The Lunar Observer

A publication of the Lunar Section of ALPO

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Recent back issues: http://moon.scopesandscapes.com/tlo_back.html

February 2020

In This Issue

Thank you for reading the February 2020 issue of *The Lunar Observer*. Before telling *what* is in this issue, look at *who* is in this issue. Contributions were received from 22 observers in 7 countries! I am thrilled that we are reaching that many lunar observers. In this issue you will find articles about the craters Galle and Clausius by Robert Hayes Jr., the crater Nöggerath by Alberto Anunziato, lunar domes in the Maraldi D region by Raffaello Lena, Maximilian Teodorescu and Jim Phillips, a discussion of whether Bliss, (formally Plato A) is a banded crater by Alberto Anunziato and Francisco A. Cardinalli, an in depth look at a light cone in the crater Hesiodus and discussions of lunar landscapes by Rik Hill, Howard Eskildsen and David Teske. The pages are graced by many stunning lunar drawings and images, all taken by amateur astronomers. Tony Cook provide another thorough look at lunar geologic change.

Lunar Calendar February 2020

2020	U.T.	EVENT
February 2	0142	First Quarter Moon
2	0900	Vesta 0.5° south of Moon, occultation China, Alaska
5	2300	Moon 1.4° south of M35
8	1100	Moon 1.0° north of M44
9	0733	Full Moon
10	2000	Moon at Perigee, 360,461 km
13	1000	Juno 0.6° south of the Moon, occultation North America, northern South America
15	2217	Last Quarter Moon
18	1300	Mars 0.8° south of the Moon, occultation much of North America, northern South America
19	2000	Jupiter 0.9° north of the Moon, occultation southern South America
20	1400	Saturn 1.7° north of the Moon
23	1532	New Moon, Lunation 1202
26	1200	Moon at apogee, 406,278 km

Lunar Librations February 2020

Libration in longitude: East limb most exposed on the 17th, +6.6°, west limb most exposed on the 5th –7.0°.

Libration in latitude: North limb most exposed on the 26th, +6.6° , south limb most exposed on the 12th, -6.6°.

The Lunar Observer welcomes all lunar related images, drawings, articles, reviews of equipment and reviews of books. You do not have to be a member of ALPO to submit material, though membership is highly encouraged. Please see below for membership and near the end of *The Lunar Observer* for submission guidelines.

Comments and suggestions? Please send to David Teske, contact information page 1. Need a hard copy, please contact David Teske.

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 nonmember 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.

Lunar Topographic Studies

Acting Coordinator – David Teske - david.teske@alpo-astronomy.org
Assistant Coordinator – William Dembowski - dembowski@zone-vx.com
Assistant Coordinator – Jerry Hubbell – jerry.hubbell@alpo-astronomy.org
Assistant Coordinator-Wayne Bailey– wayne.bailey@alpo-astronomy.org
Website: http://moon.scopesandscapes.com/

Observations Received

Alberto Anunziato, Oro Verde, Argentina. Articles and drawings of *The Nöggerath Family, Is Bliss a Banded Crater*?

Sergio Babino, Montevideo, Uruguay. Images of Langrenus, Aristarchus, Copernicus, Plato, Tycho and Proclus.

Aylen Borgatello, AEA - Oro Verde, Entre Rios, Argentina. Images of Conon, Mins Piton and Proclus.

Ioannis (Yannis) Bouhras, Athens, Greece. Image of the Penumbral Lunar Eclipse.

Francisco Alsina Cardinali, Oro Verde, Argentina. Images and article *Is Bliss a Banded Crater?*

Jairo Chavez, Popayán, Colombia. Images of 89% Waxing Gibbous Moon and 98% Waxing Gibbous Moon.

Walter Ricardo Elias, AEA - Oro Verde, Entre Rios, Argentina. Images of Aristarchus (3), Mare Crisium, Proclus (3), Wilkins, Gassendi, Atlas, Full Moon, Le Verrier, Romer, Ross, Schmidt and Tycho.

Howard Eskildsen, Ocala, Florida, USA. Articles and images of *Hesiodus/Pitatus Light Cone, Basin Transition, Rimae Sirsalis, Birt domes and Region,* images of the Brayley D Dome, Mons Rümker, Grimaldi Dome and Fracastorius Dome.

Victoria Gomez, AEA - Oro Verde, Entre Rios, Argentina. Image of Aristarchus.

Johana Gonzalez, AEA - Oro Verde, Entre Rios, Argentina. Images of Aristarchus (2), Censorinus, Mare Crisium, Mare Tranquillitatis and Plato.

Facundo Gramer, AEA - Oro Verde, Entre Rios, Argentina. Images of Alphonsus, Aristarchus, Plato, Secchi and Timocharis.

Robert Hays Jr., Worth, Illinois, USA. Articles and drawings of Galle and Clausius.

Richard Hill, Tucson Arizona, USA. Articles and images of *A Mid-Morning Landscape* (Posidonius), *Asperitatis Daybreak* (Theophilus), *Wonderful Things to See* (Aristoteles) and *Goodnight to the Lake of Death*.

Raffaello Lena, Italy, Images and Article Domes Near Maraldi D: A Preliminary Report.

Luigi Morrone, Agerola, Italy. Images of Albategnius, Archimedes, Aristillus, Mons Hadley and Palus Putredinus, Ptolemaeus (2) and Vallis Alpes

Jim Phillips, Virginia USA. Images and Article Domes Near Maraldi D: A Preliminary Report.

Raúl Roberto Podestá, SLA, Formosa, Argentina. Images of Ptolemaeus, Montes Apenninus, Clavius region and Plato

Gabriel Re, AEA - Oro Verde, Entre Rios, Argentina. Images of Proclus and Aristarchus.

Michael E. Sweetman, Tucson, Arizona, USA. Images of Tycho (2).

Maximilian Teodorescu, Romania, Images and Article Domes Near Maraldi D: A Preliminary Report.

David Teske, Louisville, Mississippi, USA. Article and image of *Bullialdus and Surroundings*.

Alan Trumper, AEA - Oro Verde, Entre Rios, Argentina. Images of Alphonsus, Le Verrier, Aristarchus, Mons Pico and Sinus Iridum.

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

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
Jerry Hubbell –jerry.hubbell@alpo-astronomy.org
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: Tycho and Herodotus

Focus on is a bi-monthly series of articles, which includes observations received for a specific feature or class of features. The subject for the **March 2020** edition will be the Tycho and Herodotus regions. 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):
Jerry Hubbell –jerry.hubbell@alpo-astronomy.org
David Teske – david.teske@alpo-astronomy.org

Deadline for inclusion in the Tycho and Herodotus region article is February. 20, 2020

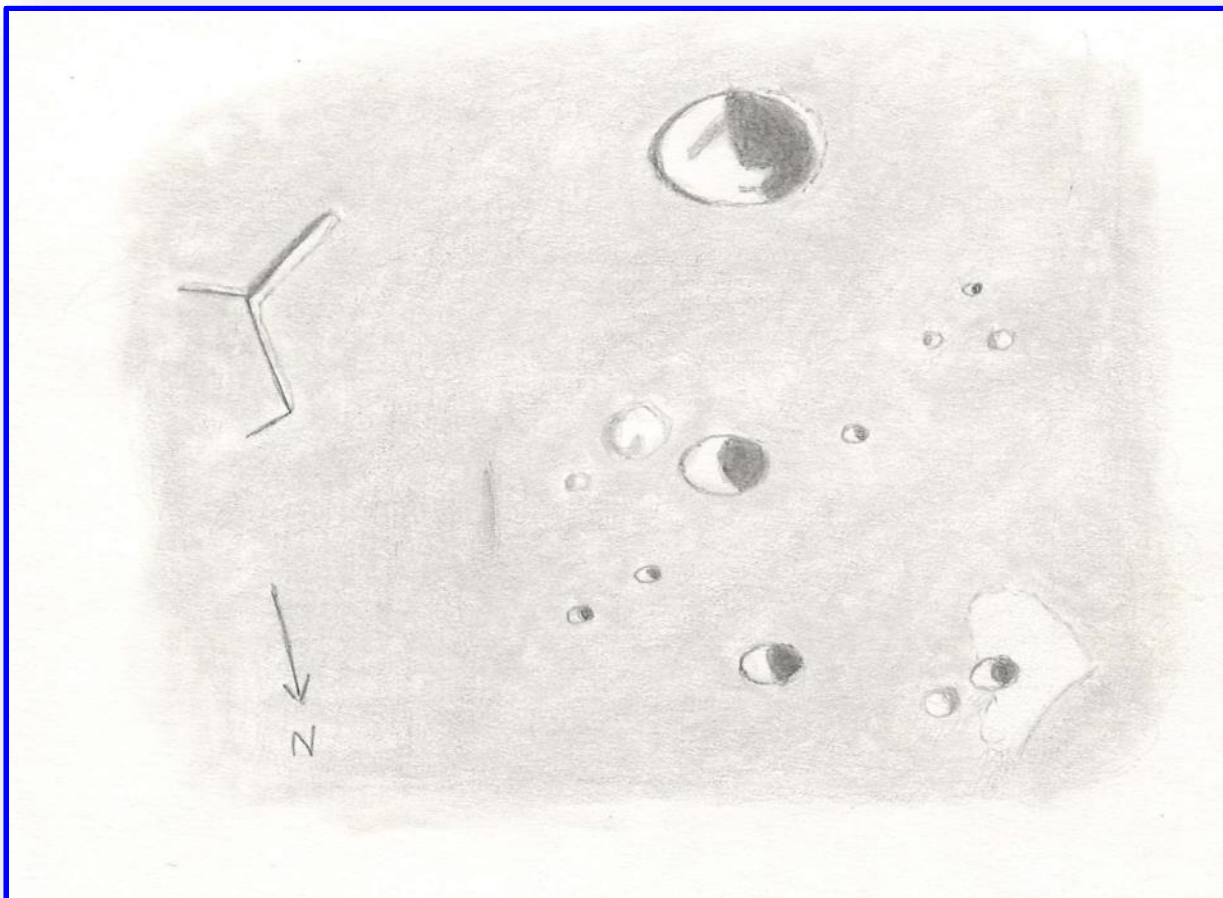
FUTURE FOCUS ON ARTICLES:

In order to provide more lead time for contributors the following future targets have been selected: The next series of three will concentrate on subjects of the Selected Areas Program.

Subject	TLO Issue	Deadline
Tycho & Herodotus	March 2020	February 20, 2020

Galle
Robert Hayes Jr.

I observed this crater and vicinity on the morning of 18 September 2019. This area is located in eastern Mare Frigoris north of Aristoteles. Galle itself is slightly triangular in shape and had an irregular internal shadow as depicted on the sketch. Galle C is north of Galle, and Kane G is farther north and slightly smaller. Kane F is west of and smaller than Kane G. These three lettered craters are all similarly crisp and deep, differing only in size. A large low mound is just southeast of Galle C and a small hill is nearby. Two small pits are northeast of Galle C and another pit is to its west. A shallow saucer is just northeast of Kane F and a bright patch is in the area. This patch is not well defined except for a fairly sharp curved northwest edge. Two small peaks are northwest of Galle and a tiny pit is nearby. This pit is smaller than the three near Galle C. The area east of Galle looks very smooth until an assemblage of linear features appears. A relatively wide ridge angles southwest from a junction, and a narrower one goes north. A short ridge branches eastward from this junction, and a very narrow strip of shadow protrudes eastward from the group's north tip. These four segments are all very sharp and very straight. They do not appear to be part of a ghost ring nor are they ordinary wrinkles.

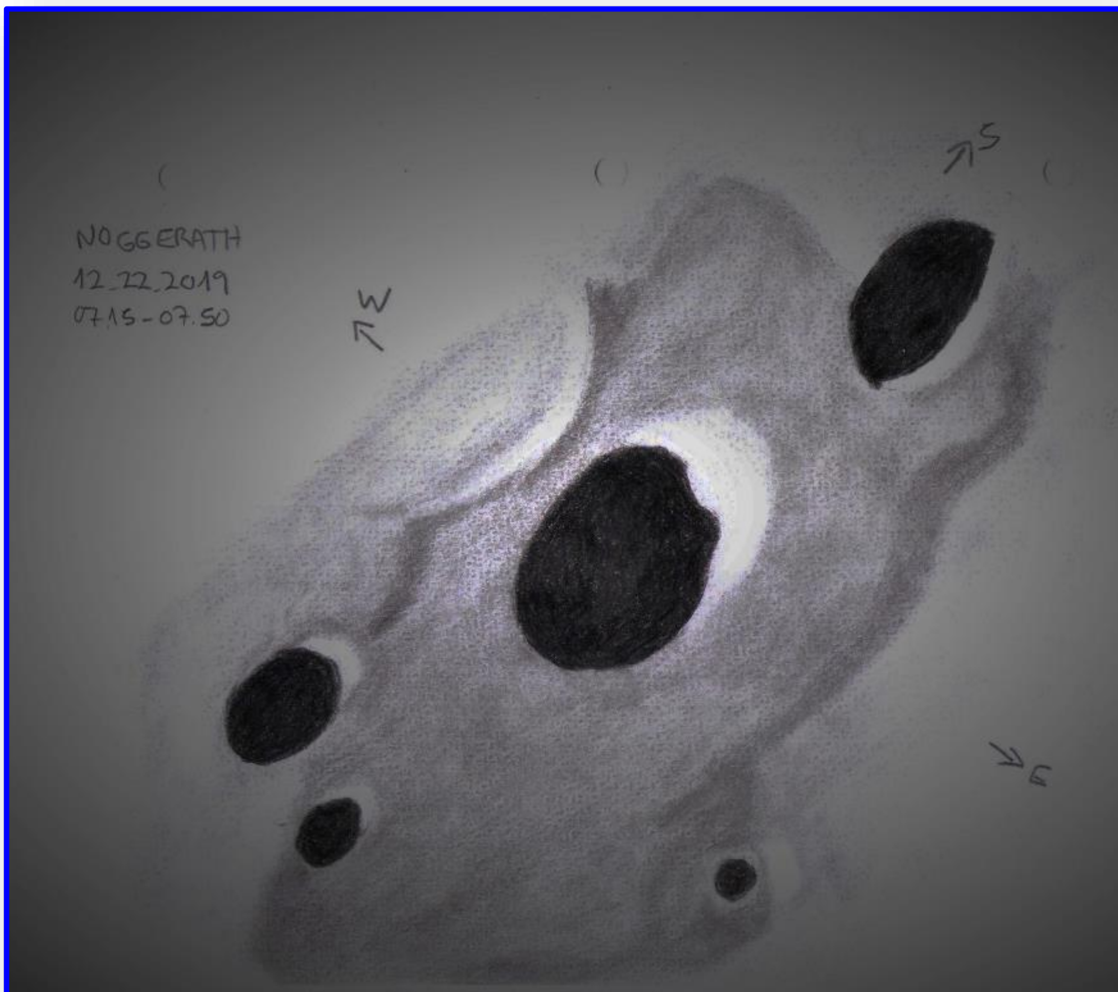


Galle, *Robert Hays Jr, Worth, Illinois, USA. 18 September 2019, 0912-0946 UT. 15 cm reflector, 170 x, Seeing 8-9/10, transparency 6.*

Please Note: This submission was featured in the December 2019 *The Lunar Observer.* I made an error in typing which made the above article read incorrectly. Please enjoy in its correct form. David Teske

The Nöggerath Family
Alberto Anunziato

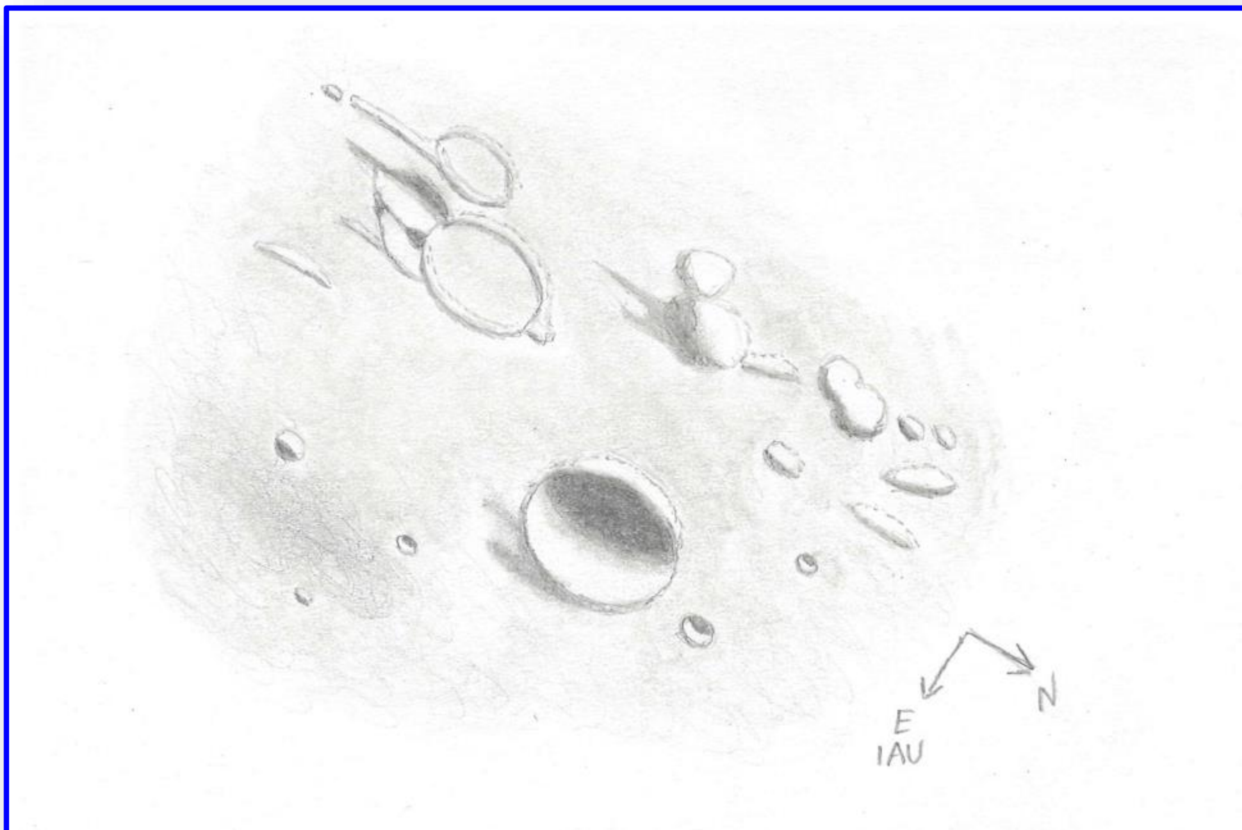
With the terminator passing through Schiller, on the 25th day of the moon, the seemingly anodyne Pre-Imbrian Nöggerath crater, 31 kilometers diameter, appears surrounded by an elevated terrain darker than the rest of the highlands that go to Schickard. From south to north (from top to bottom) appear Nöggerath G (21 kilometers diameter), Nöggerath, Nöggerath J (17 kilometers diameter), Nöggerath F (9 kilometers diameter) and finally Nöggerath A (7 kilometers diameter) in the east end. Do you notice the similarities and differences between the members of the Nöggerath family? The 4 largest craters are quite similar, elongated and with slightly steep slopes. The smallest, Nöggerath A, is circular and its entire outline appears illuminated, which would indicate higher walls, also seems to be on a higher ground (or with more reflective material) to the east. The irregularly shaped dark surface looks like a kind of massif that extends to Nöggerath G in the south and north beyond Nöggerath F, in the east you can clearly discern the boundary of the massif by the shadows they cast, while from the west it extends to the east wall of Nöggerath H, practically the only visible remainder of this ghost crater.



Nöggerath, *Alberto Anunziato, Paraná, Argentina. 22 December 2019 0750 UT. Meade ETX 105, 154 x.*

Clausius
Robert Hays Jr.

I observed this crater and vicinity on the morning of 23 October 2019. This area is in a small patch of mare material south of Mare Humorum. Clausius itself is a fairly deep crater with strips of shadow protruding from its east and south rims. Clausius A is just north of Clausius. The smaller crater west of A is probably Clausius E. Both of these are relatively deep craters that showed substantial interior and exterior shadows at this time. A varied group of peaks is west of Clausius. The largest of these is a nearly round feature with shadow strips approximately parallel to those from Clausius. Two other peaks abut this one, and a double mountain is to their north. A few smaller hills round out this group. (The Lunar Quadrant map shows a broken ring in this area.) Clausius D is the large shallow crater southwest of Clausius. Another shallow crater is just west of Clausius D. A ridge extends southward from the unnamed crater, ending with a detached peak. The south end of Clausius D appears to overlap two other rings. One of them showed more interior shadow than did Clausius D. A very dark spot was at the associated junction. Short ridges or strips of shadow protrude from the south ends of the possible rings and a detached ridge nearby. All of these linear features are nearly parallel to each other and to the aforementioned ridge with a peak. A conspicuous isolated mountain is south of Clausius and two small bits of shadow are nearby. Clausius J is the one nearer to Clausius; the other is probably a tiny peak. There is a relatively dark area southeast of Clausius near the conspicuous mountain.



Clausius, *Robert Hays Jr, Worth, Illinois, USA. 23 October 2019, 1024-1112 UT. 15 cm reflector, 170 x, Seeing 7/10, transparency 6.*

Is Bliss a Banded Crater?

Alberto Anunziato and Francisco Alsina Cardinali

When we reviewed images of Plato in the archive of the Sociedad Lunar Argentina for the "Focus On" Section of January, we came across a doubt. To the northwest of Plato appears Bliss, a 22-kilometer-diameter bowl-shaped crater, formerly known as Plato A. In all the images, although with a different degree of sharpness, it appears what looks like a pattern of radial bands on the west wall of Bliss. We hope that it can be seen in the image clippings. **Image 1** (Colongitude 69.9 °, Lunation: 13.11 days) shows in some detail the characteristics of Bliss. Even with frontal sunlight, there is a bright band clearly distinguishable (marked with an X in image 5). With the shadows retreating (**Image 2**, Colongitude: 41.5 °, Lunation: 11.18 days), the pattern of bands on the west wall does not seem to change. In **image 3** (Colongitude: 24.2 °, Lunation: 9.45 days) and **4** (Colongitude: 24.3 °, Lunation: 9.05 days) dark and bright stripes appear more distinguishable with oblique sunlight and the floor of the crater in shadows. Image 4 is the basis of the sketch (**image 5**) that attempts to schematize the pattern of the bands. At Colongitude: 18.2 °, Lunation: 8.48 days (**Image 6**) dark bands are more difficult to discern by the intense brightness of the west wall. The east and west walls are very different from each other. The east wall is low and very eroded, while the west wall is higher. There is a band that is the most distinguishable under any length, indicated in image 5. Now, in the list of the Banded Crater Program of the Moon Section of the ALPO Bliss does not appear. How should we name what looks like radial bands of the Group 5: "One half of the floor is dull and the bands radiate from near the wall inside this dull section and are visible on the dull and bright parts of the floor"? Is it a banded crater? The pattern of dark areas and bright areas could be due to differences in geological layers exposed by the impactor at the time of the crater formation, the bright areas being rich in anorthosite, rather than to landslides in the rim of the crater, as it appears to be quite an old crater.

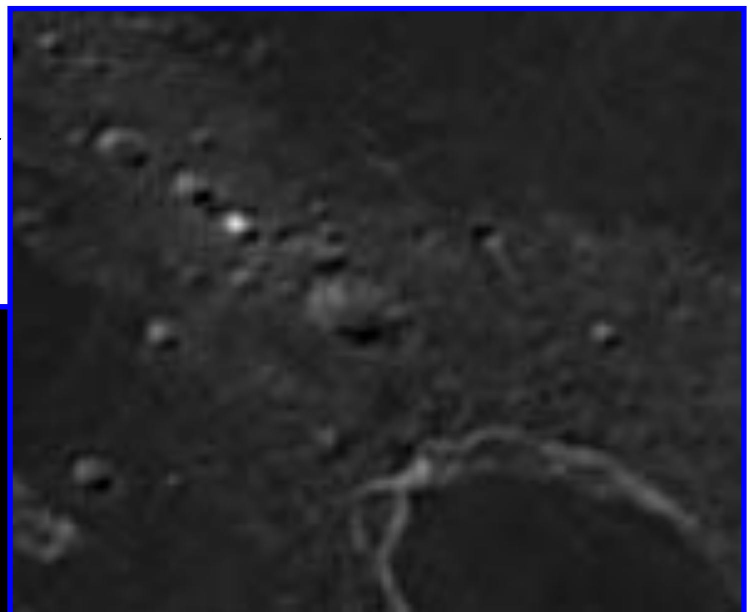


Figure 1, Plato, *Francisco Alsina Cardinali, Oro Verde, Argentina. 17 February 2019 0243 UT, colongitude 69.9º, lunation 13.11 days. 200 mm refractor, QHY5-II camera.*

Figure 2, Plato, *Francisco Alsina Cardinali, Oro Verde, Argentina. 14 August 2016 0402 UT, colongitude 41.5º, lunation 11.18 days. 130 mm Newtonian reflector telescope, Astronomik ProPlanet 742 nm IR-pass filter, QHY5-II camera.*

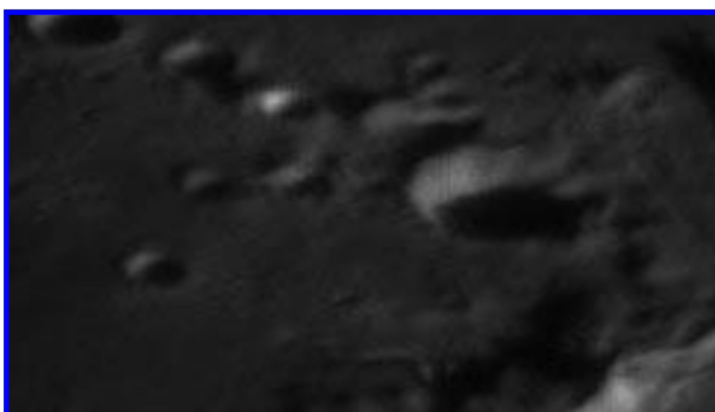


Figure 3, Plato, *Francisco Alsina Cardinali, Oro Verde, Argentina. 20 August 2018 2334 UT, colongitude 24.2º, lunation 9.45 days. 200 mm refractor, QHY5-II camera.*

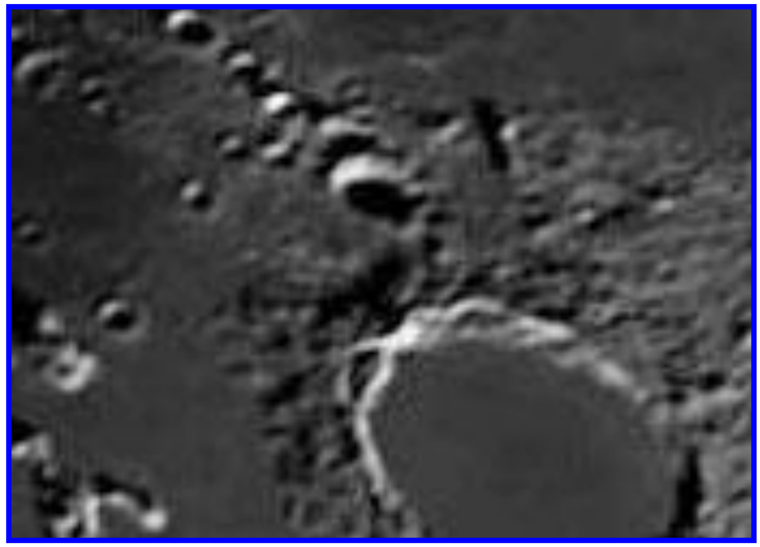


Figure 4, Mon Pico, *Francisco Alsina Cardinali, Oro Verde, Argentina. 25 February 2018 0110 UT, colongitude 24.3°, lunation 9.05 days. 200 mm refractor, QHY5-II camera.*

