most of the shallow domes show features of lava accumulation or superposition on surrounding plateau surface, which provide evidences for an effusive origin”. In the IMAGE 13 is easy to distinguish the more prominent domes of Mons Rümker, which belong to the steep-sided type.

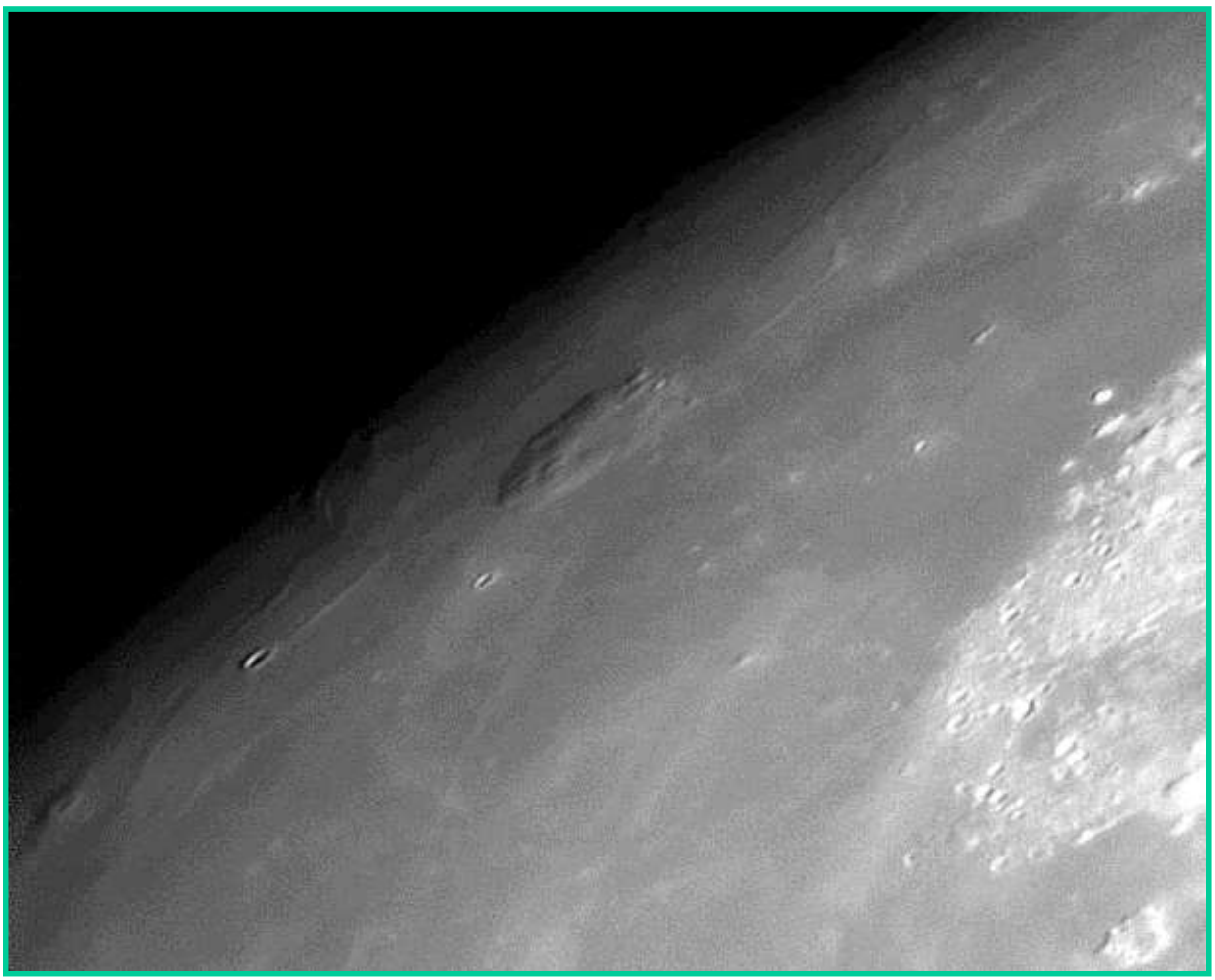


Image 13, Mons Rümker, *Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2023 January 05 04:54 UT, colongitude 67.6°. TEC 8 inch f/20 Maksutov-Cassegrain telescope, 610 nm filter, SKYRIS 132M camera. Seeing 8/10.*

FOCUS ON: Mons Rümker, A Changing Name

It is very interesting to observe that both types of domes in Mons Rümker (steep-sided and shallow) have very similar compositions, they only differ in their morphology (extrusive and effusive), derived from the eruption conditions of the magma in the different stages of the activity. Volcanic after the formation of the Rümker Plateau: "Shallow domes formed when magma started to cool down and effusion rate decreased. Absolute model ages show that they are contemporary or a little later than the volcanic event forming plateau surface unit IR2 and IR3. Then with time, magma became cooler and the effusion rate was lower, which lead to the formation of steep-sided domes".

Not only do we have domes on Mons Rümker, we have craters, although they are not very prominent: "Impact craters in the Mons Rümker region are mostly bowl-shaped simple craters. They are usually smaller than 2 km in diameter. A great many heavily degraded craters can be observed, indicating an old surface age of the region. There are also many irregular craters and clustered craters which are probably secondary craters". These secondary craters come from Copernican craters, obviously younger than the volcanic activity that formed Mons Rümker and its 22 domes: Scott and Eggleton [1973] mapped the distribution of these craters and found that most of them were formed by ejecta from Copernican craters such as Aristarchus, Copernicus, Harpalus, and Pythagoras (…). In addition, we found that the Rümker E crater is also a main source of secondary craters on the Rümker plateau".

Craters

On the very surface of Mons Rümker stands out a crater much larger than the others, located in the extreme north, described in detail in Zhao et al.: "The largest crater (central coordinates: 301.92°E, 41.59°N) on the Rümker plateau is located in the north of the region. It has an irregular circular shape and a diameter of ~4.3 km. The elevation of its southwest rim is about 1900 m, which is ~300 m higher than the north and east rim (Figure 4). The crater was interpreted as a collapsed volcanic pit by Spudis et al. [2013]. However, the crater does not resemble typical collapse pits which are usually rimless [Wyrick et al., 2004] and may not be a caldera as calderas tend to be shallow and have relatively flat floors [Wood, 1984; Burns and Campbell, 1985], whereas the crater has a V-shaped profile and its floor is several hundred meters below the surface of the surrounding terrain. In addition, we found no other evidence such as associated lava flows or pyroclastic deposits to support this interpretation. The crater does, however, have a higher southwest rim, and a cluster of small subdued craters located beyond the southwest rim, which could be formed by the ejecta from this crater. This type of crater is usually formed by an oblique impact into a titled surface". This crater is called Mons Rümker C and we see it clearly in IMAGE 14. In most images we see a bright spot, which is usually the brightest part of Mons Rümker, in the extreme northwest, west of Mons Rümker C, it is the peak Mons Rümker α (lat 41.50°N, long 58.40°W). Mons Rümker α is part of the rim crest for an unnamed flat-floored crater that is partially on the plateau with part of its northern rim submerged under the mare surface" (Garfinkle).

Image 14, Mons Rümker, *Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2009 May 07 04:18 UT. Celestron 14 inch plus 2x barlow f/22 Schmidt-Cassegrain telescope, UV/IR blocking filter, DMK21AU04 camera. Seeing 7/10.*

FOCUS ON: Mons Rümker, A Changing Name

Scarps and Wrinkle Ridges

In the complete study by Zhao et al we read that "A scarp separates the Rümker plateau from the surrounding mare plain", and inside the plateau itself "Scarps develop along the rims of some steep-sided domes, the southwest margin of Mons Rümker, and in the east of the southern high-elevation area of the plateau (…) The east scarp trends north-south and extends ~35 km". The east scarp looks bright in the IMAGE 15, it is the bright line indicated by the arrow 1 in IMAGE 16 (detail of IMAGE 15).

Image 15, Mons Rümker, *Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2023 January 05 04:54 UT, colongitude 67.6°. TEC 8 inch f/20 Maksutov-Cassegrain telescope, 610 nm filter, SKYRIS 132M camera. Seeing 8/10.*

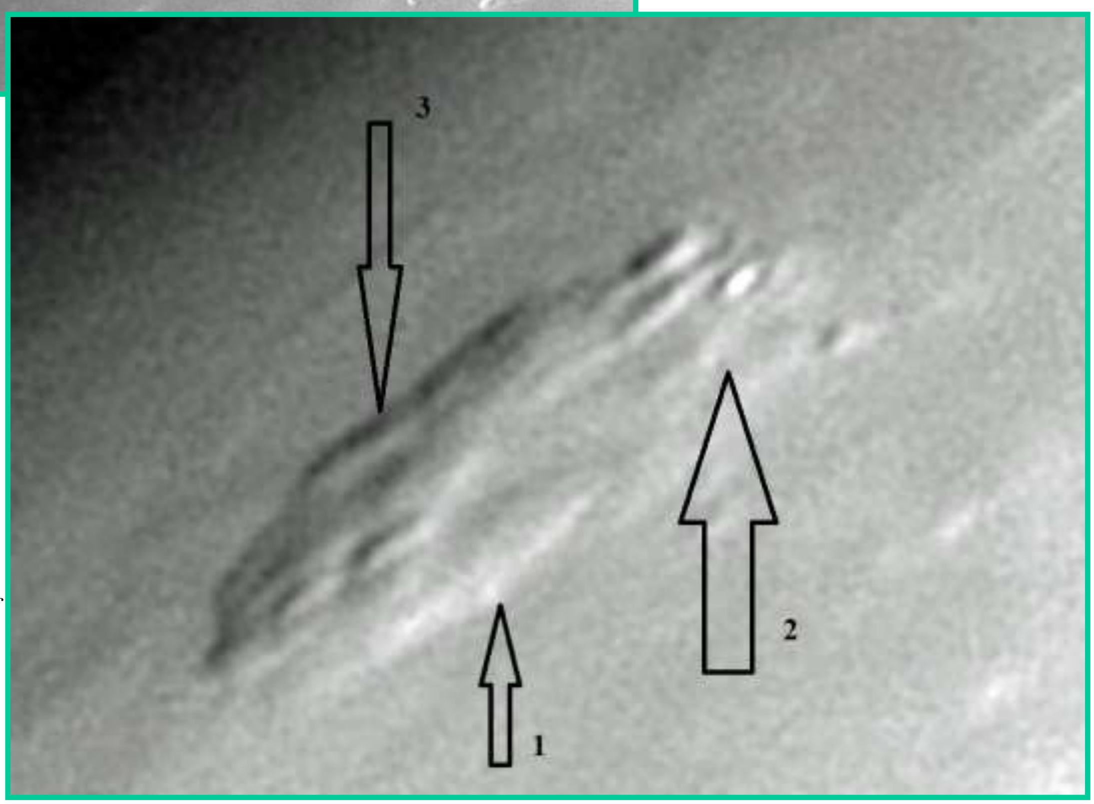


Image 16, Mons Rümker, *Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2023 January 05 04:54 UT, colongitude 67.6°. TEC 8 inch f/20 Maksutov-Cassegrain telescope, 610 nm filter, SKYRIS 132M camera. Seeing 8/10. Close-up of image 16.*

FOCUS ON: Mons Rümker, A Changing Name

Eugene Smith in 1974 determined that the orientation of the wrinkle ridges on the Rümker Plateau shows northeast and northwest trends, corresponding "to the prominent structural directions in the northern part of the Oceanus Procellarum (…) and also correspond to major directions of the lunar tectonic grid (…) these data suggest strong regional structural control for ridges and scarps on the Rümker Plateau". The accurate study by Zhao et al. indicated the existence of two wrinkle ridges on Mons Rümker, both sharing the direction of the numerous wrinkle ridges in the neighborhood. The first is at the northeast: "23 km long wrinkle ridge that is ~35 m in height and 0.6–1.8 km in width. Another wrinkle ridge on the Rümker plateau is located in the west. This wrinkle ridge is 60 km long and extends from the mare surface outside Mons Rümker to a large irregular crater in the north. It is 0.5–2.5 km in width and has an asymmetric traverse profile in which the elevation difference of the west side is usually much larger than the east side. This could have resulted from the existence of a previously existing scarp as the wrinkle ridge developed along and superposed on part of a scarp" (Zhao et al.). In IMAGE 15 and 16 we observe clearly both wrinkle ridges, the east one being merely a bright line (arrow 2 on IMAGE 16), and the west one is more visible (arrow 3 on IMAGE 16). The oblique illumination with which Mons Rümker is seen at the exact moment when the terminator passes through it makes the scarp to the north clearly visible on the east side and the wrinkle ridge to the south in the magnificent panorama of IMAGE 17.

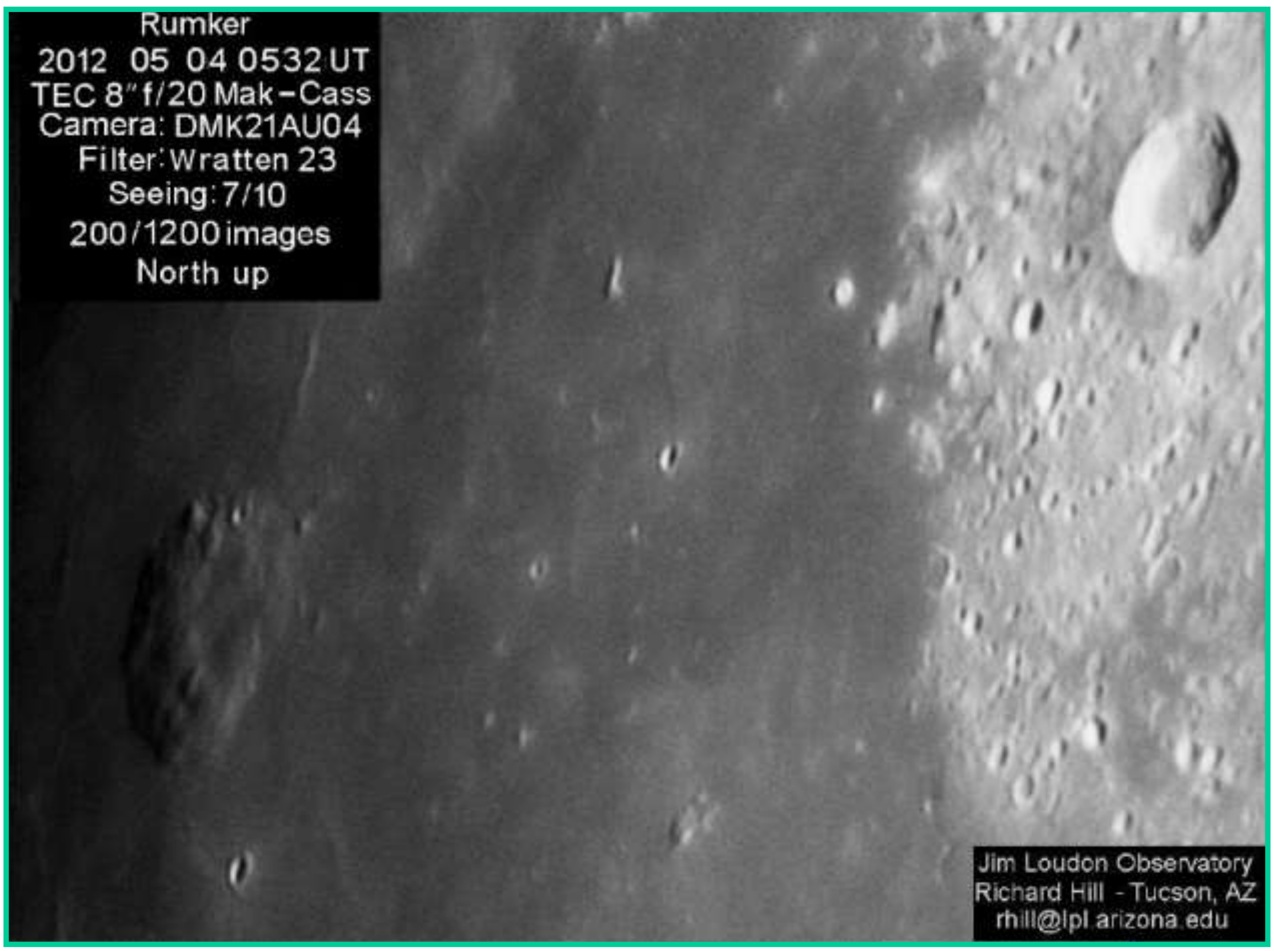


Image 17, Mons Rümker, *Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2012 May 04 05:32 UT. TEC 8 inch f/20 Maksutov-Cassegrain telescope, Wratten 23 filter, DMK21AU04 camera. Seeing 7/10.*

FOCUS ON: Mons Rümker, A Changing Name

The Highest Points

IMAGE 18 is the result of visual observation, much more impressionistic, composed of highlights and shadows rather than precise relief (Mons Rümker being small for a small telescope). But it is interesting how it agrees with what we know are the highest areas of the plateau, according to the study by Zhao et al: "The central and southern parts of Mons Rümker are higher with the maximum elevation reached at the summit of a dome), which is about 1280 m.", marked with H in IMAGE 19, obtained from the cited text. What in IMAGE 20 looks like a bright line would coincide (very approximately) with the wrinkle ridge that runs from south to north in the west, while the bright area in the northwest is another dome, the buried crater in the which is located Rümker alpha. IMAGE 21 presents a similar picture, although less accurate. If we look at IMAGE 22 and 23 (its detail) we clearly see the highest areas, which correspond to steep-sided domes in the central area, which can be easily located on the geological map of Zhao et al. (IMAGE 11). Although in the topographic map of Zhao et al. (IMAGE 19) the northwest zone doesn't seem so high, it would seem to be even higher than the central zone in IMAGE 24 and 25, especially 26 (detail of 25).

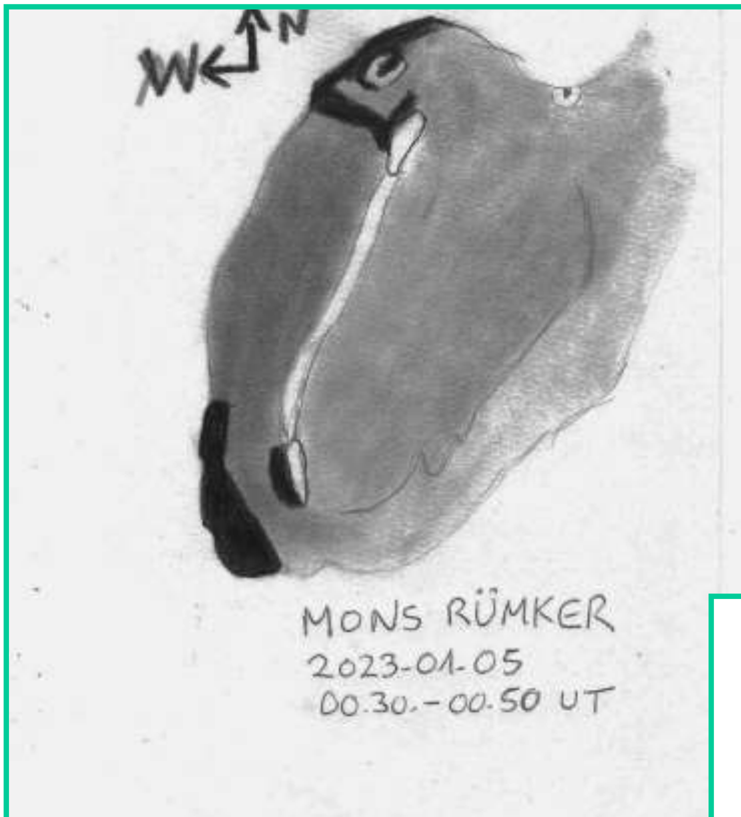


Image 18, Mons Rümker, *Alberto Anunziato, Paraná, Argentina, SLA. 2023 May 01 00:30-00:50 UT. Meade EX 105 mm Maksutov-Cassegrain telescope, 154x.*

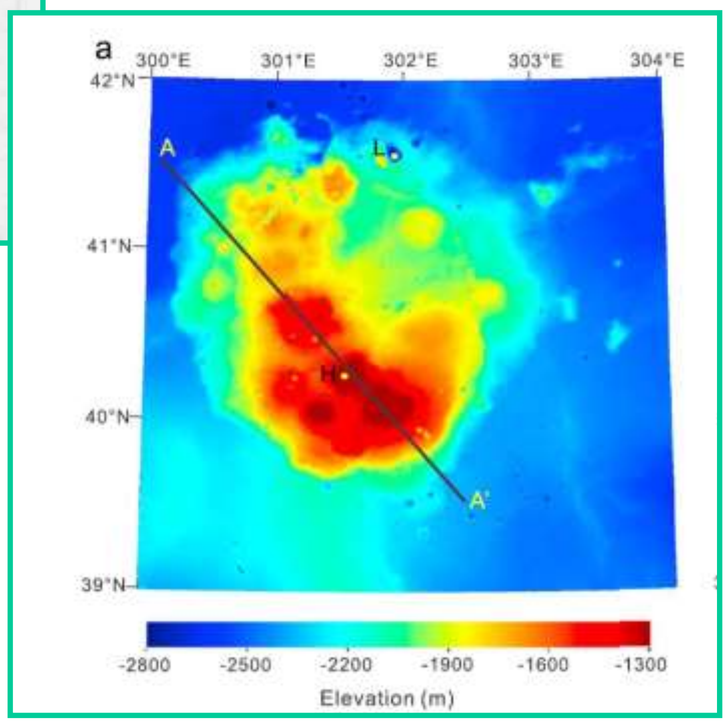


Image 19, Mons Rümker, *Zhao, et al.*

FOCUS ON: Mons Rümker, A Changing Name

***Image 20, Mons Rümker,** Paul Walker, Middlebury, Vermont, USA. 2023 April 03 03:28 UT, colongitude 57.7º. 10 inch f/5.6 Newtonian reflector telescope, Meade 2x barlow, Canon Rebel T7i EOS 800D camera. North is left, west is down. Paul adds:* "It was a good night here on the 2nd. Best shot of Vallis Schröter I've gotten. I didn't know there were so many rills in the area. I counted 9 or 10 in this image. I took a shot earlier in the evening but only the very edge of Mons Rümker showed so I observed the Moon while waiting of the Sun to rise a little higher. If I'd been really ambitious I would have stayed up a few more hours!"

***Image 21, Mons Rümker,** Alberto Anunziato, Paraná, Argentina, SLA. 2020 September 20 00:25-00:40 UT. Meade EX 105 mm Maksutov-Cassegrain telescope, 154x.*

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Image 22, Mons Rümker, *Fernando Surá, San Nicolás de los Arroyos, Argentina. 2022 August 12 23:20 UT. 127 mm Maksutov-Cassegrain telescope, Samsung A22 cell phone camera.*

Image 23, Mons Rümker, *Fernando Surá, San Nicolás de los Arroyos, Argentina. 2022 August 12 23:20 UT. 127 mm Maksutov-Cassegrain telescope, Samsung A22 cell phone camera. Close-up of image 22.*

FOCUS ON: Mons Rümker, A Changing Name

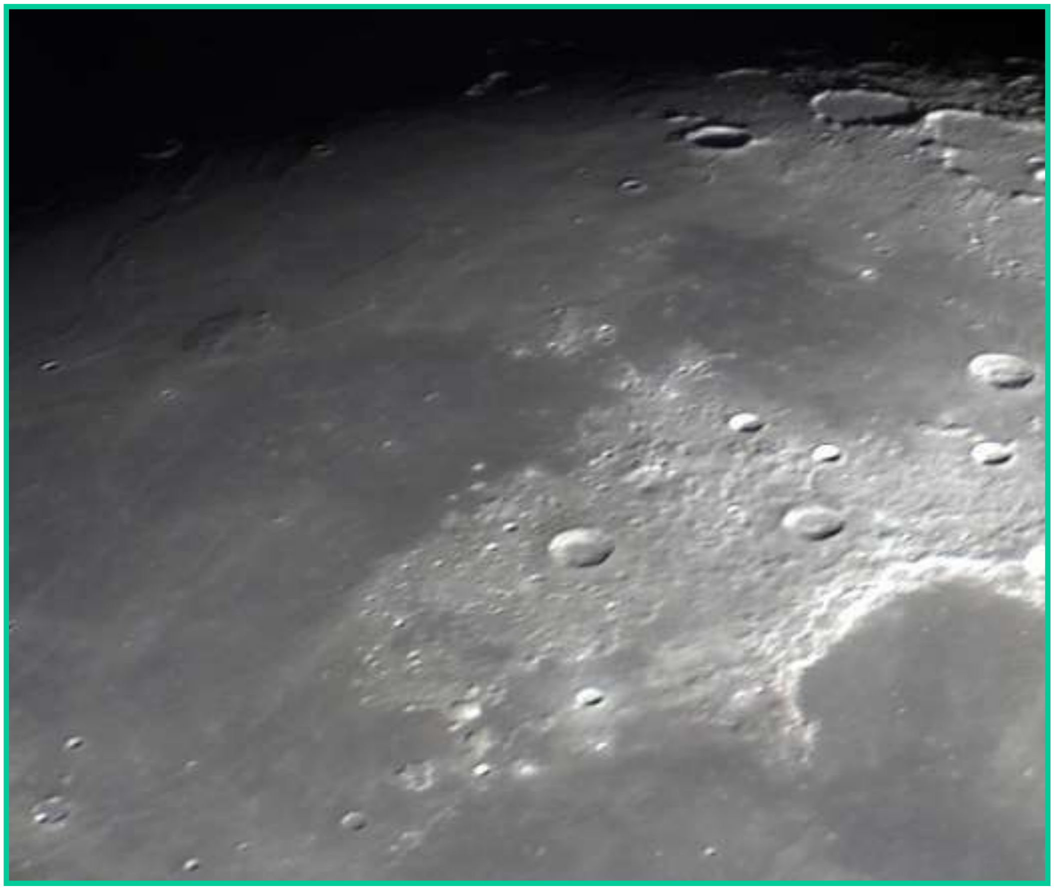

Image 24, Mons Rümker and Montes Jura, *Anthony Harding, northeast Indiana, USA. 2023 June 02 02:08 UT, colongitude 69.395º. 6 inch GSO reflector telescope, f/6, 910 mm fl, Tele Vue 2.5x Power mate, ZWO ASI 533 MC Pro color camera. Seeing 7/10, transparency 8/10. North upper right, west upper left. Anthony adds:* "The image shows the western section of Montes Jura, with Mons Rümker to the southwest. The highlands are purposely overexposed to tease details from Mons Rümker. The sunrise lighting shows the mountain's contours and details reasonably well."