Figure 5 below, Bliss. *Drawing showing radial bands, based on figure 4.*

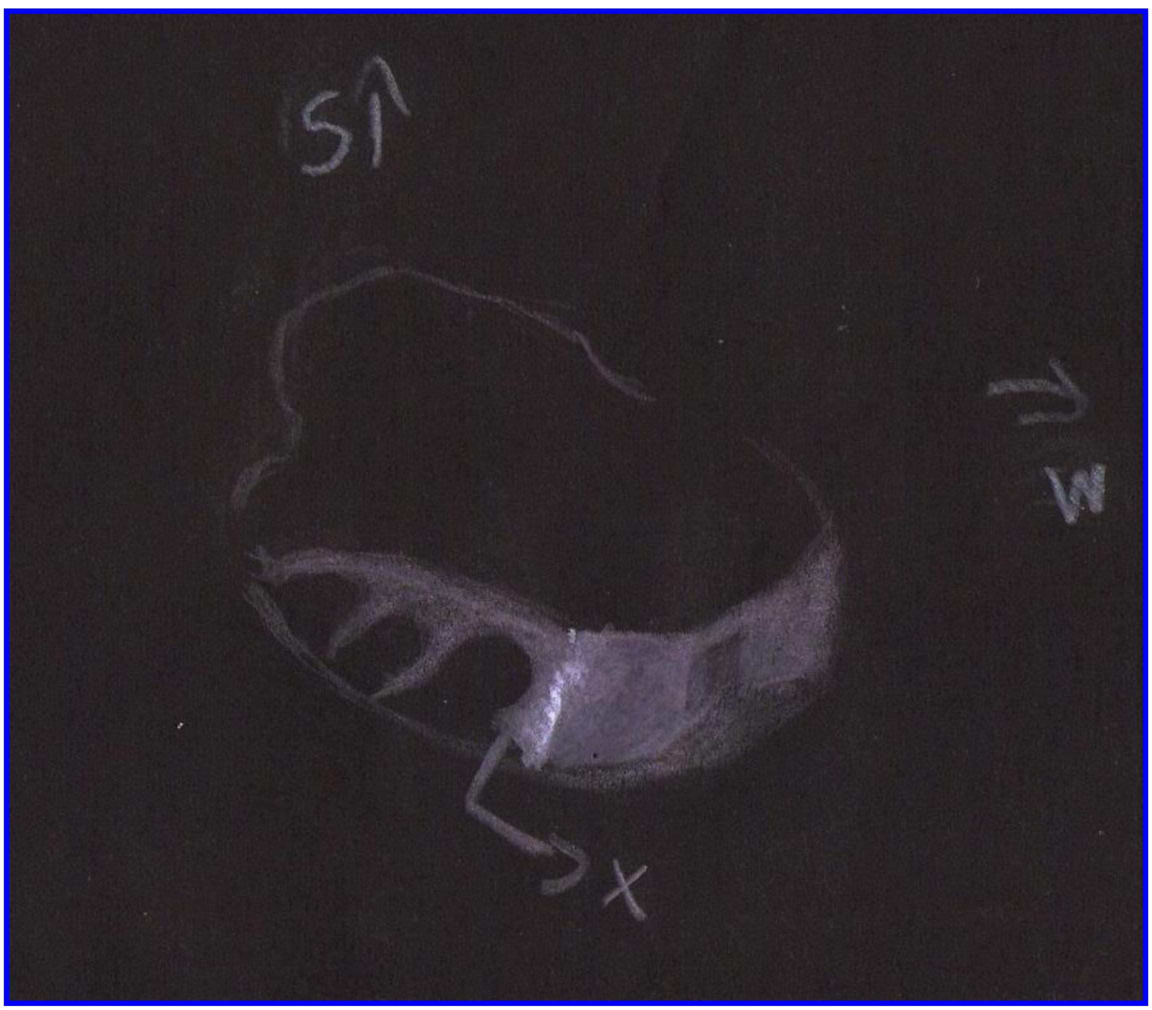


Figure 6, Plato, *Francisco Alsina Cardinali, Oro Verde, Argentina. 20 December 2015 0053 UT, colongitude 18.2°, lunation 8.48 days. 250 mm Meade LX 200, Canon EOS Digital Rebel XS camera.*

Lunar Domes Near Maraldi D: A Preliminary Report

Raffaello Lena, Maximilian Teodorescu and Jim Phillips

Important clusters of lunar domes are observed in the Hortensius/Milichius/T. Mayer region in Mare Insularum and in Mare Tranquillitatis around the craters Arago and Cauchy [1-6]. A first map of the Cauchy shield was performed based on our previous works [4, 7-14] and describes morphometric properties of forty-eight domes, termed C1-C33, Vi1-8, D (Diana) and NTA1-NTA6. In this contribution we provide an analysis of further eight lunar domes detected using CCD telescopic image and located principally near Maraldi D, in the northern region of the Cauchy shield. We term the examined lunar domes, previously not introduced and described in our map, as C35-C42 (Fig.1 and Table 1). The examined domes described in the current article (Table 1) are reported in red label. Some domes have already been measured in previous studies [4, 7-14] and are reported in brackets. In the LRO WAC imagery the examined domes are not as prominent as in the telescopic CCD image taken under lower solar illumination angle.

Ground-based observations

A telescopic CCD image of the examined lunar region, near the crater Maraldi D, is shown in Fig. 1.

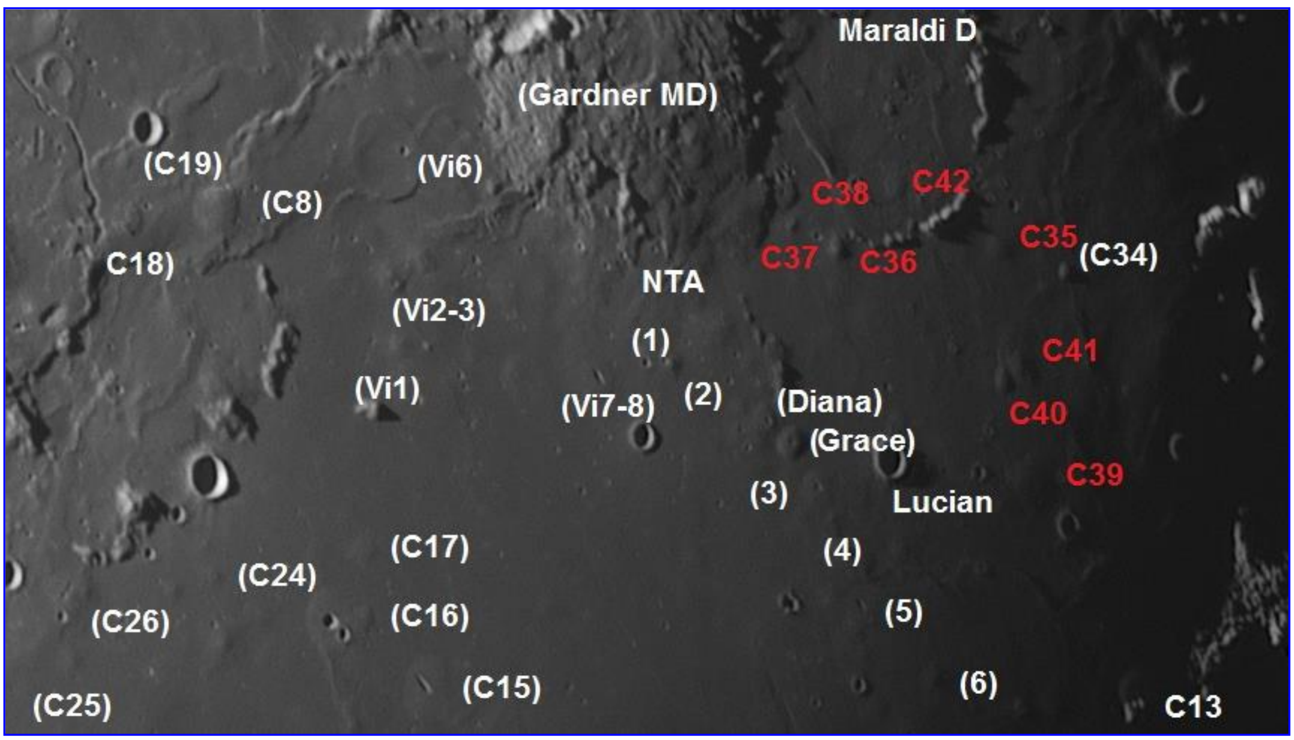


Figure 1: *Telescopic CCD image made on December 16, 2019 at 00:44 UT by Teodorescu. Crop of the original image. The identified domes are marked in red (C35-C42).*

Dome	Latitude (°)	Longitude (°)	Diameter (km)	h (m)	slope (°)	Volume Km^3	Class
C35	16.01	37.52	7.0 ± 0.3	45 ± 5	0.73 ± 0.1	0.86	A
C36	15.62	36.04	5.7 ± 0.3	120 ±	2.3 ± 0.2	1.4	A-C_2-E_1
C37	15.60	35.60	3.6 ± 0.3	70 ± 10	2.2 ± 0.2	0.36	A-E_1
C38	15.80	35.52	7.0 ± 0.3	95 ±10	1.5 ± 0.1	1.8	A-C_2
C39	14.51	38.02	12.0 ± 0.3	65 ± 10	0.62 ± 0.06	3.7	A-C_2
C40	15.15	37.68	4.8 ± 0.3	80 ± 10	2.0 ± 0.2	0.7	C_2-E_1
C41	15.27	37.79	9.8 ± 0.3	70 ± 10	0.82 ± 0.1	2.6	C_1
C42	16.13	36.49	6.4 ± 0.3	55 ± 5	0.98 ± 0.1	0.9	A-C_2

***Table 1**: Morphometric properties of the examined domes.*

Digital elevation map based on telescopic CCD imagery

Generating an elevation map of a part of the lunar surface requires its three-dimensional (3D) reconstruction. A well-known image-based method for 3D surface reconstruction is shape from shading (SfS). It makes use of the fact that surface parts inclined towards the light source appear brighter than surface parts inclined away from it. The SfS approach aims for deriving the orientation of the surface at each image location by using a model of the reflectance properties of the surface and knowledge about the illumination conditions, finally leading to an elevation value for each image pixel [15]. The SfS method requires accurate knowledge of the scattering properties of the surface in terms of the bidirectional reflectance distribution function (BRDF).

The height h of a dome was obtained by measuring the altitude difference in the reconstructed 3D profile between the dome summit and the surrounding surface, considering the curvature of the lunar surface [4]. The average flank slope ζ was determined according to: $\zeta = \arctan 2h/D$.

The uncertainty results in a relative standard error of the dome height h of ±10 percent, which is independent of the height value itself. The dome diameter D can be measured at an accuracy of ± 5 percent. The 3D reconstructions of C35-C42 are shown in Fig. 2. Further images of the wide Cauchy domes region are shown in Figs. 4-7. Likely further domes of low profile may be present in this region, but new images are necessary in order to confirm suspected bumps (at the present unverified).

LOLA DEM

ACT-REACT Quick Map tool was used to access to the LOLA DEM dataset, allowing to obtain the cross-sectional profiles for the examined domes (Fig. 3). Note the agreement of the measurements carried out on the CCD telescopic image and the LOLA DEM.

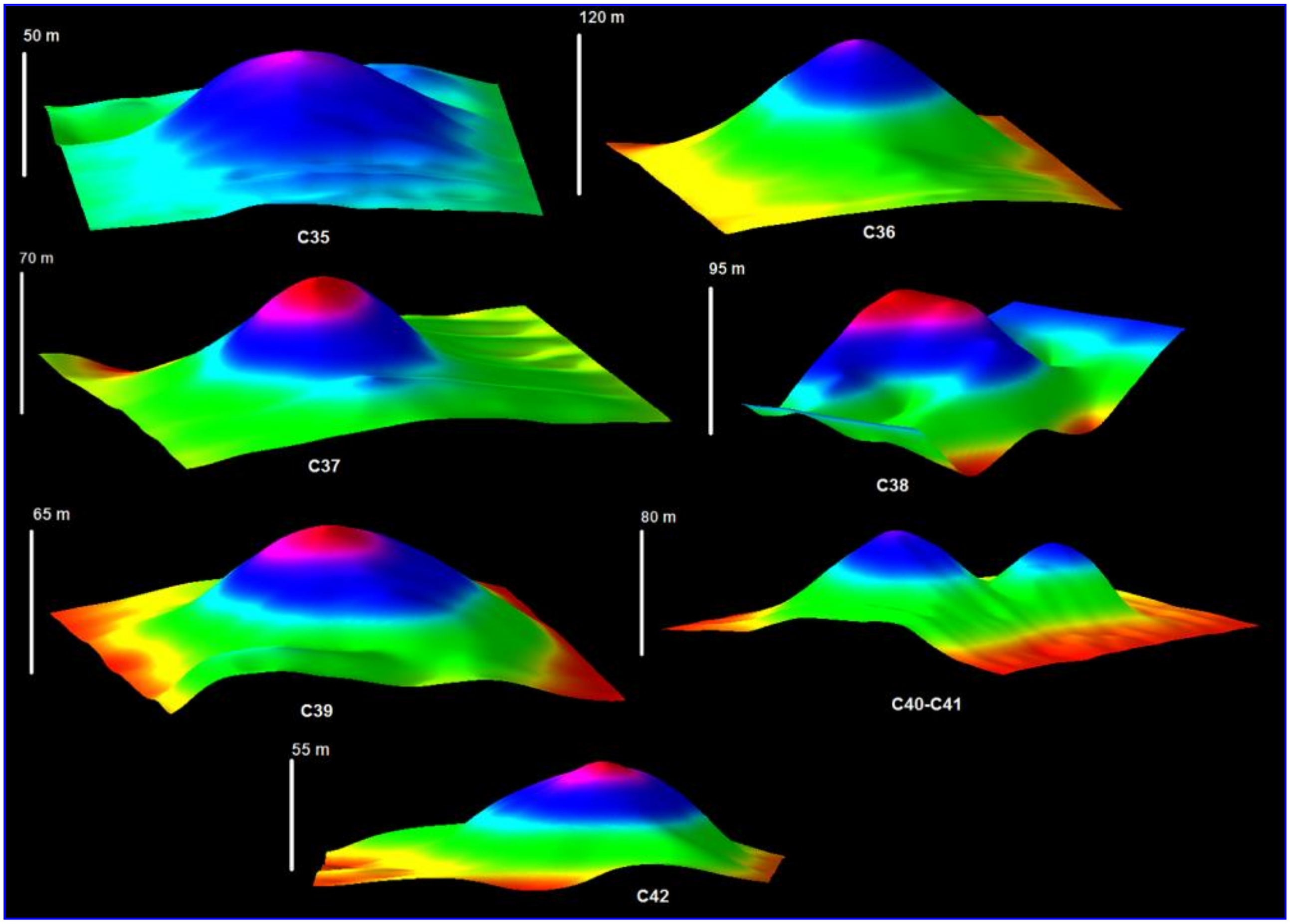


Figure 2: *3D reconstructions of C35-C42 based on terrestrial CCD image of Fig. 1 by photoclinometry and SfS analysis. The vertical axis is 20 times exaggerated.*

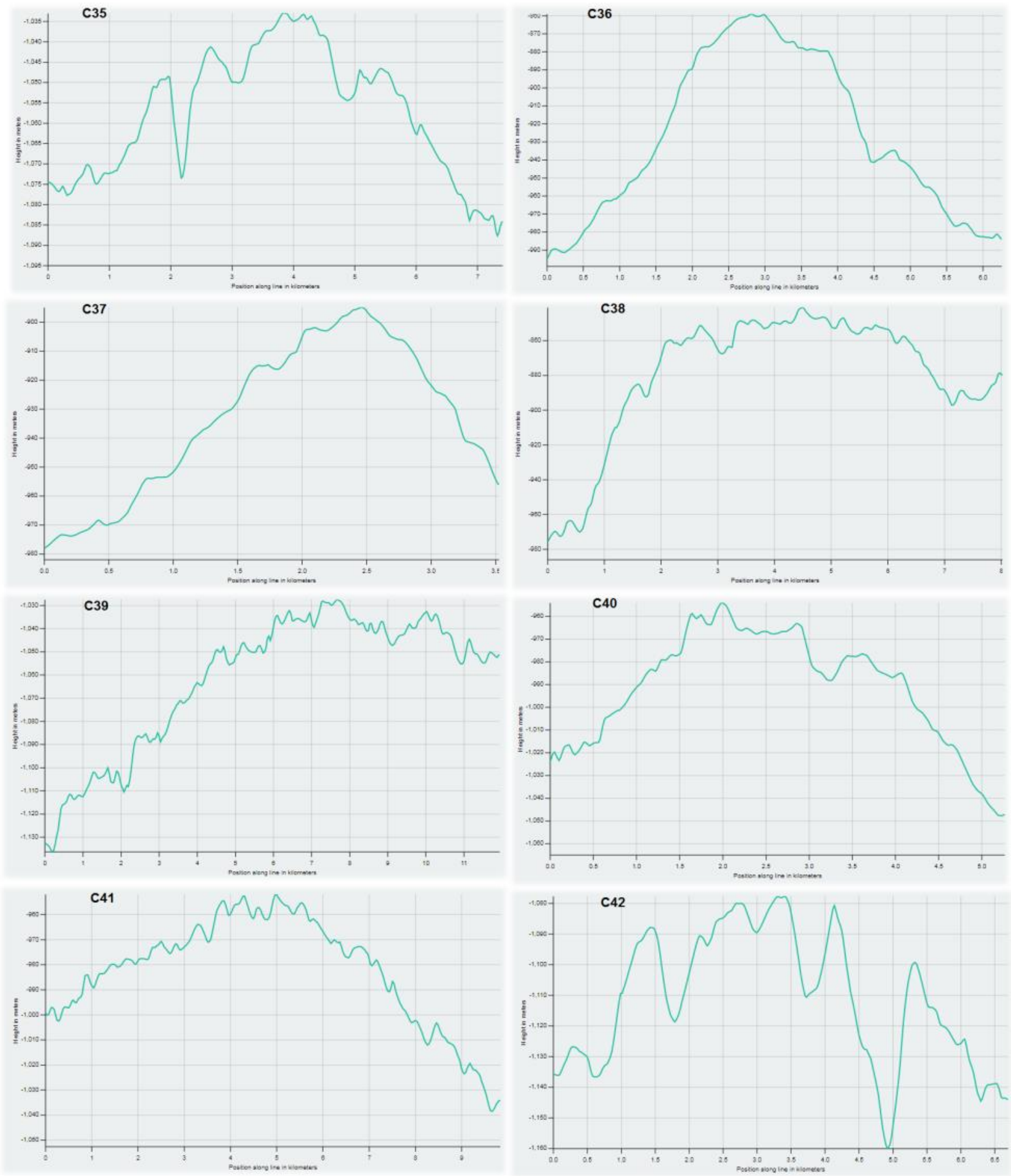


Figure 3*: LRO WAC-derived surface elevation plot of C35-C42 based on LOLA DEM.*

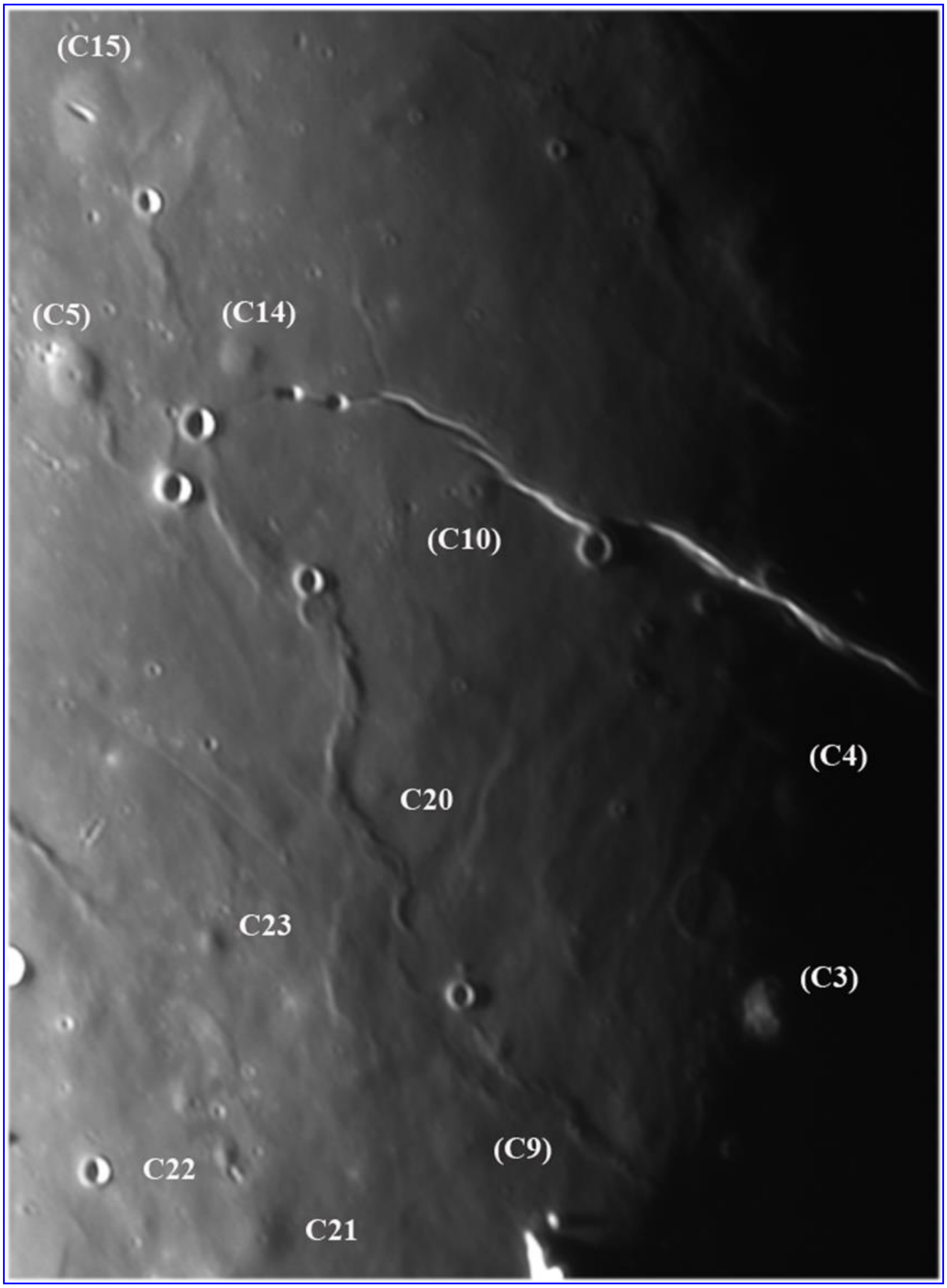


Figure 4: *Examined lunar region (quadrant 1). Image made by Phillips on October 20, 2016 at 10:09 UT using an AP 10" (254mm) F/14.6 Maksutov telescope.*

Figure 5: *Examined lunar region (quadrant 2). Image made by Phillips on October 20, 2016 at 10:04 UT using an AP 10" (254mm) F/14.6 Maksutov telescope.*

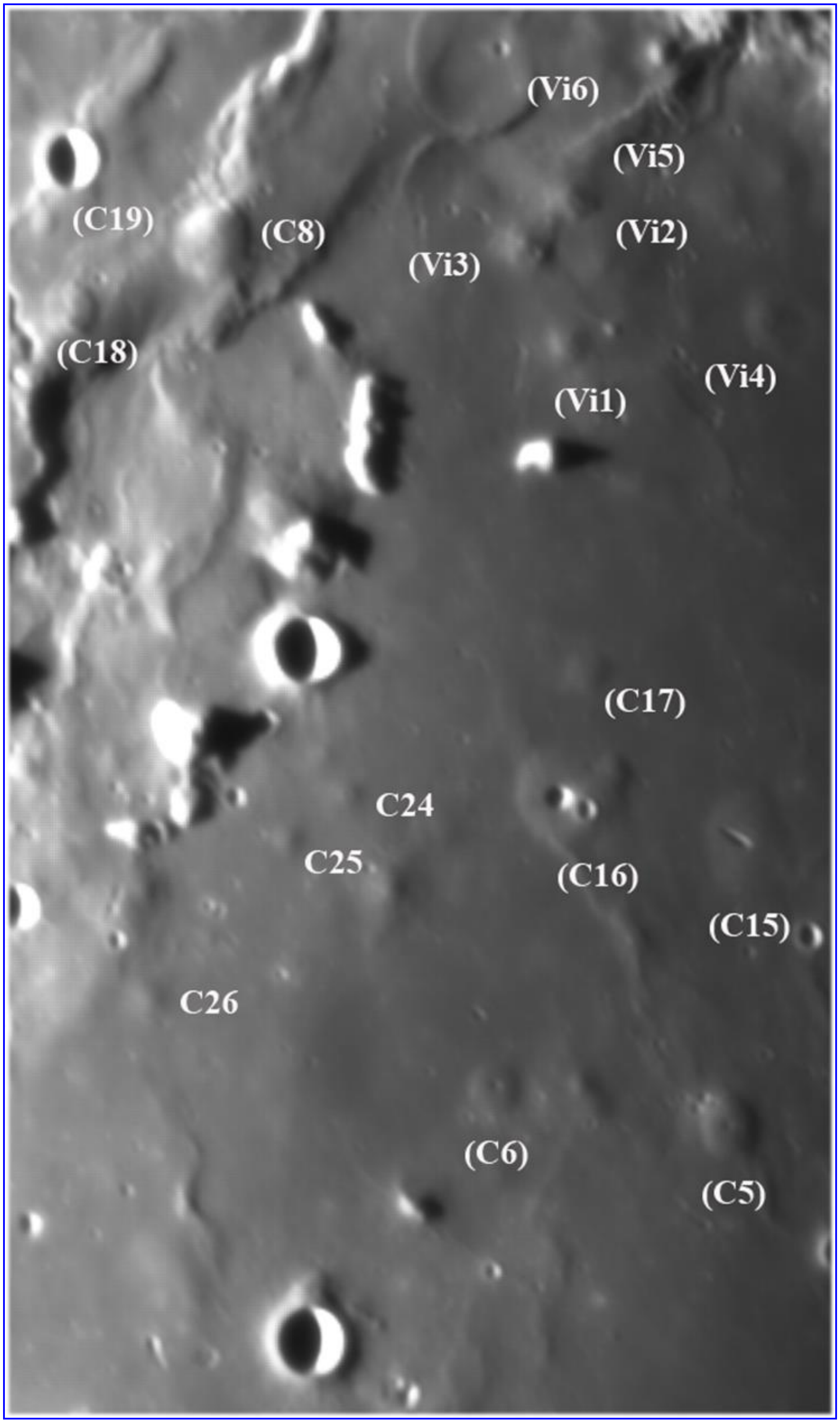


Figure 6*: Examined lunar region (quadrant 3). Image made by Phillips on October 20, 2016 at 10:19 UT using an AP 10" (254mm) F/14.6 Maksutov telescope.*

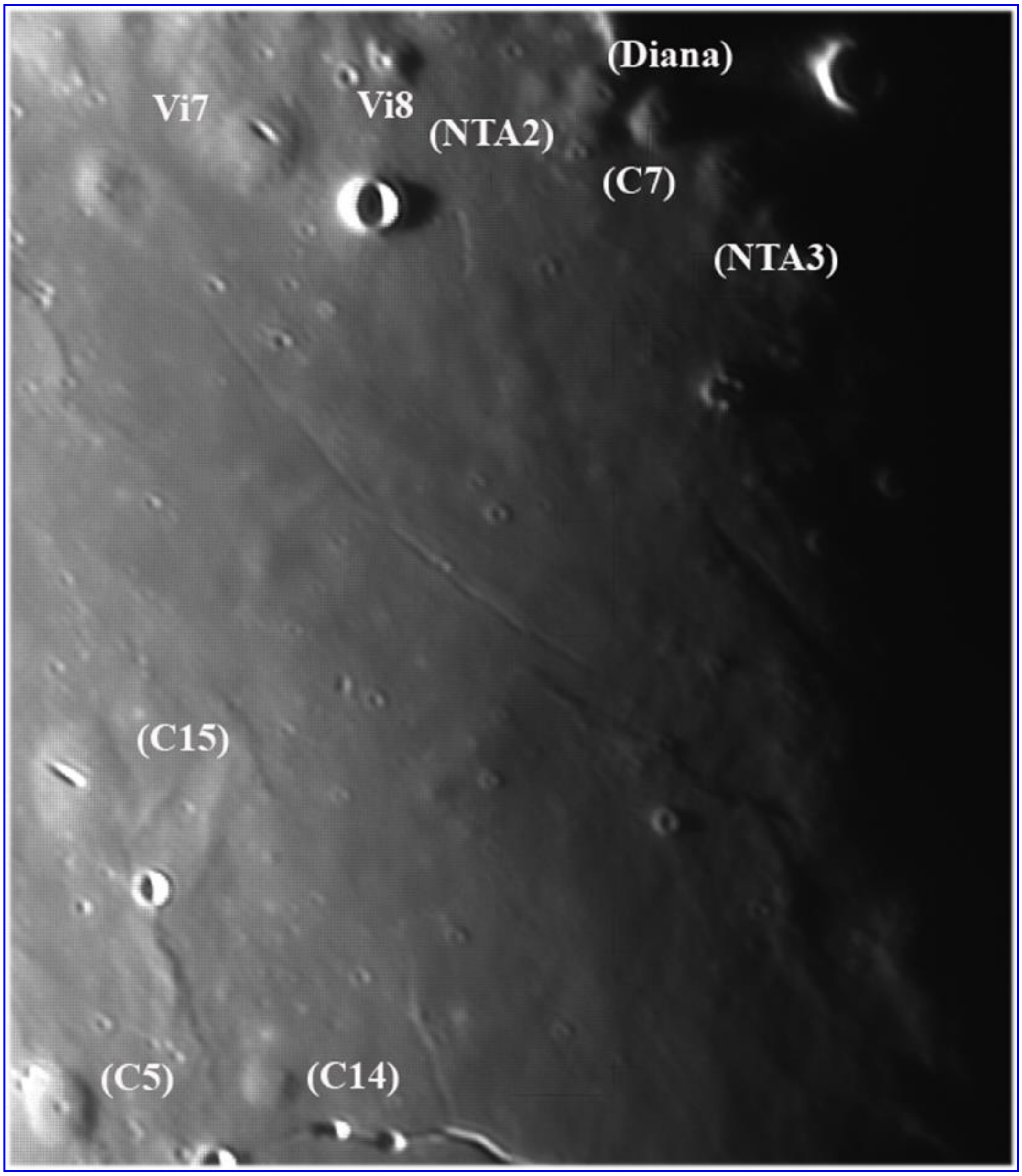


***Figure** 7: Examined lunar region (quadrant 4). Image made by Phillips on October 20, 2016 at 10:15 UT using an AP 10" (254mm) F/14.6 Maksutov telescope.*

Results and discussion

Based on the spectral and morphometric data obtained in this study, C41belongs to class C_1, while the dome C35 belong to class A. The other domes belong to class A-C_2 or are intermediates belonging to class A-C_2-E_1, A-E_1 and C_2-E_1.

They span a continuous range of properties from spectrally blue (class A) to red (class E) soils and from very low (class A) to steep (class E_1) or shallow (class E_2) flank slopes. The class E domes represent the smallest volcanic edifices formed by effusive mechanisms observed to date. Domes of class C_2 are characterized by gentle flank slopes, moderate volumes which are higher than those of class A. They originate from moderately viscous lavas between 10^4 and 10^7 Pa s. The corresponding effusion rates between 100 and 300 m^3 s^{-1} are comparable to those estimated for the class A domes, but the class C_2 domes were formed over longer periods of time between about 0.8 and 5 years.

Diviner Lunar Radiometer Experiment and Christiansen Feature (CF)

The Lunar Reconnaissance Orbiter's (LRO) Diviner Lunar Radiometer Experiment (spatial resolution of 950 m/pixel) produces thermal emissivity data, and provide compositional information from three wavelengths centered around 8 µm that are used to characterize the Christiansen Feature (CF), which is directly sensitive to silicate mineralogy and the bulk SiO_2 content. These spectral bandpass filters are centered at 7.00, 8.25, and 8.55 µm. The major minerals of lunar soils- plagioclase, pyroxene, and olivine- have different ranges of CF values [16]. The feldspar and high silicic material, including quartz, silica-rich glass, and alkali and ternary feldspars, are characterized by CF values of 7.8-7.3. In case of olivine abundances, the CF values is >8.7 [16]. We used the ACT-React Quick Map to infer the CF map derived from Diviner. Analyses of the Diviner CF map for the examined domes reveals that they do not display the short wavelength CF position characterizes silica-rich lithologies like the Gruithuisen domes. The average CF position of Luther 1 and Hal 1 domes is 8.30 ± 0.1; this value is not significantly different from the average CF position of the typical basaltic maria, which is 8.30-8.40. Hence, the examined domes are not enriched in silica relative to the surrounding mare units and display a classic basaltic composition.

Conclusion

Eight lunar domes, termed C35-C42, have been characterized in their morphometric properties. The domes with higher slopes are C36, C37 and C40 (slope 2.0-2.3°). C39 is the shallower dome with a slope angle of 0.62°. Thus, during our lunar domes survey, we have classified a total of fifty-six domes in the wide Cauchy shield. A full spectral analysis based on M^3 dataset is in progress. We encourage more high-resolution imagery of this wide lunar region so that we can have more data to identify further lunar domes not characterized in the morphometric and spectral properties yet. Please check also your past imagery and send them to us for the ongoing study (lunar-domes@alpo-astronomy.org).

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Full Moon, *Walter Ricardo Elias, AEA - Oro Verde, Entre Rios, Argentina. 10 January 2020 0235 UT. Meade LX 200 10 inch Schmidt Cassegrain telescope, ZWO ASI 120MM/S camera.*

Hesiodus/Pitatus Light Cone

Howard Eskildsen

As noted in the writeup below, the wall between Pitatus and Hesiodus has a gap that creates interesting lighting effects and raises questions as to the origin of the gap. I estimated errors of ±50m elevation and ±1km distance for the LTVT measurements.

In March of 2004 I was observing with Jose Olivarez and photographing the Moon with a Nikon Coolpix camera. Near the end of the observing session Jose said that I needed to see one more thing before I left. Through his 10," f/16, folded refractor, the light cone in Hesiodus appeared as a bright area in a shadow resembling a cloven hoof, and I took a quick photo (figure 1). It has fascinated me ever since.

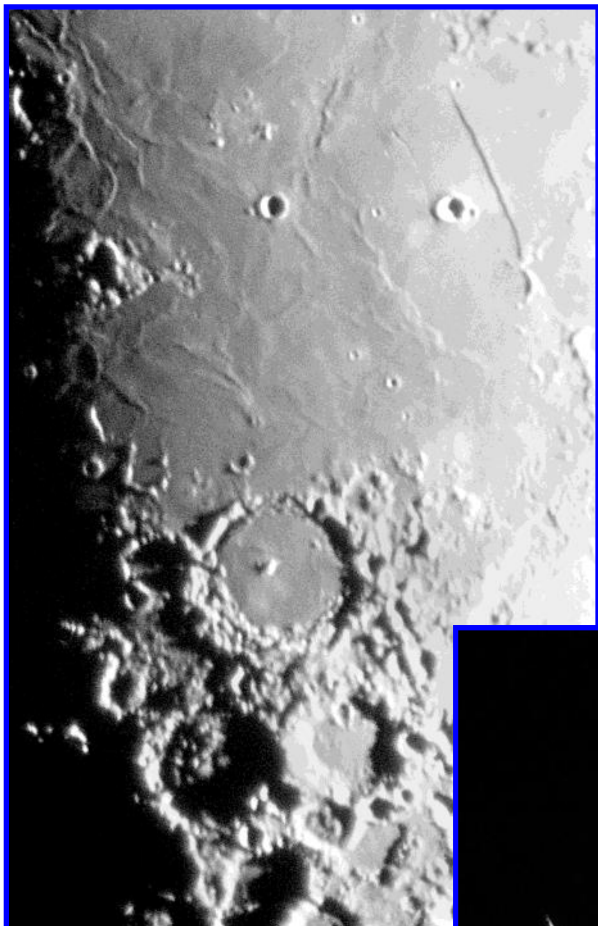
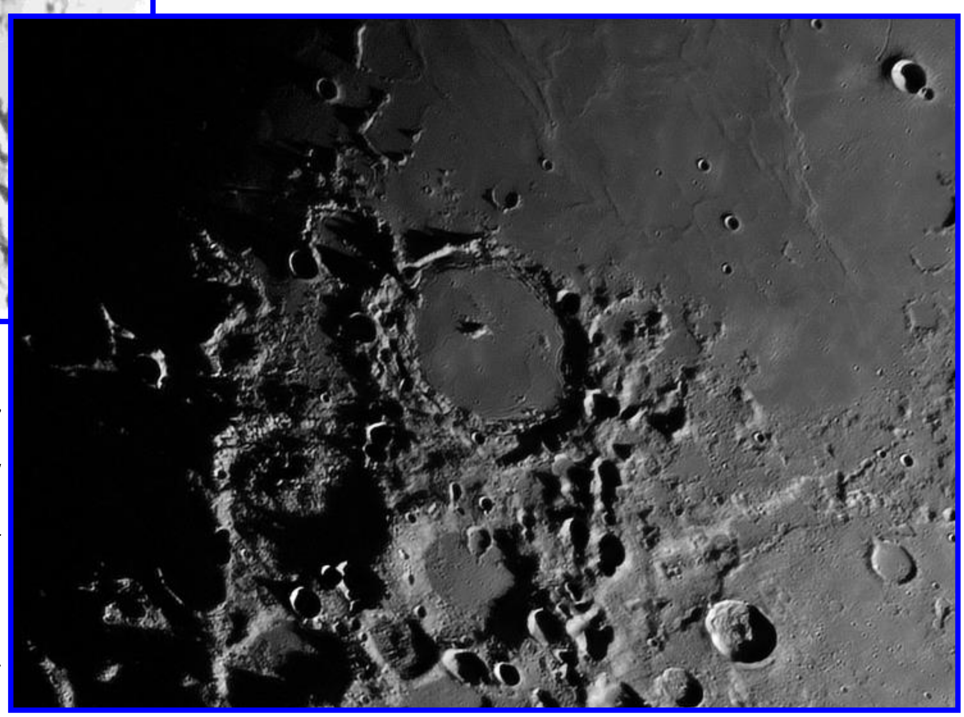


Figure 1. Pitatus-Hesiodus, *Howard Eskildsen, Ocala, Florida, USA. 30 March 2003 0318 UT. 10" f/16 refractor (Jose Olivarez), Nikon Coolpix 4300, 40 mm MaxView.*

On December 5, 2019, the cone of light split the shadowed interior of the 43 km Hesiodus. The shadow had three finger-like projections to the north of the light cone and a thick, lobster claw-like shadow below the light cone. The shadows were cast from the common wall between Hesiodus and the 97 km Pitatus, and the light of the cone projected through a breach in the common wall as seen in figure 2.



Pitatus-Hesiodus *Howard Eskildsen, Ocala, Florida, USA. 05 December 2019 2335 UT, colongitude 19.1º. C9.25 Schmidt-Cassegrain, f/10, fl 2395 mm, 2x barlow, W-25 red filter, DMK 41AU02.AS camera. Seeing 8/10, transparency 5/6.*

The Lunar Terminator Visualization Tool (LTVT) was used to measure the elevation of the prominences along the shared rim producing the finger-like shadows on the north side of the crates with estimated elevation error ±50m. Elevations producing the three "finger shadows," proceeding from the north margin of the gap are: 1325m (figure 3), 1188 m (figure 4), and 683m (figure 5) above the shadow terminal. The first most closely estimates the elevation above the floor, while the others may be starting to ascend the western rim and may not represent the true heights above the Hesiodus crater floor. South of the light cone, the prominence casting the shadow lies 1245m above tip of the shadow inside the crater (figure 6). Curiously, the highest summit on the north side of the gap lies near the gap, while the summit casting the shadow south of the gap is 5.8 km south of the gap per LTVT, with distance errors estimated as ±1 km.

LROC QuickMap gives an elevation estimate for the first peak measured as 1350 meters compared to the LTVT estimate of 1325 meters, a 25 meter or 2% difference. Whether this small of a difference is real or just due to chance is unclear with a single comparison.

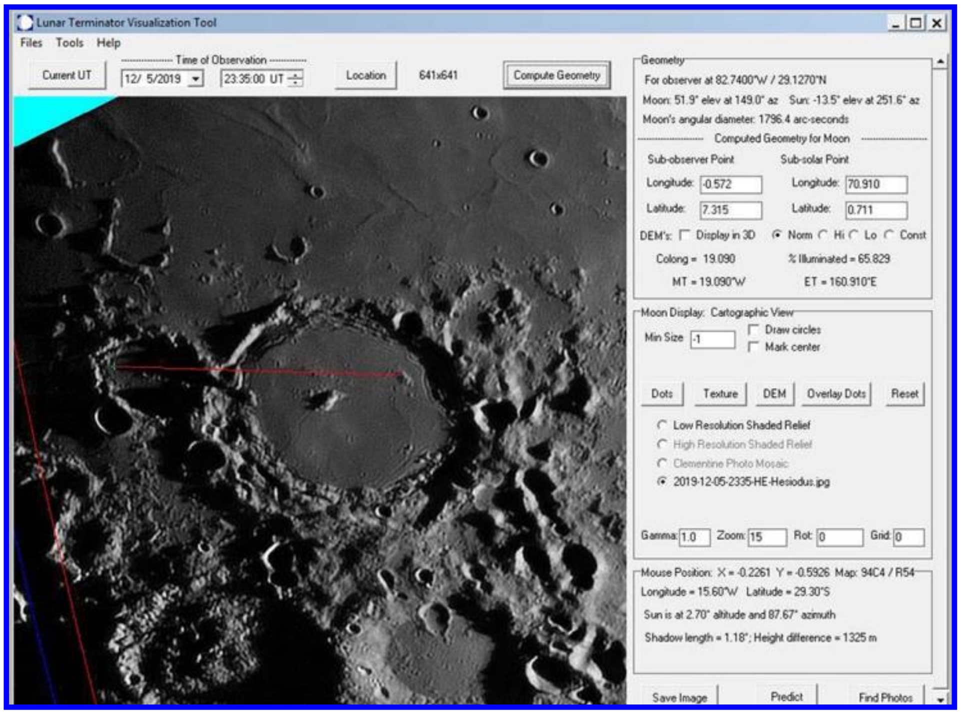


Figure 3

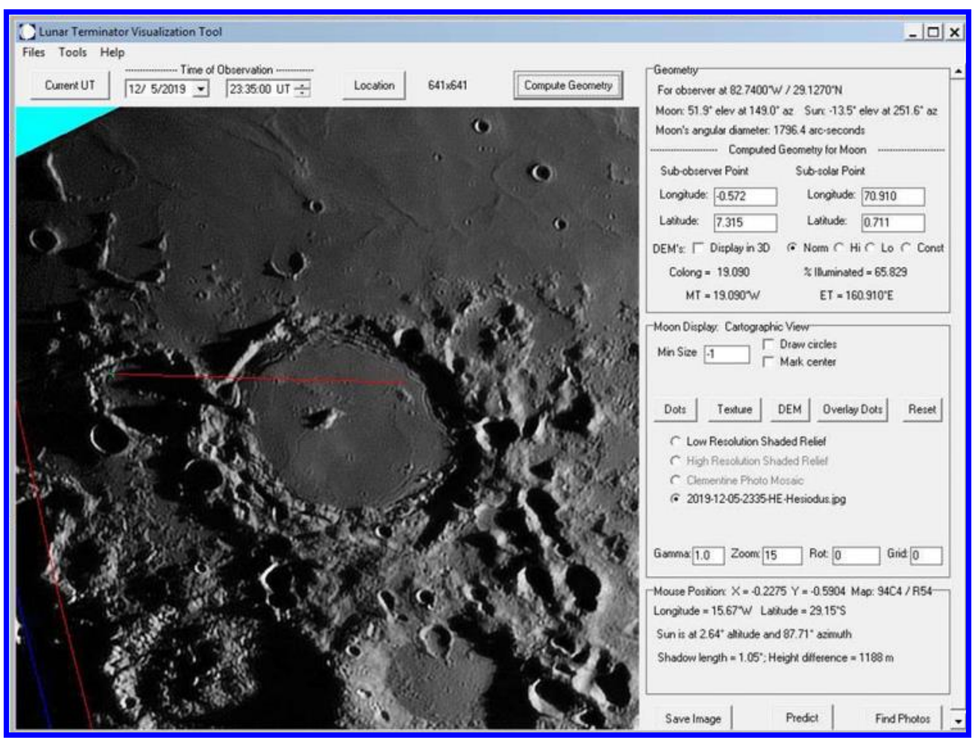


Figure 4

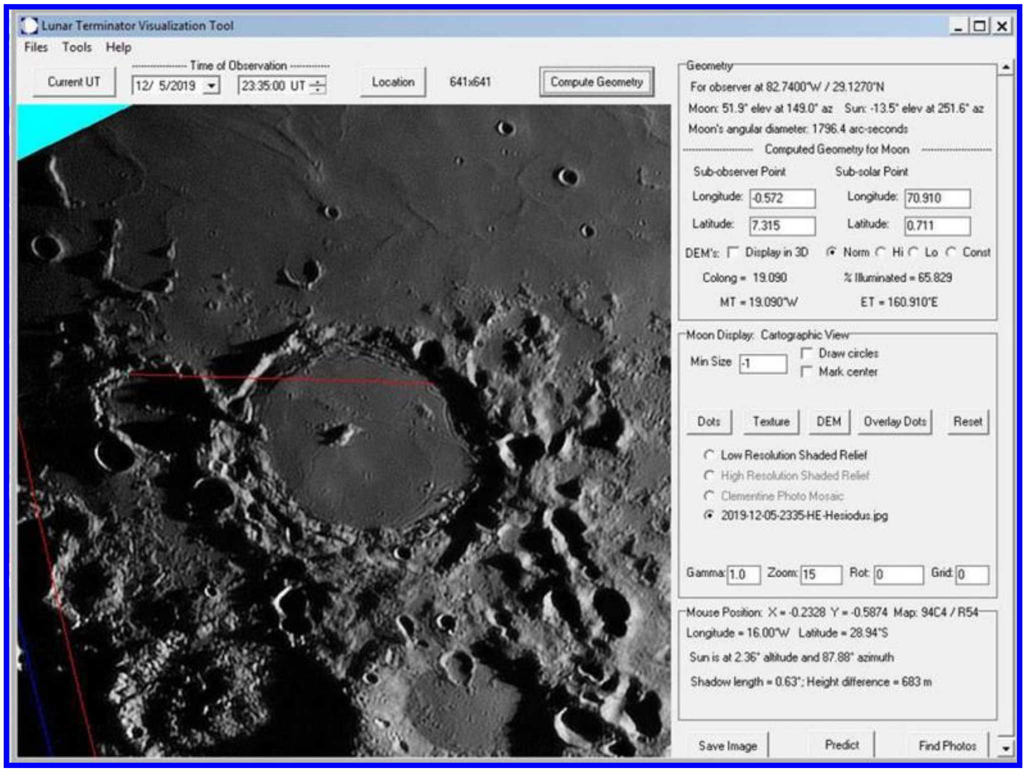


Figure 5

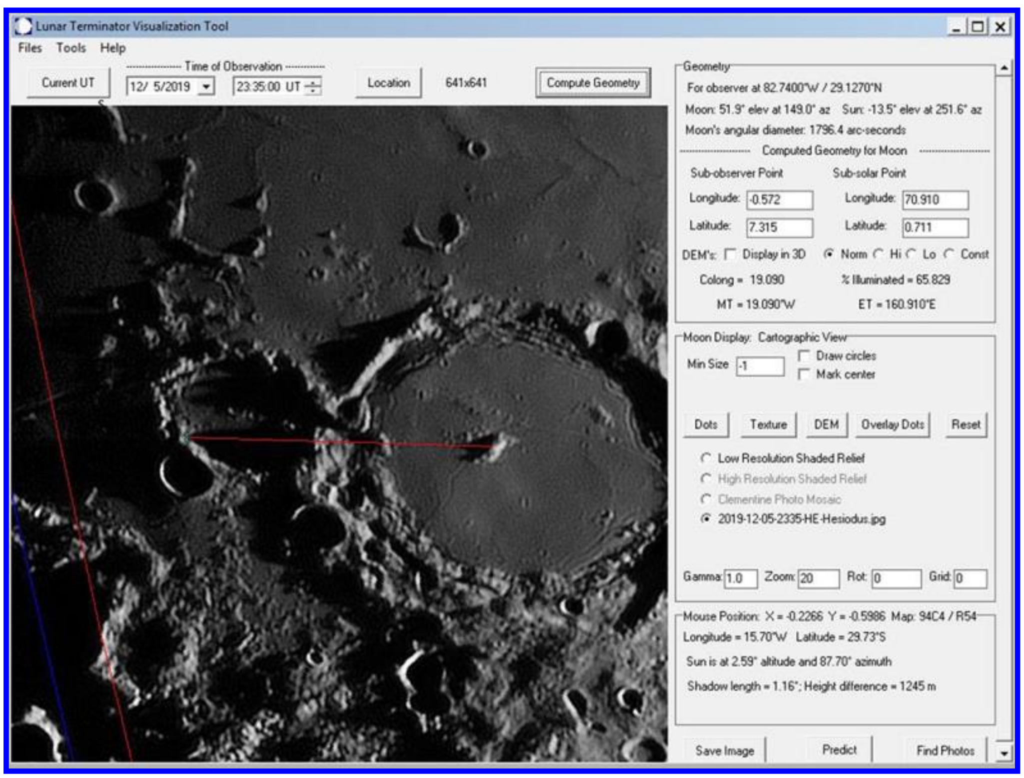


Figure 6

Per reference points shown on LTVT figure 7, the shadowed portion of the gap is 6.2 km wide at on the Hesiodus side of the rim (between points "a" and "b") and 5.3 km wide at the lower rim of Pitatus (between points "c" and "d"). The west to east gap length between these points measures 12.5 km, at an 120° azimuth. It is interesting to note that the shadow tip to peak azimuth measures 89° at this libration, or a 31° degree divergence. Some light is visible on the eastern gap floor, but it is impossible to tell how much, if any, of the western floor of the gap is in sunlight. The apex of the light cone appears to be about 4 km west of the Hesiodus rim (per LTVT) and appears to start at some rubble slightly higher than the crater floor.

The LROC QuickMap was used to measure the slope and width of the gap at its base and at the highest point on the north side of the gap and the point where the southern slope temporarily levels off. Figure 8 shows the measurement from north to south across

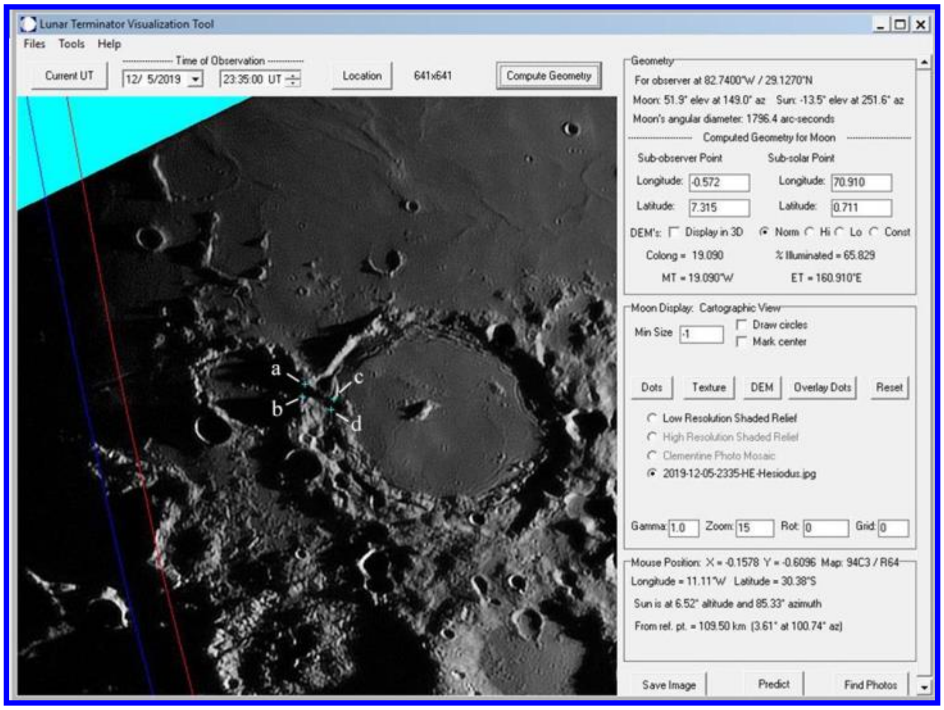


Figure 7

the gap passing through points a to b noted in Figure 7. The width between the upper portions of the gap is 12.1 km, while the floor of the gap to be 2.5 km. The north crest of the gap lies 1282 meters above the mean floor elevation and 5.9 km from the north side of the gap floor. The slope of the north wall calculates as 12°. The south rim, as measured from the point noted on figure 8, is 1425 meters above the mean floor elevation and 3.7 km from the south floor margin. The southern slope calculates to 21°.

Note: The LROC data would differ from the LTVT shadow measurements since only the shadowed portion of the gap was measured with LTVT and represents a section of the gap higher than the actual floor of the gap.

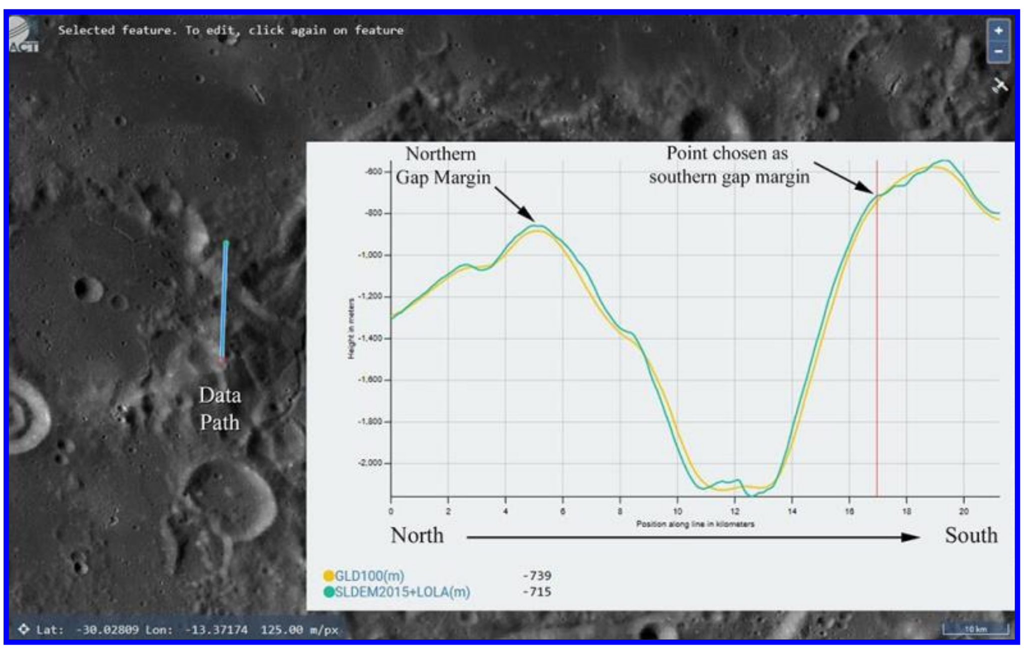


Figure 8

This is a fascinating area, and further images and measurements under different illuminations are planned for 2020.