Image 25, Mons Rümker, *Anthony Harding, northeast Indiana, USA. 2023 June 02 02:17 UT, colongitude 69.472º. 6 inch GSO reflector telescope, f/6, 910 mm fl, Tele Vue 2.5x Power mate, ZWO ASI 533 MC Pro color camera. Seeing 7/10, transparency 8/10. North upper right, west upper left. Anthony ads:* "This image shows the Aristarchus region, with Mons Rümker situated to the northwest. Though Vallis Schröteri is clearly visible, Aristarchus itself is overexposed for the sake of obtaining a good image of Mons Rümker to the northwest. The sunrise light on Mons Rümker nicely highlights its contours."

FOCUS ON: Mons Rümker, A Changing Name

Image 26, Mons Rümker, *Anthony Harding, northeast Indiana, USA. 2023 June 02 02:17 UT, colongitude 69.472º. 6 inch GSO reflector telescope, f/6, 910 mm fl, Tele Vue 2.5x Power mate, ZWO ASI 533 MC Pro color camera. Seeing 7/10, transparency 8/10. North upper right, west upper left. Anthony adds:* "This image shows the Aristarchus region, with Mons Rümker situated to the northwest. Though Vallis Schröteri is clearly visible, Aristarchus itself is overexposed for the sake of obtaining a good image of Mons Rümker to the northwest. The sunrise light on Mons Rümker nicely highlights its contours." Close-up of image 25.

Linear Depressions and Rilles

Zhao et al. identify two types of linear depressions in Mons Rümker. The first in the northwest area, which is referred to as lineated terrain and which are probably deposits of Iridum ejecta materials. "The other type of linear depression is a single structure located in the eastern part of Mons Rümker. It is a wide linear depression that is about 27 km long, 2–3 km wide, and a few meters to 50 m deep, which is much larger in scale than the first type. This depression is characterized by two elevated rims bounding a relatively flat floor. The depression extends from near the center of the Rümker plateau to the eastern margin of Mons Rümker and is buried by the surrounding mare units". IMAGE 27 and 28 (detail of 27) are the ones that best illustrate this area, thanks to the contrast of the shadows, although it is very difficult to perceive. From Earth we can't see the Mons Rümker rilles, which are very small and only visible in high-resolution images taken in orbit, Zhao et al tell us that they are "usually less than 3 km long and 100 m wide. Most originate from the top of the marginal scarps of the Rümker plateau and extend downward, which indicates that they formed when lava flowed down the scarps and eroded the substrate".

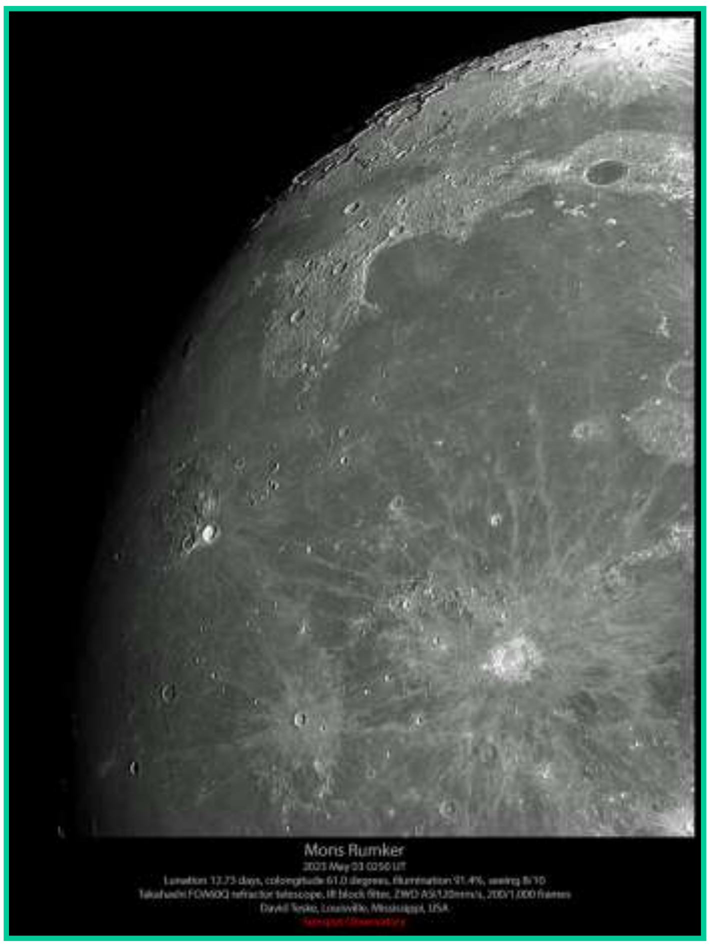

Image 27, Mons Rümker, *David Teske, Louisville, Mississippi, USA. 2023 May 03 02:50 UT, colongitude 61.0º. Takahashi FOA60Q f/15 refractor telescope, IR block filter, ZWO ASI120mm/s camera. Seeing 8/10.*

FOCUS ON: Mons Rümker, A Changing Name

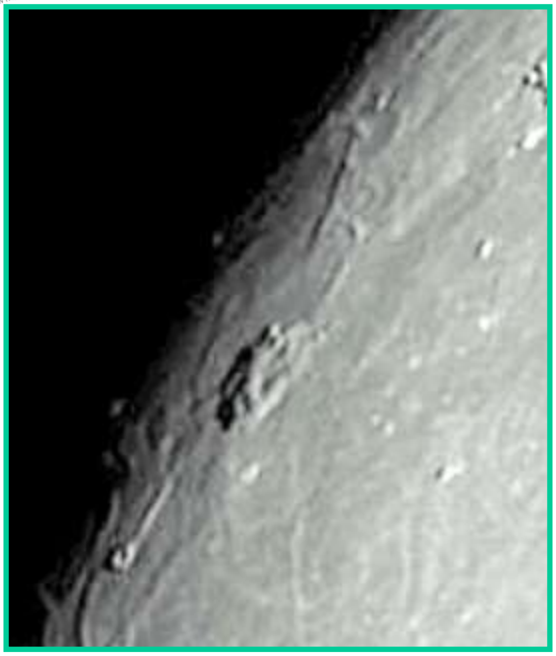

Image 28, Mons Rümker, *David Teske, Louisville, Mississippi, USA. 2023 May 03 02:50 UT, colongitude 61.0°. Takahashi FOA60Q f/15 refractor telescope, IR block filter, ZWO ASI120mm/s camera. Seeing 8/10. Close-up of image 27.*

Age Determination

How old is Mons Rümker? This plateau is embayed by an Imbrium mare unit (3.47 Ga) to the west and an Eratosthenian mare unit (1.33 Ga) to the east, which gives a probable age of at least 3.47 Ga. Zhao et al. In order to estimate the age of the plateau, identified three plateau-forming units named as IR1, IR2, and IR3, based on the spectral properties and geomorphologic characteristics. IR1 is the lineated terrain in the northern part of Mons Rümker, that could be ejecta of Iridum impact; IR2 is the northeastern Rümker plateau: "rough surface, higher density of secondary crater clusters (…) The northern part of this unit superposed on the linear depressions (Figure 2d), which indicates unit IR2 is younger than IR1"; IR3 is the most widely distributed basalt unit in Mons Rümker. "We performed crater size frequency distribution (CSFD) measurements on these three units and got absolute model ages of 3.71 Ga for IR1, 3.58 Ga for IR2, and 3.51 Ga for IR3".

Geological Evolution

Zhao et al. propose a new geological map (IMAGE 11), in which we can visualize the scenario of geological evolution of the Mons Rümker area that they propose:

"1. Ejecta of Iridum impact formed the lineated terrain in the northern part of Mons Rümker before 3.71 Ga.

2. Volcanic activity on the Rümker plateau at about 3.71 Ga, 3.58 Ga, and 3.51 Ga formed the basalt units IR1, IR2, and IR3, respectively.

3. Shallow domes (ld) formed around 3.5 Ga or slightly younger due to magma extrusion.

4. At about 3.47 Ga, magmatic eruption in Oceanus Procellarum formed the mare unit Im and superposed the outer part of Mons Rümker.

5. In the terminal stage of volcanic activity on the Rümker plateau, steep-sided domes formed and were active until ~3.0 Ga (Eratosthenian).

6. An episode of volcanic activity occurred at about 1.33 Ga in Oceanus Procellarum, and the mare lava superposed the eastern part of the Rümker plateau, covered by pyroclastic materials [Campbell et al., 2009; Farrand et al., 2015], while in our study, we did not find typical spectral characteristics of volcanic glass with M3 data, and there are also no related geomorphologic features such as dark mantle deposits identified".

FOCUS ON: Mons Rümker, A Changing Name

The Surroundings

Southeast of Mons Rümker we find a Copernican-age, bright-rayed crater Mons Rümker E, the largest of the Mons Rümker satellite craters. Zhao says that "Rümker E crater is 6.7 km in diameter (…). It has several crater rays that are up to 80 km long (…) Some crater clusters on southeastern Rümker plateau spread along the direction of these rays and could be also formed by ejecta of Rümker E crater". Very slightly we can see in IMAGE 29 something similar to bright rays (to the northeast), of course, oblique illumination does not help to distinguish them.

Image 29, Mons Rümker, *Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2009 May 07 04:18 UT. Celestron 14 inch plus 2x barlow f/22 Schmidt-Cassegrain telescope, UV/IR blocking filter, DMK21AU04 camera. Seeing 7/10.*

About the area around our target, Peter Grego says: "the marial plains are crossed by one or two very inconspicuous wrinkle ridges and are dusted with a few rays, and it is one of the most topographically bland areas on the entire Moon". There are no high elevations around Mons Rümker, no prominent craters or other features, just wrinkle ridges, the area is really full of wrinkle ridges. To the south the most prominent, as we see in IMAGE 29, is the one that ends at Nauman B (the 10 km diameter crater in the lower left corner). The most prominent dorsa in the area appear in IMAGE 30. The southernmost panorama is clearly seen in IMAGE 31. In IMAGE 32 we see the complicated drawing of the wrinkle ridges to the north of Mons Rümker, whose intertwining seems to betray the presence of buried craters (IMAGE 33). An excellent panorama of Mons Rümker and its surroundings is found in the image and text by Robert H. Hays Jr. that is included in this Section. An interesting detail is that Robert points out that "The interior of Rümker appears darker as the surrounding maria", a very sharp observation, which is confirmed by the image obtained with Mons Rümker in the terminator, IMAGE 34 (detail of IMAGE 5).

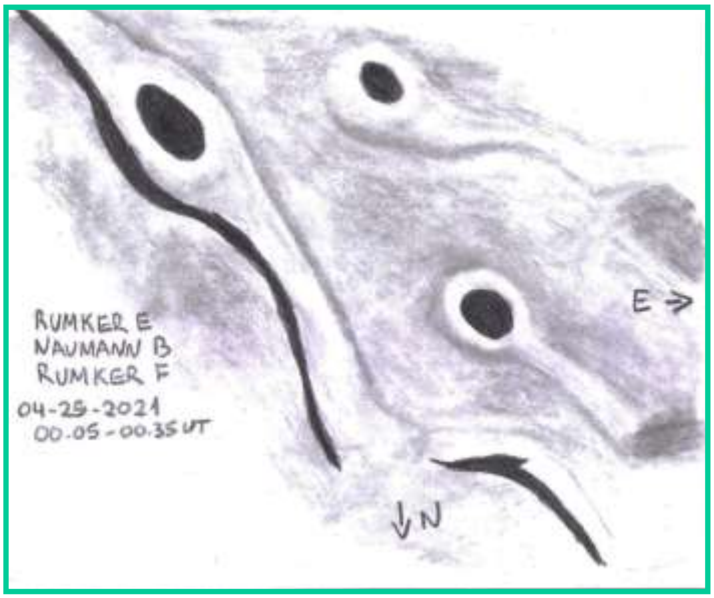

Image 30, Rümker E, Naumann B and Rümker F, *Alberto Anunziato, Paraná, Argentina, SLA. 2021 April 25 00:05-00:35 UT. Meade EX 105 mm Maksutov-Cassegrain telescope, 154x.*

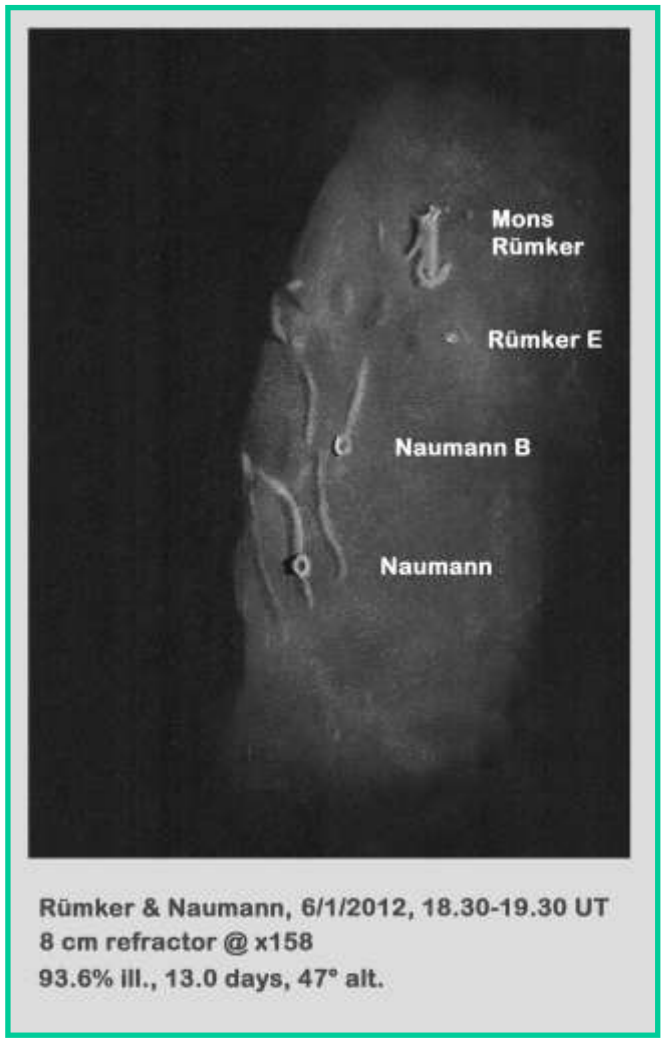

Image 31, Mons Rümker, *Jef De Wit, Hove, Belgium. 2012 January 06 18:30-19:30 UT. 8 cm refractor telescope, 158 x.*

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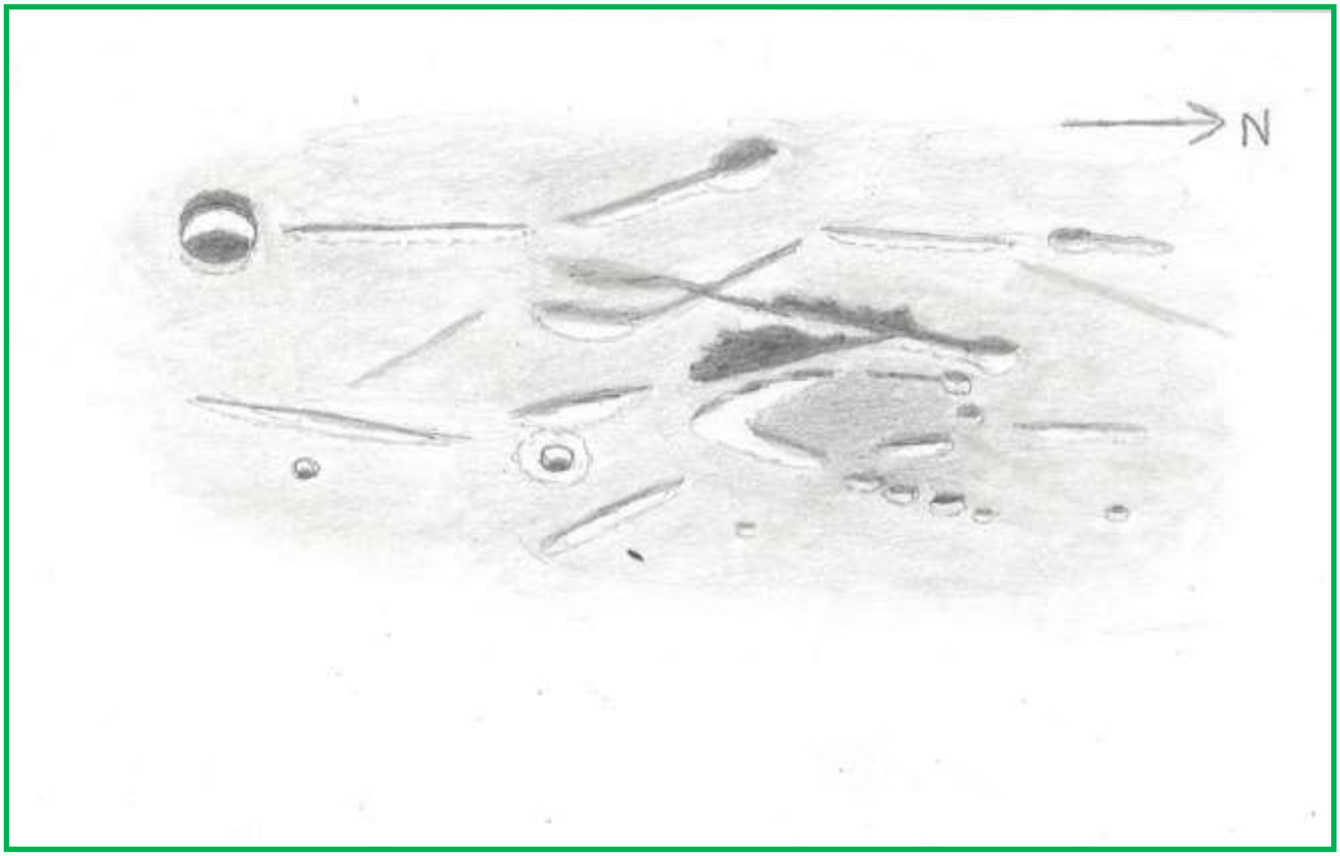
Rümker
Robert H. Hays, Jr.



Rümker, *Robert H. Hays, Jr., Worth, Illinois, USA. 1997 February 20 01:22-01:50 UT. 15 cm reflector telescope, 170 x. Seeing 7/10, transparency 6/6.*

I had seen this large dome many times, and had taken it for granted. It was well placed for observation on the evening of February 19/20, 1997, so I tried sketching this feature after timing the occultation of 29 Cancri. It took only a few minutes to realize that this was not a single dome but a collection of domes and hills, and that it would not be easy to draw. I went at it anyway. The brightest part of Rümker is a V-shaped area at its south end. There is a clump of hills to the east and north, and serrated shadows to the west. These serrated shadows were near but did not adjoin the bright V-shaped area. The interior of Rümker appears darker than the surrounding maria. An assortment of linear detail is in the vicinity. Some are definitely ridges, while others are probably just wrinkles. At least three are swollen at one end. The sketch probably shows the detail better than words can describe. Rümker E is the modest crater near the southern point of the 'V'. This crater is surrounded by a halo. Rümker F is the smaller pit south of E. The relatively large crater with much exterior shadow is Neumann B. The most prominent ridge in the area begins just north of this crater.

FOCUS ON: Mons Rümker, A Changing Name

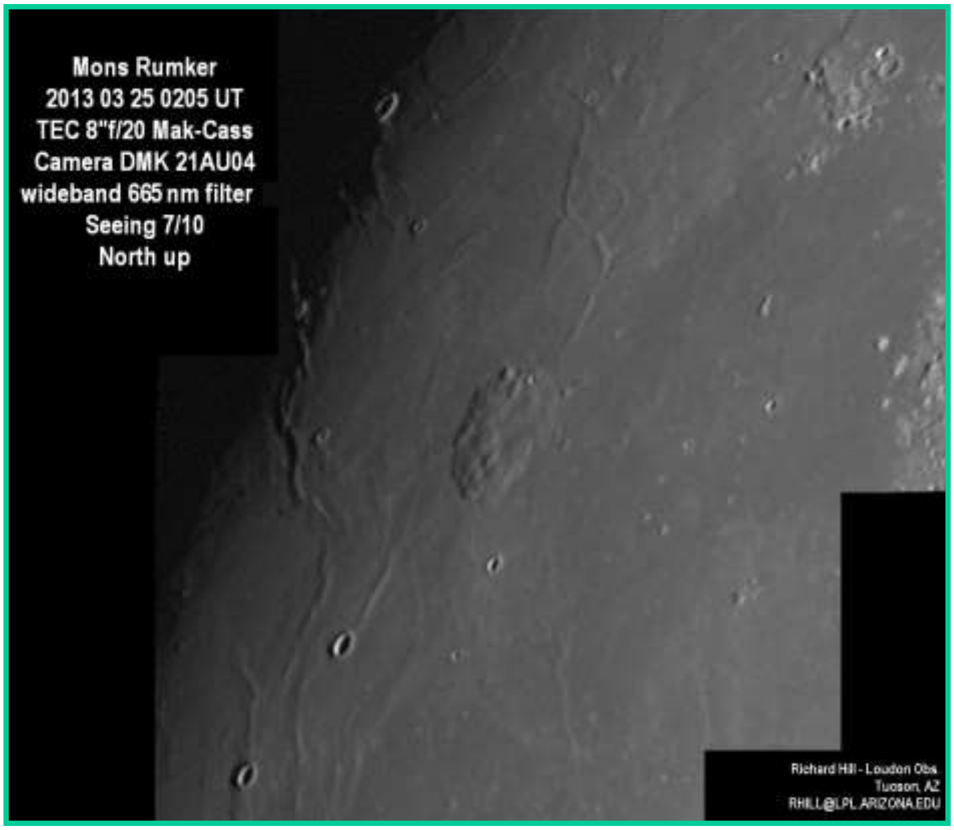


***Image 32, Mons Rümker,** Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2013 March 25 02:05 UT. TEC 8 inch f/20 Maksutov-Cassegrain telescope, wideband 665 nm filter, DMK21AU04 camera. Seeing 7/10.*

***Image 33, Dechen D to Mons Rümker,** Alberto Anunziato, Paraná, Argentina, SLA. 2022 June 12 00:05-00:30 UT. Meade EX 105 mm Maksutov-Cassegrain telescope, 154x.*

FOCUS ON: Mons Rümker, A Changing Name

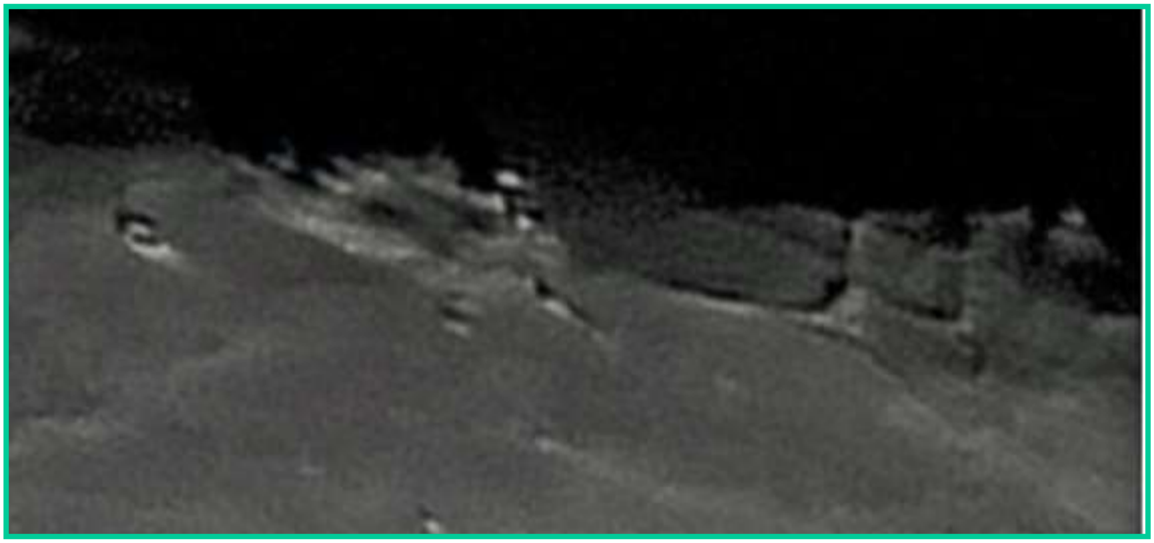


Image 34, Mons Rümker, *Fernando Surá, San Nicolás de los Arroyos, Argentina. 2021 March 27 00:15 UT. 127 mm Maksutov-Cassegrain telescope, DMK21618AU camera.*

The Chang'E-5 landing site

On December 1, 2020, the Chinese probe Chang'E-5 landed on the moon in the north of Oceanus Procellarum, in the vicinity of Mons Rümker. It was the first time since 1976, when the Soviet Luna 24 returned samples from Mare Crisium, that a mission had succeeded in returning samples of lunar soil, and they were the most northerly samples taken, as well as being the most recent of those that the other missions returned. The 1.7 kilograms that arrived on Earth on December 17, 2020 brought several novelties, including a new mineral (changesite) and crystals formed by meteorite impacts that contain water (which says a lot about the origin of water on the Moon surface). It is a pity that none of the two sites that the study by Zhao et al. (that was so useful in this Focus ON) proposed were selected. The sites proposed are marked as A and B on the geological map in IMAGE 11. "The first candidate landing site (…) is located on the top of a steep- sided dome (…) This site is also of high scientific value. By analyzing the composition of rocks, we can determine the silica content, titanium, and iron abundances, which are directly related to the magma viscosity. These, together with the physical properties of the rock (e.g., density and porosity), will provide basic information for rheologic modeling in the analysis of formation mechanism of steep-sided domes on the Rümker plateau and provide references for the study of other volcanic domes on the Moon (…) The other candidate landing site is located in the northern lineated terrain (….) This area could be the oldest unit on the surface of Mons Rümker (IR1, 3.71 Ga), and some confusing problems about this area are still unsolved. First, it has been proposed that this area could be covered by pyroclastic materials, while in our study, we did not find typical spectral characteristics of volcanic glass with M3 data, and there are also no related geomorphologic features such as dark mantle deposits identified". A moon landing on the very Mons Rümker would have been very exciting, it is likely that it will not take many years for it to happen.

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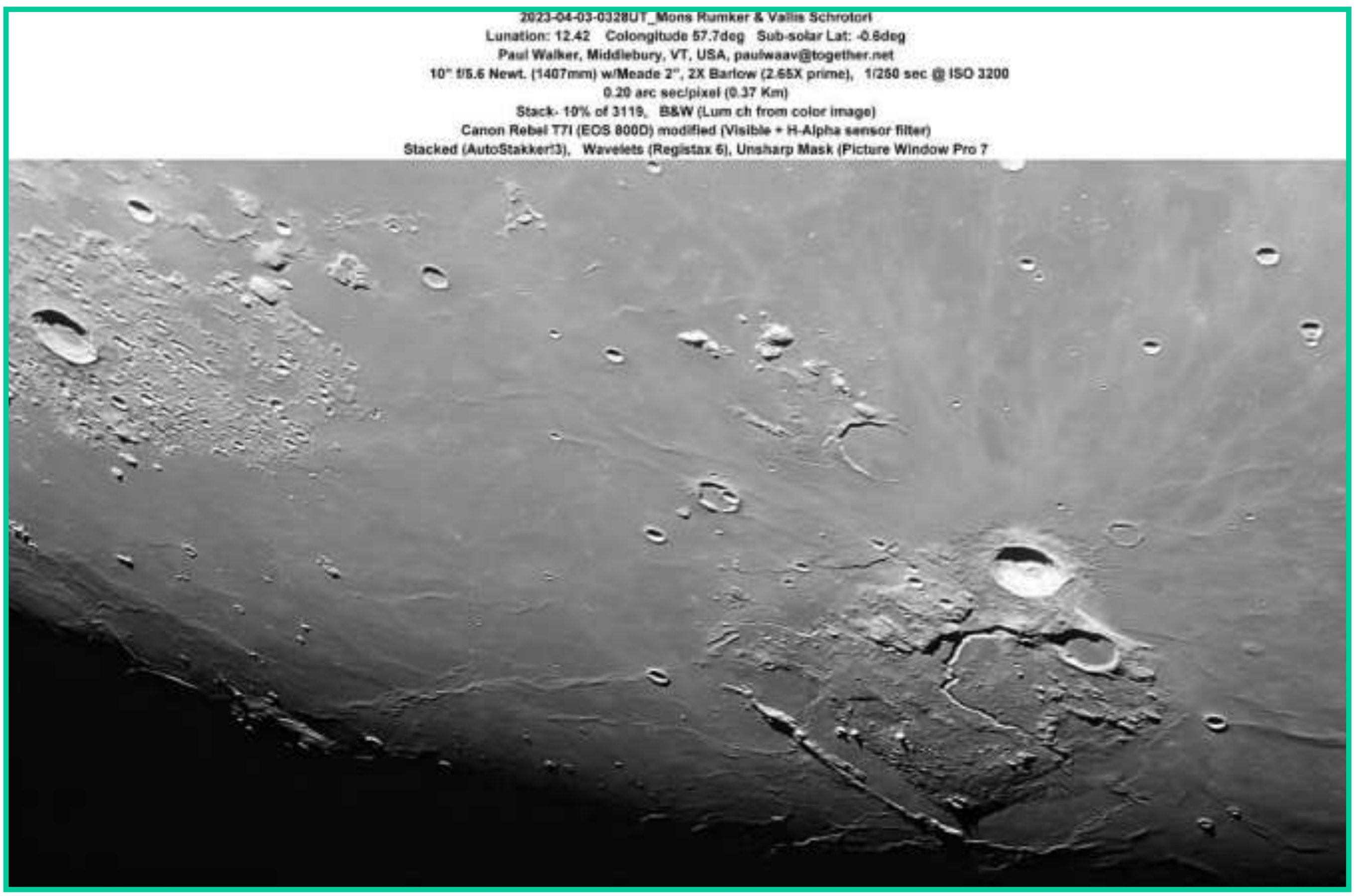


FOCUS ON: Mons Rümker, A Changing Name

Mons Rümker

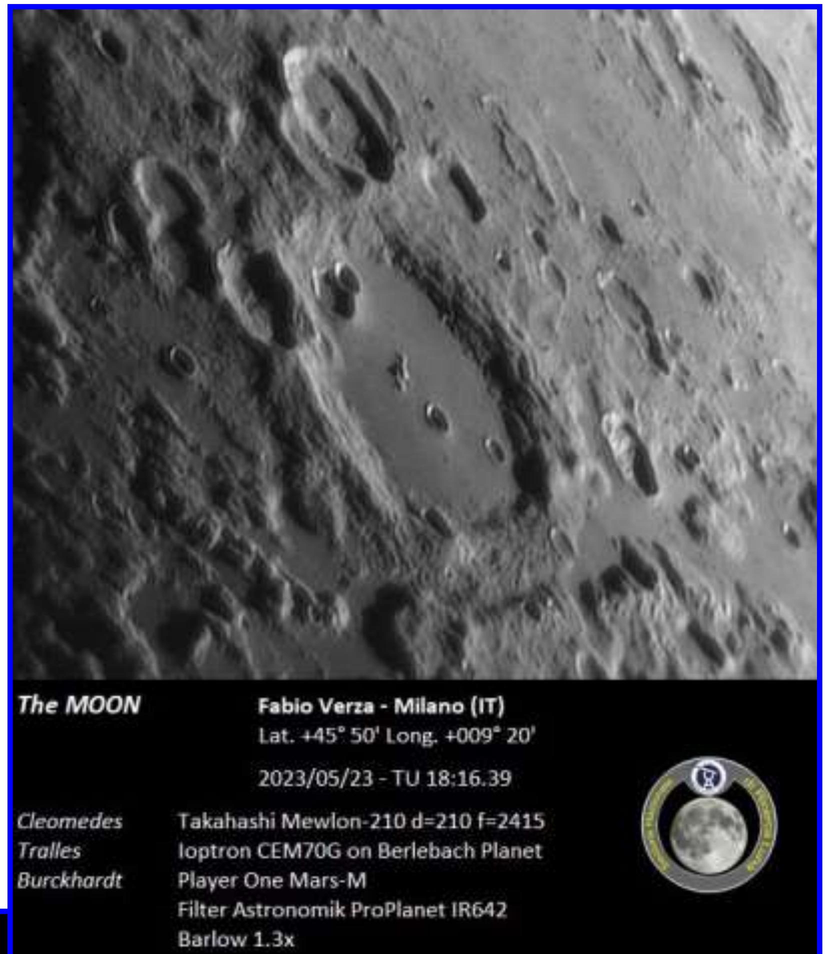
Rik Hill

Here we have one of the more peculiar of features on the moon located in the north of Oceanus Procellarum. Looking like a blob of cheese that has dripped off of a hot pizza, it's actually several dozen blobs of solidified lava some with summit pits or craters, rather than the proverbial green cheese. The elevation of these domes (similar to shield volcanoes on the Earth) is only 1100m near the middle of the mass has a diameter of some 70 km (or 70,000m). A gentle rise indeed! As you can see here, the very highest portion is just south of center with a couple more local rises south of that. China's Chang'e-5 mission landed very near Mons Rümker on Dec. 1, 2020 and returned 1.73g of samples from Procellarum on Dec. 16.

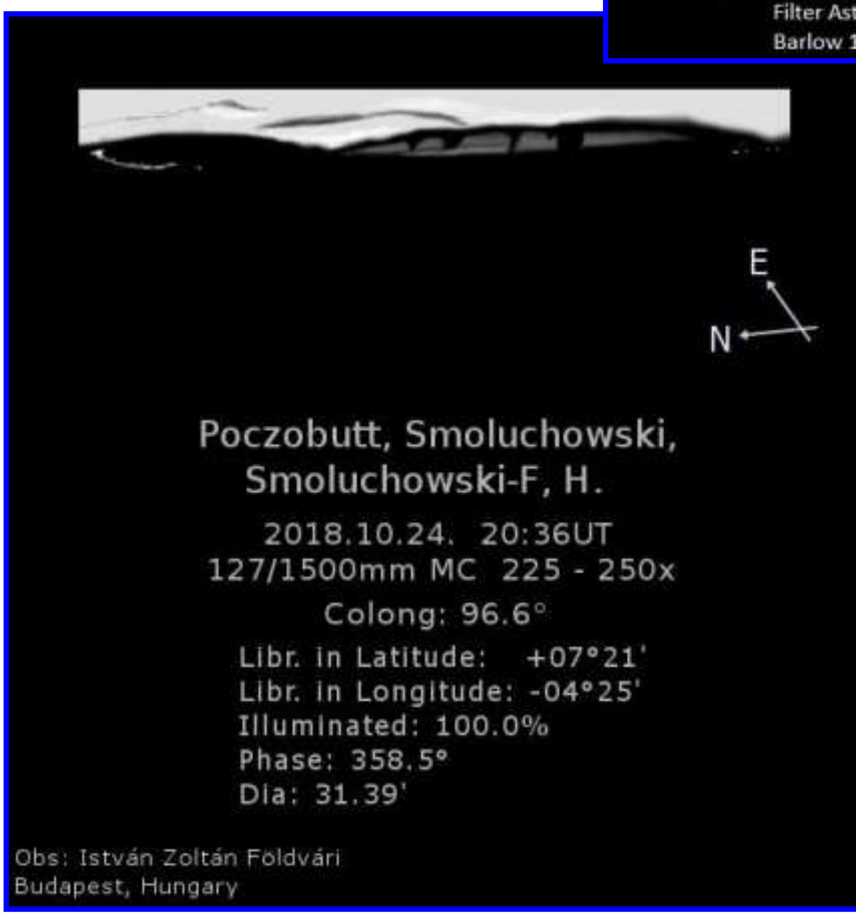
You can see this feature when the moon is but one or two days short of full depending on libration. I would urge you to put Mons Rümker on your Lunar Bucket list!

Mons Rümker, *Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2023 January 05 04:54 UT, colongitude 67.6°. TEC 8 inch f/20 Maksutov-Cassegrain telescope, 610 nm filter, SKYRIS 132M camera. Seeing 8/10.*

FOCUS ON: Mons Rümker, A Changing Name



Cleomedes, *Fabio Verza, SNdR, Milan, Italy. 2023 May 23 18:16 UT. Takahashi Mewlon 210 mm Dall-Kirkham telescope, Astronomik Pro-Planet IR642 nm filter, 1.3 x barlow, Player One Mars-M camera.*



Poczobutt, Smoluchowski and Smoluchowski F, H, *István Zoltán Földvári, Budapest, Hungary. 2018 October 24, 19:50-20:36 UT, colongitude 96.6°. 150 mm Maksutov-Cassegrain telescope, 1500 mm focal length, 6 mm orthoscopic and 10 mm Plossl, 1.5x barlow. Seeing 8/10, transparency 6/6.*

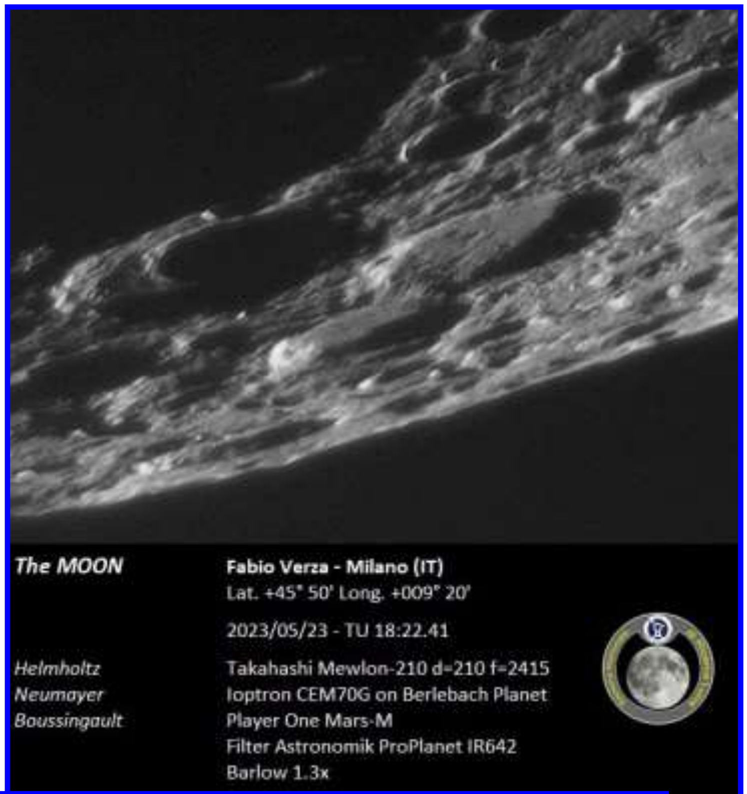
Recent Topographic Studies

Endymion, *Fabio Verza, SNdR, Milan, Italy. 2023 May 23 18:13 UT. Takahashi Mewlon 210 mm Dall-Kirkham telescope, Astronomik ProPlanet IR642 nm filter, 1.3 x barlow, Player One Mars-M camera.*

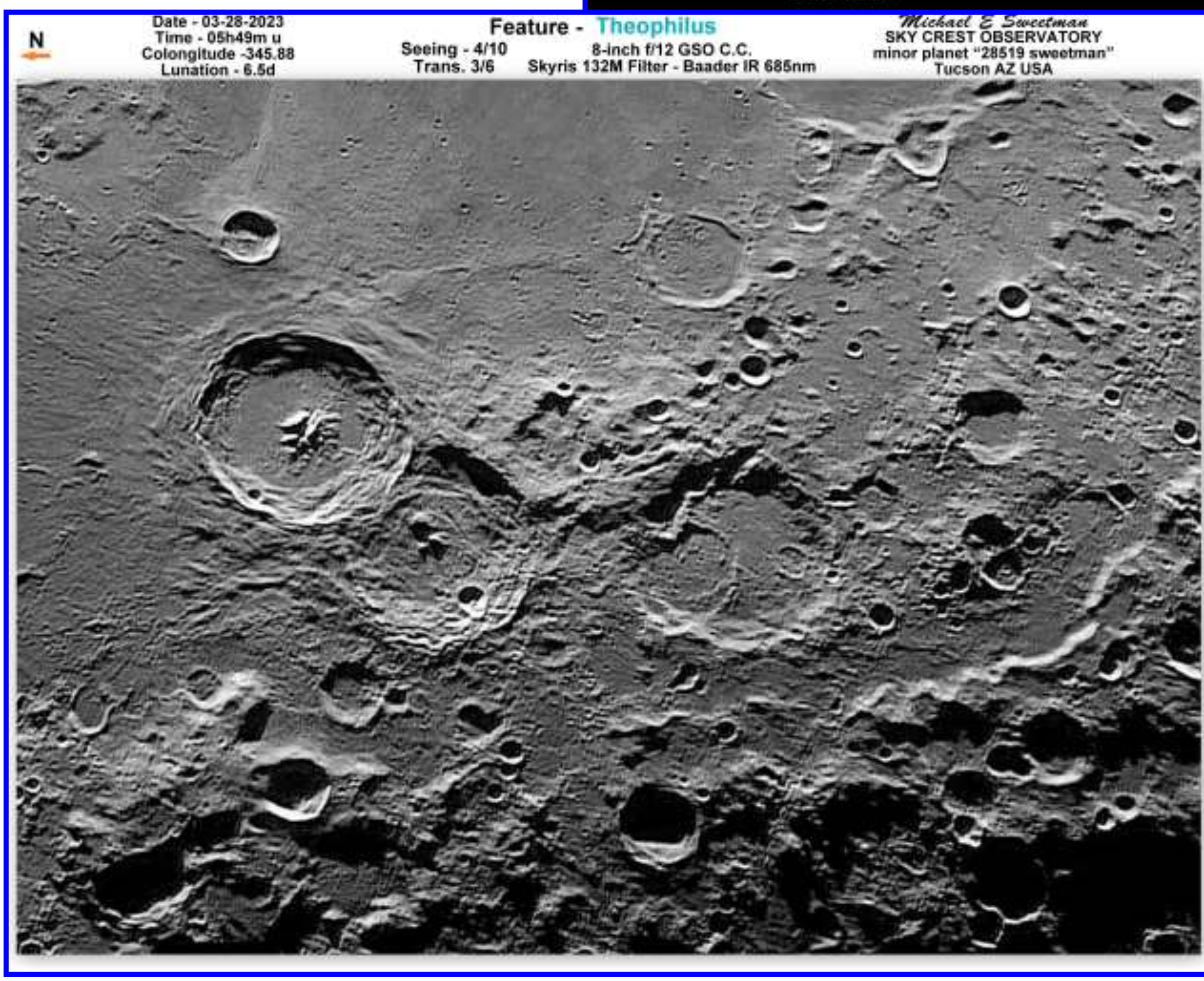
95% Waxing Gibbous Moon, *Anthony Harding, northeast Indiana, USA. 2023 June 02 02:55 UT, colongitude 69.793º. 6 inch GSO reflector telescope, f/6, 910 mm fl, Tele Vue 2.5x Power mate, ZWO ASI 533 MC Pro color camera. Seeing 7/10, transparency 8/10. North upper right, west upper left. Anthony adds: "*This full-disc shot of the Moon shows a lot of detail, especially the ejecta blankets of the larger craters."

Recent Topographic Studies

Helmholtz, *Fabio Verza, SNdR, Milan, Italy. 2023 May 23 18:22 UT. Takahashi Mewlon 210 mm Dall-Kirkham telescope, Astronomik ProPlanet IR642 nm filter, 1.3 x barlow, Player One Mars-M camera.*



Theophilus, *Michael Sweetman, Sky Crest Observatory, Tucson, Arizona, USA. 2023 March 28 05:49 UT, colongitude 345.88º. 8 inch f/12 GSO classical Cassegrain telescope, Baader IR 685 nm filter, Skyris 132M camera. North is to the left, west is down. Seeing 4/10, transparency 3/6.*



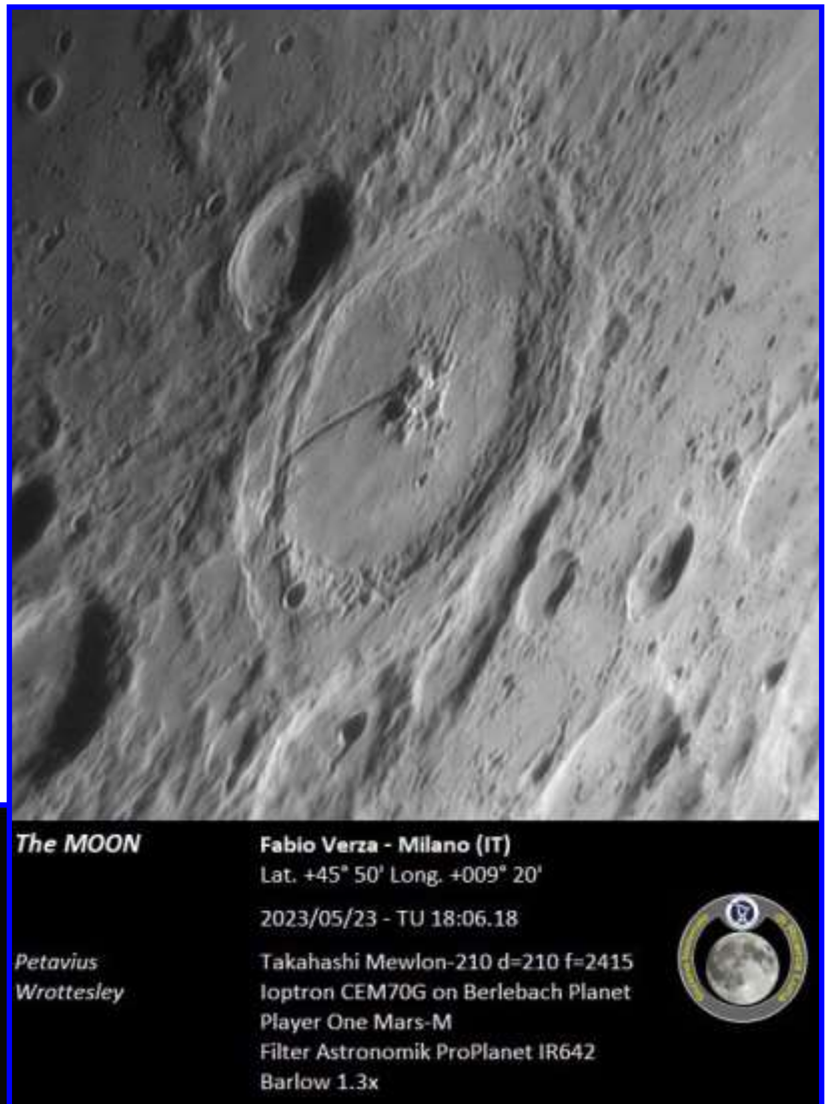
Recent Topographic Studies

Mare Crisium, *Fabio Verza, SNdR, Milan, Italy. 2023 May 23 18:10 UT. Takahashi Mewlon 210 mm Dall-Kirkham telescope, Astronomik ProPlanet IR642 nm filter, 1.3 x barlow, Player One Mars-M camera.*

Montes Pyrenaeus and Bohnenberger, *István Zoltán Földvári, Budapest, Hungary. 2018 September 28, 22:10-22:29 UT, colongitude 140.6°. 80 mm refractor telescope, 900 mm focal length, Circle-T Japan 6 mm orthoscopic, 150x. Seeing 7/10, transparency 5/6.*