Bullialdus and Surroundings
David Teske

I enjoy looking at the southwestern Moon when Bullialdus, the Copernicus-like crater in the lower center of this image is well lit. Named after the French astronomer, historian and theologian Ismaël Boulliau who lived from 1605 to 1694, Bullialdus is a 61 km diameter conspicuous crater that looks fresh, though it is ancient. It has terraced inner walls tower 3.5 km above the convex floor and a central mountain with multiple peaks. A great number of landslips inside its walls tend to give parts of its walls a squared off appearance. The interior of Bullialdus has interesting features including a ridge running from the central peaks to the inside of the southeast wall. These crater walls are gabbro and basalt as expected, but the 1 km high central peaks are made of norite, made of the minerals plagioclase and calcium-poor pyroxene. This suggests that the central peak was excavated from 6 km below the lunar surface, so Bullialdus must have excavated different rock layers beneath the mare lavas that filled the Nubium basin.

Just outside of Bullialdus the Nubium basin adjacent to the crater seems to have been partially melted by the impact. Outside of Bullialdus are hundreds of "bomb craters" that ring its parent crater, the result of secondary ejecta from the main event. Looking carefully, these secondaries surround Bullialdus except to its northwest where these secondaries are covered by the same lavas that filled Lubiniezky. These younger lavas are then covered by much younger ray material from Tycho, better seen later in the lunar day. Lubiniezky is the flooded ring just northwest (upper left) of Bullialdus. At 39 km in diameter, its ring barely rises above the floods of Nubium. Named after the Polish astronomer Stanislaus Lubiniezky who lived from 1623 to 1675, you can just about trace its rim for 360^{o}, though there is a gap on its southeast rim.

The southeast rim of Bullialdus has a bent wavy form to it as Bullialdus seems to have impacted near the pre-existing crater Bullialdus A. Note that Bullialdus A mirrors Bullialdus with a wavy form to its southeast wall. A bit further south towards Kies is the fresh crater Bullialdus B that sits on the Bullialdus ejecta blanket. Looking closely, Bullialdus B is a smaller version of Bullialdus with terraced inner walls and central rises.

Because it lacks rays and has some impact craters on its floor, though it has the same morphology as Tycho, it is an older sibling. The age of Bullialdus is of the Eratosthenian Period (3.15 billion years old) to late Imbrian Period some 3.2 billion years old.

Southeast of Bullialdus on the plains of Mare Nubium lies the odd, heavily eroded lava filled crater Wolf. The remnants of the southern wall are overlapped by Wolf B. The 25 km diameter crater is immediately adjacent to the west of a mountain 17 by 17 km in size.

Southwest of Bullialdus is the relatively fresh-looking crater König. At 24 km in diameter, this crater named after Rudolf König, an Austrian selenographer, musician and merchant who lived from 1865 to 1927, has walls of irregular shape. Its floor is bowl-shaped with a central mound. Bright ejecta from Tycho can be seen on part of the crater wall as one of the rays of Tycho cross the floor König.

Near the bottom center of the image is one of my favorite craters to observe, that of Kies. Named after Johann Kies, a German mathematician and astronomer who lived from 1713 to 1781, Kies is a flooded crater with a hill that is an extension of its southern wall. At around 4 billion years old, much older that the Mare Nubium lavas that flooded it, Kies is 45 km across. Its low crater wall is polygonal in shape and is breached in at least two places. It was the breach to the west that might have been the entry point of the Mare Nubium lavas that flooded Kies. Directly west of Kies is Kies π, one of the most perfectly formed domes that you can see on the Moon. It is 14 km wide and 160 m tall. At the top of Kies π is a summit crater 1 km across.

I end this survey with some delipidated craters east of Bullialdus and a mystery. Northeast of Bullialdus is Opelt, the 49 km diameter remains of a crater. It has the fresh crater Opelt, E 8.0 km in diameter, on its southwest side. South of Opelt is a 34 km diameter remnant of a crater Gould. Gould has a fresh crater, Gould P, 7.5 km in diameter, on its east side. I call attention to Gould because emanating through Gould, toward Bullialdus A is an interesting string of craters. Older maps referred to it as Rima Gould I, though it is clearly a crater chain. The largest crater in the chain is Gould B, 3.5 km in diameter, on its westernmost end. From where did this crater chain originate? It is not in line with Bullialdus, so I don't think it was formed by that impact. Any thoughts? The Moon still holds so many mysteries that are ours to ponder and enjoy.

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Bullialdus, *David Teske, Louisville, Mississippi, USA, 06 January 2020 at 0141 UT, colongitude 34.1°. 180 mm Takahashi Mewlon, ZWOASI120mms, 500 frames, Firecapture, Registax, Photoshop. Seeing 8/10.*

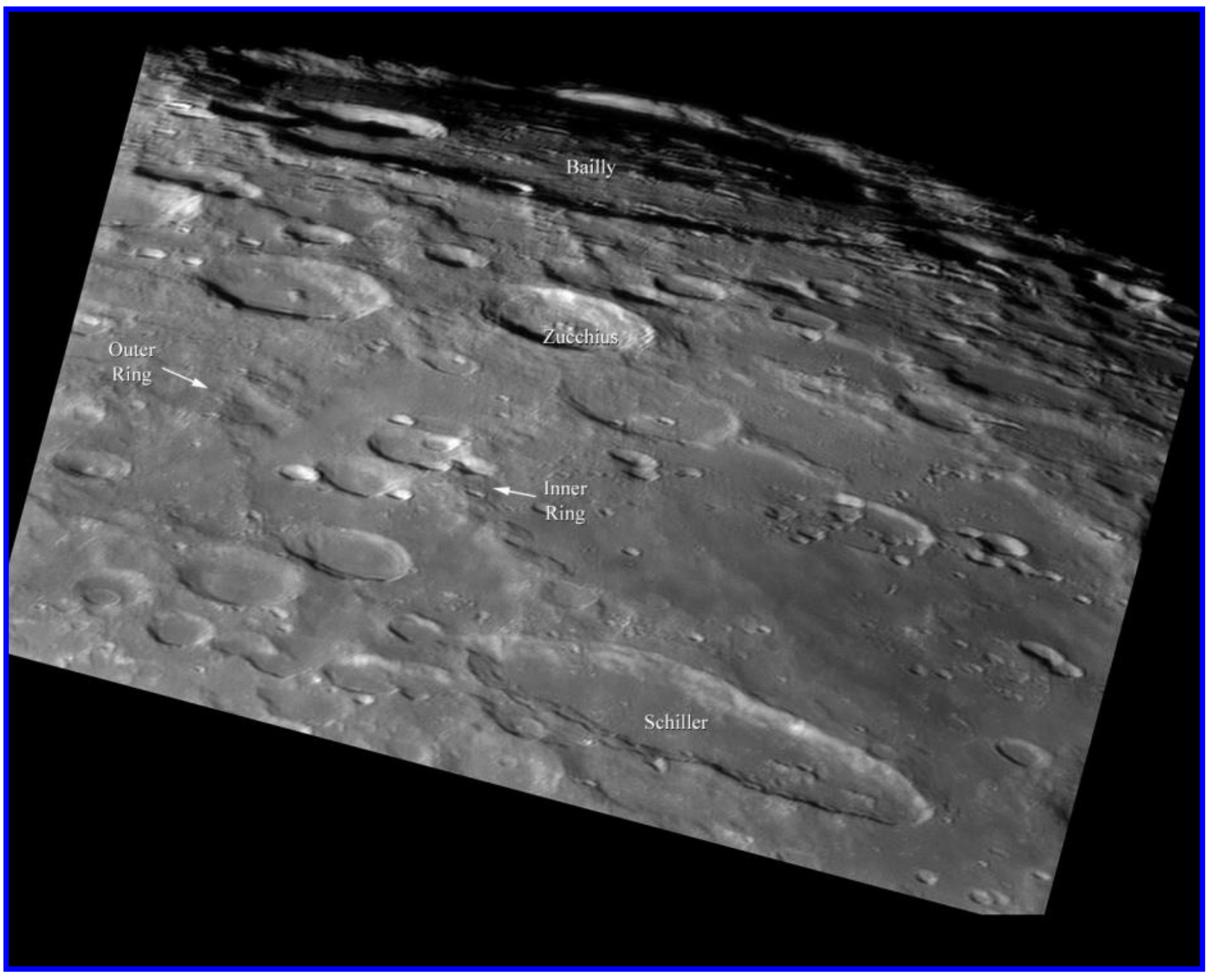
Basin Transition

Howard Eskildsen

This image is oriented in the telescopic view (south up, east-west reversed) and shows the two impact basins, Bailly and the Schiller-Zucchius Basin. Bailly has been listed in the past as the largest impact crater on the Moon. Per page 293 of *The Moon* by Wilkins and Moore, it was described as "The largest of all the lunar ringed structures, the 'seas' alone excepted." It has a diameter of 303 km per the Virtual Moon Atlas (VMA) and the *Atlas of the Moon* by Rükl. However, it is now recognized as the smallest impact basin with a small, irregular inner ring of 150 km and outer ring 300 km (Table 4.1, page 64, of *The Geological History of the Moon* by Wilhelms, McCauley, and Trask). Hints of the inner rim can be seen on near the label "Bailly" on the image.

In contrast, the inner and outer rings of the slightly larger Schiller-Zucchius Basin (SZ), named for two nearby craters, are quite apparent and are marked by arrows on the image. This basin's outer ring diameter is listed as 325 km and inner ring 165 by Wilhelms, while Chuck Wood's Impact Basin Database (https://web.archive.org/web/20110615073328/http://www.lpod.org/cwm/DataStuff/Lunar%20Basins.htm) lists a minimally larger size of 335km outer ring, and 175 km inner ring. Comparison of the two basins shows how the inner ring becomes more apparent with increase in size.

Schiller, located on the outer SZ ring, is an oblique impact crater 179km by 70 km in size and is described as " larger version of Messier" by Wood and Collins in the *21st Century Atlas of the Moon*. It adds to the delight of this target of opportunity as the Moon nears full phase.

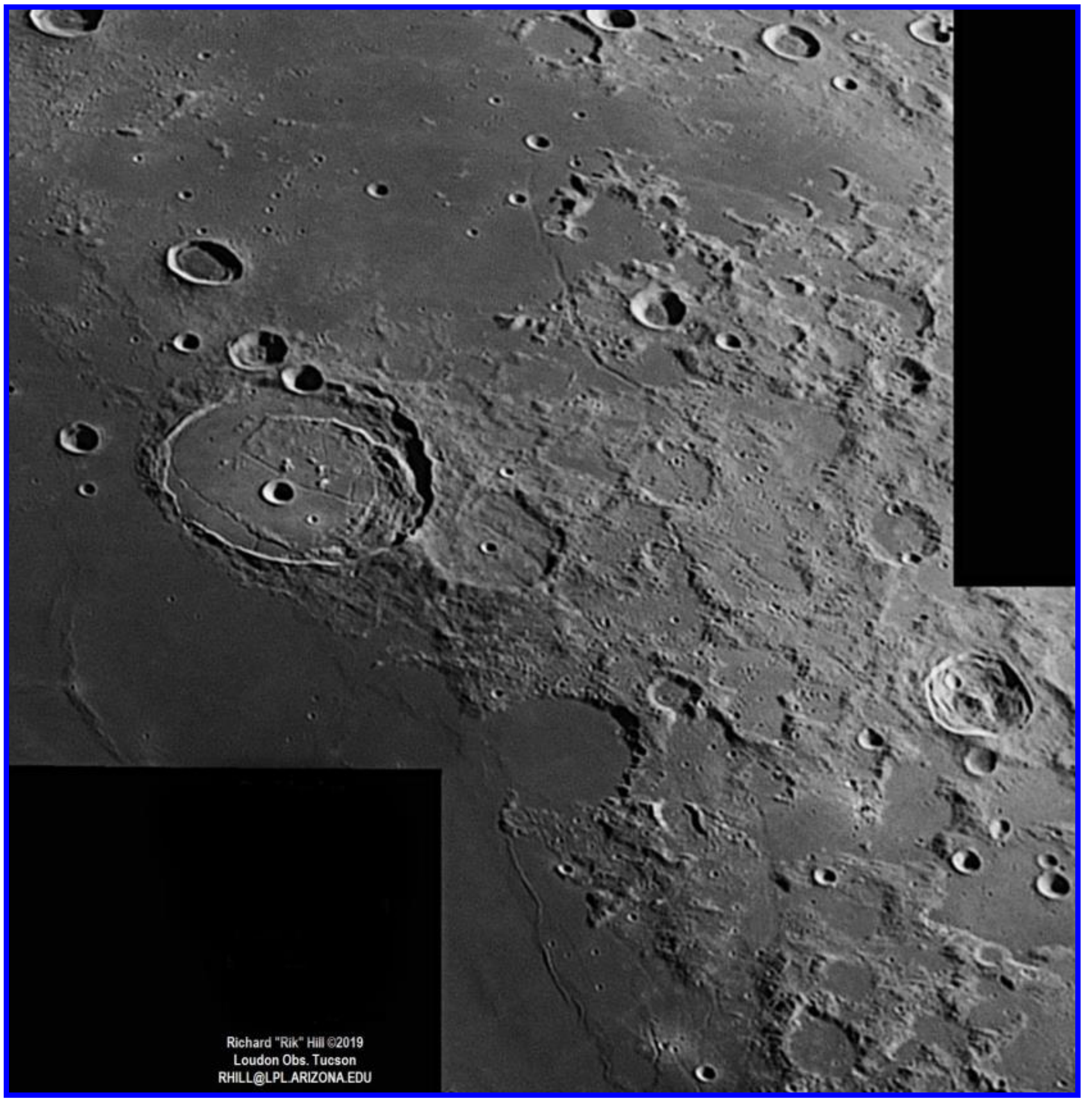


Bailly and Schiller-Zucchius Basin, *Howard Eskildsen, Ocala, Florida, USA. 09 January 2020 0152 UT, colongitude 73.6°. C9.25 Schmidt-Cassegrain, f/10, fl 2395 mm, 2x barlow, IR-block filter, DMK 41AU02.AS camera. Seeing 7/10, transparency 3/6. Image rotated 180° from normal orientation.*

A Mid-Morning Landscape

Rik Hill

The great 99 km diameter crater Posidonius dominates this image with its system of interior rimae and the curious mountainous ridge on the east side (right side) of the crater floor. There is no central peak but there is an interesting ring of small peaks on the floor near center. The mountains are thought to be a possible wall of a near center concentric crater that once existed here. They curve around to the south and then up the other side along the large rima on the east side. This makes that rima easier to spot. Southeast and adjacent to Posidonius is the older and hence more weathered crater Chacornac (53 km). It has three rimae running southeast through it and two of them extend beyond the crater down to a crater that has become and bay on the shores of Mare Serenitatis to the west (left). This bay is Le Monnier (63 km) and is quite an attractive feature for study. Leading south from the lower promontory of this bay is a nice this delicate wrinkle ridge, Dorsa Aldovandri. There are three craters north of Posidonius, the largest of which is Daniell (31 km). It lies in Lacus Somniorum.



East of Daniell and Posidonius is a large rima, Rima G. Bond (155 km long) and just beyond it is the crater G. Bond (32 km). This rima is a graben type rima where the central portion has dropped below the outer portions as a block, clearly seen here and different than the thin faults in Chacornac. Above G. Bond is a broken ring of mountains that is Hall (41 km), the last remnants of an old crater. Way south on the east edge (right) of this image is the very clear oddly shaped crater, Romer (41 km) with its very nice system Rimae Romer just to the west of it running 114 km, almost all the way to Rima G. Bond. Lots of cracks to see.

Posidonius, *Richard Hill, Tucson, Arizona, USA. 09 July 2019 0248 UT, colongitude 351.3°. TEC 8" f/20 Mak-Cas, Skyris 445M camera, 610 nm filter. Seeing 9/10.*

Rimae Sirsalis
Howard Eskildsen

Sirsalis rille extends 300 km from top to bottom of this image. Near the top of the image, the rille passes east of the crater pair, Sirsalis (closest to rille) and Sirsalis A. The rille is buried for a short distance by ejecta from the small craters Sirsalis E and F (lower crater). Near the central image another smaller branch joins the main rille. Near the bottom of the image Sirsalis rille terminates in a graceful curve in an un named crater complex where it disrupts an older rille, Rimae Darwin, which originates in the crater Darwin to the left of the intersection.

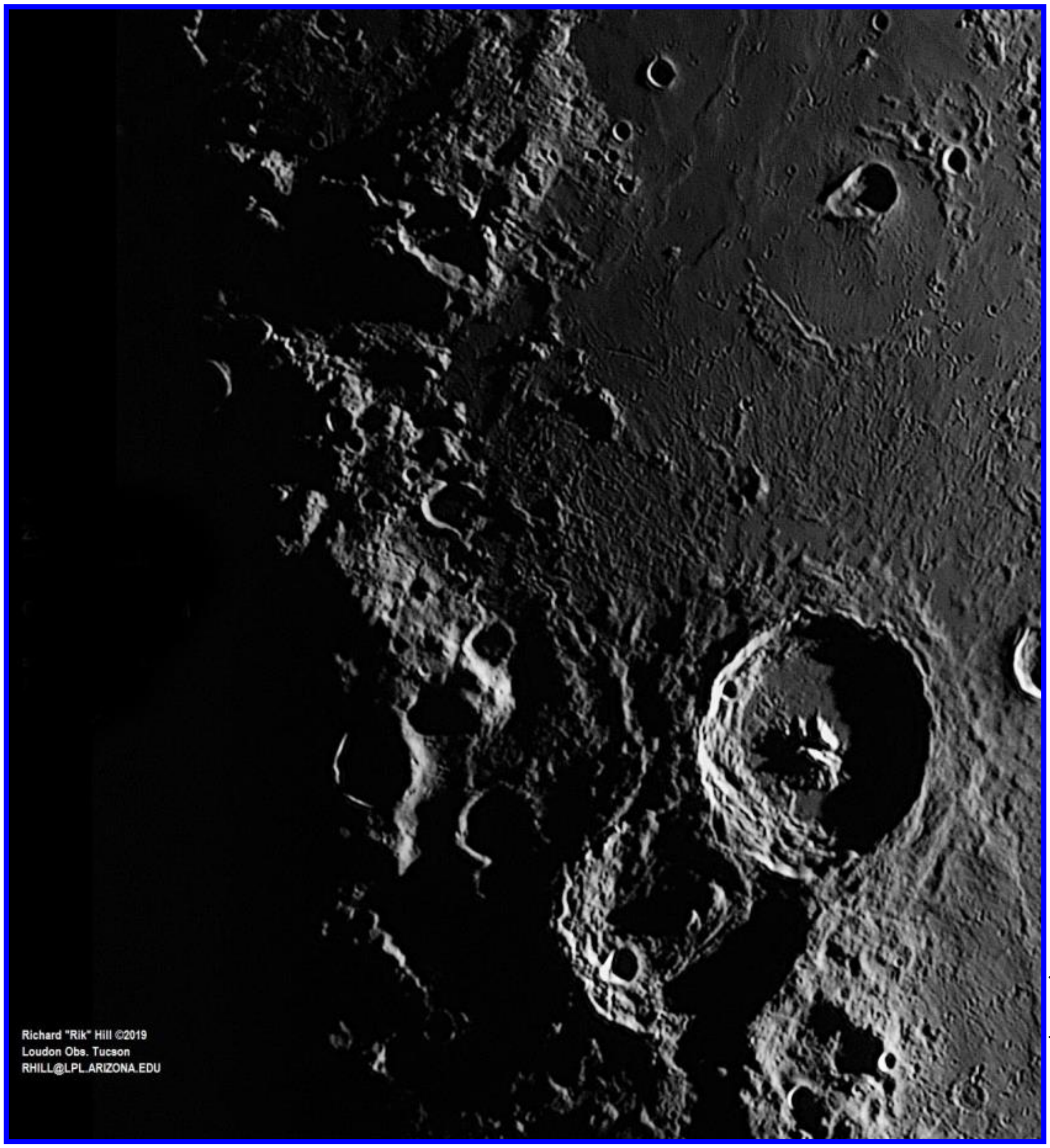
Rimae Sirsalis, *Howard Eskildsen, Ocala, Florida, USA. 09 January 2020 0146 UT, colongitude 73.5^o. C9.25 Schmidt-Cassegrain, f/10, fl 2395 mm, 2x barlow, IR-block filter, DMK 41AU02.AS camera. Seeing 7/10, transparency 3/6.*

Asperitatis Daybreak

Rik Hill

Here it is, irresistible when on the terminator, "the awfulest" crater on the Moon as my mentor Jim Loudon (from University of Michigan) used to call the 104 km diameter crater, Theophilus seen here in all its magnificent glory just below center. Its spectacular central peaks and wonderful terraced western wall are displayed in morning sunlight with the crater still half filled with shadow. Just below is the older, more tortured crater Cyrillus (100 km) with its great rimae on the floor just beyond the shadow's edge. West of Cyrillus (left) still deep in shadow is Ibn Rushd (34 km) and a little further is similar sized Kant (32 km) even deeper in shadow. Above these two craters forming an isosceles triangle is Mons Penck rising some 4 km above the plain to its east. North of Theophilus is the plain Sinus Asperitatis splattered with the radial streaks of ejecta from the Theophilus impact, full of small (<5 km) secondary craters. This is an enjoyable area for high powered viewing or imaging on a good night, with all the detail available.

Moving further north we see the little sideways pear-shaped crater Torricelli (24 km in the long dimension). It sits north of center in a much more ancient crater that is almost completely destroyed and only well seen at low lighting angle as with this image. It is a shame that this feature is unnamed as it is very interesting with the rima on the western wall. Torricelli gets its shape from the merging of two impacts, one about 15 km in diameter and the other about 10 km, as measured on LROC QuickMap. It is likely they occurred at nearly the same time creating the smooth floor. Note the small crater on the southern wall of Torricelli. Though it looks quite round on the QuickMap it shows as triangular! Before leaving this area of craggy delights scan over to the western shore of the Sinus to see the odd-shaped, shadow filled crater Hypatia (43 km). Though it has no central peak per se, we can see two little points of light in the interior where some low mountains are just catching the morning light. Another day begins in Sinus Asperitatis.



Theophilus, *Richard Hill, Tucson, Arizona, USA. 08 July 2019 0251 UT, colongitude 339.0°. TEC 8" f/20 Mak-Cas, Skyris 445M camera, 610 nm filter. Seeing 9/10.*

Birt Domes and Region
Howard Eskildsen

Behold the Sword of Huygens cutting vertically across the central image with the “handle” at the lower end. Rupes Recta, which forms the blade is a normal fault that is 110 km long and 300 meters high per the Virtual Moon Atlas (VMA). To its left, the craters Birt (17km diameter) and Birt A (6.8 km) overlap, and both show asymmetrical slumping on their interiors.

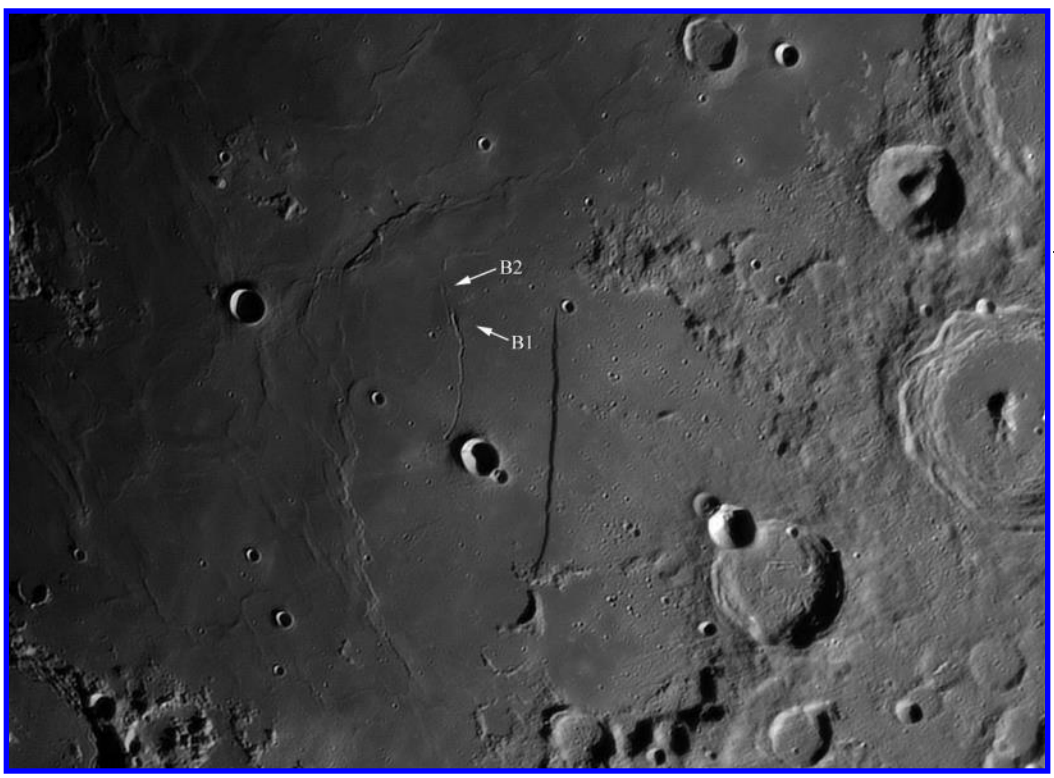
To the upper left of Birt, Rima Birt courses upward about 55 km per LROC QuickMap measurements and terminates at the dome B1 noted on the image. Near its termination on the left margin of B1, a rille continues upward for another 16 km to B2. The rilles run radial to the Imbrium Basin. Domes B1 and B2 are "bisected domes" and imply a volcanic origin for the rilles. Per http://rupesrectadomes.blogspot.com/ Birt 1 is 16 km wide, 170 meters high and has a slope of 1.2 degrees. Birt 2 is 7.8 km wide, 70 km high, with a slope of 1.0 degrees.

Farther to the left, the 15 km Nicollet rests at the intersection of several wrinkle ridges or "dorsa." These were caused by compression of the terrain, probably sagging under the weight of the mare basalt as it cooled. Just below Nicollet the dorsa form an irregular arc reminiscent of Lamont in Mare Tranquillitatis.

On the lower right of the image a trio of craters resembles an expansion of the Birt and Birt A theme. The 58 km Thebit has its northwest rim pocked by the margin of 20 km Thebit A, which is in turn indented by 12 km Thebit L. The latter two craters also show asymmetrical interior slumping, likely from their common wall and leaving the question how they might have appeared without the slumping.

Finally, part of 97 km Arzachel is visible on the right margin and above it the strange looking, 40 km Alpetragius. It has a central peak about 15 km wide at the base per my measurement using QuickMap. This is huge for a central peak and brings to mind the old quote: "That's no banana, that's my nose..." (If you're under 50, or just don't know, Google "Jimmy Durante”) The crater interior is covered in ejecta which may contribute to its strange central peak.