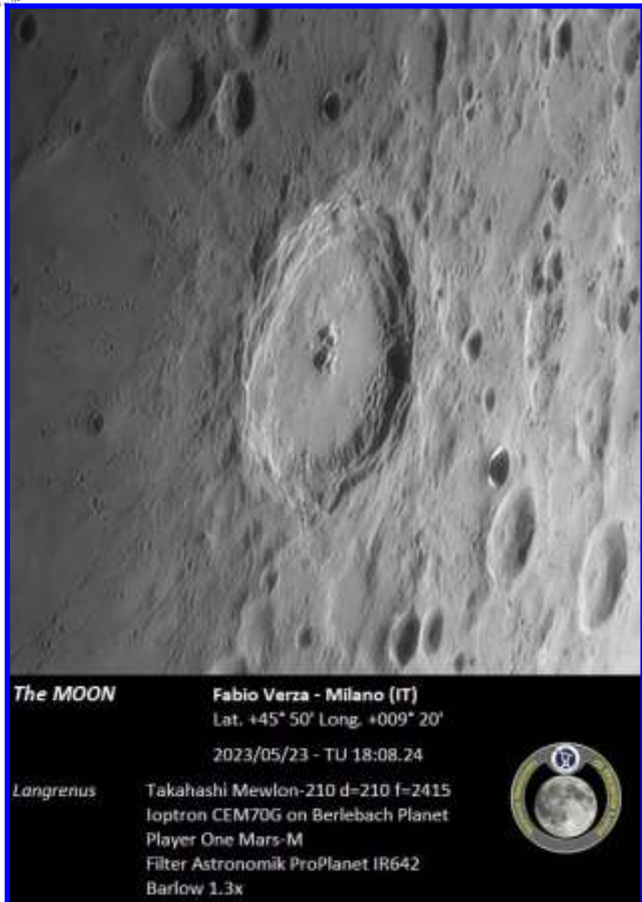
Recent Topographic Studies

***Petavius,** Fabio Verza, SNdR, Milan, Italy. 2023 May 23 18:06 UT. Takahashi Mewlon 210 mm Dall-Kirkham telescope, Astronomik ProPlanet IR642 nm filter, 1.3 x barlow, Player One Mars-M camera.*

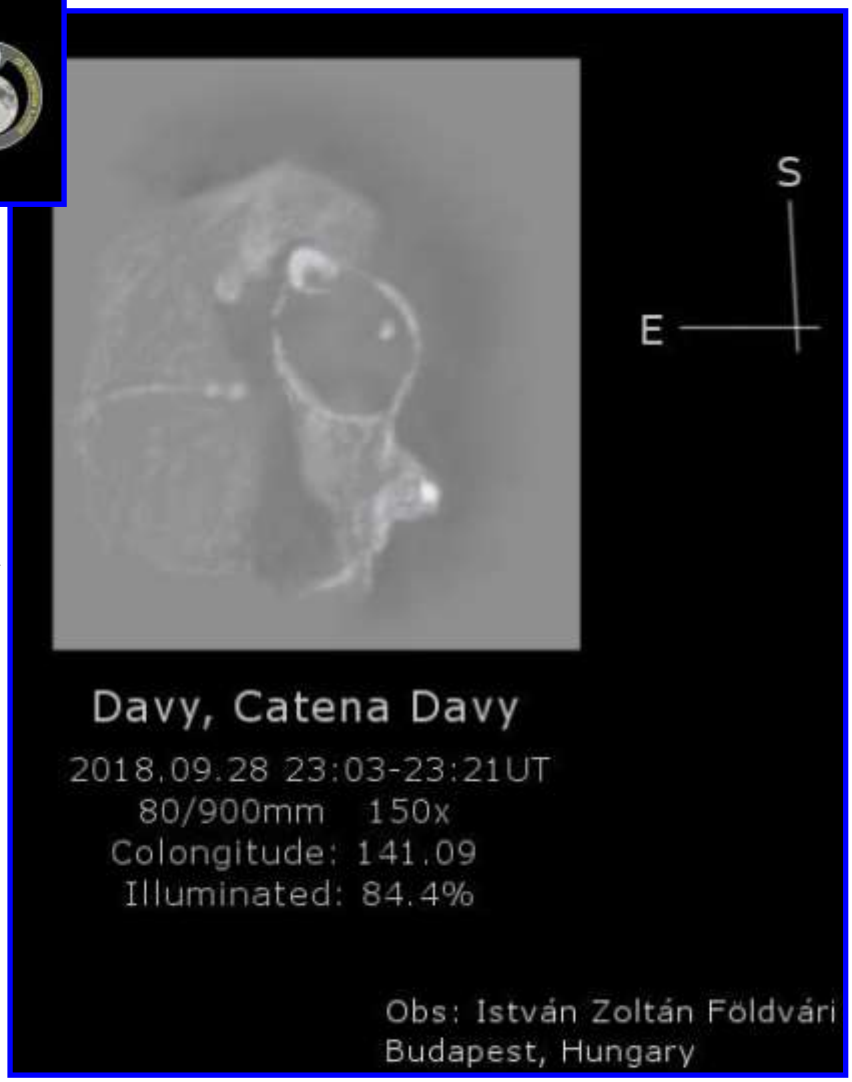


***Pythagoras,** Larry Todd, Dunedin, New Zealand. 2023 June 02 08:32 UT. OMC 200 Maksutov-Cassegrain telescope.*

Recent Topographic Studies



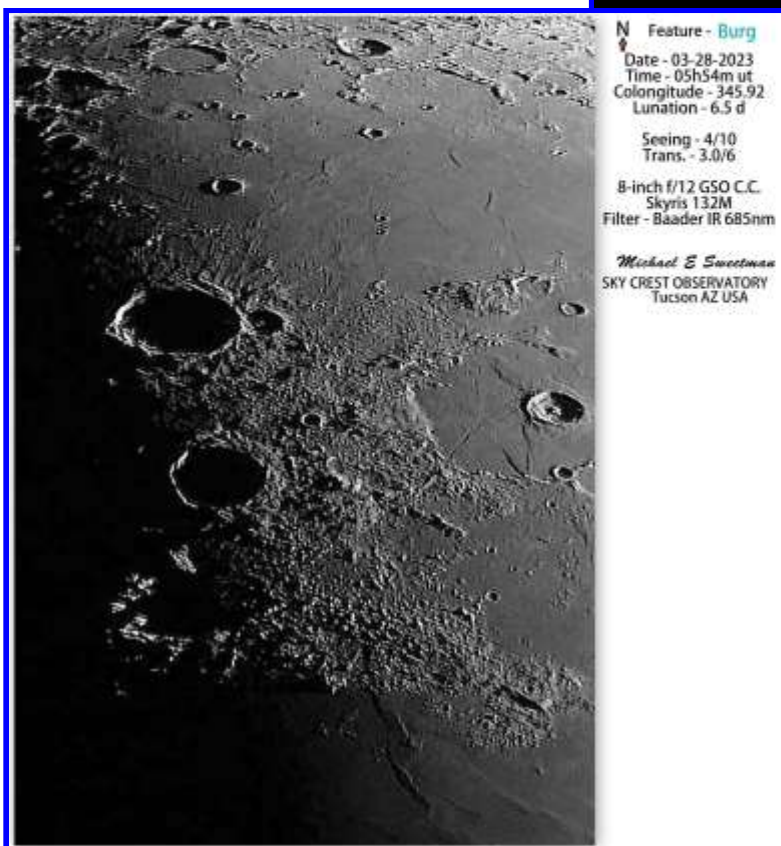
Langrenus, *Fabio Verza, SNdR, Milan, Italy. 2023 May 23 18:08 UT. Takahashi Mewlon 210 mm Dall-Kirkham telescope, Astronomik ProPlanet IR642 nm filter, 1.3 x barlow, Player One Mars-M camera.*



Davy and Catena Davy, *István Zoltán Földvári, Budapest, Hungary. 2018 September 28, 23:03-23:21 UT, colongitude 141.09°. 80 mm refractor telescope, 900 mm focal length, Circle-T Japan 6 mm orthoscopic, 150x. Seeing 7/10, transparency 5/6.*

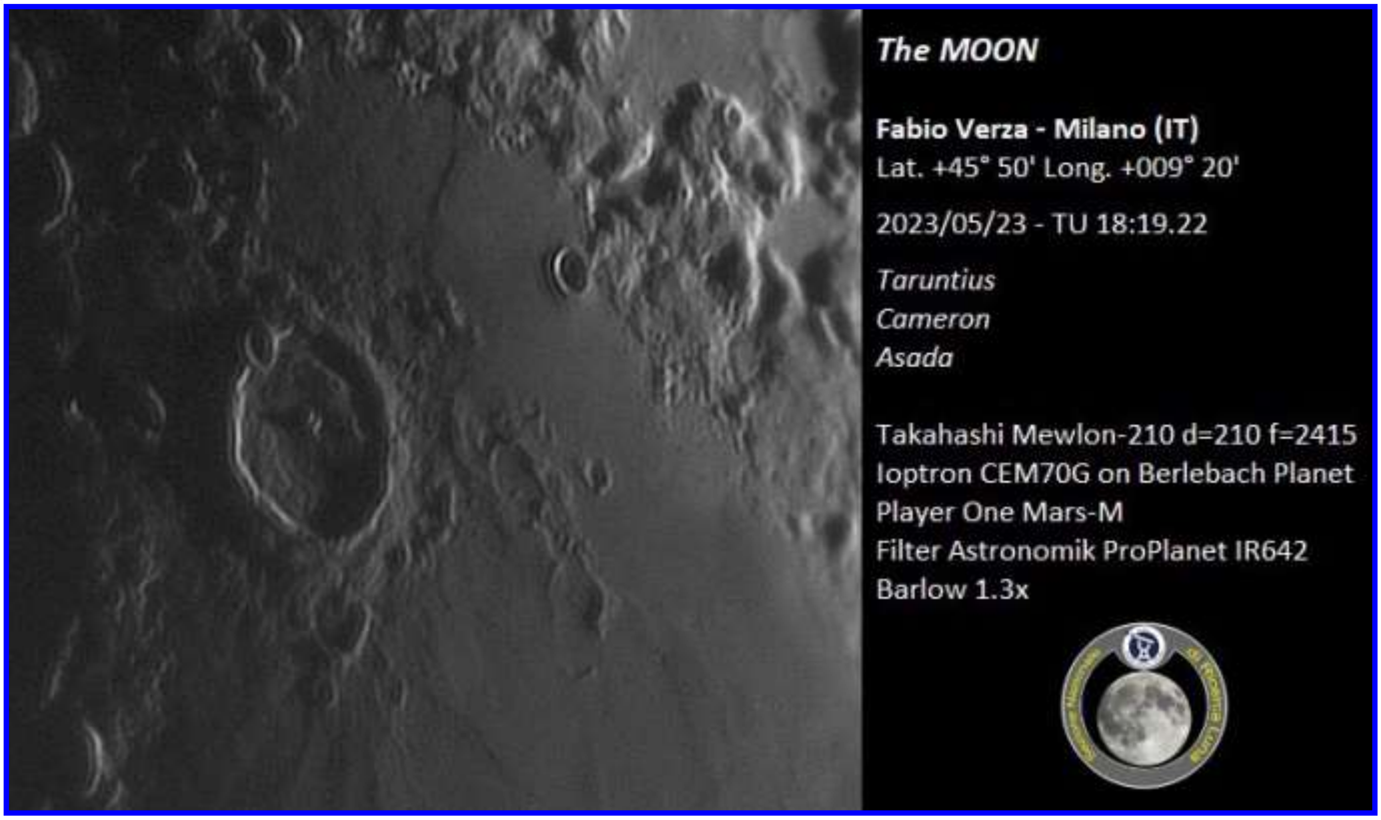
Recent Topographic Studies

Snellius, *Fabio Verza, SNdR, Milan, Italy. 2023 May 23 18:25 UT. Takahashi Mewlon 210 mm Dall-Kirkham telescope, Astronomik ProPlanet IR642 nm filter, 1.3 x barlow, Player One Mars-M camera.*



Bürg *Michael Sweetman, Sky Crest Observatory, Tucson, Arizona, USA. 2023 March 28 05:54 UT, colongitude 345.92º. 8 inch f/12 GSO classical Cassegrain telescope, Baader IR 685 nm filter, Skyris 132M camera. Seeing 4/10, transparency 3/6.*

Recent Topographic Studies

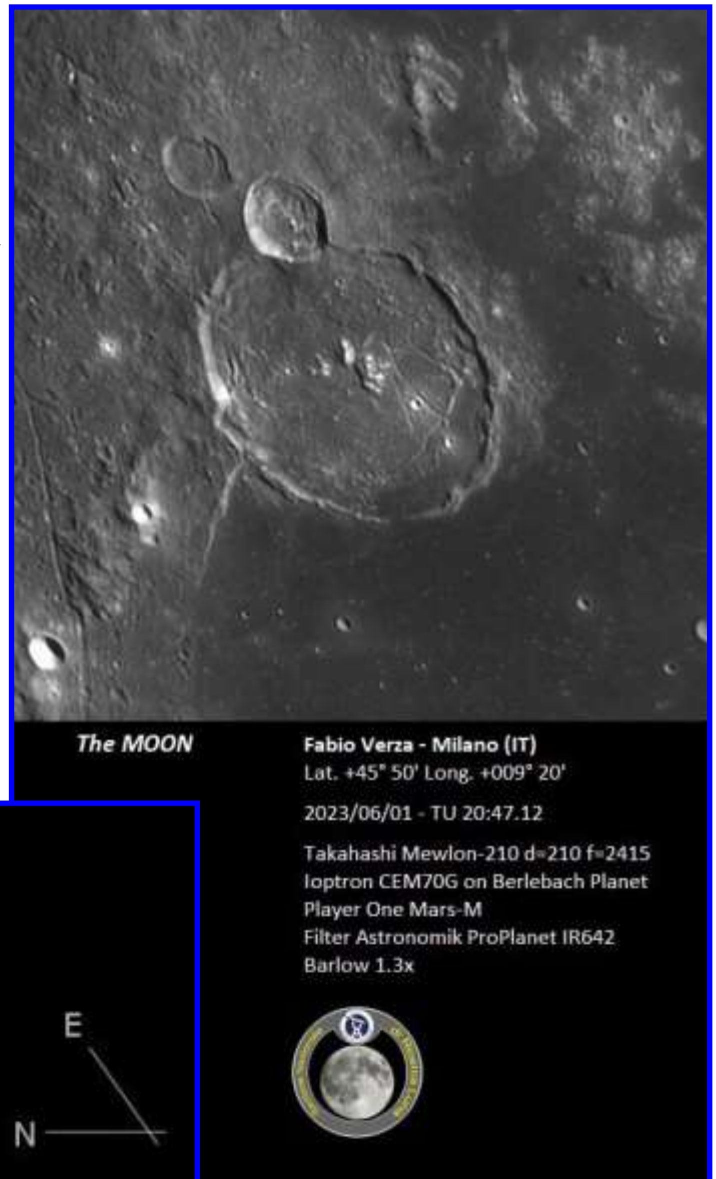


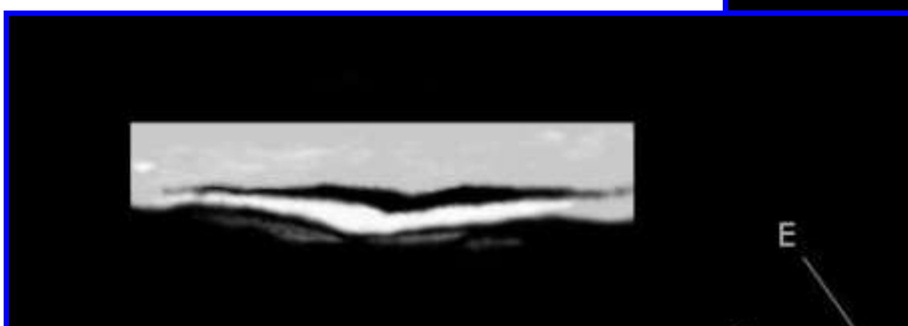
Taruntius, *Fabio Verza, SNdR, Milan, Italy. 2023 May 23 18:19 UT. Takahashi Mewlon 210 mm Dall-Kirkham telescope, Astronomik ProPlanet IR642 nm filter, 1.3 x barlow, Player One Mars-M camera.*

Eddington, *Larry Todd, Dunedin, New Zealand. 2023 June 02 08:18 UT. OMC 200 Maksutov-Cassegrain telescope.*

Recent Topographic Studies

Gassendi, *Fabio Verza, SNdR, Milan, Italy. 2023 June 01 20:47 UT. Takahashi Mewlon 210 mm Dall-Kirkham telescope, Astronomik ProPlanet IR642 nm filter, 1.3 x barlow, Player One Mars-M camera.*





McLaughlin and McLaughlin C, *István Zoltán Földvári, Budapest, Hungary. 2018 October 24, 20:38-20:59 UT, colongitude 96.7°. 150 mm Maksutov-Cassegrain telescope, 1500 mm focal length, 6 mm orthoscopic 250x. Seeing 8/10, transparency 6/6.*

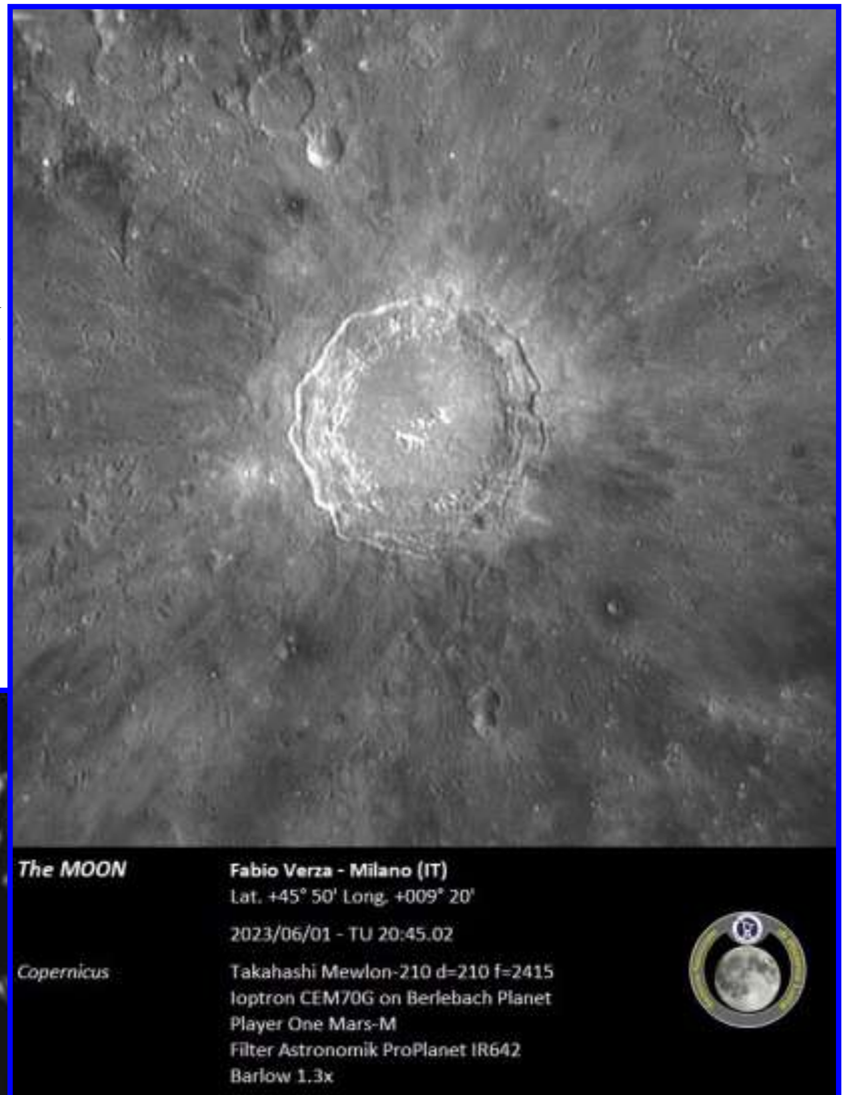
Recent Topographic Studies

Aristarchus, *Fabio Verza, SNdR, Milan, Italy. 2023 June 01 20:42 UT. Takahashi Mewlon 210 mm Dall-Kirkham telescope, Astronomik ProPlanet IR642 nm filter, 1.3 x barlow, Player One Mars-M camera.*

Hercules, *Larry Todd, Dunedin, New Zealand. 2023 June 07 10:23 UT. OMC 200 Maksutov-Cassegrain telescope.*

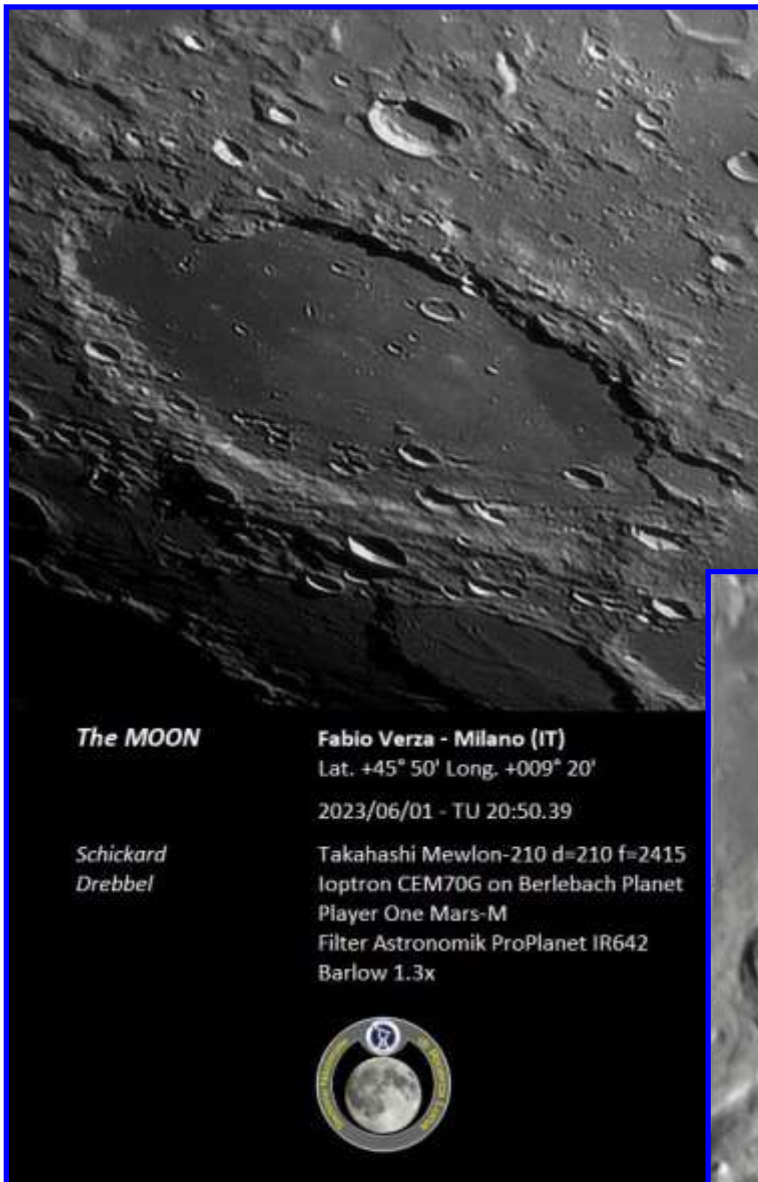
Recent Topographic Studies

Copernicus, *Fabio Verza, SNdR, Milan, Italy. 2023 June 01 20:45 UT. Takahashi Mewlon 210 mm Dall-Kirkham telescope, Astronomik ProPlanet IR642 nm filter, 1.3 x barlow, Player One Mars-M camera.*



Römer, *Larry Todd, Dunedin, New Zealand. 2023 June 07 10:26 UT. OMC 200 Maksutov-Cassegrain telescope.*