I just love this part of the Moon.



Birt Domes, *Howard Eskildsen, Ocala, Florida, USA. 05 December 2019 2336 UT, colongitude 19.1^o. C9.25 Schmidt-Cassegrain, f/10, fl 2395 mm, 2x barlow, W-25 red filter, DMK 41AU02.AS camera. Seeing 8/10, transparency 5/6.*

Wonderful Things to See

Rik Hill

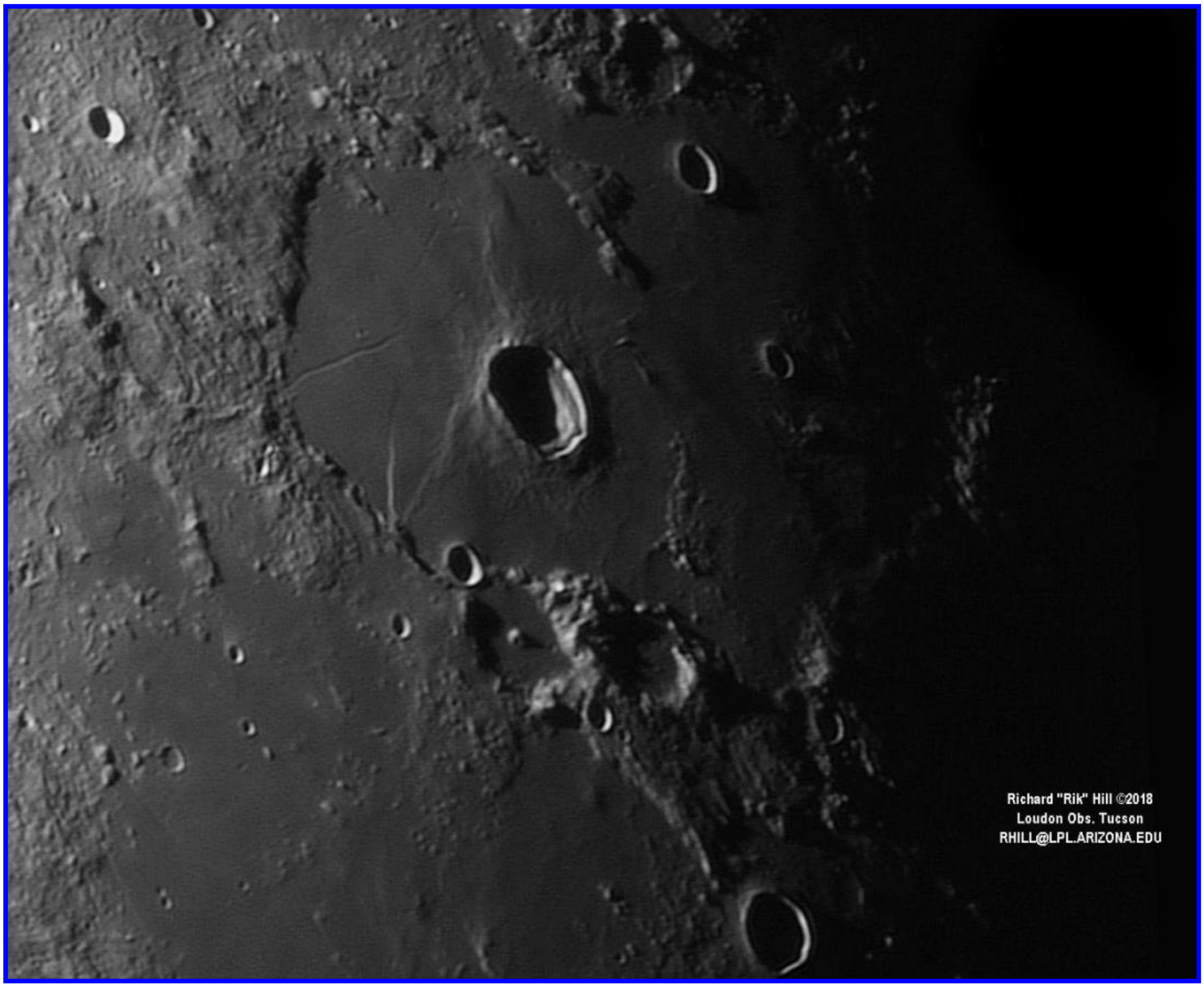
There are just some scenes on the lunar landscape that just never fail to thrill the observer and this is one of them. So much is available to see from Aristoteles to Hercules that one can spend hours here in pure delight. First, we have the dominant Aristoteles (90 km) on the left side of the image with its beautiful hummocky terrain and Mitchell (31 km) on its east (right) wall. Note the wonderful detail on the inner west wall of Aristoteles. Above this is the crater Galle (22 km) isolated in the eastern Mare Frigoris. Further to the west of Aristoteles, deep in the shadows you can see the tops of the walls of Egede (37 km) as a ring just coming into the light. Below Aristoteles is the equally impressive though smaller Eudoxus (70 km) with the ejecta field to the east softening the details like those seen to the south.

Just east of the center of this image is the polygonal Lacus Mortis with the various rimae contained with it and the more or less central crater Bürg (41 km). Above Bürg is another fairly polygonal crater Baily (27 km). Then below Bürg are two interesting craters Plana (46 km) on the left and Mason (44 km) on the right. To my eye they don't look so dissimilar in size but I like the little central peak in Plana, the last remnant of the buried mountain. Below Mason you can see the dome Mason-1 in the flat northern portion of Lacus Somniorum that extends to the bottom of this image. Over near the right edge is the rather isolated crater Grove (29 km). Above Grove in the upper right (northeast) corner of this image is another great crater Hercules (71 km) with nice terraced walls. This is a difficult scene to leave on a good clear and calm night!

Goodnight to the Lake of Death

Rik Hill

The other day I promulgated an image covering from Aristoteles to Hercules in sunrise. Today I want to zoom in one a small area of that region this time at sunset. Just above the center in this image is the crater Bürg (41 km) is the center of the rough hexagon Lacus Mortis (155 km). The detail in the eastern wall of Bürg is nicely displayed here along with several of the diverse rimae on the floor of this Lacus. Below Bürg are two wonderful craters, the flat floored Mason (44 km) on the right and Plana (46 km) with the little central peak to the left. The central peak, with the 3 km impact crater on the south side, is only the tip of what was once a much larger mountain but for the lava flooding of this crater that filled up the interior. The only feature on the floor of this crater seen here is a small (2.5 km) crater at the tip of the shadow from the central peak. South of these two is Lacus Somniorum of which you can only see a small northern portion here but interestingly just south of Plana you can see the dome Mason-1 which is well shown on the floor of the Lacus. This is always an added treat when observing in this area!



Lacus Mortis, *Richard Hill, Tucson, Arizona, USA. 01 August 2018 0726 UT, colongitude 145.1°. TEC 8" f/20 Mak-Cas, Skyris 445M camera, 610 nm filter. Seeing 8-9/10.*

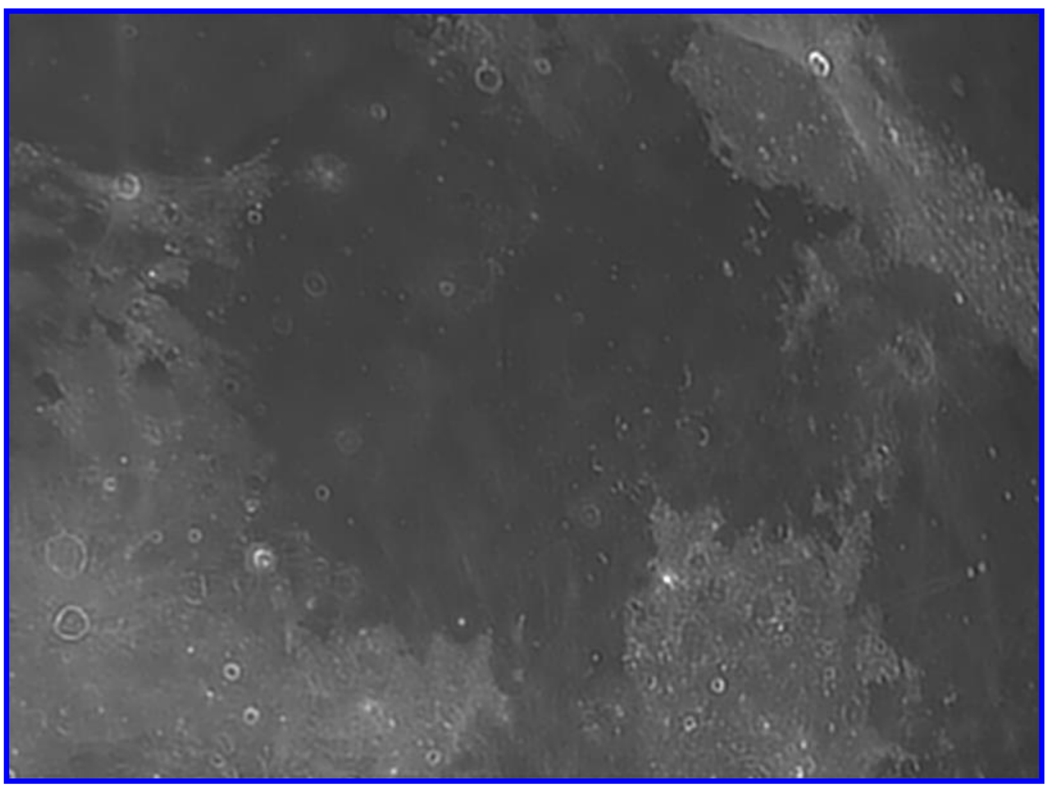
Recent Topographic Studies

***Ptolemaeus,** Raúl Roberto Podestá, SLA, Formosa, Argentina. 03 January 2020, 2345 UT. 127 mm Maksutov-Cassegrain, Hokenn CCD Imager.*

***Langrenus,** Sergio Babino, Montevideo, Uruguay. 10 December 2019 0122 UT. 250 mm Catadioptric telescope, ZWO 174 camera.*

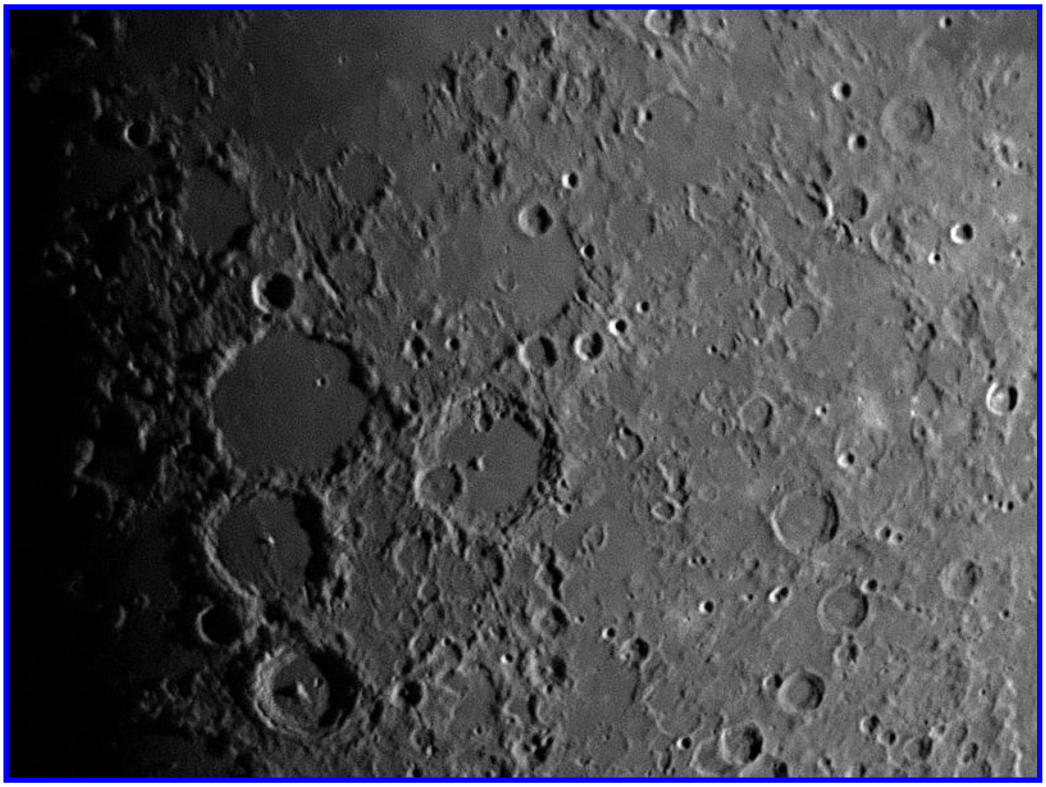
Recent Topographic Studies

Gassendi, Walter Ricardo Elias, AEA - Oro Verde, Entre Rios, Argentina. 06 January 2020 2308 UT. Meade LX 200 10 inch Schmidt Cassegrain telescope, ZWO ASI 120MM/S camera.

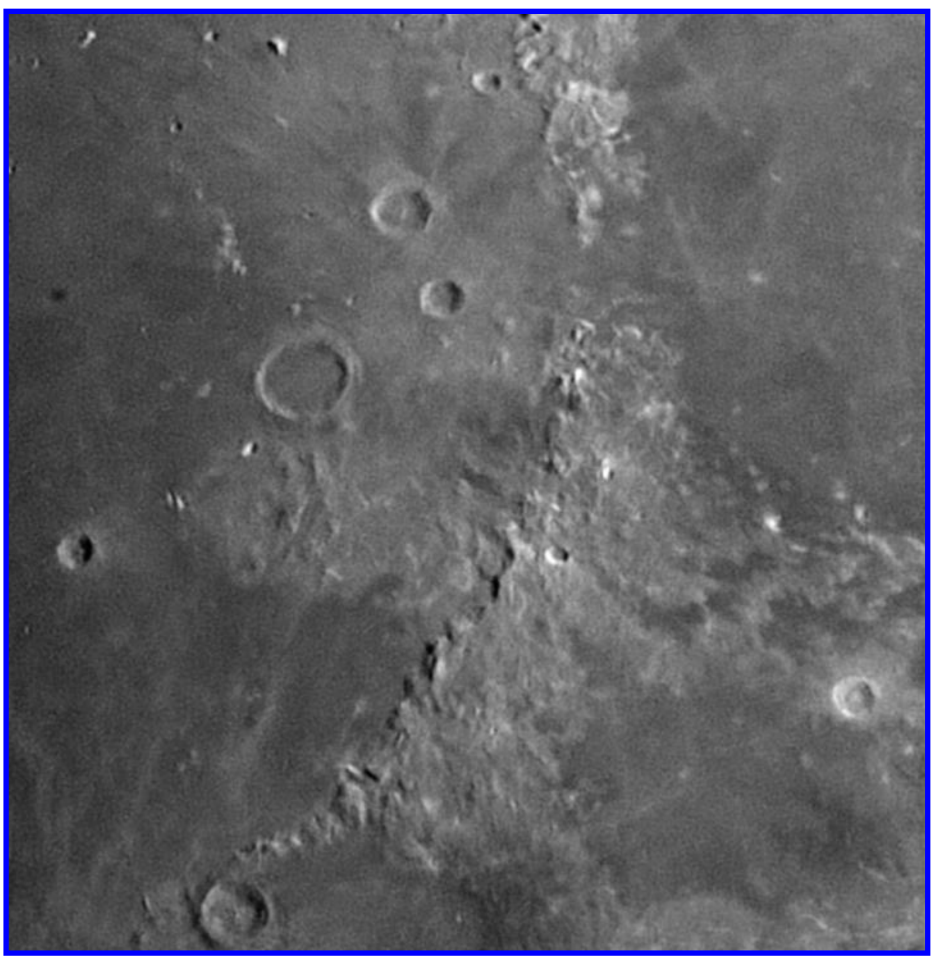


Mare Tranquillitatis, *Johana Gonzalez, AEA - Oro Verde, Entre Rios, Argentina. 10 January 2020 0113 UT. Meade LX 200 Schmidt Cassegrain telescope, ZWO ASI 120 MM/S camera.*

Recent Topographic Studies

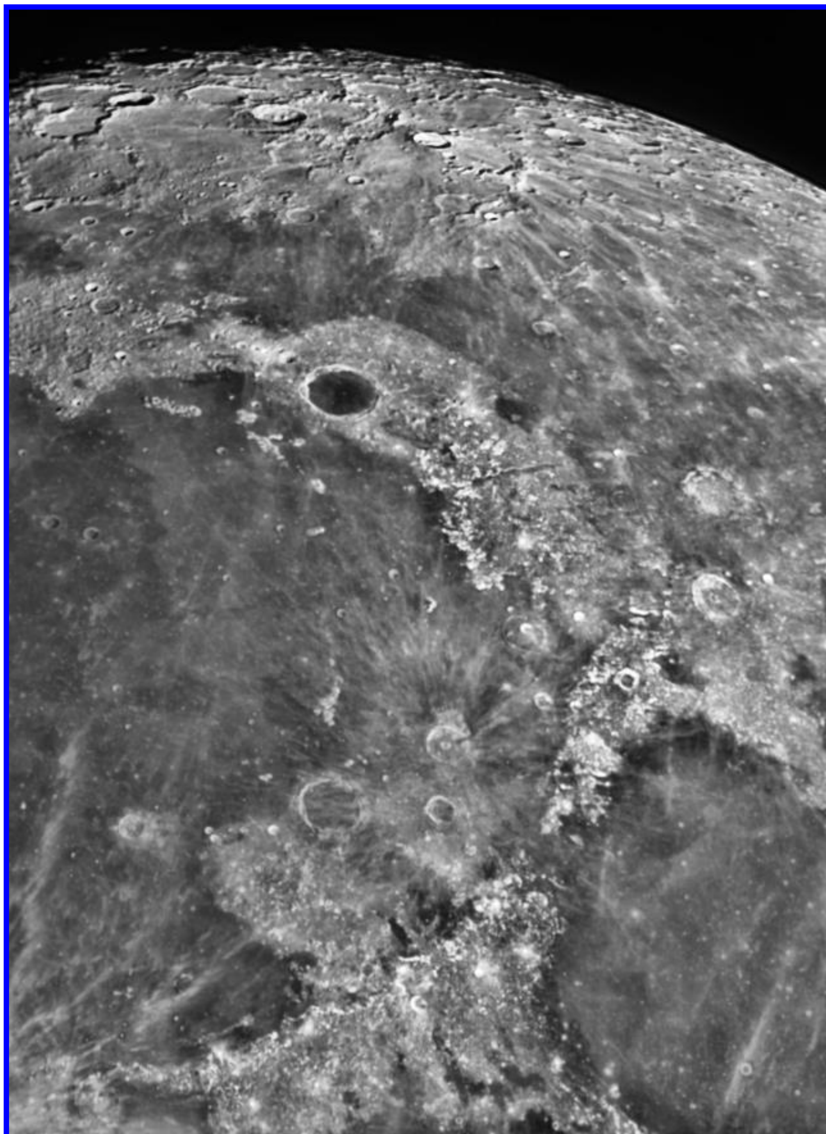


Alphonsus, *Facundo Gramer, AEA - Oro Verde, Entre Rios, Argentina. 05 December 2019 0222 UT. Meade LX 200 10 inch Schmidt Cassegrain telescope, ZWO ASI 120MM/S camera.*

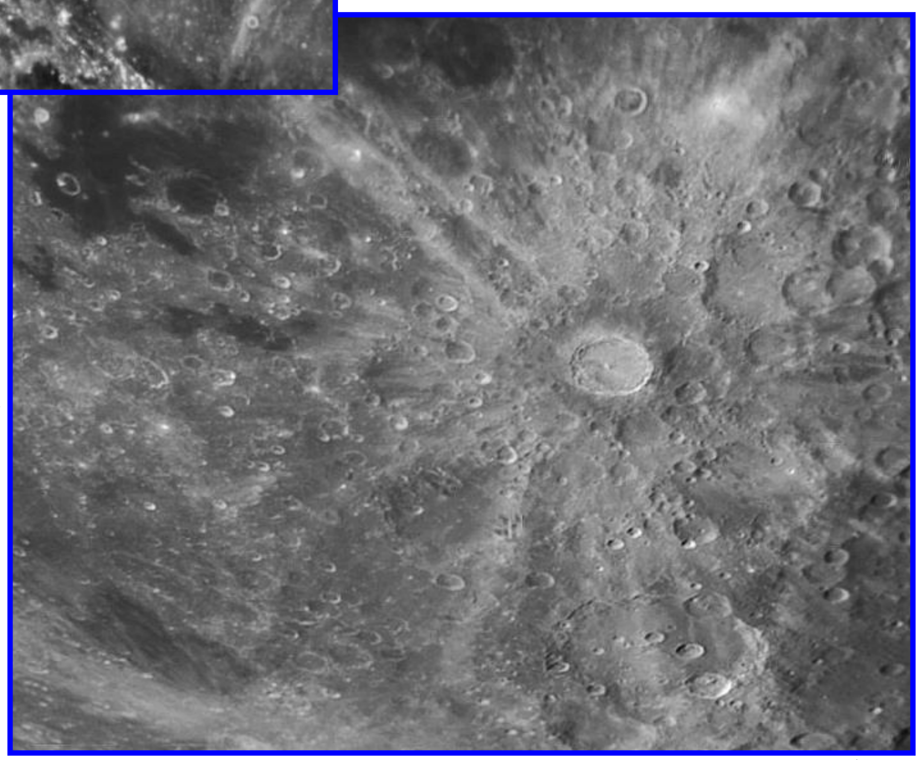


Conon, *Aylen Borgatello, AEA - Oro Verde, Entre Rios, Argentina. 07 December 2019 0330 UT. Meade LX 200 10 inch Schmidt Cassegrain telescope, ZWO ASI 120MM/S camera.*

Recent Topographic Studies



Plato, *Sergio Babino, Montevideo, Uruguay. 10 December 2019 0140 UT. 250 mm Catadioptric telescope, ZWO 174 camera.*



Tycho, *Michael E. Sweetman, Tucson, Arizona, USA. 02 June 2018 1127 UT. 3" Celestron/Vixen refractor telescope f/22, Skyris 132M camera, Baader fringe filter. Seeing 4/10, transparency 3/6.*

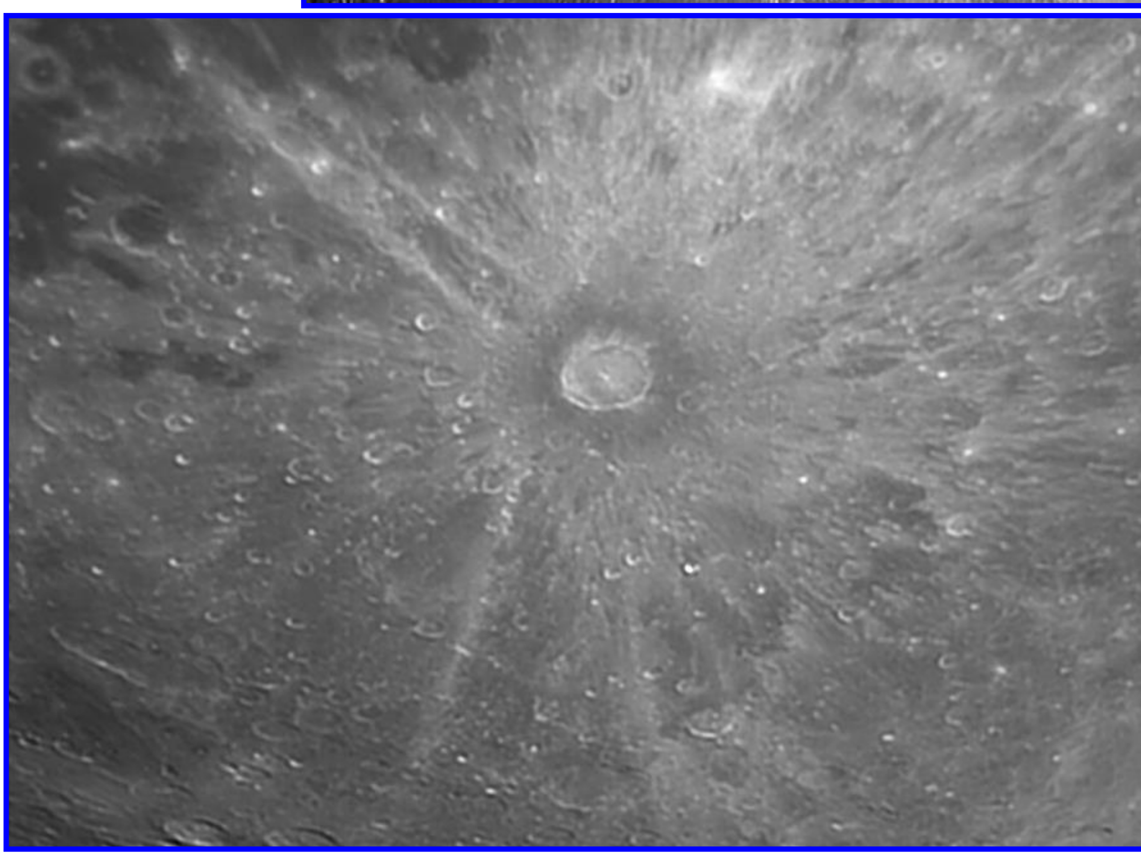
Recent Topographic Studies

Vallis Alpes , *Luigi Morrone, Agerola, Italy. 03 January 2020 1719 UT. Celestron 14 Edge SCT, 355 mm, Fornax Mount, ZWO ASI 178M camera, barlow Zeiss Abbe, Baader R+IR filter 610 nm.*

89% Waxing Gibbous Moon*, Jairo Chavez, Popayán, Colombia. 08 January 2020 0146 UT. 114 mm KONUS refractor telescope, MOTO ES PLAY.*