Recent Topographic Studies

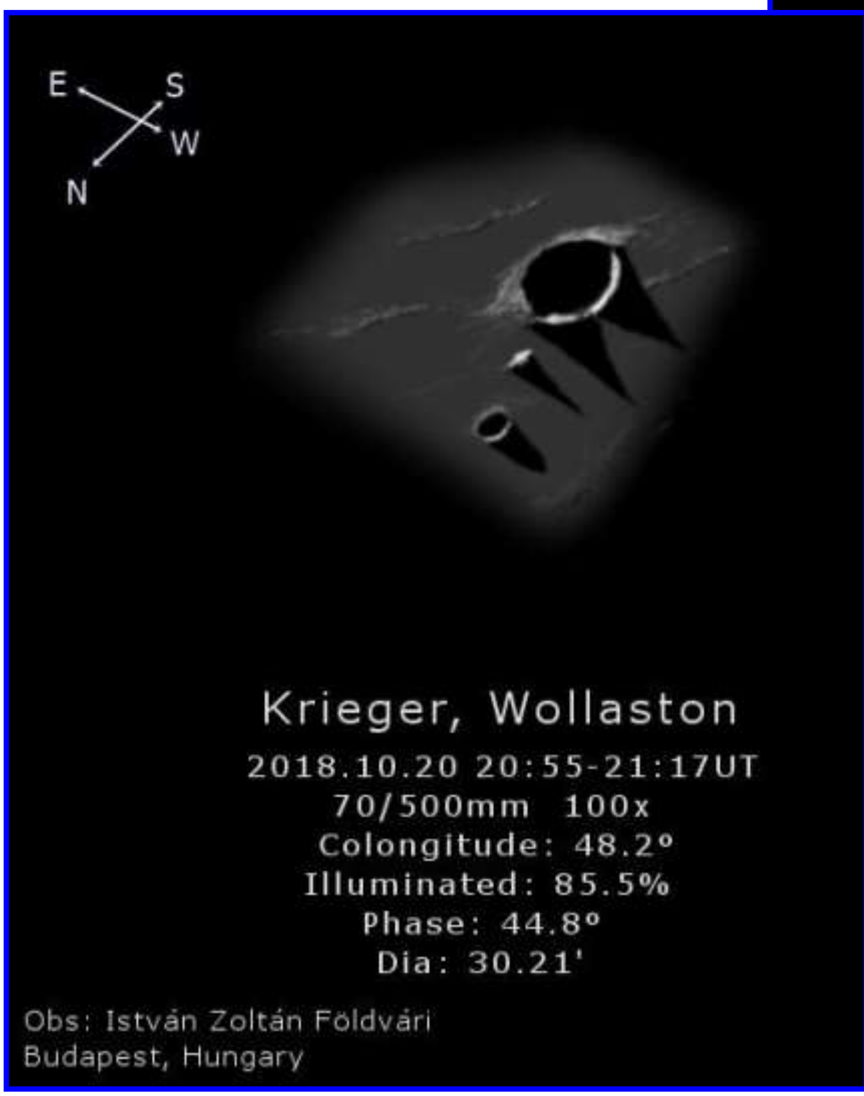


Schickard, *Fabio Verza, SNdR, Milan, Italy. 2023 June 01 20:50 UT. Takahashi Mewlon 210 mm Dall-Kirkham telescope, Astronomik ProPlanet IR642 nm filter, 1.3 x barlow, Player One Mars-M camera.*

Mare Nectaris, *Larry Todd, Dunedin, New Zealand. 2023 June 07 10:33 UT. OMC 200 Maksutov-Cassegrain telescope.*

Recent Topographic Studies

Plato, *Fabio Verza, SNdR, Milan, Italy. 2023 June 01 20:38 UT. Takahashi Mewlon 210 mm Dall-Kirkham telescope, Astronomik ProPlanet IR642 nm filter, 1.3 x barlow, Player One Mars-M camera.*



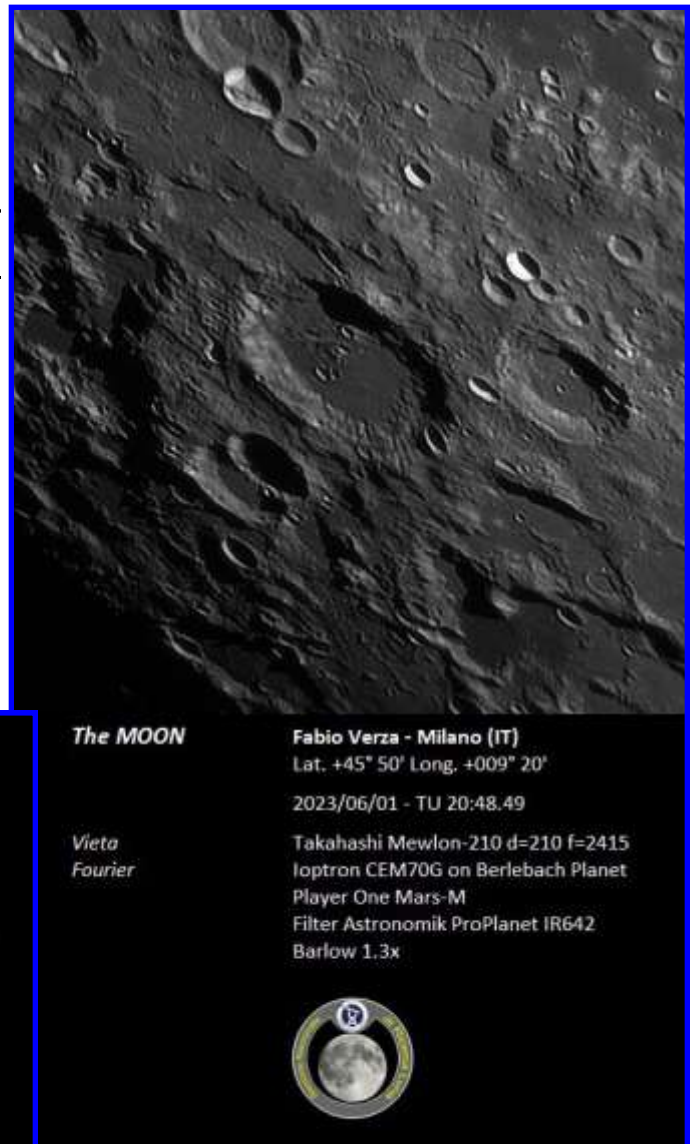
Krieger and Wollaston, *István Zoltán Földvári, Budapest, Hungary. 2018 October 20, 20:55-21:17 UT, colongitude 48.2°. 70 mm refractor telescope, 500 mm focal length, 10 mm Plossl, GSO 2x barlow, 100x. Seeing 2-5/10, transparency 2/6.*

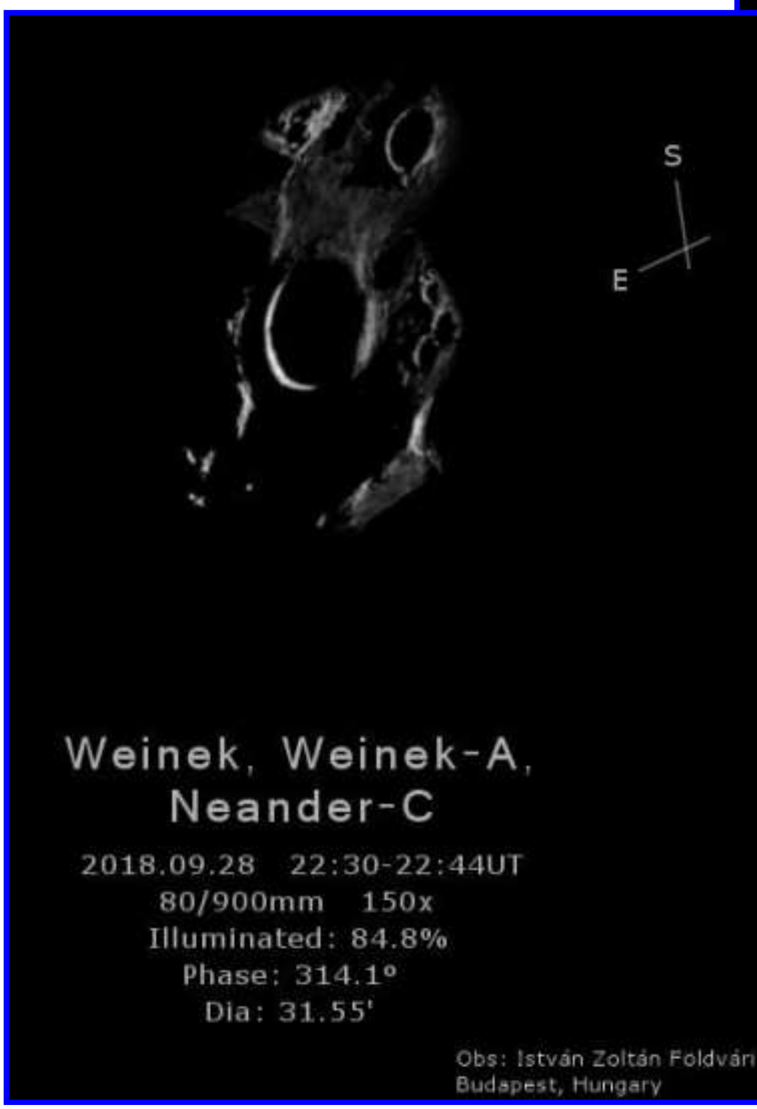
Recent Topographic Studies

Schiller, *Fabio Verza, SNdR, Milan, Italy. 2023 June 01 20:13 UT. Takahashi Mewlon 210 mm Dall-Kirkham telescope, Astronomik ProPlanet IR642 nm filter, 1.3 x barlow, Player One Mars-M camera.*

Posidonius, *Larry Todd, Dunedin, New Zealand. 2023 June 07 10:40 UT. OMC 200 Maksutov-Cassegrain telescope.*

Vieta, *Fabio Verza, SNdR, Milan, Italy. 2023 June 01 20:48 UT. Takahashi Mewlon 210 mm Dall-Kirkham telescope, Astronomik ProPlanet IR642 nm filter, 1.3 x barlow, Player One Mars-M camera.*





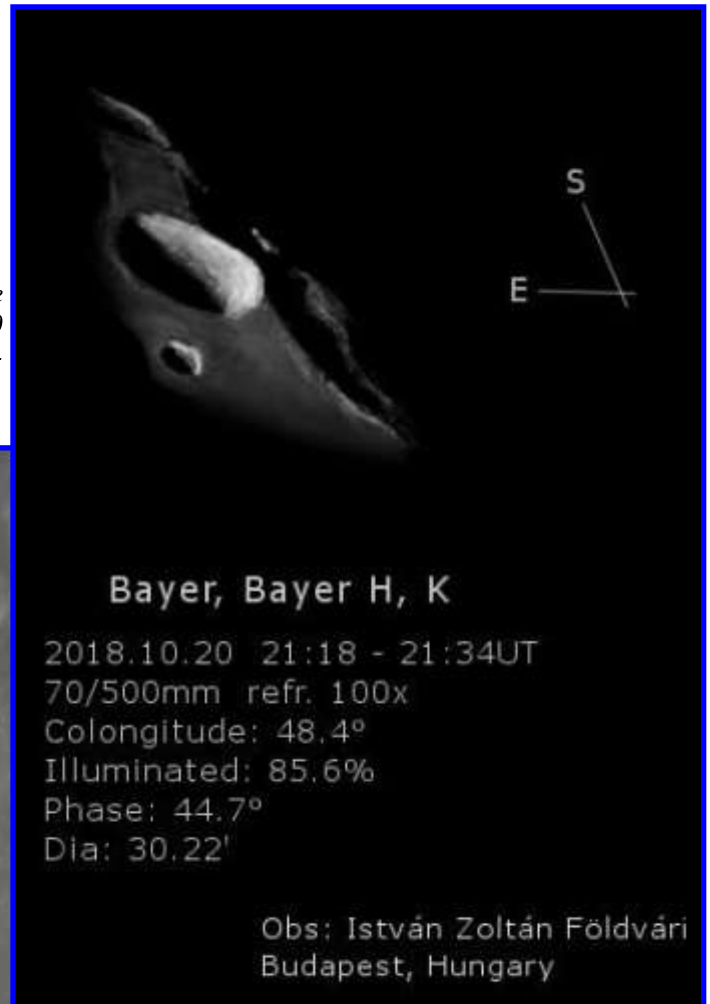
Weinek, *István Zoltán Földvári, Budapest, Hungary. 2018 September 28, 22:30-22:44 UT, colongitude 140.8°. 80 mm refractor telescope, 900 mm focal length, Circle-T Japan 6 mm orthoscopic, 150x. Seeing 7/10, transparency 5/6.*

Sinus Iridum, *Fabio Verza, SNdR, Milan, Italy. 2023 June 01 20:40 UT. Takahashi Mewlon 210 mm Dall-Kirkham telescope, Astronomik ProPlanet IR642 nm filter, 1.3 x barlow, Player One Mars-M camera.*

Aristarchus, *Larry Todd, Dunedin, New Zealand. 2023 June 02 08:14 UT. OMC 200 Maksutov-Cassegrain telescope.*

Recent Topographic Studies

Bayer, Bayer H and K, *István Zoltán Földvári, Budapest, Hungary. 2018 October 20, 21:18-21:34 UT, colongitude 48.4°. 70 mm refractor telescope, 500 mm focal length, 10 mm Plossl, GSO 2x barlow, 100x. Seeing 4/10, transparency 3/6.*



Hevelius, *Larry Todd, Dunedin, New Zealand. 2023 June 02 08:10 UT. OMC 200 Maksutov-Cassegrain telescope.*

Recent Topographic Studies

7-Day Moon, *Maurice Collins, Palmerston North, New Zealand. 2023 June 25 06:14-06:35UT. Celestron 8 inch Schmidt-Cassegrain telescope, QHY5III462C camera.*

Recent Topographic Studies

Lunar Geologic Change Detection Program

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

2023 July

LTP Reports: Two candidate impact flashes have been captured from Brazil, one by Eneida Passos Pereira on 2023 Apr 22 UT 21:52:19 close to Mare Vaporum. The second was captured by Silvano de Souza on 2023 May 24 UT 21:16:13 close to 10E, 65S. If you were videoing or imaging the Moon at the time, please check your observations as we would like to confirm these. For further details see: https://alpo-astronomy.org/lunarupload/lunimpacts.htm

One candidate LTP report was received for **Gassendi**, but is listed under the repeat illumination reports below, even though it is seen in a different part of the crater, but we have a March report concerning Tycho and Cavendish E described below:

Tycho: On 2023 Mar 23 UT 19:25-19:55 Cervoni Maurizio (UAI) observed visually for the following lunar schedule request:

ALPO Request: Try viewing the central peak through a red and blue filter e.g., Wratten 25a and 38, and comparing the brightness to the of the eastern sunlit rim. Does the size of the central peak change between filters? If you do detect color here, obviously check for color on other central peaks. If taking color images, make sure that you do underexpose slightly so as to avoid saturating the central peak. All visual reports, sketches or color images should be emailed.

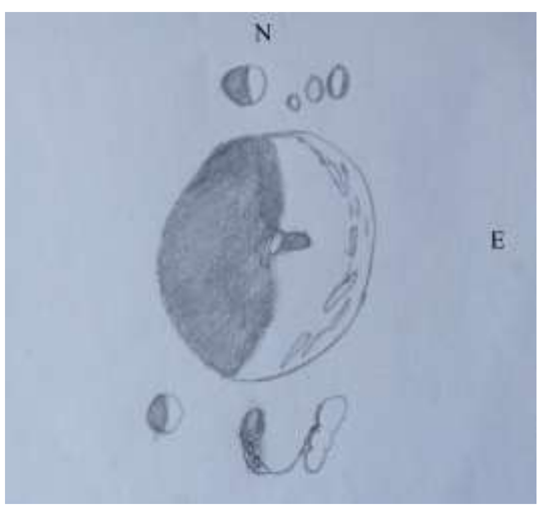


Figure 1. *Tycho as sketched by Cervoni Maurizio (UAI) on 2023 Mar 23 UT 19:25-19:55 and orientated with north towards the top. A Maksutov/Cassegrain 127/1500 f.11.8 telescope was used - Mag. 224x - Seeing Antoniadi III - Transp. 3*

Cervoni reported that despite the good elevation of the Moon above the horizon (about 70°), lunar details were subject to strong turbulence, and a really good view was only visible occasionally. A sketch was made (Fig 1). At 19:30 UT: alternating the filters with the blink method, the dimensions of the central peak appeared identical. With the red filter the eastern edge of the crater was brighter than the peak; this difference in brightness appeared to increase when viewed with the blue filter. At 19:55 UT the crater Moretus was observed also, with the same seeing conditions; with the red filter the east edge was slightly brighter than the peak, while with the blue filter the peak and the east edge were the same brightness. In other words, different to Tycho with the blue filter?

The original LTP report that the lunar schedule requests refer to is from 1996 Apr 27 and the description below was gleaned from: http://www.lpl.arizona.edu/~rhill/alpo/lunarstuff/ltp2.html which is a now defunct web site:

1996 April 27 2:26 UT to 3:14 UT.

Robert Spellman of Arcadia California submitted an excellent report on the darkening of the central peak of Tycho. Using the Moon Blink technique which consist of the W# 25A Red and W# 38 Blue filters. The following is a description of what he reports.

02:26 U.T. Sunrise on Tycho 3/4 of the crater was in shadow, topmost section of the central peak was in sunlight. In white light brightness of the central peak rivaled the brightness of the Eastern (sunlit) wall. No change was detected in red light, however in blue light definite strong darkening was observed. Blink obtained when viewing thru 25A and 38 filters. At 2:52 U.T. in the poor to fair seeing the apparent size of the central peak in white and red light was the same, in blue light the central peak size shrank to 1/2 white and red size (and brightness). Also appearing sharper. Comparison was made also with the central peak of Alphonsus, no changes were observed. The significant part of the observation was the relative brightness of the central peak to the sunlit rim in white and red light, they appeared almost identical with the crater rim, being just slightly brighter. In blue light the brightness of the central peak was reduced by at least half while the rim brightness was not, (relative to one another). I strongly believe that this was a real event. The shadow filled portion of Tycho was examined for any abnormalities but none were observed.

The ALPO/BAA weight was 3 and we shall leave it at that, but at least we have a good quality sketch now for what the crater ought to have looked like although the +/-0.5˚ selenographic colongitude and subsolar-latitude tolerances probably explain the slight differences in described appearances of the shadow covering. As Cervoni saw something different to the 1996 report, and different to the comparison Moretus crater, technically this should be treated as a LTP, especially as filters were used and these can eliminate the effects of atmospheric spectral dispersion and chromatic aberration. However, I note that this is the first observation received from them, so they could be treated as a beginner. Therefore, I shall assign a weight of 1 for now, but if anyone has any color images taken at the time Cervoni made their observation, I would appreciate if you could please email it to me so I can check.

Cavendish E: On 2023 Apr 02 UT 19:45 Massimo Giuntoli (BAA) found that the western rim of Cavendish E (just coming into sunlight) was "very bright" in its northern position, almost as bright as Aristarchus. The following day, 2023 Apr 03 UT 19:45 (7.6 cm Newtonian used at x143, and seeing Antoniadi IV/V the crater had its normal appearance. Fig2 is an image taken by Aldo Tonon on 2023 Apr 04, and although taken after the event on 2nd April, it is useful for those of you who are unfamiliar with this crater, as a finder chart. The fact that the bright spot in Cavendish E is brighter in green than near-IR light might suggests that there is a fresh crater that is more reflective in shorter wavelength light. However, if you examine the LROC Quickmap website we find that this is not the case and it is just reflective landslide material on a steep slope. Let us keep our eye on this crater!

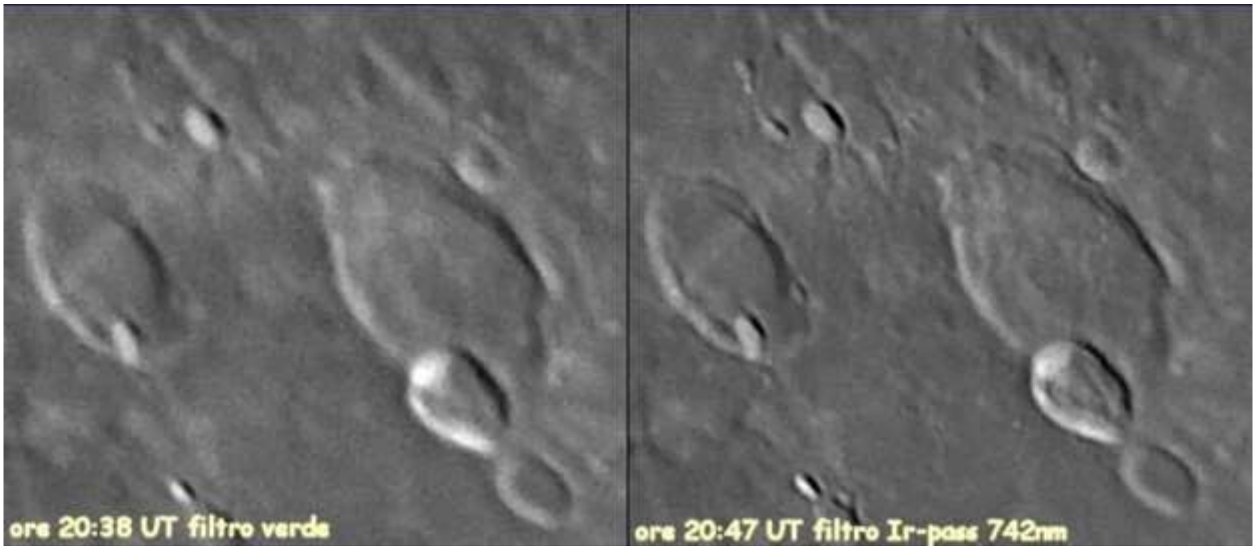


Figure 2. Cavendish E as imaged by Aldo Tonon (UAI) on 2023 Apr 04 at the UTs quoted in the images and with north towards the top. (Left) in green light. (Right) in the near IR.

News: I appear to have ended up on the Science team for an Italian cubesat Moon mission, called LUMIO, to do with coordinating Citizen Science. The mission is due to fly in 2027 and will be looking for impact flashes on the lunar far-side from a Lagrange Halo orbit. Amateurs around the world will be encouraged to look for impact flashes on the nearside and overlapping limb regions, for comparison. Please keep a look out on the ALPO Lunar Impact website , organized by Brian Cudnik, for further information on how to participate. We don't have details as yet, but you can certainly gain some valuable experience by working on Brians observing program, and be ready to hit the ground running when LUMIO citizen science starts well prior to the launch.

Routine reports received for April included: Massimo Alessandro Bianchi (Italy – UAI) imaged: Copernicus, Deslandres, Herodotus, Lansberg, and several features. Cook (Newtown & Mundesley, UK – ALPO/BAA) imaged: several features in the Short-Wave IR and in visible light. Walter Elias (Argentina – AEA) imaged: Alphonsus and Plato. Les Fry (West Wales, UK – NAS) imaged: Dorsum Bucher, Kepler, Klaproth and Schiller. Massimo Giuntoli (Italy – BAA) observed: Cavendish E. Michael Hather (Sheffield, UK – BAA) observed: Aristarchus, Catherina P, Censorinus, Gassendi, Janssen, Mare Crisium, Mare Fecunditatis, Petavius, Rima Oppolzer, Schickard, Schiller, Vallis Alpes, and imaged several features. Rik Hill (Tucson, AZ, USA – ALPO/BAA) imaged the crescent Moon, the Janssen area, and Rupes Recta. Trevor Smith (Codnor, UK – BAA) observed: Alphonsus, Bailly, earthshine, Herodotus, Plato, and Tycho. Aldo Tonon (Italy – UAI) imaged: Cavendish E.

Routine reports received for May included: Jay Albert (FL, USA – ALPO) observed: Gassendi, Mons Pico, Plato and several features. Alberto Anunziato (Argentina – SLA/ALPO) observed: Alpetragius, Eratosthenes, Pitiscus and Tycho. Anthony Cook (Newtown & Mundesley, UK – ALPO/BAA) imaged: several features in the Short-Wave IR and in visible light. Walter Elias (Argentina – AEA) imaged: Proclus and Romer. Massimo Giuntoli (Italy – BAA) observed: Cavendish E. Jean Marc Lechopier (Spain – UAI) observed: Censorinus. Bob and Sophie Stuart (- BAA/NAS) imaged: Abenezra, Abulfeda, Agrippa, Albategnius, Alanon, Alphonsus, Aristotles, Burg, Cassini, Cyrillus, Delambre, Delaunay, Gamma Frisius, Godin, Heraclitus, Hipparchus, Julius Caesar, La Caille, Lade, Lilius, Lindsay, Mare Nectaris, Mare Serenitatis, Maurolycus, Menelaus, Messier, Montes Apenninus, Mutus, Nasireddin, Palus Putredinis, Piccolomini, Posidonius, Purbach, Regiomontanus, Rima Ariadaeus, Sacrobosco, Sinus Medii, Stofler, Tannerus, Theophiulus, Torricelli, Triesnecker, Vallis Alpes, Werner and Zollner. Aldo Tonon (Italy – UAI) imaged: Censorinus and Herodotus. Fabio Verza (Italy – UAI) imaged: Censorinus. Garry Varney (Pembroke Pines, FL, USA – ALPO) observed: several features. Ivan Walton (Codnor, UK – BAA) imaged Gutenberg and several features).

Analysis of Reports Received (April and May):

Luna 5 Crash Sites: On 2023 Apr 02 Massimo Alessandro Bianchi (UAI) imaged the area near Lansberg and the area near Deslandre where a soviet astronomer imaged a possible ejecta cloud from the lander and an East German astronomer, Penzel, imaged a possible ejecta cloud from the Luna 5 rocket, respectively. Massimo's images were under similar illumination and so can allow a direct comparison with these 1960's era photos.

On 1965 May 12 at UT 19:10 E. Penzel (Rodewisch, East Germany) was taking a sequence of images during the impact of the Soviet Lunik 5. He detected a tens of km scale elongated cloud after the impact over a duration of 9.5 minutes. However there are differences between the images elsewhere on the Moon, possibly due to different exposures or some other effects and it is not 100% sure that what he detected was impact debris/cloud?. The ALPO/BAA weight=3.

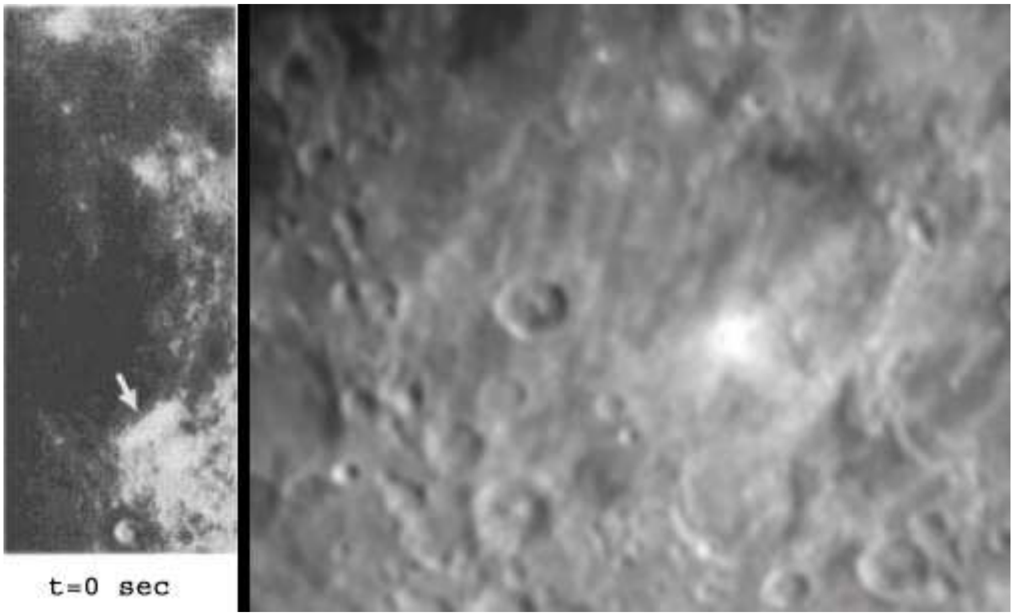


Figure 3. *Deslandres crater and surrounds with north towards the top.* ***(Left)*** *Photograph taken by Penzel on 1965 May 12 from a paper by Geake and Mills: Possible Physical Processes Causing Transient Lunar Phenomena Events, Physics of the Earth and Planetary Interiors, 14 (1977) p299-320.* ***(Right)*** *An image taken by Massimo Alessandro Bianchi (UAI) on 2023 Apr 02 UT 18:24 – this has been blurred to make it a bit more compatible with the resolution in the Penzel photograph.*

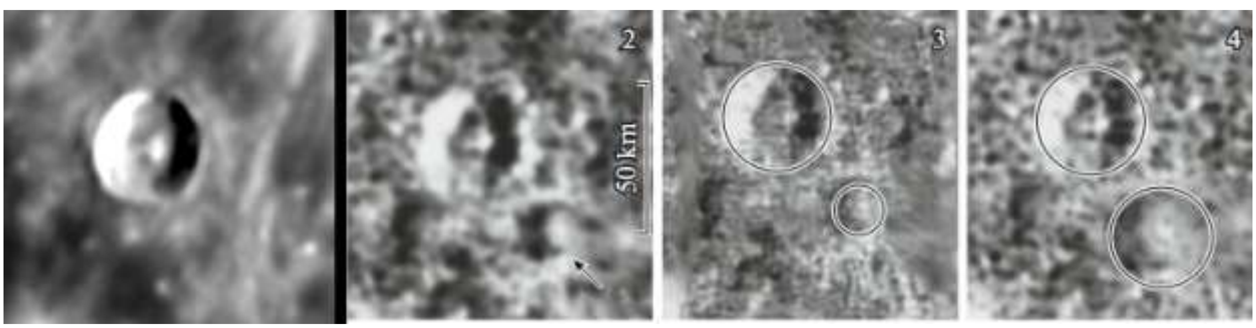


Figure 4. *Lansberg crater orientated with north towards the top.* ***(Far Left)*** *An image taken by on 2023 Apr 02 UT 18:27 by Massimo Alessandro Bianchi (UAI) – image has been degraded in resolution, and contrast stretched to match those in the Ksanfomality paper (See Ref below).* ***(Left)*** *From p280, Fig 4: image 2 from (see Ref below) – arrow points to a possible impact side of the Lun 5 lander.* ***(Right)*** *From p280, Fig 4: image 3 from (see Ref below) – circle indicates possible impact cloud of Luna 5 lander.* ***(Far Right)*** *From p280, Fig 4: image 3 from (see Ref below) – circle indicates possible impact cloud of Luna 5 lander.*

Reference: Ksanfomality, (2018) Luna-5 (1965): Some results of a Failed Mission to the Moon Cosmic Research, Vol 56, No. 4, pp276-282.

The attempt to replicate the Penzel photograph of an expanding cloud from the carrier rocket impact, near Deslandre crater (See Fig 3) was not a great success. The region covered by Massimo (Fig 3 – Right) is a lot smaller, and I cannot place it in the Penzel image. In the bottom of the Penzel image you can quite clearly see Tycho crater. Where the arrow is, apart from the claimed expanding cloud, is the dark floored Pitiscus crater (though its better visible in other images from 1965 not shown here). A bit of lighter highland material can be seen that encompasses Fra Mauro, Parry, Bonpland, and Guericke, but that's about all that can be recognized. I cannot clearly see where Deslandre is in the 1965 photo, not even the very bright patch close to Hell crater. So, I am left wondering why the quality of the Penzel photos were so bad and grainy? Were they taken through broken cloud? Could the bright patch be internal reflection, like one sometimes gets with Barlow lens projection?

Although not mentioned in the Lunar Schedule predictions, at roughly the same time in colongitude, another one of Massimo's images (Fig 4 – far left) corresponds to the region where the lander was supposed to have impacted, near Lansberg crater (See Fig 4 – Left). Again, the images from 1965 are pretty grainy compared to Massimo's image. What you need to do is to find recognizable bright are dark points in the 1975 images and compare to what you see in Massimo's image. Although the arrowed purported impact cloud looks promising, as it does not appear in the 2023 image, there are lots of other examples of bright and/or dark small-scale features that do not appear either. So, we need to take Ksanfomality's example images with a "pinch of salt" – in other words it is perhaps not so convincing.

If you think about it, there has been only three other examples of spacecraft, impacting the Moon, where the impact has been imaged: Japan's Hiten, SMART-1, and the LCROSS spacecraft, but all needed observations in the near IR or longer wavelengths to be seen, and none covered such large areas of the Moon's surface.

Censorinus: On 2023 Apr 26 UT Michael Hather (BAA) imaged the region in the vicinity of this crater about an hour after a repeat illumination and repeat topocentric libration window for the following event:

On 1984 Jul 05 at UT 00:00-01:25 Marshall (Medelin, Columbia, seeing=II) observed that Censorinus was much less bright than Proclus (confirmed by CED readings). Cameron 2006 catalog ID=247 and weight=3. ALPO/BAA weight=1.

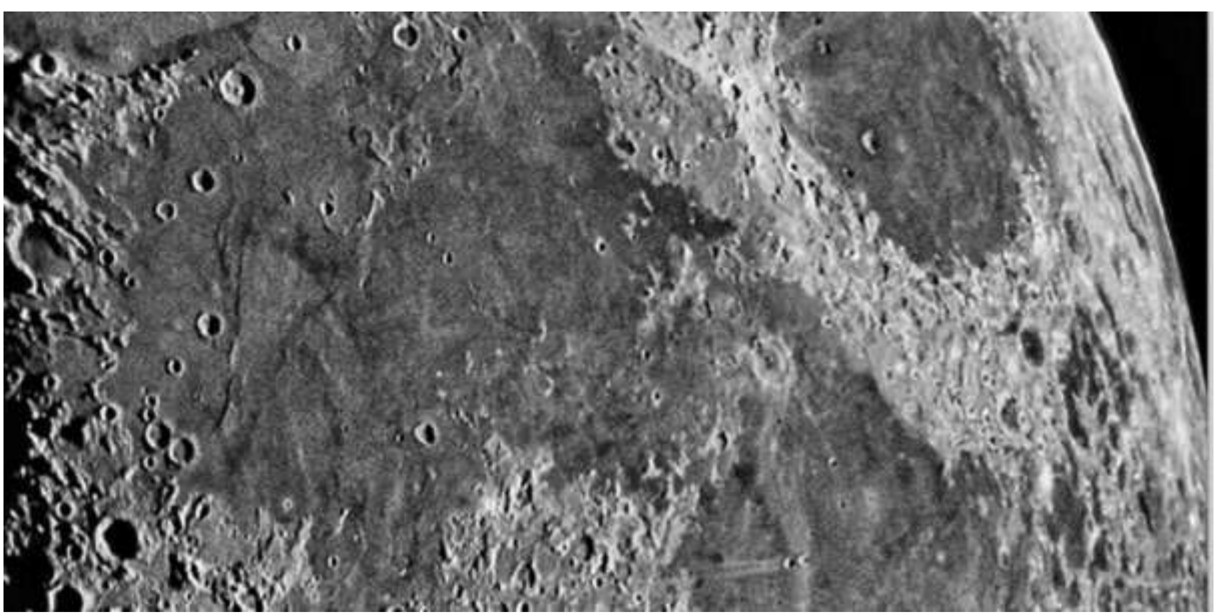


Figure 5. *A large portion of the Moon containing Censorinus and Proclus as imaged by Michael Hather (BAA) on 2023 Apr 26 UT 21:40 and orientated with north towards the top.*

Michael made a visual observation much later still: 22:25-22:40 UT and interestingly noted that: "Appearance exceptionally bright. Took an image earlier but it doesn't show the same visual brilliance". Which is at odds with the appearance in Fig 5? I think although both the image and the visual report were made outside the requested observe g window, that we should leave the weight of the 1984 report as it is for now.

Plato: On 2023 Apr 28 UT 20:30-20:45 Trevor Smith (BAA) and Walter Elias (AEA) observed and imaged respectively this crater under similar illumination to the following report:

Plato 1907 Jan 22 UT 20:00 Observed by Fauth (Germany?) "Glow of light in part of crater" NASA catalog weight=3. NASA catalog ID 327. ALPO/BAA weight=3.

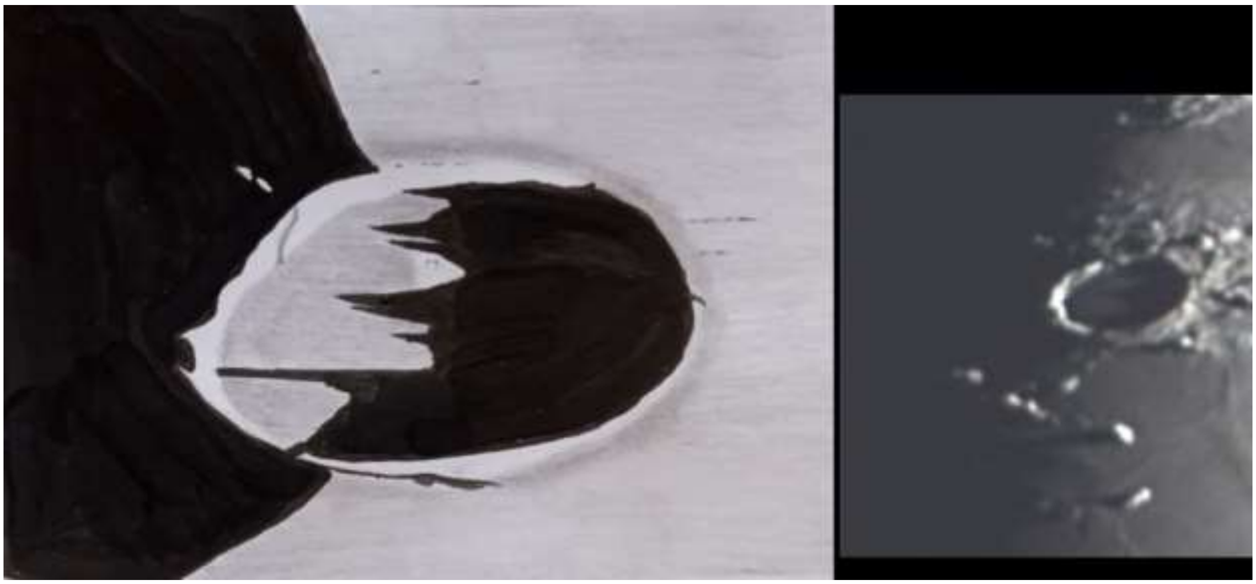


Figure 6. *Plato orientated with north towards the top from 2023 Apr 28.* ***(Left)*** *A sketch by Trevor Smith (BAA) made at 20:30-20:45UT, from the UK.* ***(Right)*** *As imaged by Walter Elias (AEA) at 21:38 UT, from the other side of the Atlantic in Argentina.*

We have covered this before in the 2013 Jan newsletter, under similar illumination conditions. Trevor was using a 16-inch Newtonian under Antoniadi III seeing conditions. He found Plato right on the terminator, as confirmed by Walter's image (Fig 6 – Right). During better moments of seeing Trevor could see a large amount of detail in the form of many black shadow spires crossing the crater floor (Fig 6 – Left). One thin needle-like spire just reached the inner west wall of Plato and it looked at times as though it encroached onto the inner sloping rim. The floor to the north, which was in shadow, gave the impression of being slightly raised or slightly conical. This was in the general area of the double craterlet. He could not say for certain whether this was real or an illusion. This area of the floor also looked to be slightly lighter in color than the rest of the floor. You cannot see it in the Fig 6 (Right) image. Perhaps we shall add this to the lunar schedule program to see if this repeats?

Gassendi: On 2023 May 02 UT 01:21 Jay Albert (ALPO) imaged this crater under the following repeat illumination observations:

On 1967 May 20 at UT 21:05-21:20 Kelsey (Riverside, CA, 8" reflector, x300) using an English Moon blink device found color on the south west part of the floor. Note that for the times given by Cameron, the Moon was below the horizon from California - so possibly these are local times and these times need to be correctly converted into UT? The Cameron 1978 catalog ID=1037 and weight=3. The ALPO/BAA weight=1.

and at 01:35-02:23UT observed this crater under the above repeat illumination observation and the following below:

Gassendi 1966 Oct 25 UT 22:30-23:10 Observed by Moore and Moseley (Armagh, Northern Ireland, 10" refractor) and Sartory(England, 8.5" ? reflector) "2 faint blinks (Eng.) on NW (IAU ?) wall. (Indep. confirm.?). NASA catalog weight=5. NASA catalog ID #987. ALPO/BAA weight=4.

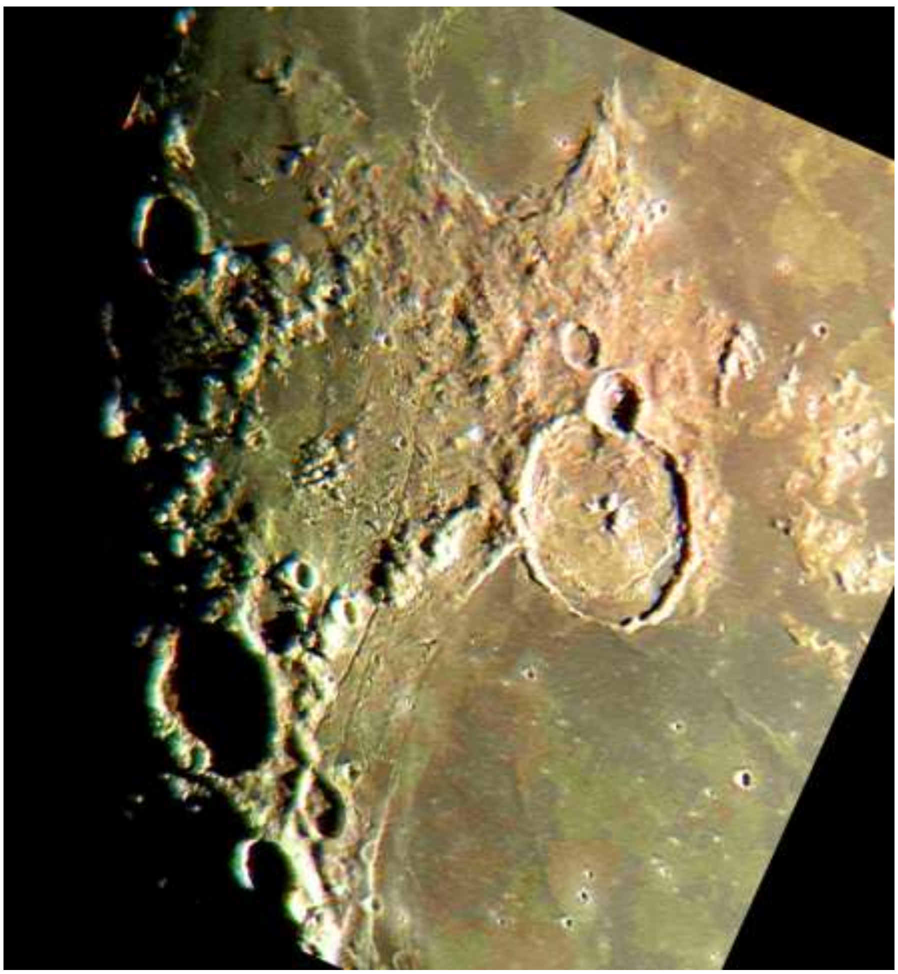


Figure 7. *Gassendi as imaged by Jay Albert (ALPO) on 2023 May 02 UT 01:21 and mirror image reversed and orientated with north towards the top. Camera used was an iPhone 14Pro attached to a Celestron NexStar Evolution 8" SCT via a 9mm orthoscopic eyepiece. Transparency was magnitude 3 and seeing was 7/10. The image has had its color saturation increased.*

Jay checked the crater without filters as well as comparing with W25 red and W44A blue filters using 226x. He saw no color on the SW part of the crater floor or on the NW wall. Using the filters, however, he did note that the high peak on the S wall was brighter in blue than red. He tried this filter blink a number of times because he had never seen this before in Gassendi, but the result was the same each time. We shall leave the weights of the two LTP observations as they are but consider moving Jay's report to LTP status of weight 2. I would have given it a 3 but it does not show in the image (Fig 7), possibly because the peak on the south rim was saturated and unable to show color?

Cavendish E: On 2023 May 04 UT 19:40 Massimo Giuntoli (BAA) found that the crater had a normal appearance. A 7.6 cm Newtonian used at x180 and seeing was Antoniadi IV.

Romer: On 2023 May 08 UT 02:18 Water Elias (AEA) imaged this area under similar illumination to the following report:

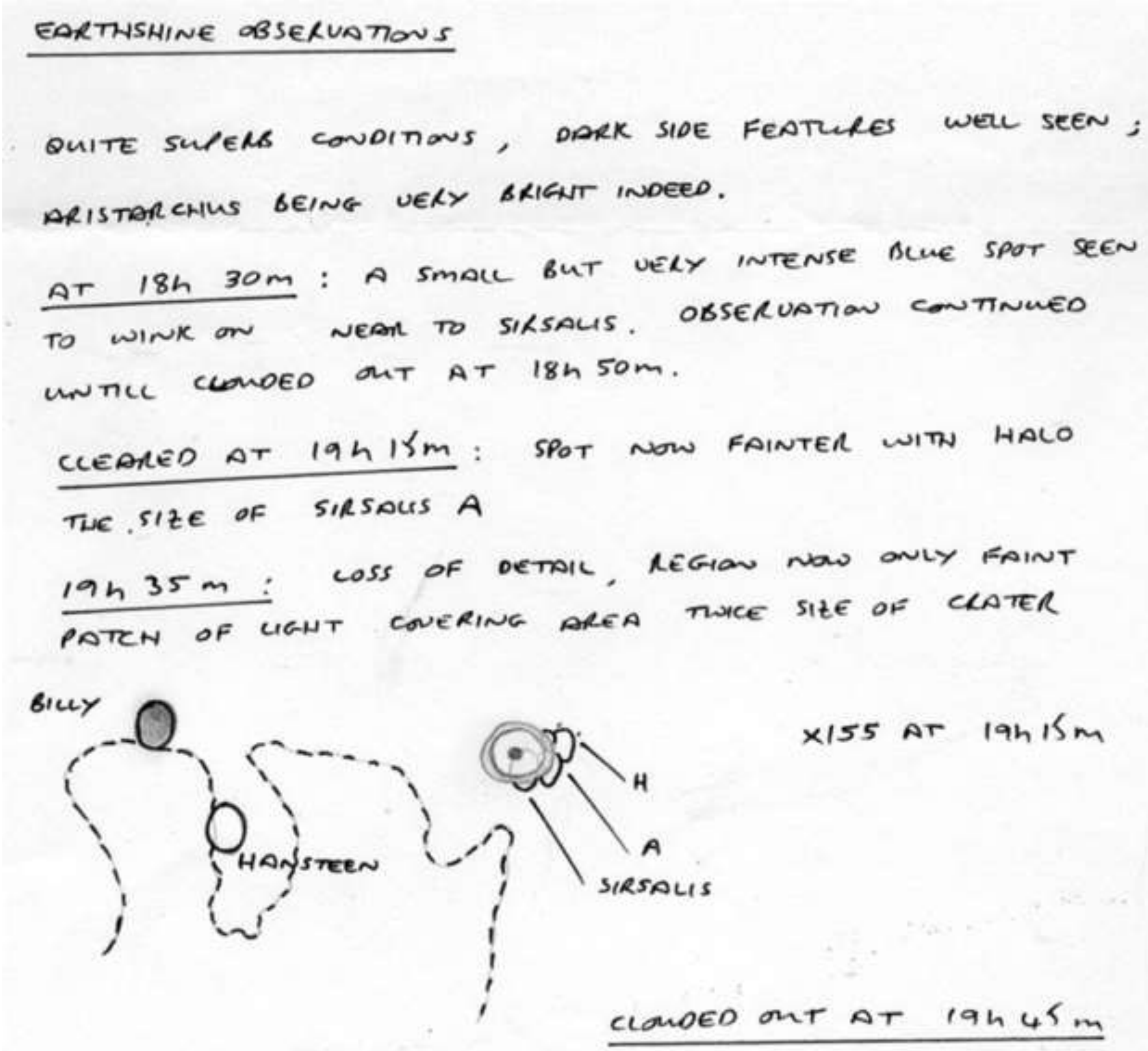
On 1979 Sep 09 at UT08:00-08:15 D. Darling (Sun Praire, WI, USA, 12.5" reflector, x75 and photography used, seeing 4/10 and the Moon's altitude was 45deg) photographed Romer crater and recorded two adjacent bright cigar shaped objects - these were the same size as an observation made in 1987. Darling believes that these are ridges. Cameron comments that in LO-IV 192-3,2 a ridge is revealed on the inside wall that matches the description. Cameron 2006 catalog ID=66 and weight=2. ALPO/BAA weight=1.

Figure 8. *Romer as located close to the centre of the image – taken by Walter Elias on 2023 May 08 UT 02:18 and orientated with north towards the top.*

No sign of what David Darling described can be seen in Fig 8. Therefore, we shall leave the weight as it is.

Sirsalis: On 2023 May 24 Ivan Walton (BAA) imaged the whole Moon (Fig 10) under similar illumination and topographic libration to the following curious earthshine LTP report (See Fig 9):

Sirsalis 1990 Mar 01 UT18:30-19:45 M. Holmes (Rochdale, UK, 21.5cm Newtonian, seeing Antoniadi I/II, Transparency very good) was observing in earthshine and saw an intense blue spot "wink on" near to Sirsalis (sketch shows location on SE rim), until clouded out at 18:30. When the sky cleared at 19:15UT the spot was still visible but fainter, with a halo, the size of Sirsalis A. By 19:35 there was a loss of detail, region only a faint patch of light covering area twice the size of Sirsalis crater. Clouded out permanently at 19:45UT. Cameron 2006 catalog event #392, weight=0. ALPO/BAA weight=3.


EARTHSHINE OBSERVATIONS

QUITE SUPERB CONDITIONS, DARK SIDE FEATURES WELL SEEN; ARISTARCHUS BEING VERY BRIGHT INDEED.