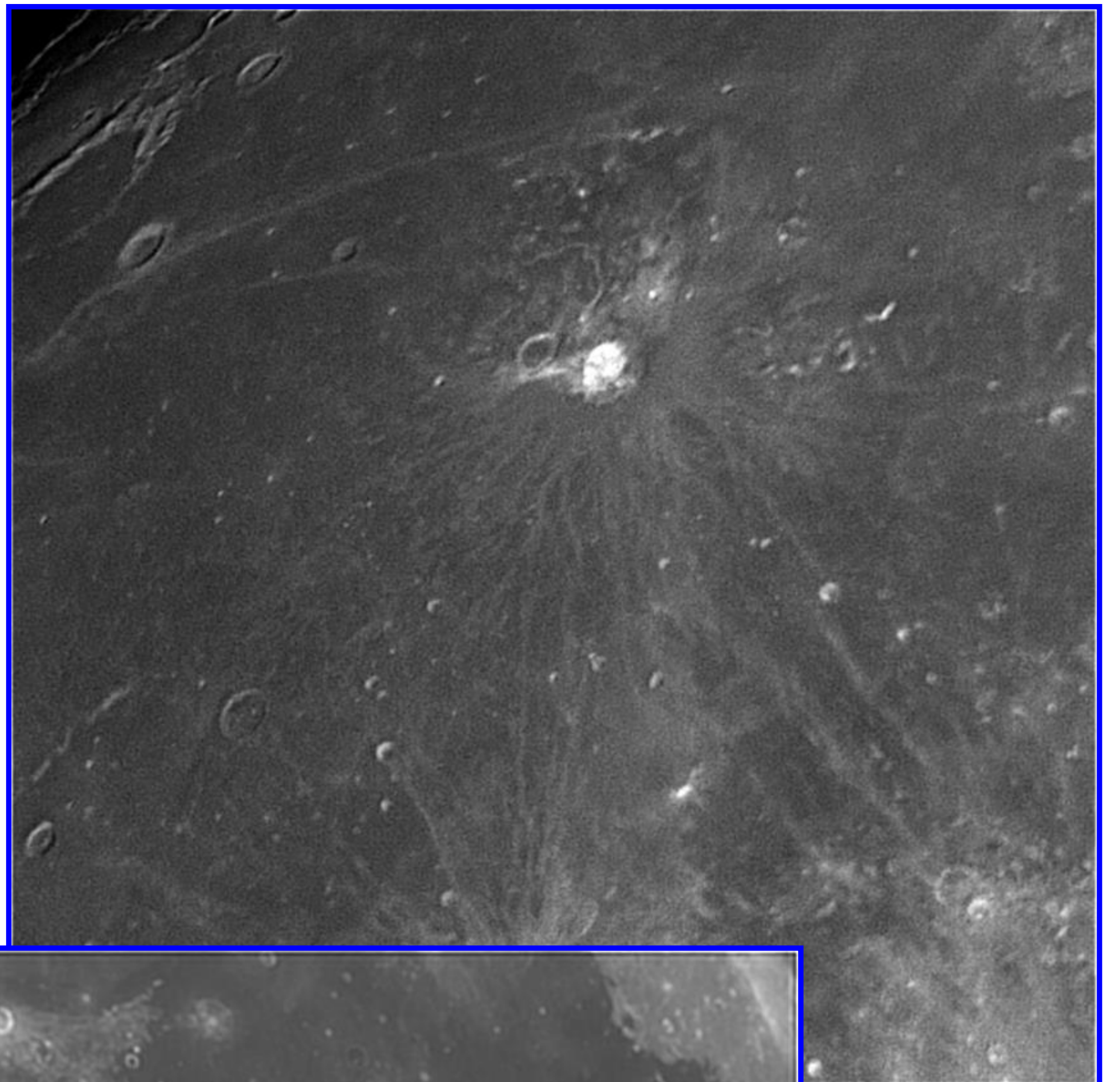
Recent Topographic Studies

***Le Verrier,** Alan Trumper, AEA - Oro Verde, Entre Rios, Argentina. 09 January 2020 0435 UT. Heritage 130 mm, fl 650 mm telescope, Nikon D5100 camera.*



***Tycho**, Walter Ricardo Elias, AEA - Oro Verde, Entre Rios, Argentina. 10 January 2020 0053 UT. Meade LX 200 10 inch Schmidt Cassegrain telescope, ZWO ASI 120MM/S camera.*

Recent Topographic Studies



Aristarchus, *Gabriel Re, AEA - Oro Verde, Entre Rios, Argentina . 11 December 2019 0445 UT. Meade LX200 10 inch Schmidt Cassegrain telescope, ZWO 120 camera.*

Schmidt, *Walter Ricardo Elias, AEA - Oro Verde, Entre Rios, Argentina. 10 January 2020 0020 UT. Meade LX 200 10 inch Schmidt Cassegrain telescope, ZWO ASI 120MM/S camera.*

Recent Topographic Studies

Alphonsus, *Alan Trumper, AEA - Oro Verde, Entre Rios, Argentina. 04 January 2020 0143 UT. Heritage 130 mm, fl 650 mm telescope, Nikon D5100 camera.*

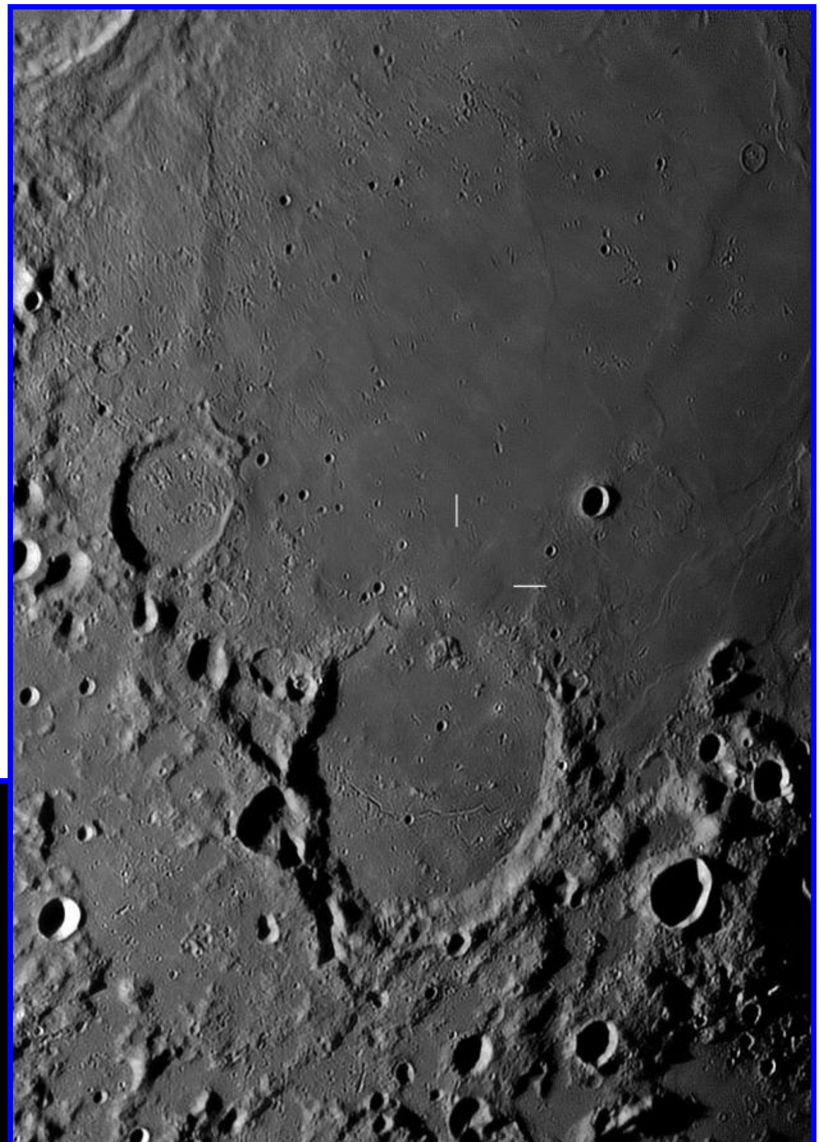
Plato *Johana Gonzalez, AEA - Oro Verde, Entre Rios, Argentina. 10 January 2020 0318 UT. Meade LX 200 Schmidt Cassegrain telescope, ZWO ASI 120 MM/S camera.*

Recent Topographic Studies

Atlas, *Walter Ricardo Elias, AEA - Oro Verde, Entre Rios, Argentina. 10 January 2020 0121 UT. Meade LX 200 10 inch Schmidt Cassegrain telescope, ZWO ASI 120MM/S camera.*

Mons Piton, *Aylen Borgatello, AEA - Oro Verde, Entre Rios, Argentina. 05 December 2019 0210 UT. Meade LX 200 10 inch Schmidt Cassegrain telescope, ZWO ASI 120MM/S camera.*

Recent Topographic Studies



Fracastorius Dome, *Howard Eskildsen, Ocala, Florida, USA. 14 January 2020 1142 UT, colongitude 138.9°. C9.25 Schmidt-Cassegrain, f/10, fl 2395 mm, 2x barlow, W-25 red filter, DMK 41AU02.AS camera. Seeing 7/10, transparency 2/6.*

Note Fracastorius dome (Fr1) is visible just outside the north rim of Fracastorius. Per http://fracastorius.blogspot.com/, it is 37x27 km in diameter, 300-340 meters high, and has an average slope of 1 degree. By the way, see the concentric crater, Fracastorius E, on the upper left rim of Fracastorius?

Proclus *Sergio Babino, Montevideo, Uruguay. 10 December 2019 0156 UT. 250 mm Catadioptric telescope, ZWO 174 camera.*

Recent Topographic Studies

Secchi, *Facundo Gramer, AEA - Oro Verde, Entre Rios, Argentina. 04 December 2019 2319 UT. Meade LX 200 10 inch Schmidt Cassegrain telescope, ZWO ASI 120MM/S camera.*

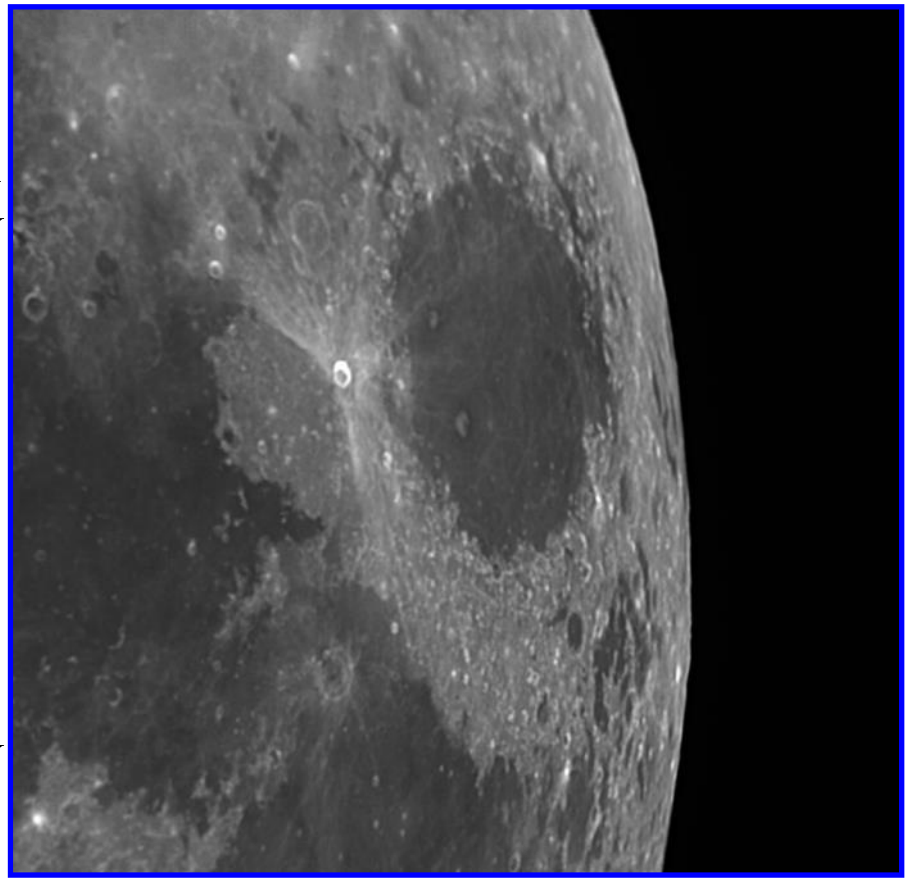
Ross, *Walter Ricardo Elias, AEA - Oro Verde, Entre Rios, Argentina. 10 January 2020 0100 UT. Meade LX 200 10 inch Schmidt Cassegrain telescope, ZWO ASI 120MM/S camera.*

Recent Topographic Studies

Aristarchus *Walter Ricardo Elias, AEA - Oro Verde, Entre Rios, Argentina. 10 January 2020 0314 UT. Meade LX 200 10 inch Schmidt Cassegrain telescope, ZWO ASI 120MM/S camera.*

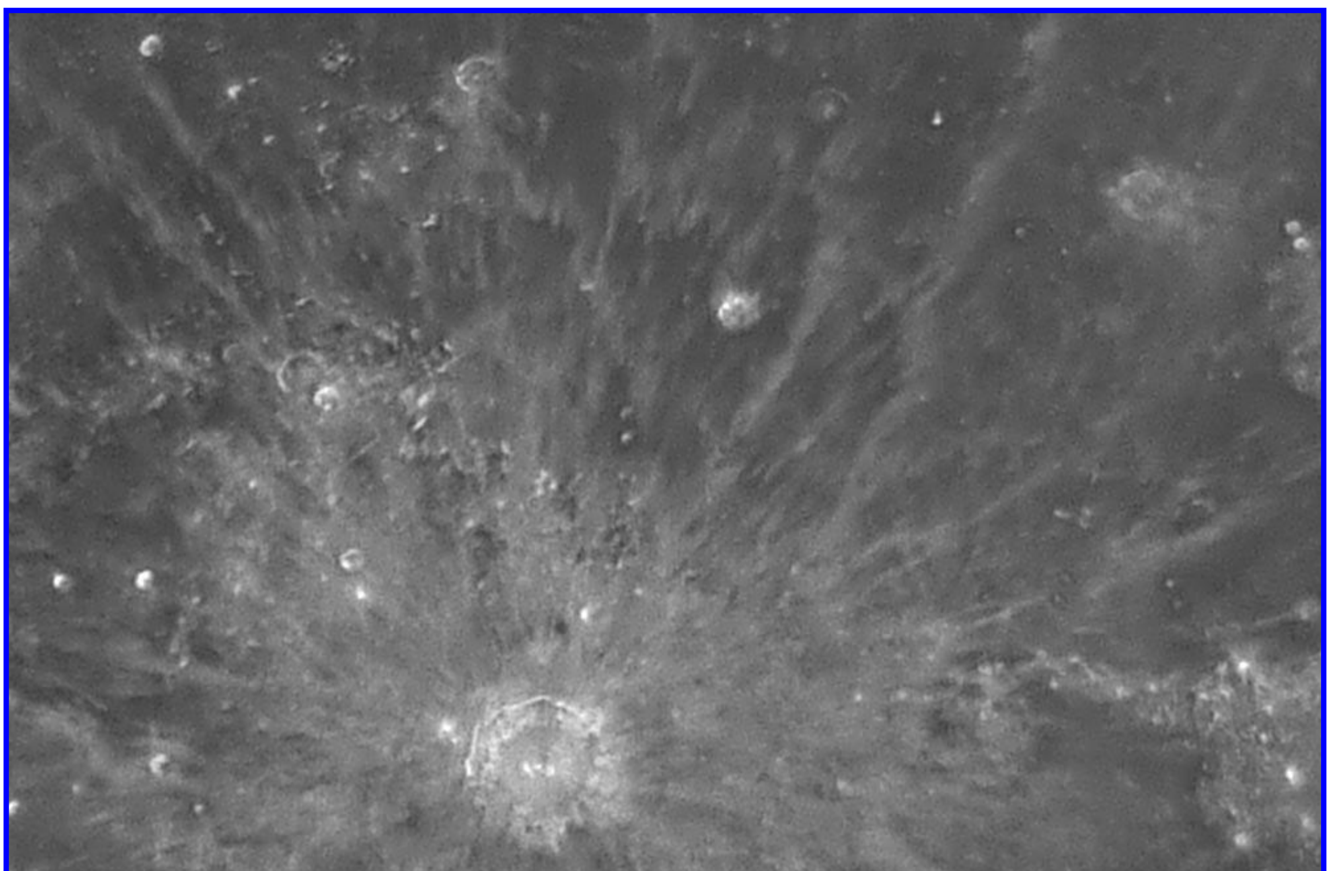
Mare Crisium *Johana Gonzalez, AEA - Oro Verde, Entre Rios, Argentina. 10 January 2020 0115 UT. Meade LX 200 Schmidt Cassegrain telescope, ZWO ASI 120 MM/S camera.*

Recent Topographic Studies

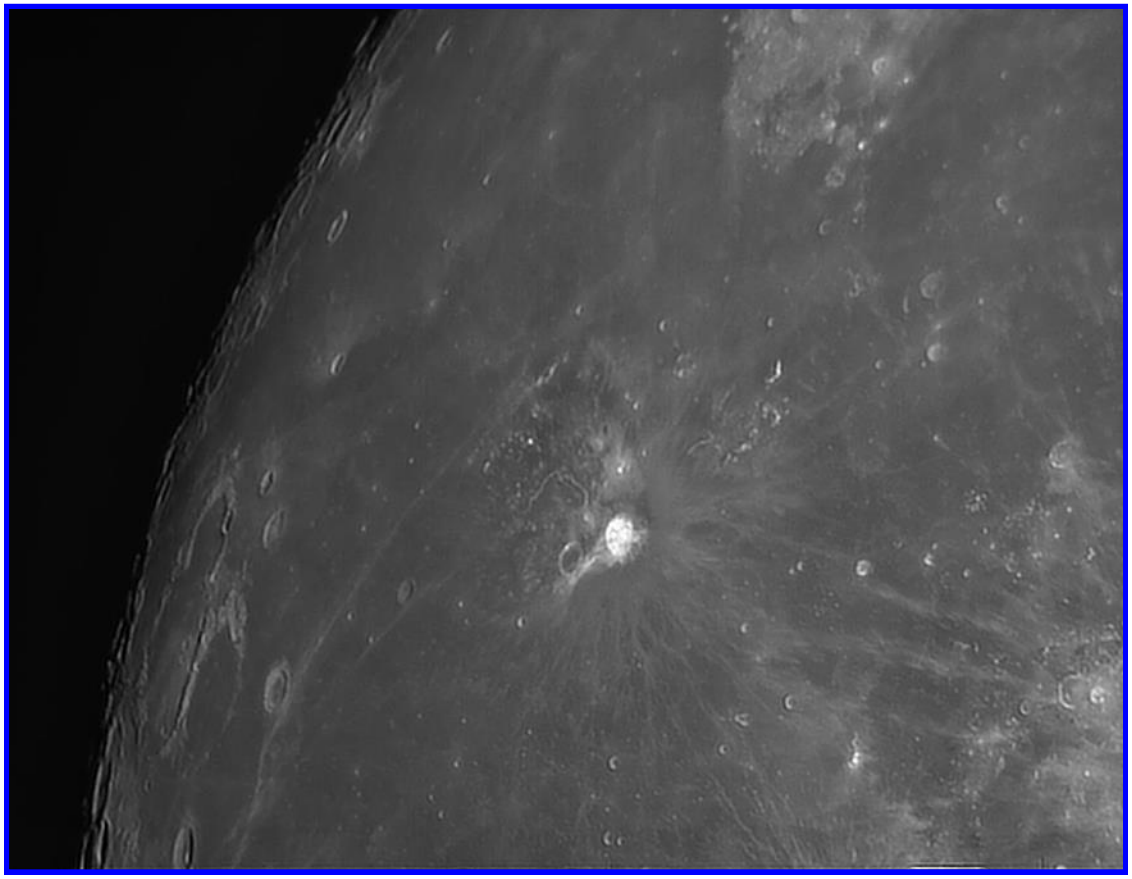


Proclus, *Walter Ricardo Elias, AEA - Oro Verde, Entre Rios, Argentina. 06 January 2020 2323 UT. Meade LX 200 10 inch Schmidt Cassegrain telescope, ZWO ASI 120MM/S camera.*

Timocharis, *Facundo Gramer, AEA - Oro Verde, Entre Rios, Argentina. 11 December 2019 0449 UT. Meade LX 200 10 inch Schmidt Cassegrain telescope, ZWO ASI 120MM/S camera.*



Recent Topographic Studies

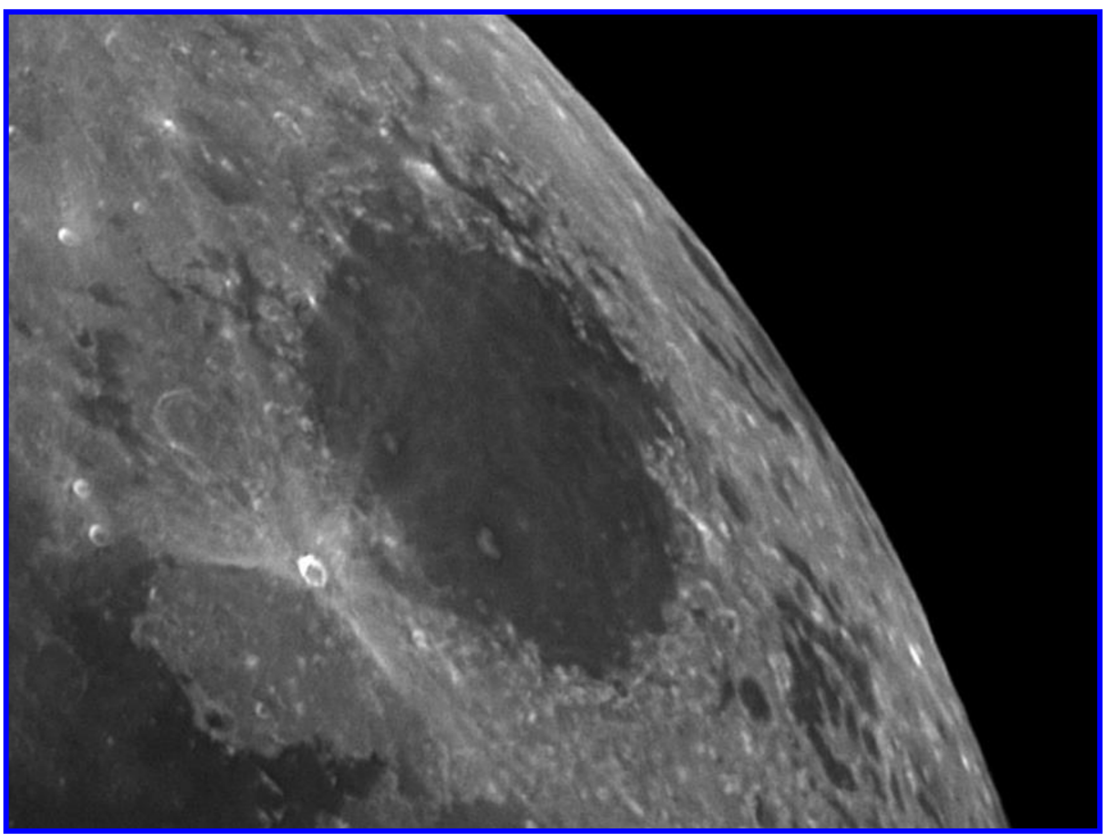


Aristarchus, *Johana Gonzalez, AEA - Oro Verde, Entre Rios, Argentina. 10 January 2020 0050 UT. Meade LX 200 Schmidt Cassegrain telescope, ZWO ASI 120 MM/S camera.*

Proclus, *Aylen Borgatello, AEA - Oro Verde, Entre Rios, Argentina. 04 December 2019 2317 UT. Meade LX 200 10 inch Schmidt Cassegrain telescope, ZWO ASI 120MM/S camera.*

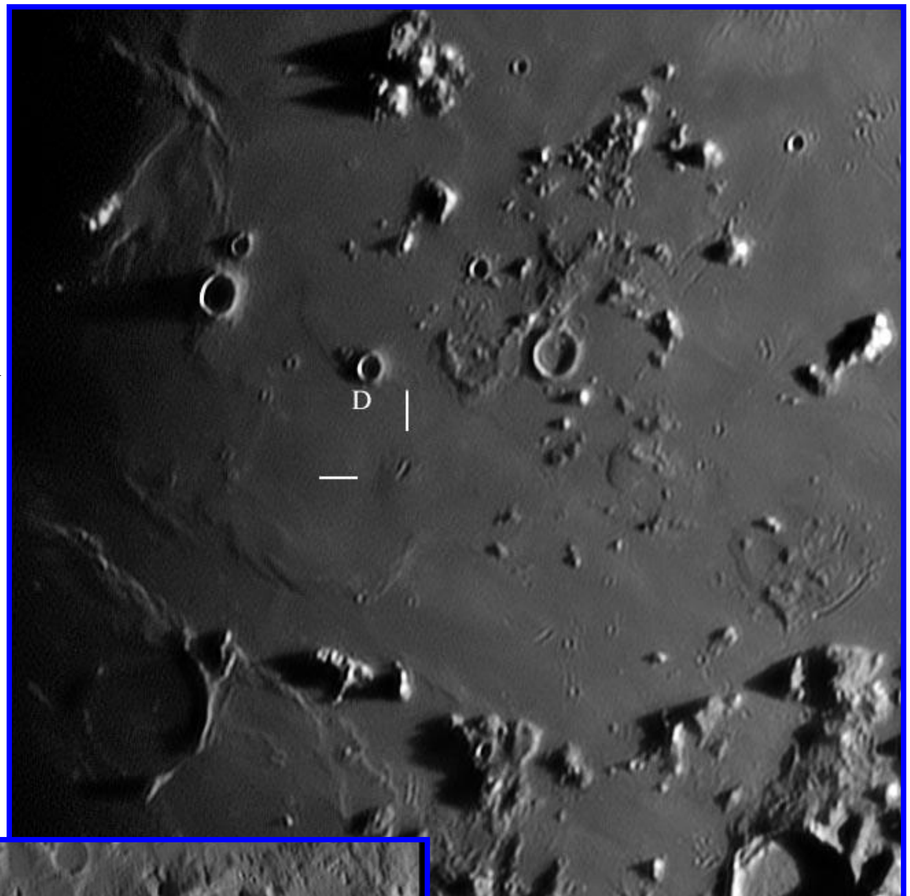
Recent Topographic Studies

Aristarchus, Victoria Gomez, AEA - Oro Verde, Entre Rios, Argentina . 11 December 2019, 0542 UT. Meade LX200 10 inch Schmidt Cassegrain, ZWO ASI 120MM/S.



Proclus, Gabriel Re, AEA - Oro Verde, Entre Rios, Argentina . 07 December 2019 0336 UT. Meade LX200 10 inch Schmidt Cassegrain telescope, ZWO 120 camera.

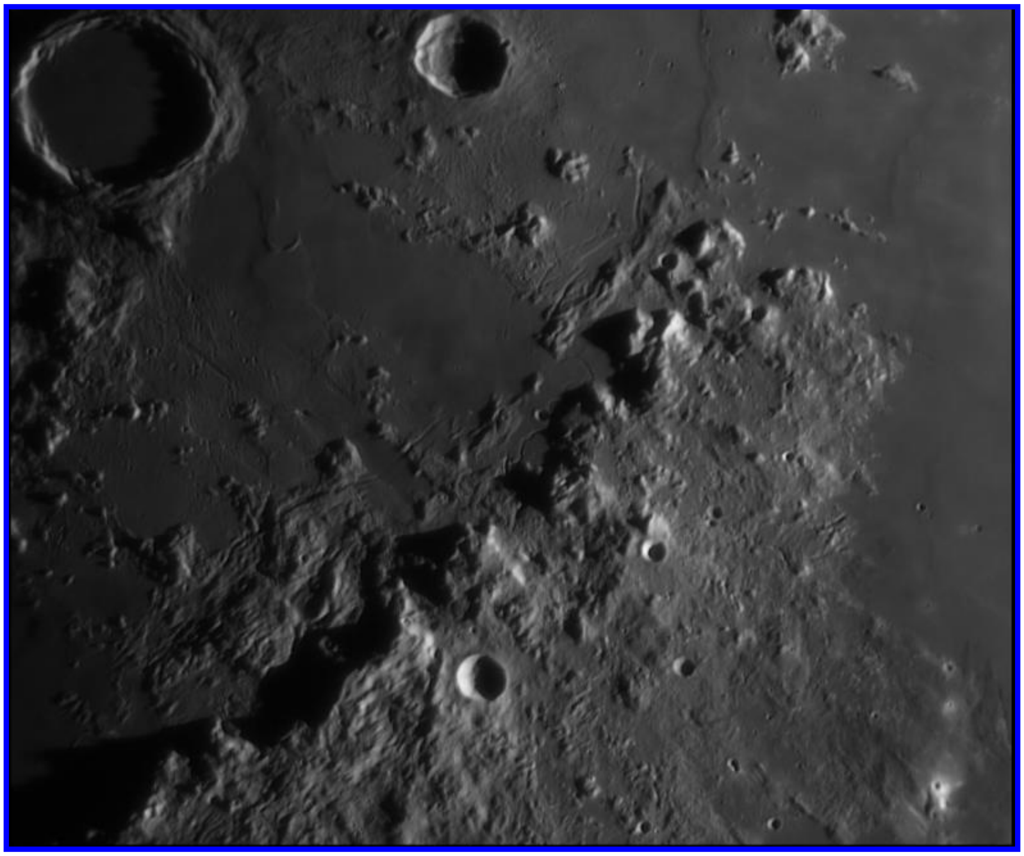
Recent Topographic Studies



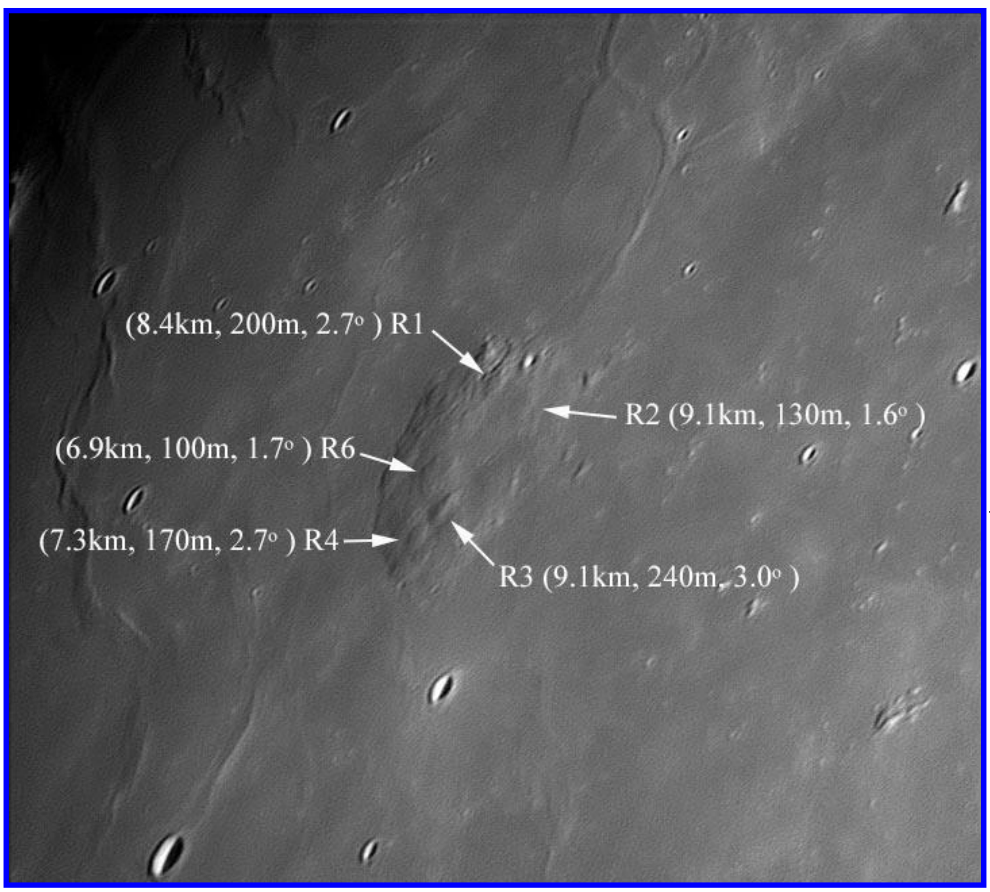
Brayley D Dome, *Howard Eskildsen, Ocala, Florida, USA. 05 January 2020 2316 UT, colongitude 35.9º. C9.25 Schmidt-Cassegrain, f/10, fl 2395 mm, 2x barlow, W-25 red filter, DMK 41AU02.AS camera. Seeing 7/10, transparency 5/6.*

Albategnius, *Luigi Morrone, Agerola, Italy. 03 January 2020 1710 UT. Celestron 14 Edge SCT, 355 mm, Fornax Mount, ZWO ASI 178M camera, barlow Zeiss Abbe, Baader R+IR filter 610 nm.*

Recent Topographic Studies



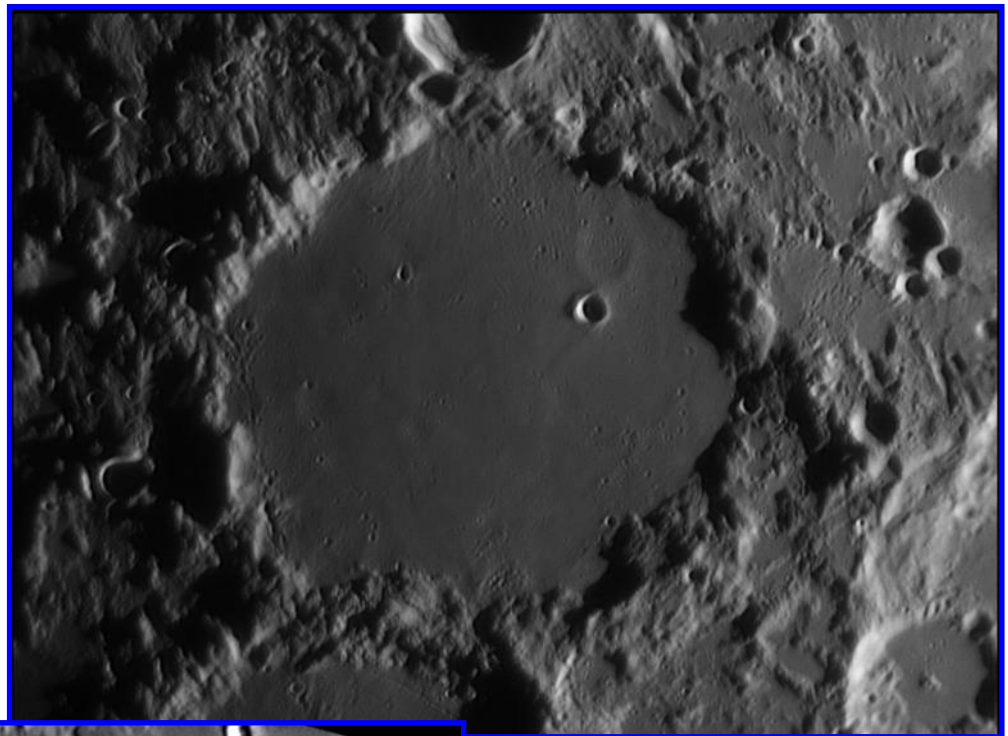
Archimedes, Aristillus, Mons Hadley and Palus Putredinus , *Luigi Morrone, Agerola, Italy. 03 January 2020 1714 UT. Celestron 14 Edge SCT, 355 mm, Fornax Mount, ZWO ASI 178M camera, barlow Zeiss Abbe, Baader R+IR filter 610 nm.*



Mons Rümker, *Howard Eskildsen, Ocala, Florida, USA. 09 January 2020 0142 UT, colongitude 73.5°. C9.25 Schmidt-Cassegrain, f/10, fl 2395 mm, 2x barlow, IR-block filter, DMK 41AU02.AS camera. Seeing 7/10, transparency 3/6.*

Recent Topographic Studies

__Ptolemaeus__ , Luigi Morrone, Agerola, Italy. 03 January 2020 1728 UT. Celestron 14 Edge SCT, 355 mm, Fornax Mount, ZWO ASI 178M camera, barlow Zeiss Abbe, Baader R+IR filter 610 nm.



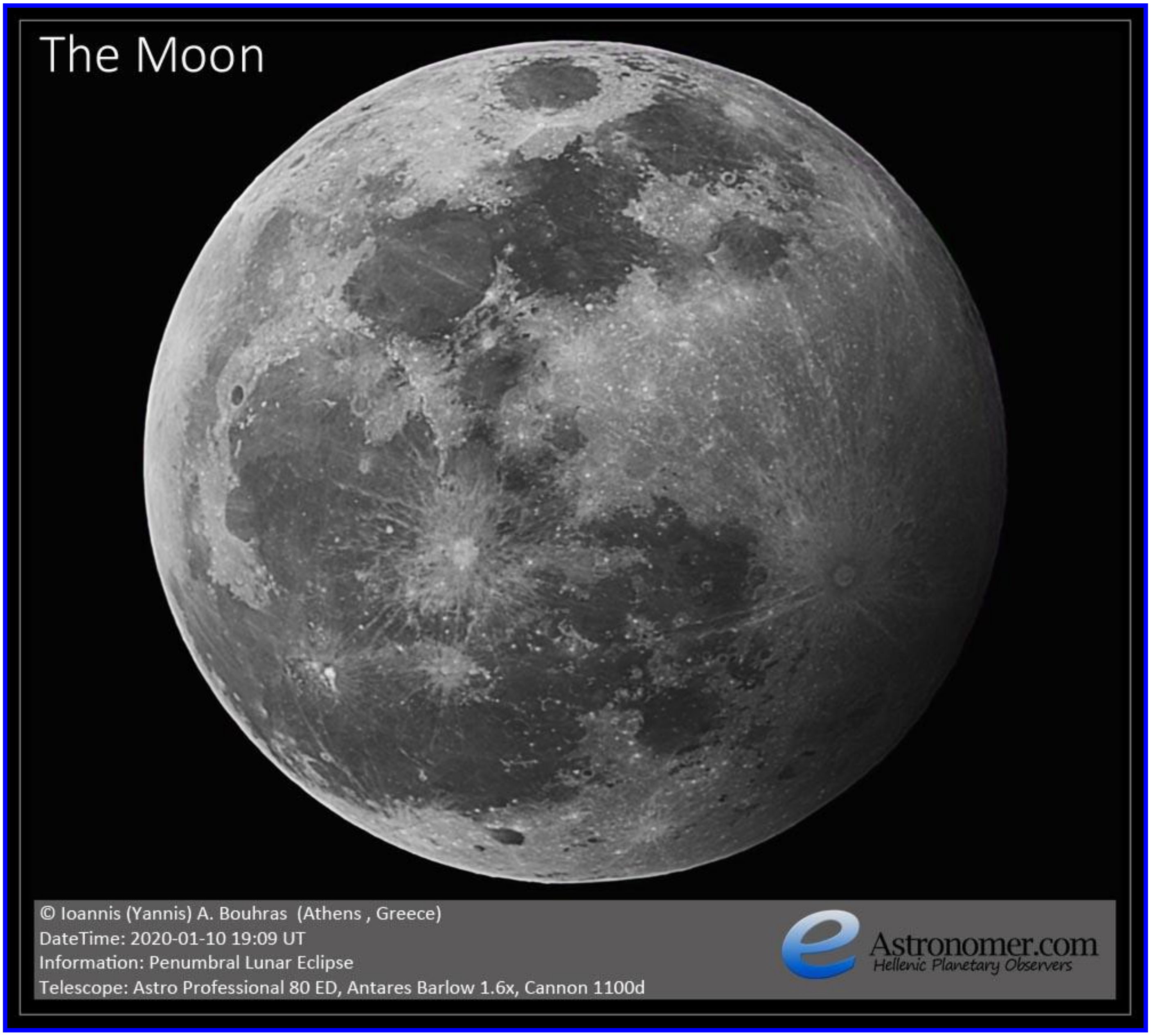
__Grimaldi Dome,__ Howard Eskildsen, Ocala, Florida, USA. 09 January 2020 0140 UT, colongitude 73.5°. C9.25 Schmidt-Cassegrain, f/10, fl 2395 mm, 2x barlow, IR-block filter, DMK 41AU02.AS camera. Seeing 7/10, transparency 5/6.

Recent Topographic Studies

Montes Apenninus, *Raúl Roberto Podestá, SLA, Formosa, Argentina. 03 January 2020, 2324 UT. 127 mm Maksutov-Cassegrain, Hokenn CCD Imager.*

98% Waxing Gibbous Moon*, Jairo Chavez, Popayán, Colombia. 10 January 2020 0220 UT. 114 mm KONUS refractor telescope, MOTO ES PLAY.*

Recent Topographic Studies



Penumbral Lunar Eclipse , *Ioannis (Yannis) Bouhras, Athens, Greece. 10 January 2020 1909 UT. Astro Professional 80 ED, Antares Barlow 1.6 x, Canon 1100d.*

Recent Topographic Studies

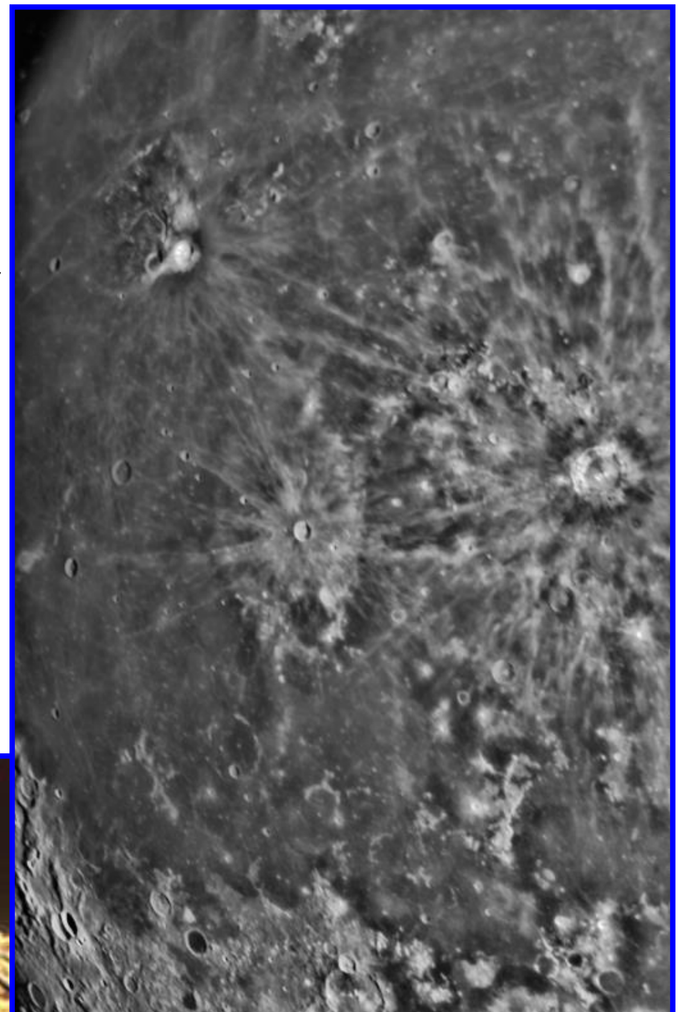
Clavius region, *Raúl Roberto Podestá, SLA, Formosa, Argentina. 03 January 2020, 2340 UT. 127 mm Maksutov-Cassegrain, Hokenn CCD Imager.*

Aristarchus, *Sergio Babino, Montevideo, Uruguay. 10 December 2019 0303 UT. 250 mm Catadioptric telescope, ZWO 174 camera.*

Recent Topographic Studies

Ptolemaeus , *Luigi Morrone, Agerola, Italy. 03 January 2020 1706 UT. Celestron 14 Edge SCT, 355 mm, Fornax Mount, ZWO ASI 178M camera, barlow Zeiss Abbe, Baader R+IR filter 610 nm.*

Recent Topographic Studies

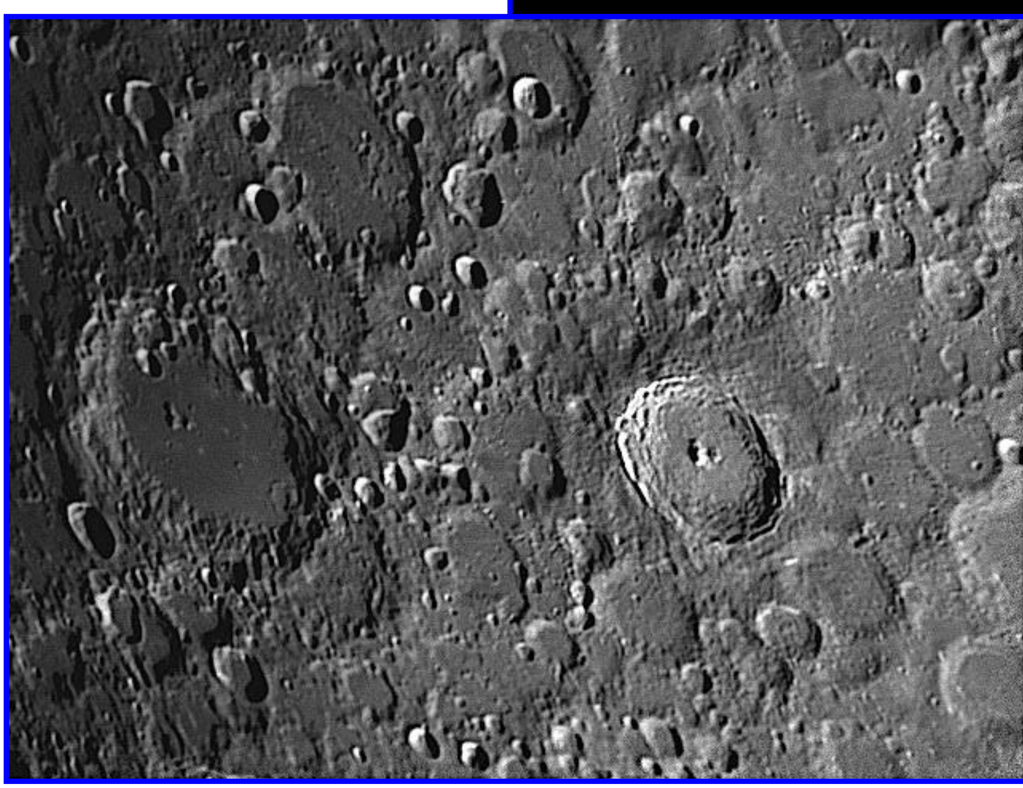


Copernicus, *Sergio Babino, Montevideo, Uruguay. 10 December 2019 0301 UT. 250 mm Catadioptric telescope, ZWO 174 camera.*

Plato, *Raúl Roberto Podestá, SLA, Formosa, Argentina. 03 January 2020, 2342 UT. 127 mm Maksutov-Cassegrain, Hokenn CCD Imager.*

Recent Topographic Studies

Tycho, *Sergio Babino, Montevideo, Uruguay. 10 December 2019 0150 UT. 250 mm Catadioptric telescope, ZWO 174 camera.*



Tycho, *Michael E. Sweetman, Tucson, Arizona, USA. 22 November 2015 0623 UT. 5" Explore Scientific APO refractor telescope f/7.5 @ f/22.5, Skyris 132M camera, IR cut filter. Seeing 6-7/10, transparency 3/6.*

Lunar Geologic Change Detection Program

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

2020 February

Reports have been received from the following observers for Dec: Jay Albert (Lake Worth, FL, USA - ALPO) observed: Aristarchus and Plato. Alberto Anunziato (Argentina, SLA) imaged: Aristarchus, Copernicus, Langrenus, Plato, Proclus, Theophilus, and Tycho. Aylen Borgatello (Argentina - AEA) imaged: Conon, Mons Piton and Proclus. Maurice Collins (New Zealand - ALPO/BAA/RASNZ) imaged: Alphonsus, Aristarchus, Aristillus, Clavius, Copernicus, Eratosthenes, Grimaldi, Heraclitus, Langrenus, Mare Crisium, Mare Nectaris, Oceanus Procellarum, Plato, Rupes Recta, Theophilus, Triesnecker and captured some whole Moon images. Philip Denyer (London, UK – BAA) imaged Herodotus. Walter Elias (Argentina - AEA) imaged: Mare Crisium, Proclus, Wilkins and Several features. Victoria Gomez (Argentina - AEA) imaged: Aristarchus. Facundo Gramer (Argentina - AEA) imaged: Alphonsus, Aristarchus, Secchi, and Timocharis. Gabriel Re (Argentina – AEA) imaged: Aristarchus and Proclus. Trevor Smith (Codnor, UK – BAA) observed visually: Alphonsus, Archimedes, Aristarchus, Censorinus, Fra Mauro, Gassendi, Hyginus, Mare Vaporum, Oenopides, Pallas, Plato, Proclus, Promontorium Laplace, Sirsalis, Timocharis, Torricelli, and Vallis Schroteri. Bob Stuart (Rhayader, UK – BAA) imaged: Aristarchus, Babbage, Cavendish, Copernicus, Damoiseau, Hevelius, Lacus Excellentiae, Mare Insularum, Mersenius, Pythagoras, Schickard, Schiller, Sirsalis, and several features. Aldo Tonon (Italy – UAI) imaged Censorinus.

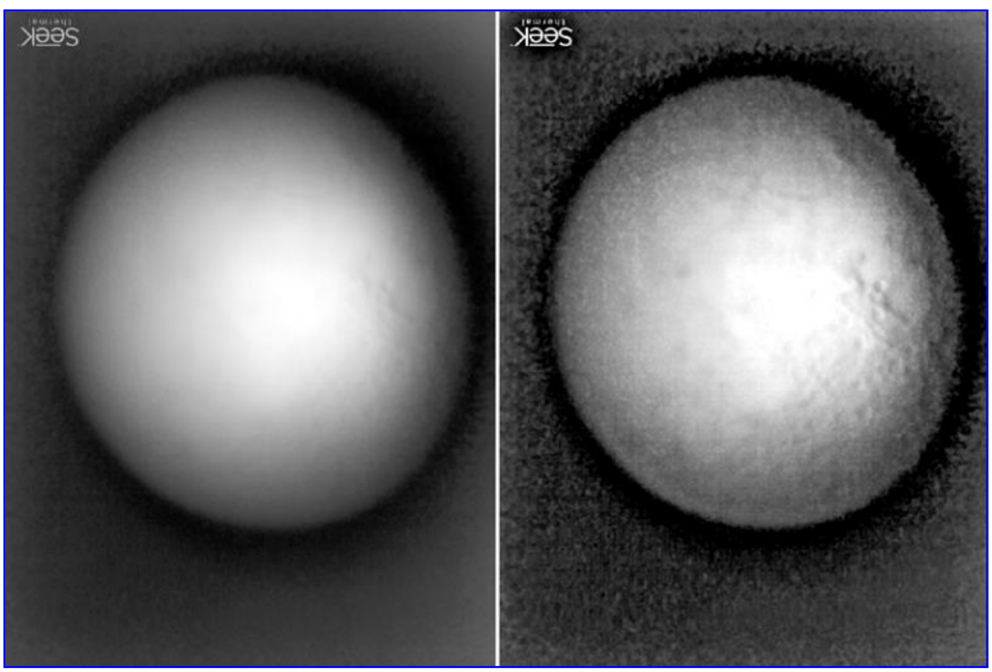


Figure 1. The disk of the gibbous Moon captured on 2020 Jan 13 UT 04:41 in the Thermal Infrared (7.2-13μm) by Tony Cook, using a 20cm f/8 reflector via thermal IR eyepiece projection. White is hot, dark is cold. **(Left)** A raw image. **(Right)** A high pass filtered image.

News: I received a very useful present at Christmas, a Seek Thermal Compact Pro High Resolution camera for Android phones. Technically speaking 320x240 high is not high resolution, but it seems cost effective compared with larger format 640x480 cameras by other manufacturers, which are very pricy, and is somewhat better resolution than FLIR ONE Pro camera at 160x120 pixels. Unfortunately, the camera came with a lens attached which I was reluctant to remove in case it broke the camera. Therefore, I decided to do what many people do with Smart phones, literally put the camera up to the eyepiece in a holder. Alas glass eyepieces do not transmit thermal IR, nor do SCT telescopes with glass corrector plates, so Newtonians with special eyepieces are needed. The camera was fitted onto my 8" f/8 Newtonian and to get around the glass eyepiece problem, a laser cutter lens, made of ZnSe (Zinc Selenide), was ordered up, making an improvised 1" thermal IR eyepiece. This was placed into the eyepiece draw tube and projected an image into the thermal imaging camera lens. First results were not encouraging (Fig 1 – Left). You can see the heat from the drawtube, the Moon is a bit saturated towards the centre, and pixel sizes are something like 12 x 12 km on the lunar surface. The Moon looks a bit like a featureless orange. Darryl Williams in his past two ALPO TLO articles (See the Sep and Nov 2019 TLO newsletter) has recommended flat fielding to remove these artefacts. I was not quite ready to do this on my first proper observing run with the camera, so instead have tried out some high pass filtering to bring out more detail. You can just about make out Theophilus, Mare Crisium and the edges of some other mare areas in the high pass filtered version of the image in Fig 1 (Right). Anyway, I will work on ways to get the resolution up and join in with this new observing technique that Darryl has been investigating.

LTP reports: No LTP reports were received in December.

Routine Reports: Below are a selection of reports received for Dec that can help us to re-assess unusual past lunar observations – if not eliminate some, then at least establish the normal appearance of the surface features in question.

Censorinus: On 2019 Dec 02 19:35-20:00 Aldo Tonon (UAI) imaged this crater for an ALPO request to find how early in selenographic colongitude the blue color in this impact color can be captured on a color camera.

Aldo seems to have good atmospheric transparency from 19:35-19:44, but after that image contrast worsened as the Moon got lower in the sky? Anyway, a slight turquoise-blue/green can be seen in the ejecta blanket around Censorinus – though there is quite a bit of atmospheric spectral dispersion too in Fig 2. The color though vanishes in images after 19:44UT. These are important findings as they suggest the bluishness starts to become visible at least as early as a colongitude of 340.6°, and also the visibility of the color can be severely affected by observing conditions. This is something we need to take into account when interpreting old LTP reports involving color.

Figure 2. A time sequence of images of the crater Censorinus taken by Aldo Tonon (UAI) on 2019 Dec 02 UT 19:35 -20:00. All images have had their color saturation increased to 70%. Images orientated with north towards the top.

Alphonsus: On 2019 Dec 05 UT 02:22 Facundo Gramer (AEA) imaged this crater under very similar illumination (±0.5°) to the following Russian report:

Alphonsus 1931 Apr 25 UT 18:00 Observed by Vasilev (Russia) "The triang. dark spot close to the w.bank was not vis. after SR & appeared along the length of the term., 8-9 deg" NASA catalog weight=1. NASA catalog ID #401. ALPO/BAA weight=1

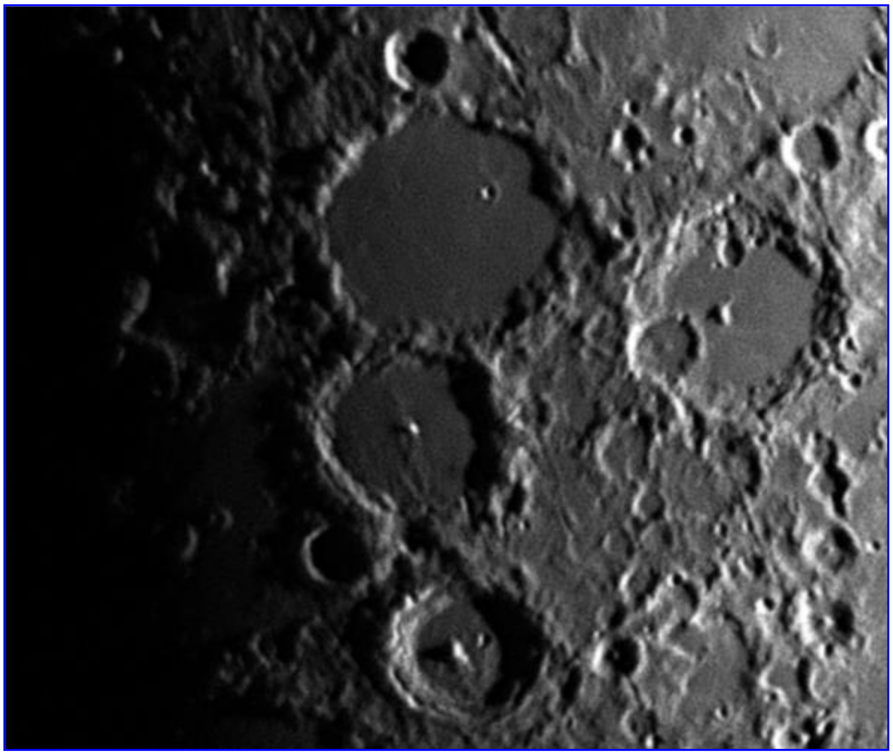


Figure 3. Alphonsus as imaged by Facundo Gramer (AEA) on 2019 Dec 05 UT 02:22 and orientated with north towards the top.