AT 18h 30m: A SMALL BUT VERY INTENSE BLUE SPOT SEEN TO WINK ON NEAR TO SIRSALIS. OBSERVATION CONTINUED UNTILL CLOUDED OUT AT 18h 50m.

CLEARED AT 19h 15m: SPOT NOW FAINTER WITH HALO THE SIZE OF SIRSALIS A

19h 35m: LOSS OF DETAIL, REGION NOW ONLY FAINT PATCH OF LIGHT COVERING AREA TWICE SIZE OF CRATER

CLOUDED OUT AT 19h 45m

Figure 9. *A sketch of the Sirsalis area, made in earthshine, by Mark Holmes (BAA) made on 1990 Mar 1 UT 18.50-19:45. North is towards the bottom.*

Although Ivan's image was originally intended to show details on the dayside of the Moon, I took the opportunity to do a contrast stretch just in case any earthshine was visible, or there was a bright spot where Sirsalis was, but there is nothing there (Fig 10). Readers who are familiar with Sirsalis under Full Moon or indeed earthshine conditions, will know that Sirsalis A is quite a very bright craterlet. What was unusual was the size, change in size, brightness, and 1 hour duration of this event. One other observer was observing earthshine that night, Sally Beaumont, but that was later at 20:00 and she reported: *"earthshine was visible but not nearly as much detail as yesterday. The western limb was very bright. Aristarchus could be made out faintly, especially with averted vision"*. I am not sure why the Cameron (updated) catalog assigns a weight of 0 (no reason is given), in my view the ALPO/BAA weight of 3 is justified.

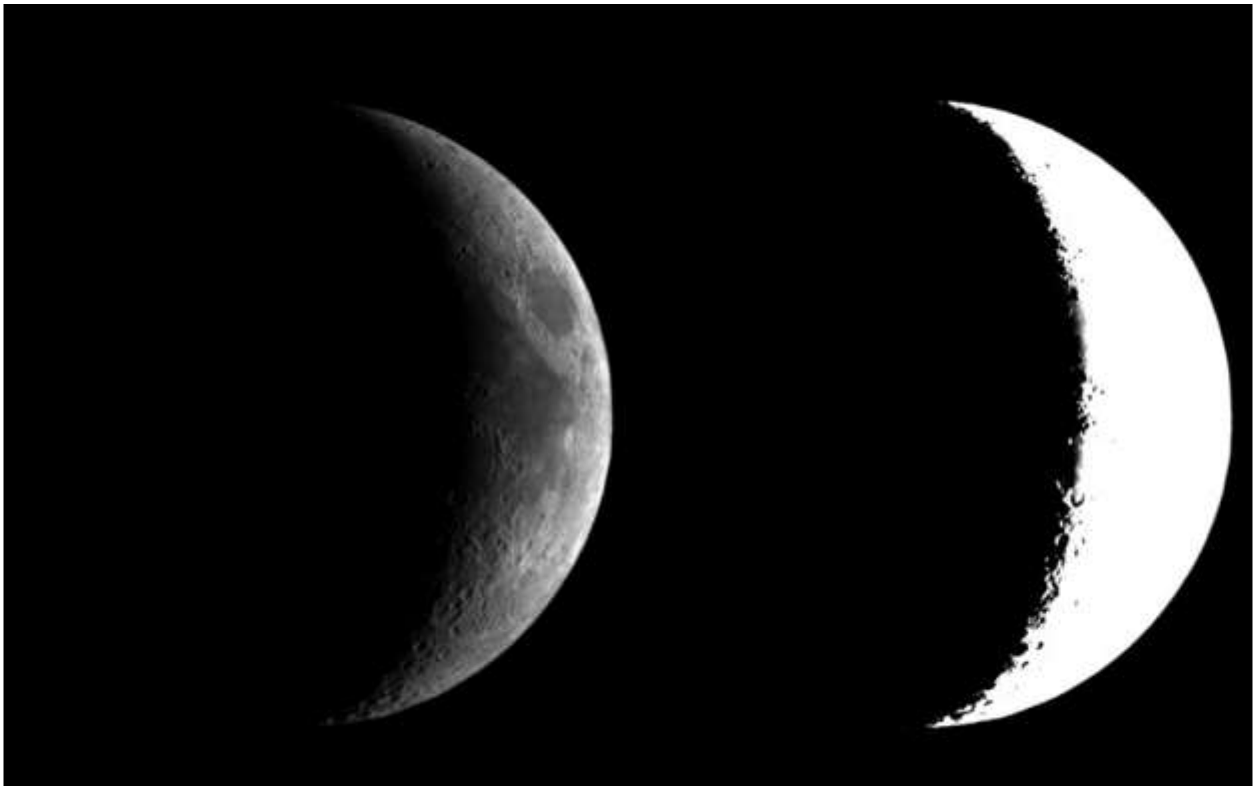


Figure 10. *The crescent Moon on 2023 May 24 UT 21:40 by Ivan Walton (BAA).* ***(Left)*** *Original image.* ***(Right)*** *Contrast stretched version.*

Censorinus: On 2023 May 25 UAI observers: Jean Marc Lechopier, Aldo Tonon, and Fabrio Verde respectively observed, imaged and imaged for the following lunar schedule request:

ALPO Request: The aim here is simply to see at what earliest colongitude can you record with a color camera, natural blue color on the crater during sunrise. The effect can be quite impressive. Try to get the exposure right else the crater will be saturated white and you will not capture any color. Please send your images to: a t c @ a b e r. a c. u k

Figure 11. *The Censorinus area with north towards the top on 2023 May 25. Images have been color normalized and then had their color saturation increased significantly.* ***(Left)*** *Image taken by Aldo Tonon (UAI) at 21:01UT.* ***(Right)*** *Image taken by Fabio Verza (UAI) at 21:07 UT.*

Jean Marc observed visually between 19:50 (with alternating clouds and clear spells) and 22:10 using a 150/1200ed Skywatcher refractor (x240-300) under good seeing conditions. Jean Marc says that Censorinus is a small crater of 4 km in diameter in the centre of a luminous area of about 20 km in diameter in the shape of a butterfly. Its bottom was half filled by the shadow of its eastern wall. Observing ended due to a deterioration in seeing as the Moon got closer to the horizon. No color was seen.

So, let us see if anything showed up in the imaging? Fig 11 shows some color enhanced views by Aldo Tonon and Fabio Verza. The color saturation has been pushed to its limits, but does appear to show some blueness that Jean Marc did not see visually. However, we have to be a little careful as the color saturation enhancement could be enhancing atmospheric spectral dispersion or chromatic aberration. Anyway, the colongitude appears to be about 329.2˚. It probably does not make any sense to continue observing this as at a colongitude earlier than this as we are unlikely to see anything in the images and certainly not visually – cameras being more sensitive to color. So will remove this from the lunar schedule program as the job is now done!

Sabine: On 2023 May 26 UT 19:37 Bob and Sophie Stuart (BAA/NAS) imaged (Fig 12 – top) this crater under similar illumination to the following report:

Sabine 1967 Sep 11 UT 00:32,00:45 Observers: Jean at al. (27 obs., 21 telescopes, Montreal, Canada, 3-6" refractors, reflectors) "A black, rectangular-shaped cloud vis. in M.Tranquill, moving W-E (IAU ?) & dissipated nr. term., surrounded by viol. color. Bright yellow flash at 00:45, (obs. In response to request to obs. impact of Surveyor V at 0046) NASA catalog weight=3. NASA catalog ID #1043. ALPO/BAA weight=2.

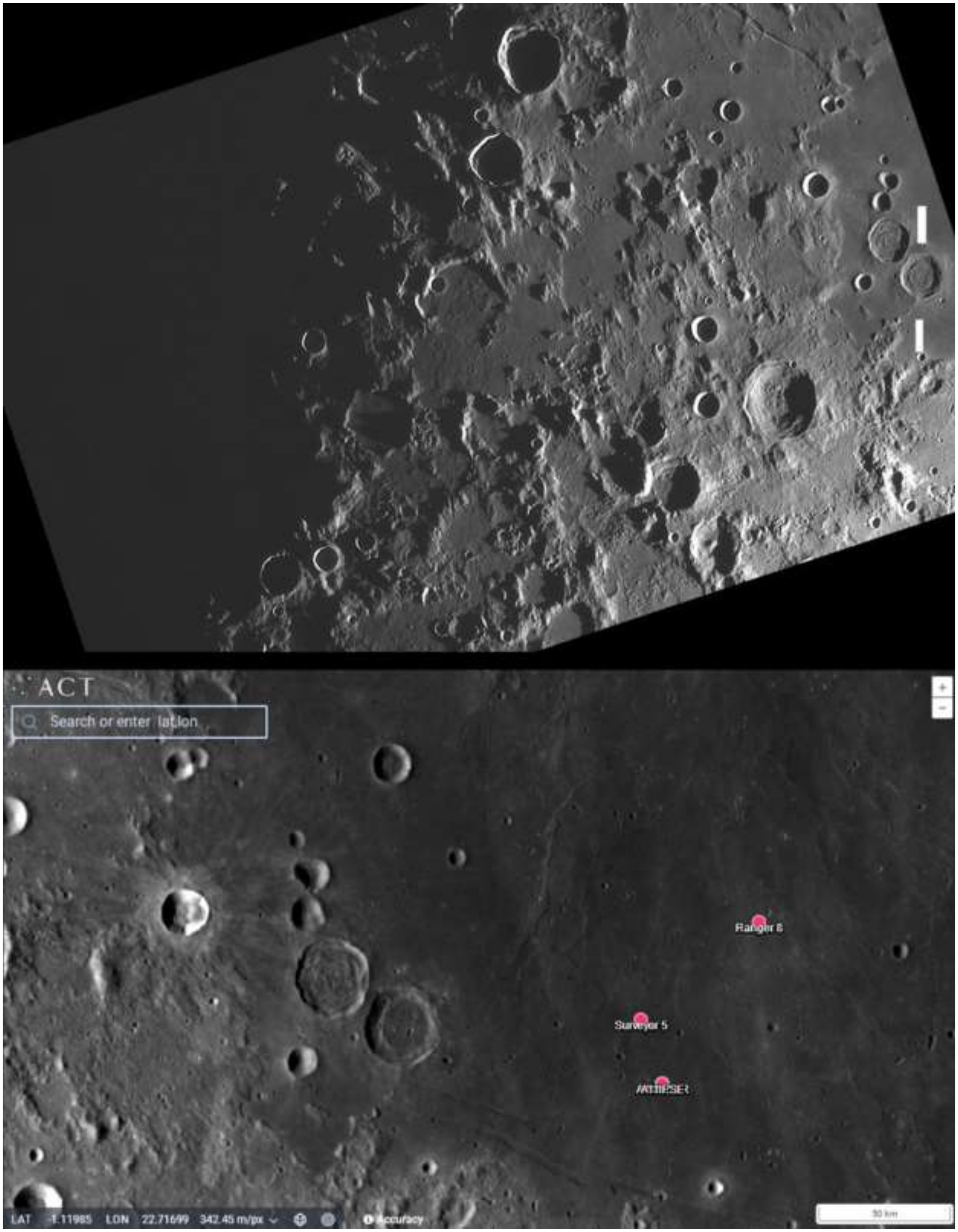


Figure 12. *The area in the vicinity of Sabine crater, orientated with north at the top.* ***(Top)*** *An image by Bob and Sophie Stuart, taken on 2023 May 26 UT 19:37 – the location of Sabine lies between the two rectangular markers.* ***(Bottom)*** *A NASA Quickmap view of the landing site of Surveyor V and Apollo 11.*

The account of Mrs P. Jean's (Montreal, Canada) observing team appeared in the BAA Lunar Section Circular, Vol 2, No. 11, p3 and was:

"At the request of the Space Centre, Pasadena, California, I organised an observation night for Surveyor V. We had 27 observers, 21 telescopes 3 to 6" refractors and reflectors. We followed instructions by telephone and I report a LTP near Sabine Crater, west side – around the impact point of Surveyor V. Two observers have seen a black cloud visible 8-9 seconds, surrounded by violet color in M.Tranquilitatus at 0h32m UT. Also, at 0h45m three observers saw a bright yellow flash visible a fraction of a second near Sabine crater, west side. A V shaped umbra west of Sabine was clearly visible, very long and black. Two refractors, 4 and 6 inches were used for this observation x150 – x175. We were glad to have worked in co-operation with NASA for this occasion.

I wonder if other members have seen these phenomena? We were very fortunate with the weather and for the positions of the moon at that date."

According to the NASA report, the spacecraft landed at 00:46:44 UT, which might correspond to the 2nd report of 00:45UT that Jean gives. However, in the opinion of Winnie Cameron, the compiler of the NASA catalog of LTP, she told me that reports from P. Jean were often riddled with mistakes and some far-fetched descriptions. Given that 27 observers were taking part in this Surveyor V watch (location of the Surveyor V landing site is in Fig 12 (Bottom), I am surprised that only 2 observers saw the 00:32 report and only 3 saw the 2nd report. It is possible that one of these reports may have been the carrier rocket stage that got Surveyor from Earth orbit to the Moon – alas I have no information on that. Also, there is no mention that I can find in the NASA Surveyor V Science report of P. Jean's observers. If any readers took part in the Surveyor V landing watch, organized by NASA JPL, I would certainly be interested to hear from them, or indeed anyone who knew P. Jean of Quebec, so as to set the record straight. Likewise, if anyone knows about the fate of the Surveyor V carrier stage? Incidentally in the BAA Lunar Section Circular account, the E/W coordinates are probably "classical", so when she says "West" it is really "East" IAU directions. But anyway at least we have a good image now of what Sabine crater would have looked like on the night of the Surveyor V landing. I am tempted to lower the weight from 2 to 1 in view of the small scopes used.

Tycho: On 2023 May 28 UT 22:50-23:10 Alberto Anunziato (SLA/ALPO) observed this crater for the following repeat illumination report:

Tycho 1995 Mar 10 UT 20:00-23:34 observed by G. North (UK) seen to have greyness inside parts of its shadow. Confirmed by J.D. and M.C. Cook. Possibly light scattered of illuminated wall into shadow or highland starting to break through the shadow. ALPO/BAA weight=1.

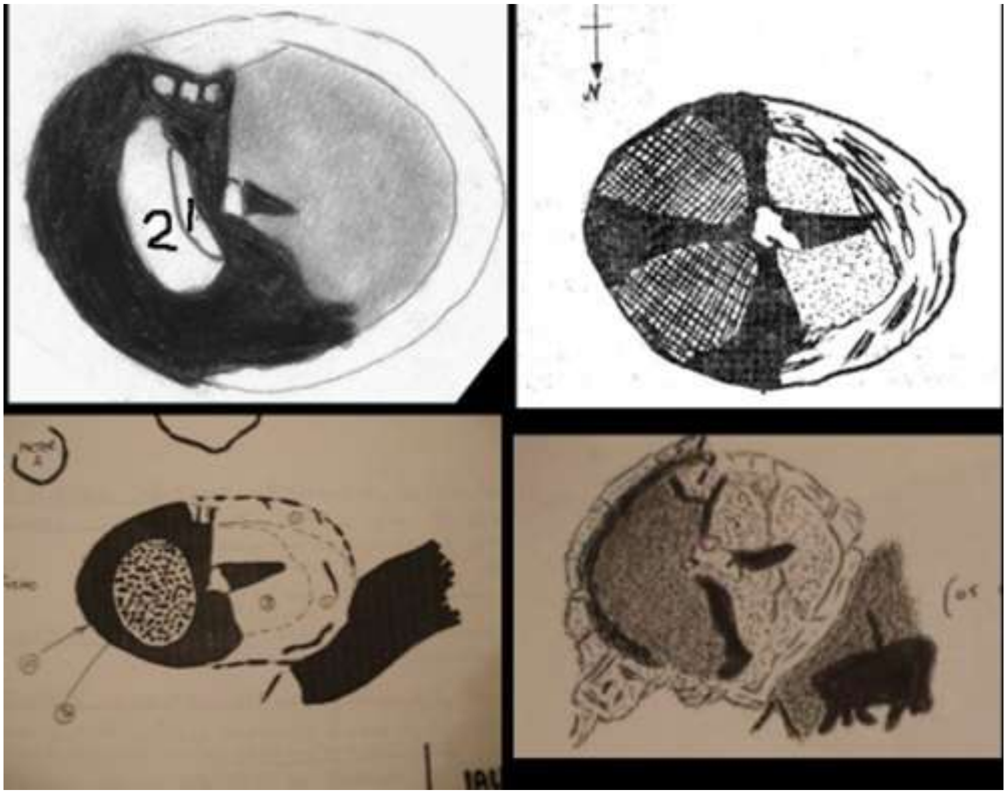


Figure 13. *Tycho with north towards the bottom.* ***(Top Left)*** *As sketched by Alberto Anunziato (SLA/ALPO) on 2023 May 28 UT 22:50-23:10 – this has been mirror reversed and re-annotated.* ***(Top Right)*** *As sketched by Gerald North (BAA) on 1995 Mar 10 at UT 20:00.* ***(Bottom Left)*** *As sketched by Jeremy Cook (BAA) on 1995 Mar 10 at UT 22:45.* ***(Bottom Right)*** *As sketched by Marie Cook (BAA) on 1995 Mar 10 at 23:00UT.*

Alberto could see two zones in the shadow that were less dark than the rest. It was possible however, that the observation was biased by reading about the North LTP report? Anyway, he could see a grey zone in the shadow, marked by the number 1 in the sketch, and after some minutes a second grey zone (marked 2), but he was not so sure of this second zone. Alberto made this report in case the location of his "grey zones" matched the same location as was reported by North. As you can see from Fig 13, Alberto's sketch seems to correspond to Jeremy Cook's sketch but differs to the odd appearances in Gerald North and Marie Cook's sketch. I think that we may increase the weight of this LTP to 2 as the appearances are so different.

Cavendish E: On 2023 May 31 UT 20:30 Massimo Giuntoli (BAA) found that the northern floor of Cavendish E was just coming into sunlight; it was very bright but not brilliant. A 7.6 cm Newtonian used at x180 and seeing was Antoniadi IV.

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

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

Basin and Buried Crater Project

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

As we missed out the June edition of this project, in the last TLO, I am including May and June contributions in this slightly extended version.

The Schiller-Zucchius Basin

This basin is proving quite popular. István Zoltán Földvári (Budapest, Hungary - ALPO) sent in a spectacular sketch, forwarded by David Teske of this region.

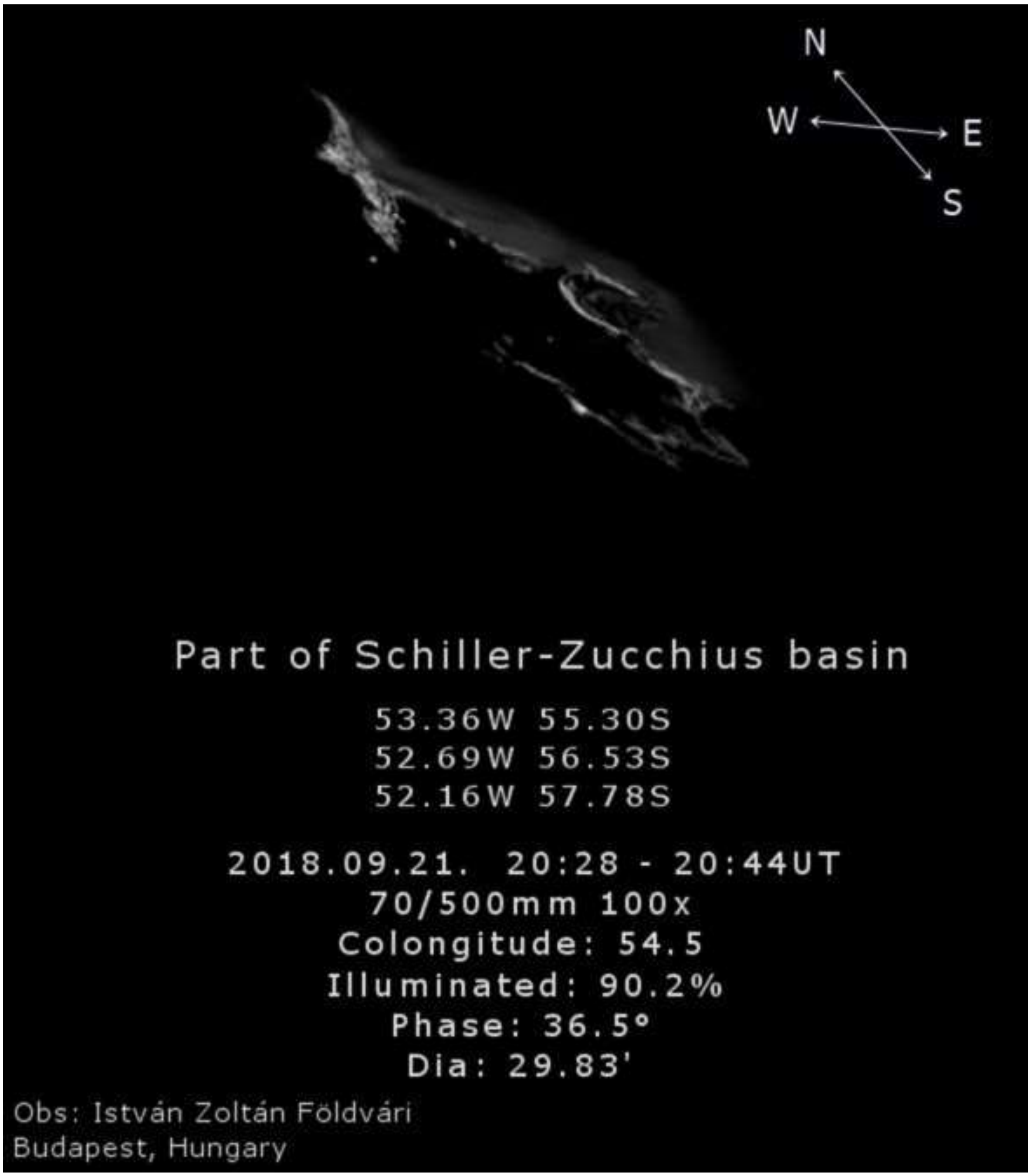


Figure 1. *A sketch of the Zucchius-Schiller basin – details about date, UT, observer, are listed above. Eyepiece used: 10mm Plossl, GSO 2x Barlow. Seeing: 7/10. Transparency: 5/6*

Just a reminder that this "known" basin is centred on 45W, 56S, (near the SW limb) and is 335 km in diameter, is pre-Nectarian in era, i.e., heavily degraded, and has at least 2 rings, possibly 3? I will be updating details about this basin, and others over the Summer in our catalogue, and will add the range of selenographic colongitudes, when they are best visible, to the database, based upon observations sent in so far.

Buried Crater(?) SE of Grove

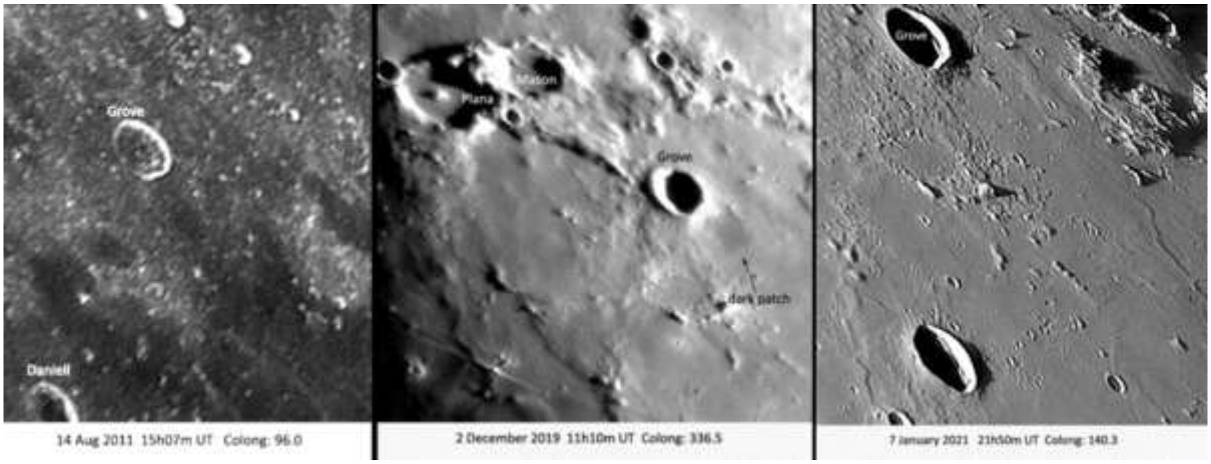


Figure 2. *Images of the area SE of Grove taken by K.C. Pau on the dates and UTs given in the images.*

Following on from Alberto Anunziato's (SLA) sketch, suggesting a buried crater SE of Grove (See last month's newsletter), K.C. Pau (Hong Kong), has sent in some additional images (Fig 2) which may support the case. Fig 2 (Left) definitely shows a dark patch, but further to the SE than the one shown in Fig 2 (Centre), whereas Fig 2 (Right) perhaps better reflects the protrusion of parts of the suggested crater rim in the area? The most convincing colongitudes appear to be 96.0˚ and 336.5˚

Buried Crater(?) West of Grove

Again, following on from Alberto Anunziato's (SLA) sketch of a candidate buried crater SE of Grove, István Zoltán Földvári (Budapest, Hungary - ALPO) sent in (via David Teske) the following outline sketch (Fig 2 – Right) that they made in 2007 of another buried crater in the area of Grove. They noted that it appeared as a very thin curved wall and was located north of Posidonius and centred on 30˚E, 40˚N. The diameter appears to be 102 km. On a scale of 0 to 10, 0 meaning definitely not a buried crater, and 10 meaning 100% certain, I would give this a wight of 3. The selenographic colongitude at which it was seen, back in 2007 was: 149.5˚-149.7˚, but Fig 2 (centre) shows that it is also well presented at 336.5˚.