As readers may know, Alphonsus is famous for at least three pyroclastic dark spots on the floor. However, it seems that under sunrise conditions they are simply difficult/impossible to see, and there is so much shading on the floor anyway (See Fig 3). So therefore, we shall assign a weight of 0 to this report and effectively remove it from the ALPO/BAA LTP database.

Conon: On 2019 Dec 07 UT 03:30 Aylen Borgatello (AEA) imaged this crater under similar illumination, to within ±0.5° to the following report from the 1940's report:

Conon 1941 Feb 07 UT 03:00? Observed by Vaughon (Des Moines, Iowa, 3" reflector) "Faint bright spot on floor, no definite outline (??? reported 6th, but if local time 7th in UT)" NASA catalog weight=3. NASA catalog ID #484. ALPO/BAA weight=1.

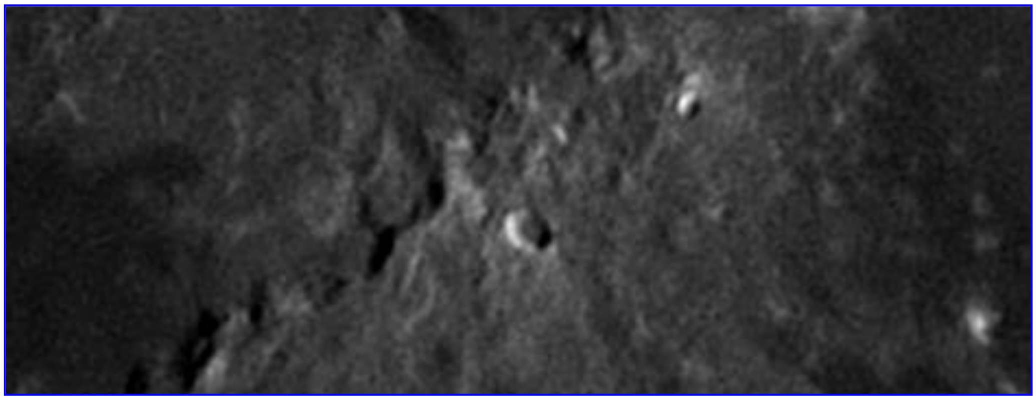


Figure 4. Conon as imaged by Aylen Borgatello (AEA) on 2019 Dec 07 UT 03:30 and orientated with north towards the top.

You can quite clearly see in Fig 4 a faint spot near the center of Conon. It is just some hilly terrain. I think we can therefore remove this report from the ALPO/BAA LTP database by assigning a weight of 0.

Herodotus: On 2019 Dec 08 UT 19:12 Phil Denyer (BAA) imaged Herodotus midway between similar illumination for two past LTP events – 25 minutes after the former observing window and 33 minutes before the opening window of the latter:

Herodotus 1966 Jun 30 UT 03:10-03:35 Observed by Bartlett (Baltimore, MD, USA) described in the NASA catalog as: "Bright pseudo-peak again vis. within floor shadow. Peak est. 5 bright. Had seen it at successive lunations in '66" 4" x280 refractor used. NASA catalog weight=4. NASA catalog LTP ID No. #950. ALPO/BAA weight=3.

On 2017 Sep 02/03 UT 23:55-00:30 A. Anunziato (Parana, Argentina, 105 mm Maksutov Cassegrain, x154, seeing 6/10, some interruption from clouds) observed a light spot SE of the centre of the floor of the crater, which came and went in visibility. There is a light spot here, but what was unusual was that the visibility decreased over time. ALPO/BAA weight=1.

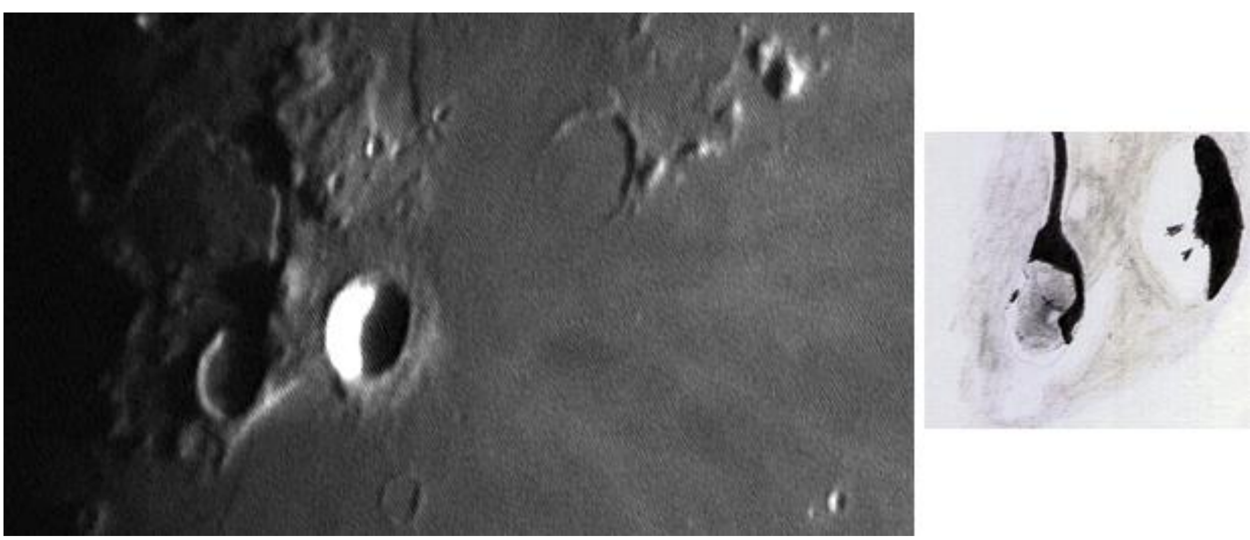


Figure 5. Herodotus and Aristarchus orientated with north towards the top. **(Left)** An image by Phil Denyer (BAA) taken on 2019 Dec 18 UT 19:12. **(Right)** A sketch by Alberto Anunziatio made on 2017 Sep 02/03 UT 23:55-00:30.

Sirsalis: On 2019 Dec 09 UT 19:19 Bob Stuart (BAA) imaged and at 19:24-19:32 UT Trevor Smith (BAA) observed this crater under similar illumination (±0.5°) to the following GLR LTP observation:

Sirsalis 1999 Jan 30 UT 01:00-01:20 Observed by Giuseppe Sorrentino (Italy) described as: "A temporary change in appearance to sunlit floor of crater" for further references including images please see: http://digilander.libero.it/gibbidomine/sirsalis.htm . ALPO/BAA weight=1.

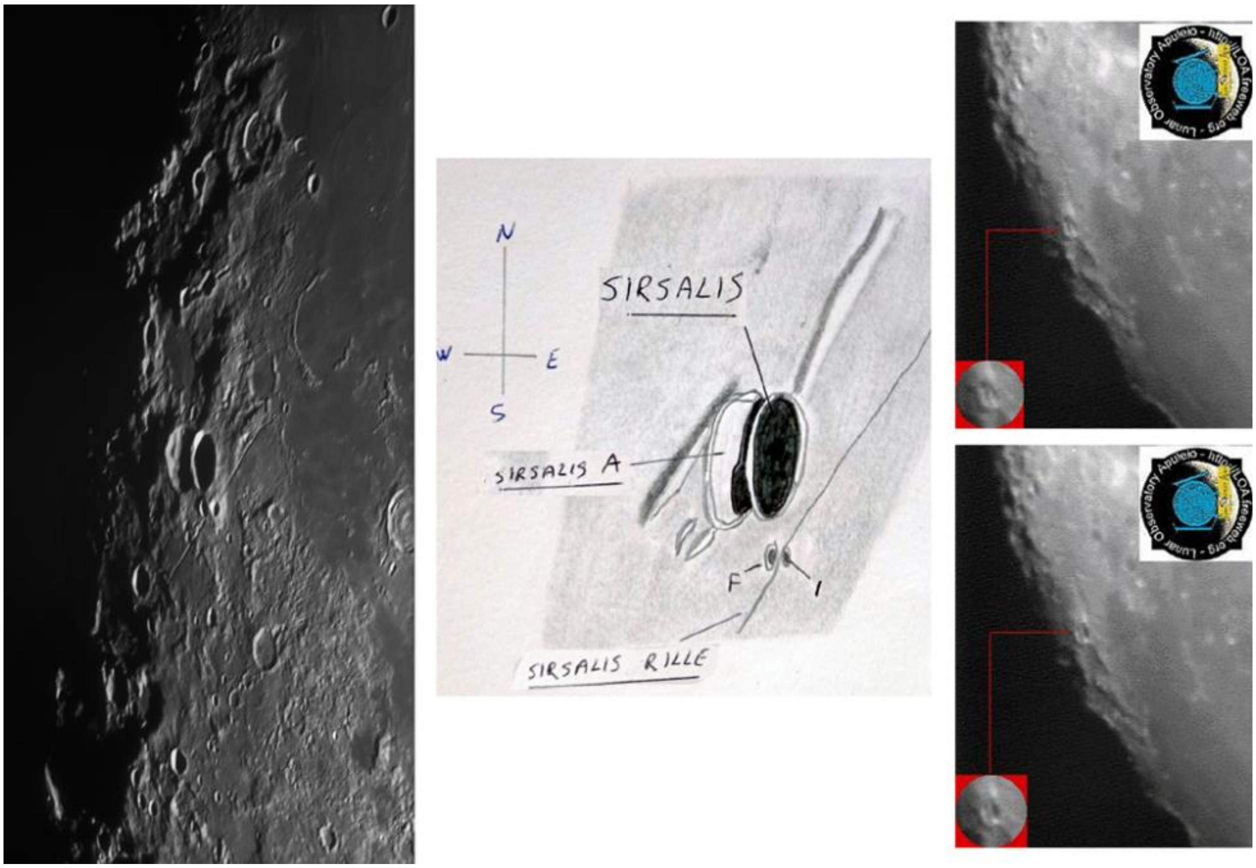


Figure 6. Sirsalis orientated with north towards the top. **(Left)** An image by Bob Stuart (BAA) taken on 2019 Dec 09 UT 19:19. **(Centre)** A sketch by Trevor Smith (BAA) made on 2019 Dec 09 UT 19:24-19:32 – note that the sketch has been re-orientated and the labels switched around to match Bob Stuart's image. **(Right)** Two images from the GLR web site showering a LTP in Sirsalis from 1999 Jan 30 UT 01:00-01:20, taken by Giuseppe Sorrentino (GLR).

Although I was not coordinating the LTP sections of ALPO or the BAA at the time, I am familiar with the debate that took place between GLR, UAI, and REA astronomical organisations concerning this event. Although I have not seen all the Sorrentino images (Fig 6 – Right), based upon Bob's image (Fig 6 – Left) and Trevor's sketch (Fig 6 – Centre), as well as the image scale of the GLR images, I think that I would probably come down on the conclusion made by UAI that the effect seen was the result of atmospheric turbulence and a low image scale. If anybody still has all the original images, it would be interesting to run them through a modern-day image stacking program to see if they can give us more information. But for now, I think I will lower the weight to 0 as there is not much more we can do with repeat illumination studies of this crater.

Mons Piton: On 2019 Dec 10 UT 03:01 Alberto Anunziato (AEA) imaged this mountain under similar illumination (to within ±0.5°) to the following report:

On 1982 Aug 02 at UT 22:59-23:10 M.Price (Frimley, Surrey, UK, seeing=II-III) found that the north point of this mountain appeared poorly defined and merged into the surroundings - however suspected that this might be normal for this colongitude? The Cameron 2006 catalog ID=179 and weight=1. The ALPO/BAA weight=1.

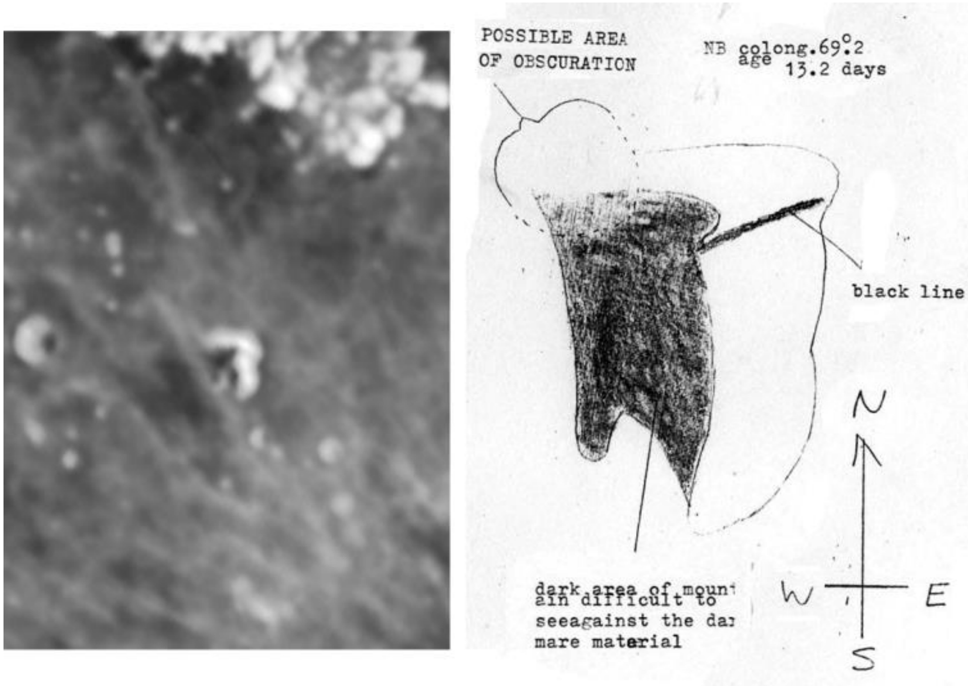


Figure 7. Mons Piton orientated with north towards the top. **(Left)** Highly enlarged section of an image submitted by Alberto Anunziato, taken on 2020 Dec 10 UT 01:40. **(Right)** A sketch by Marcus Price (BAA) made on 1982 Aug 02 UT 22:59-23:10.

Alberto's image (Fig 7 – Left) clearly shows a fuzzy area that Price depicted as a candidate obscuration (Fig 7 – right). I think therefore we can lower the weight to 0 and remove this from the ALPO/BAALTP catalog.

Plato: On 2019 Dec 10 UT 09:41 Maurice Collins (ALPO/BAA/RASNZ) imaged this crater in color when the illumination was similar to ±0.5°to the following 1960's observation:

Plato 1964 Nov 14 UT 01:00? Observed by Bartlett (Baltimore, MD, USA, 4" refractor?) "Peak on E. wall brilliant white, strong blue band at inner base; on S. wall was a small, bright red spot." NASA catalog weight=4. NASA catalog ID #864. ALPO/BAA weight=3.

Figure 8. Color image of Plato taken by Maurice Collins (ALPO/BAA/RASNZ) on 2019 Dec 10 UT 09:41, reoriented with north towards the top. The image has been color normalized and the color saturation increased to 60%.

Fig 8 shows none of the color effects that Bartlett described, using his 3" refractor. It could be that they were related to chromatic aberration in the 3" refractor. Unfortunately, it is difficult to find out, so we shall leave the weight at 3 for now as the small red spot that Bartlett describes is unusual and difficult to replicate with standard color producing mechanisms in our atmosphere, or with optics.

Aristarchus: On 2019 Dec 11 two AEA observers imaged this crater at 04:45 and 05:42 under similar illumination (±0.5°) to the following LTP reports:

On 1980 Aug 25 at UT06:55-07:10 Bartlett (Baltimore, MD, USA, 4.5" reflector, x40-150, seeing=4 and transparency=4) found the west wall bands of Aristarchus to be faint initially and at 07:00 a pale red color appeared suddenly (and lasted for 2 minutes) on the inner south east wall, and then into south west BS to the west BS. "BS" meaning in Bartlett's notation a bright spot. There was no violet glare this time. Cameron 2006 catalog ID=106 and weight=4. ALPO/BAA weight=3.

Aristarchus 1973 Jun 15 UT 06:12-06:21 Observed by Bartlett (Baltimore, MD, USA, 3" refractor x54, x100, x300, x360, S=3, T=3) "Pinkish-red glow on F., wall -- where he usually sees the violet glare. (LTP albedo=7?, normal=5?, nearby plain=1?). All along rim nr. crest & went over EWBS. Wanted to compare a bright spot on Lyell with Aris. wall brightness. At 0612h pink glow changed to a rust-brown, fading rapidly & gone at 0615h. First time he had ever obs. a red glow. (in 20 yrs)."NASA catalog weight=4 (high). NASA catalog ID #1369.

Aristarchus 1969 Apr 01 UT 18:35 Observed by Kozyrev (Crimea, Ukraine, 40" reflector). "Spectrograms of an unusual red spot on W. slope at ?=.405, eta=.680. Spot = 1-2 km in diam. Molecules identified were N2 & C2. Later thru clouds crater was bluer in Corralitos (New Mexico) MB (confirm. of activity at Ariz. ?)." NASA catalog weight=5. NASA catalog ID #1119. ALPO/BAA weight=5.

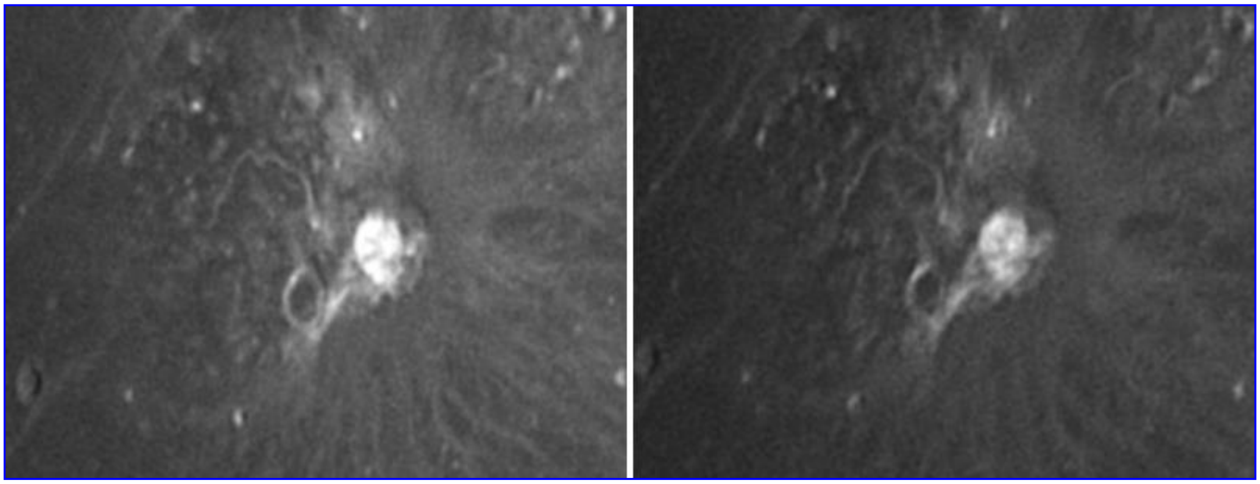


Figure 9. Aristarchus images captured on 2019 Dec 11 and orientated with north towards the top. **(Left)** taken by Gabriel Re (AEA) at 04:45UT. **(Right)** taken by Victoria Gomez (AEA) at 05:42 UT.

Although the images in Fig 9 are monochrome, and so won't help to solve the color/spectral reports in the LTP descriptions above, they do at least illustrate the general routine appearance of the crater as would have been seen by the observers concerned. We shall leave the weights as they are for now.

Plato: On 2019 Dec 15 UT 04:30-04:55 Jay Albert (ALPO) observed visually this crater under similar illumination (±0.5°) to the following report:

On 1984 Nov 11 at UT21:00? Marshall (England) noted that there was no normal brightness on the floor to most southernmost craterlet. The Cameron 2006 catalog ID=253 and the weight=2. The ALPO/BAA weight=1.

Jay found that Plato's east wall was very bright and that the central craterlet, N pair and S craterlet were all seen. The entire floor was darker than Mare Frigoris and Mare Imbrium. However, unlike the LTP description, the floor actually appeared slightly brighter in an ill-defined E-W strip near the southern craterlet. I also cannot find this report in the ALPO/BAA archives. We shall therefore leave the report at a weight of 1.

Aristarchus: On 2019 Dec 17 UT 05:09 Walter Elias imaged the Moon in color and captured the Aristarchus area under similar illumination, to within (±0.5°, to the following report:

In 1964 Jan 05 at UT 22:00? Doherty (Stoke-on-Trent, UK, 3" refractor, 8" or 10" reflector) observed Aristarchus to be purplish-blue in color. The Cameron 1978 catalog ID=794 and weight=3. The ALPO/BAA weight=3.

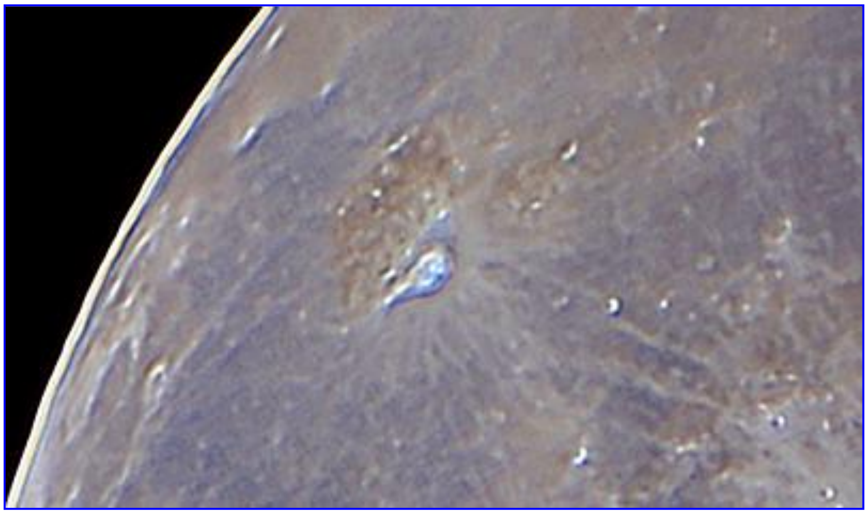


Figure 10. A color image of the NW of the Moon, taken by Walter Elias on 2019 Dec 17 UT 05:09, showing Aristarchus. The supplied image has been high passed filter and its color saturation increased before it was submitted to the Lunar Section. The purple loop around Aristarchus is a processing artefact.

Although Fig 10 has been sharpened a little heavily as can be seen by the bright ring on the limb of the Moon, we can at least see some blueness to Aristarchus crater, though the purple line is probably an artefact of the image processing. I am tempted though to lower the weight from 3 to 2 due to the craters color having at least some similarity to the original report.

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. To keep yourself busy on cloudy nights, why not try "Spot the Difference" between spacecraft imagery taken on different dates? This can be found on: http://users.aber.ac.uk/atc/tlp/spot_the_difference.htm . 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 .

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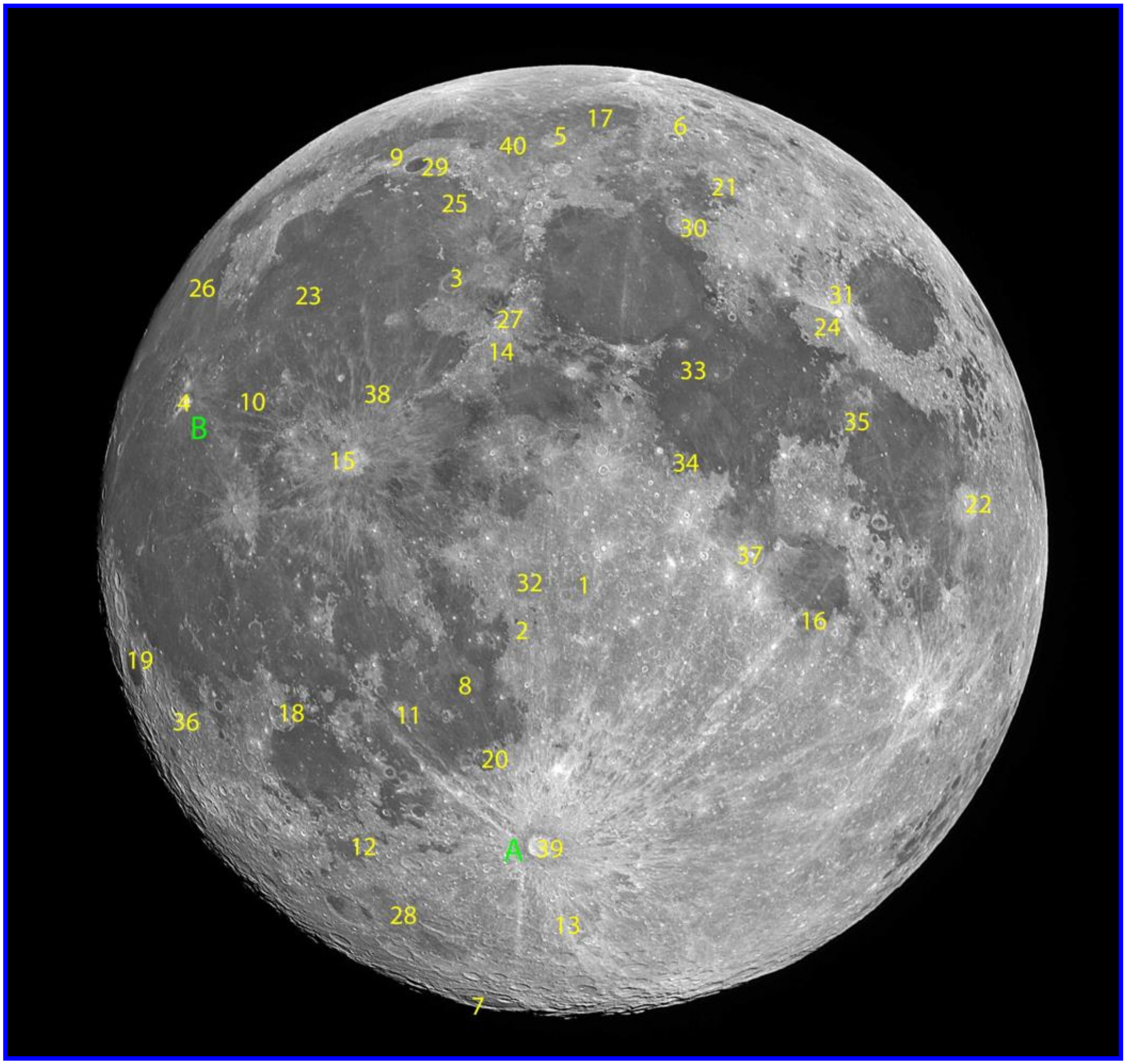
Key to Images In This Issue



1. Albategnius
2. Alphonsus
3. Archimedes
4. Aristarchus
5. Aristoteles
6. Atlas
7. Bailly
8. Birt
9. Bliss
10. Brayley
11. Bullialdus
12. Clausius
13. Clavius
14. Conon
15. Copernicus
16. Fracastorius
17. Galle
18. Gassendi
19. Grimaldi
20. Hesiodus
21. Lacus Mortis
22. Langrenus
23. Le Verrier
24. Maraldi
25. Mons Piton
26. Mons Rumker
27. Montes Apenninus
28. Noggerath
29. Plato
30. Posidonius
31. Proclus
32. Ptolemaeus
33. Ross
34. Schmidt
35. Secchi
36. Sirsalis
37. Theophilus
38. Timocharis
39. Tycho
40. Vallis Alpes

Upcoming Focus-On targets:

A. Tycho
B. Herodotus