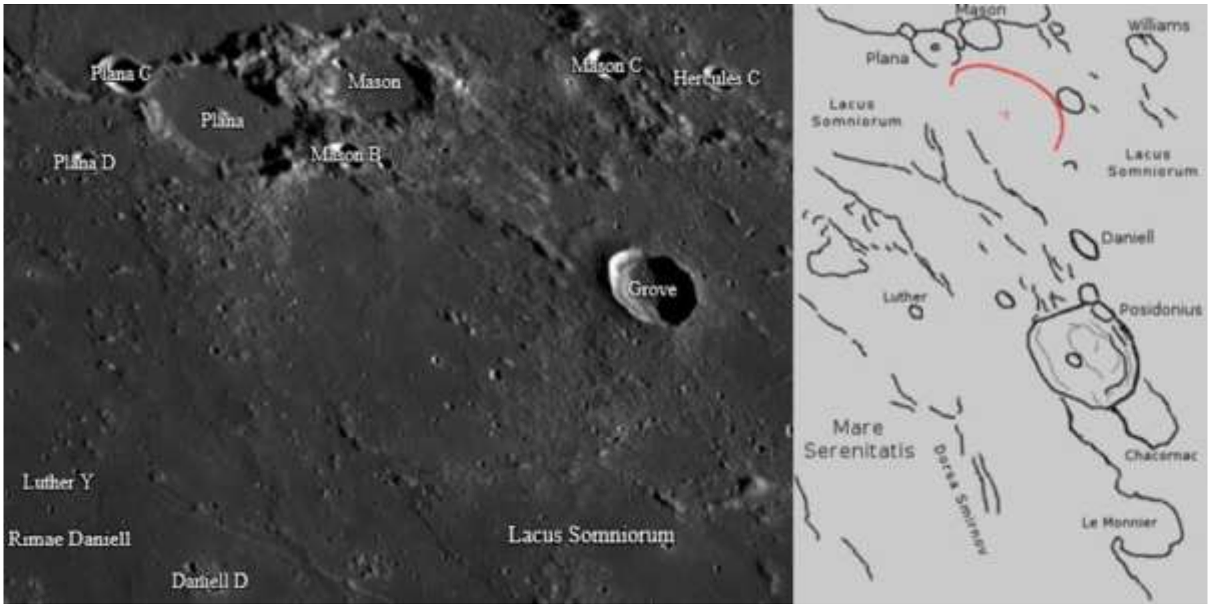


Figure 3. *The area to the west of Grove crater. (Left) NASA LROC Quickmap view. (Right) A sketch made on 2007 Sep 03 UT 00:02-00:20, by István Zoltán Földvári (Budapest, Hungary - ALPO) with red indicating a possible buried crater.*

Thoughts on Buried Craters from June:

No images or sketches have been sent in during the last month for this project, therefore I delved into the archives of the British Astronomical Association (BAA) Lunar Section Circular and came across something interesting in Vol 2, No. 11, Oct 1967, p3 – see Fig 4.

GHOST RINGS A.Gabriel. Belgium.

I was looking carefully at the photographs I have, and I believe I have found a ring in the highlands. This ring lies almost between Lilius, Cuvier and Jacobi. It is reasonably well shown on two photographs in "Atlas de la Lune", pages 8 and 12. The first photo was taken on 1944 January 3 when the age of the Moon was 7.54 days, the second photo on 1944, May 1, the Moon's age being 8.94 days.

In the same Atlas I find an overlapping crater named as Piccolomini C, on planche 4, the Moon's age is 5.35 days and the crater C is there clearly overlapping Piccolomini A.

I observed this case under evening lighting on September 23, 1967, at about 4.20 UT, and it is this observatiln that made me sure that this is a certain case. I should be very glad to hear from other members who also observed these objects.

Figure 4. *A possible ghost ring/crater between Lilius, Curvier and Jacobi, mentioned on p3 of Vol 2, No. 11 BAA Lunar Section Circular from Oct 1967.*

Although I don't have "Atlas de la Lune", the selenographic colongitude for 1967 Sep 23 UT 04:20 was 141.1˚ and the closest similar illumination image we have in the archives is one taken by Maurice Collins and is shown in Fig 5.

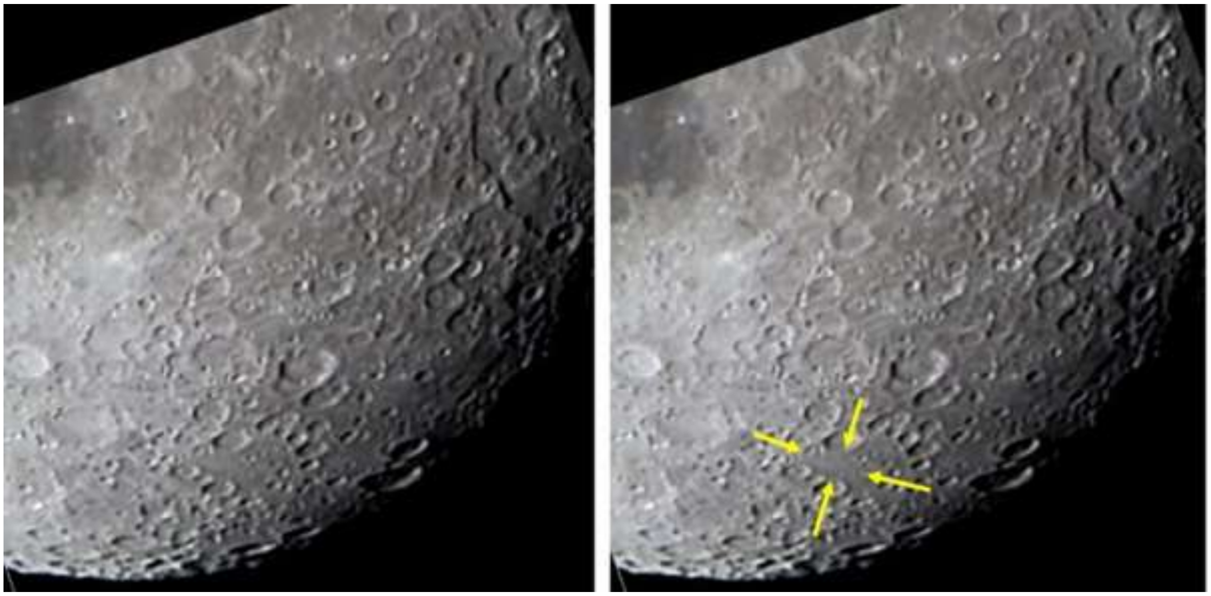


Figure 5. *Location of a ghost crater in an image by Maurice Collins, taken on 2013 Jan 01 UT 11:27-11:34*.

The buried crater appears to have a depth of approximately 300m (Fig 6), measured in the N-S direction, and is located at 9.7˚E, 53.4˚S with a diameter of 81 km. Interestingly the E-W depth is more difficult to measure as the topography is on a slope in that direction.

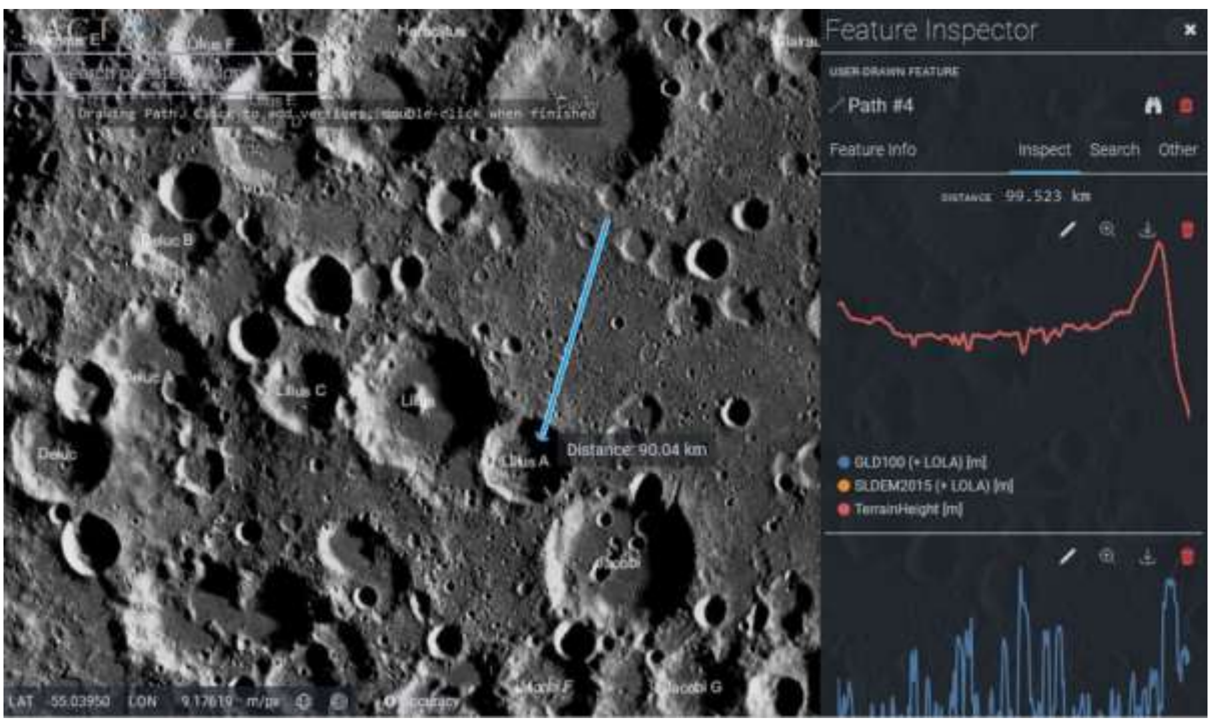


Figure 6. *The N-S topographic profile measured through the proposed buried crater using the LROC Quickmap web page.*

So what evidence is there for a buried crater here? In Fig 7 (Top left), it could be said that this might just be a flat highland area between craters, despite the arrows showing where to look for the perimeter of the buried crater. Fig 7 (top right) shows a hint of parts of a rim, and maybe a depression, though the former is far from conclusive. Fig 7 (bottom left) again hints at curvature which might be due to the rim. The azimuth slope direction plot in Fig 7 (bottom right) shows a circular region of mottled texture. On a scale of 0 to 10, 0 being not a buried crater and 10 being a crater, I would probably give this buried crater a weight of 2. I will add this to the list of buried craters in due course.

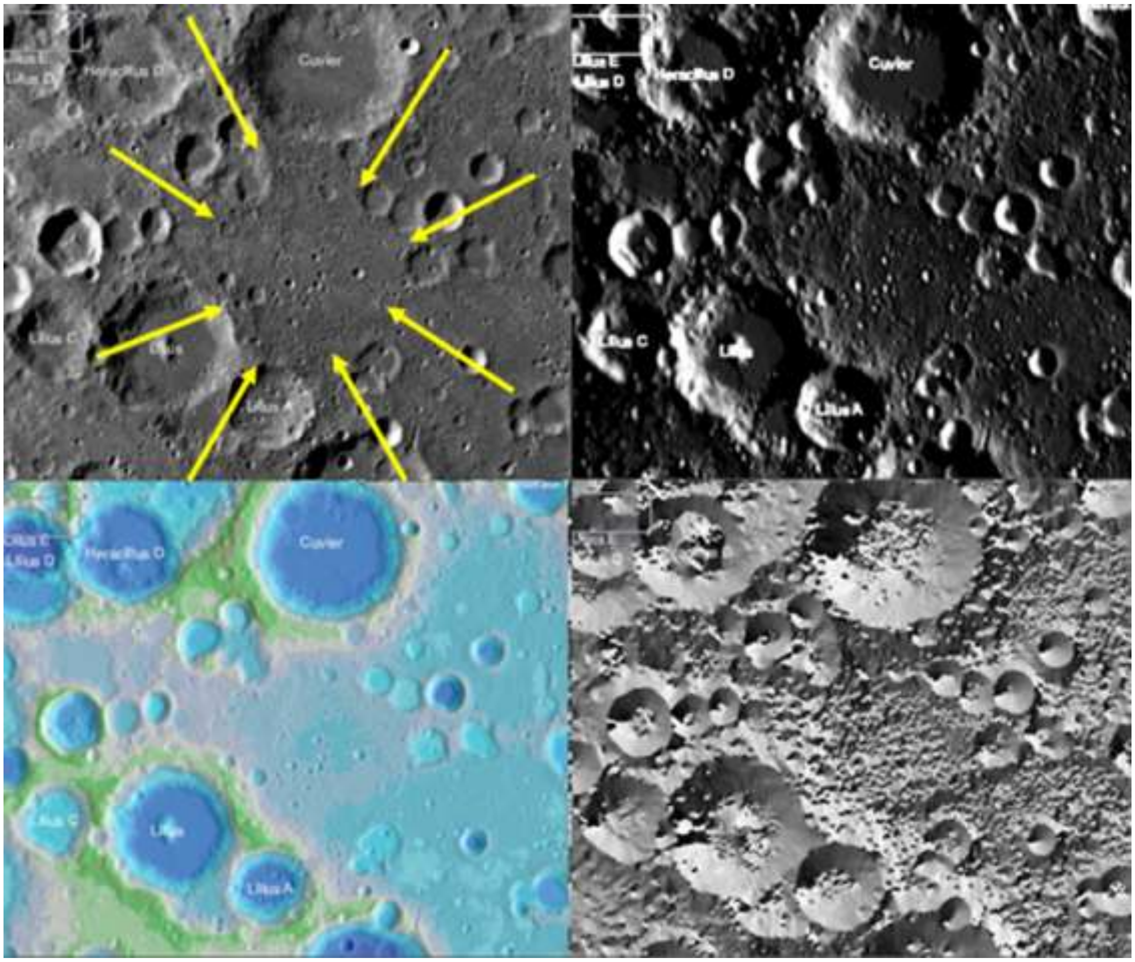


Figure 7. *NASA LROC Quickmap views of the proposed buried crater area.* ***(Top Left)*** *A WAC mosaic of the near side with plenty of shadow. Arrows have been added to show the approximate location of the buried crater.* ***(Top Right****) A hill shaded view of the area.* ***(Bottom Left)*** *A hill shaded view colourized by topography.* ***(Bottom Right)*** *A slope azimuth map of the area.*

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

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

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

Lunar Calendar July 2023

Date	UT	Event
1	0800	Antares 1.5° south of Moon
3	1139	Full Moon
3		Greatest southern declination (-27.8°)
4		Moon at perigee 360,149 km
5		North limb most exposed (+6.5°)
7	0300	Saturn 3° north of Moon
8	1400	Neptune 1.7° north of Moon
10	0148	Last Quarter Moon
11	0123	Moon at ascending node
11	2100	Jupiter 2° south of Moon
11		East limb most exposed (+6.7°)
12	1800	Uranus 2° south of Moon
13	0700	Moon 1.7° south of Pleiades
16		Greatest northern declination (+27.9°)
17	1832	New Moon lunation 1244
18		South limb most exposed (-6.6°)
19	0900	Mercury 4° south of Moon
20	0700	Moon at apogee 406,289 km
21	0400	Mars 3° south of Moon
25	1505	Moon at descending node
25	2207	First Quarter Moon
27		West limb most exposed (-7.7°)
28	1800	Antares 1.3° south of Moon
30		Greatest southern declination (-27.7°)

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

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

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

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

To learn more about membership in the A.L.P.O. go to: **http://www.alpo- astronomy.org/main/member.html** which now also provides links so that you can enroll and pay your membership dues online.

SUBMISSION THROUGH THE ALPO IMAGE ARCHIVE

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

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

It is helpful if the filenames follow the naming convention :

FEATURE-NAME_YYYY-MM-DD-HHMM.ext

YYYY {0..9} Year

MM {0..9} Month

DD {0..9} Day

HH {0..9} Hour (UT)

MM {0..9} Minute (UT)

.ext (file type extension)

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

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

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

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

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

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

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: Floor-Fractured Craters

Focus on is a bi-monthly series of articles, which includes observations received for a specific feature or class of features. The subject for the September 2023, will be Floor-Fractured Craters. Observations at all phases and of all kinds (electronic or film based images, drawings, etc.) are welcomed and invited. Keep in mind that observations do not have to be recent ones, so search your files and/or add these features to your observing list and send your favorites to (both):

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

Deadline for inclusion in the Floor-Fractured Craters Focus-On article is August 20, 2023

FUTURE FOCUS ON ARTICLES:

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

Subject	TLO Issue	Deadline
Floor-Fractured Craters	**September 2023**	**August 20, 2023**
Dorsa Smirnov	**November 2023**	**October 20, 2023**
Sinus Iridum	**January 2024**	**December 20, 2023**
Lacus Mortis	**March 2024**	**February 20, 2024**

Focus-On Announcement
Floor-Fractured Craters

Floor-Fractured Craters are a relatively recent category of craters, which have undergone a modification of their floor after their formation by an impact: their higher floors are smooth, with fractures, ridges, hills and other features. We have spectacular craters like Posidonius or Taruntius or lesser known craters like Le Verrier or Letronne. We will use Robert Garfinkle's "Luna Cognita" catalog and typology for a monograph on these very special and diverse craters. Please check your files for images of these spectacular craters and forward them by August 20, 2023 to Alberto Anunziato and David Teske.

SEPTEMBER 2023 ISSUE-Due August 20th 2023: FLOOR FRACTURED CRATERS
NOVEMBER 2023 ISSUE-Due October 20th 2023: DORSA SMIRNOV
JANUARY 2024 ISSUE-Due December 20th 2023: SINUS IRIDUM
MARCH 2024 ISSUE: Due February 20th 2024: LACUS MORTIS

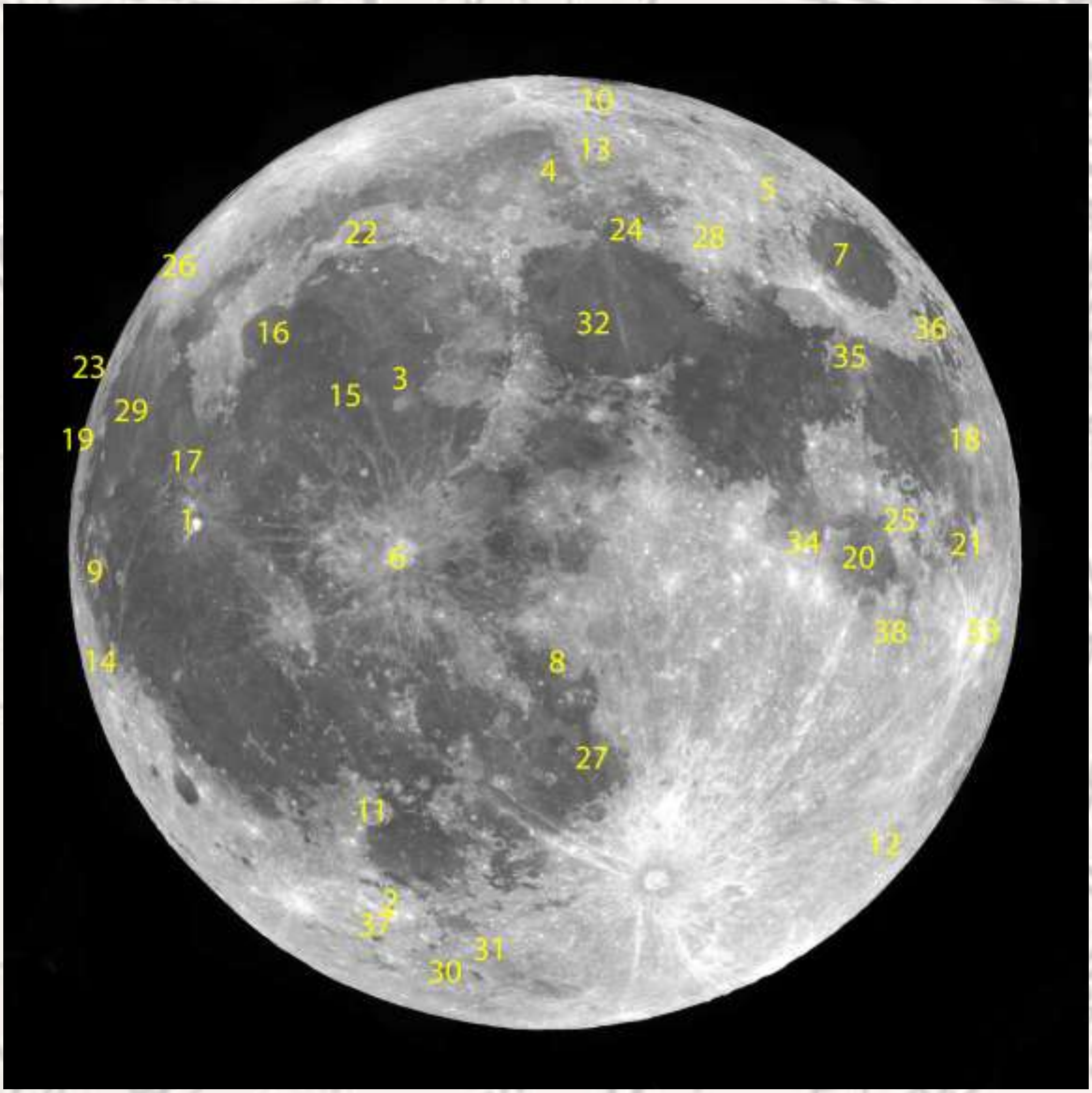
Focus-On Announcement
Hiking in the Moon: Dorsa Smirnov

It costs nothing to dream about the future. If the Moon will surely be humanity's first step out of its terrestrial cradle, the place where we do everything a second time, there will also be a time for us to take our passion for the trails to our second home. And when we get used to walking in the regolith, perhaps the new challenge will be the gentle heights that almost completely cover the maria, we are talking about the wrinkle ridges. Although Dorsa Smirnov would not be the first option for a walk, due to the steepness of its crests, it is ideal for a telescopic tour. It is the most complex and extensive dorsal system on the Moon. It is located on the eastern edge of the Mare Serenitatis and is better known as Serpentine Ridge (an ancient name that also included what is now known as Dorsa Lister). We will tour the Serpentine Ridge structure, trying to see the topographic details of this fascinating series of elevations. Please check your files for images of these spectacular craters and forward them by October 20, 2023 to Alberto Anunziato and David Teske.

SEPTEMBER 2023 ISSUE-Due August 20th 2023: FLOOR FRACTURED CRATERS
NOVEMBER 2023 ISSUE-Due October 20th 2023: DORSA SMIRNOV
JANUARY 2024 ISSUE-Due December 20th 2023: SINUS IRIDUM
MARCH 2024 ISSUE: Due February 20th 2024: LACUS MORTIS

Serpentine Ridge, 2020/05/28, 00:37 UT
Colongitude 338.7, Seeing 7-8/10, Transparency 5/6
C9.25 Schmidt-Cassegrain, f/10, FL 2395mm, Celestron Skyris 236M, No Filters
Howard Eskildsen, Ocala, Florida, USA

Key to Images In This Issue



1. Aristarchus
2. Bayer
3. Beer
4. Bürg
5. Cleomedes
6. Copernicus
7. Crisium, Mare
8. Davy
9. Eddington
10. Endymion
11. Gassendi
12. Helmholtz
13. Hercules
14. Hevelius
15. Higazy, Dorsum
16. Iridium, Sinus
17. Krieger
18. Langrenus
19. McLaughlin
20. Nectaris, Mare
21. Petavius
22. Plato
23. Poczobutt
24. Posidonius
25. Pyrenaeus, Montes
26. Pythagoras
27. Recta, Rupes
28. Römer
29. Rümker, Mons
30. Schickard
31. Schiller
32. Serenitatis, Mare
33. Snellius
34. Theophilus
35. Taruntius
36. Undarum, Mare
37. Vieta
38. Weinek