Visibility of the domes of Mare Undarum.

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.

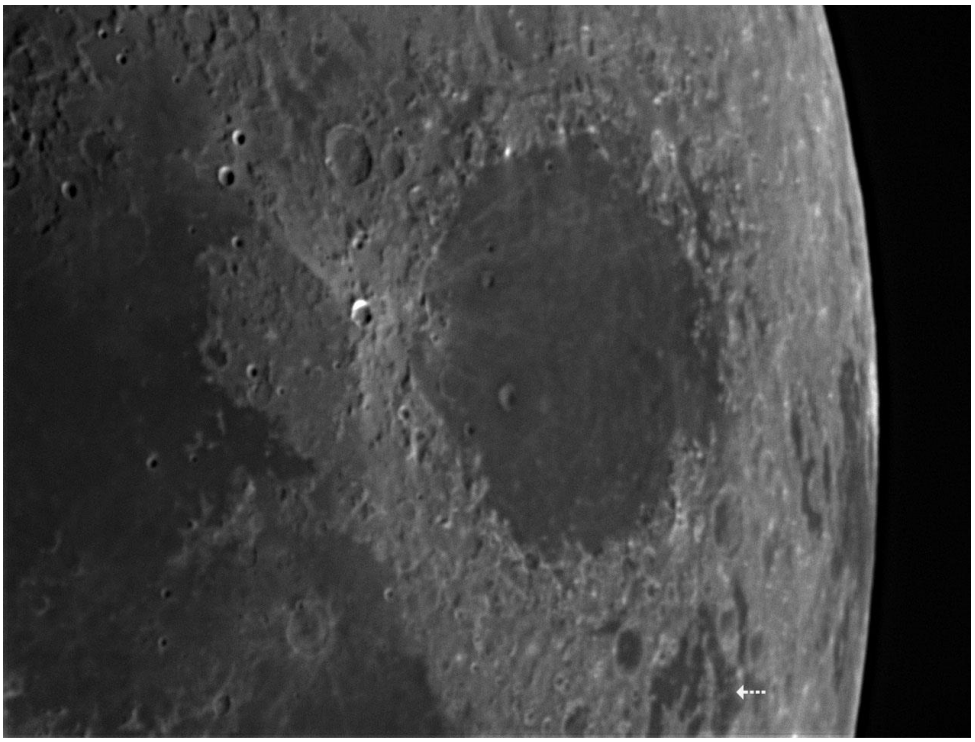
With the high declination of +40 and +52 degrees during two observing periods on May 27, 2023, I decided to reverse my observing methods, observing at phases far removed from the similar illumination dates.

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.

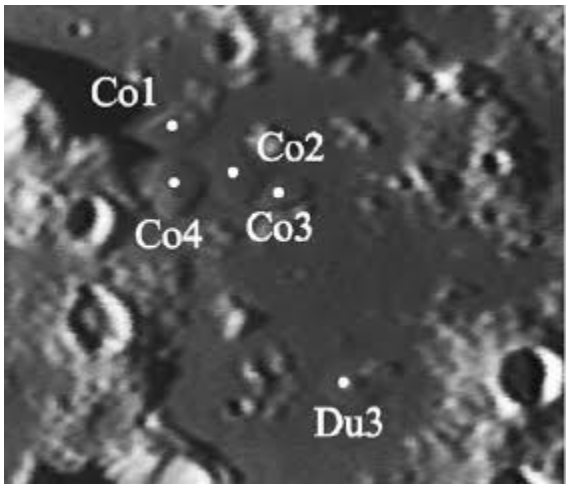
At once I noticed an additional feature not seen before. This was an extension of light from one of Mare Undarum's mountain ridges into the normally dark mare floor.

An image from Wayne Baily in the June 2023 TLO imaged the position but not exact shape of the extension I observed.



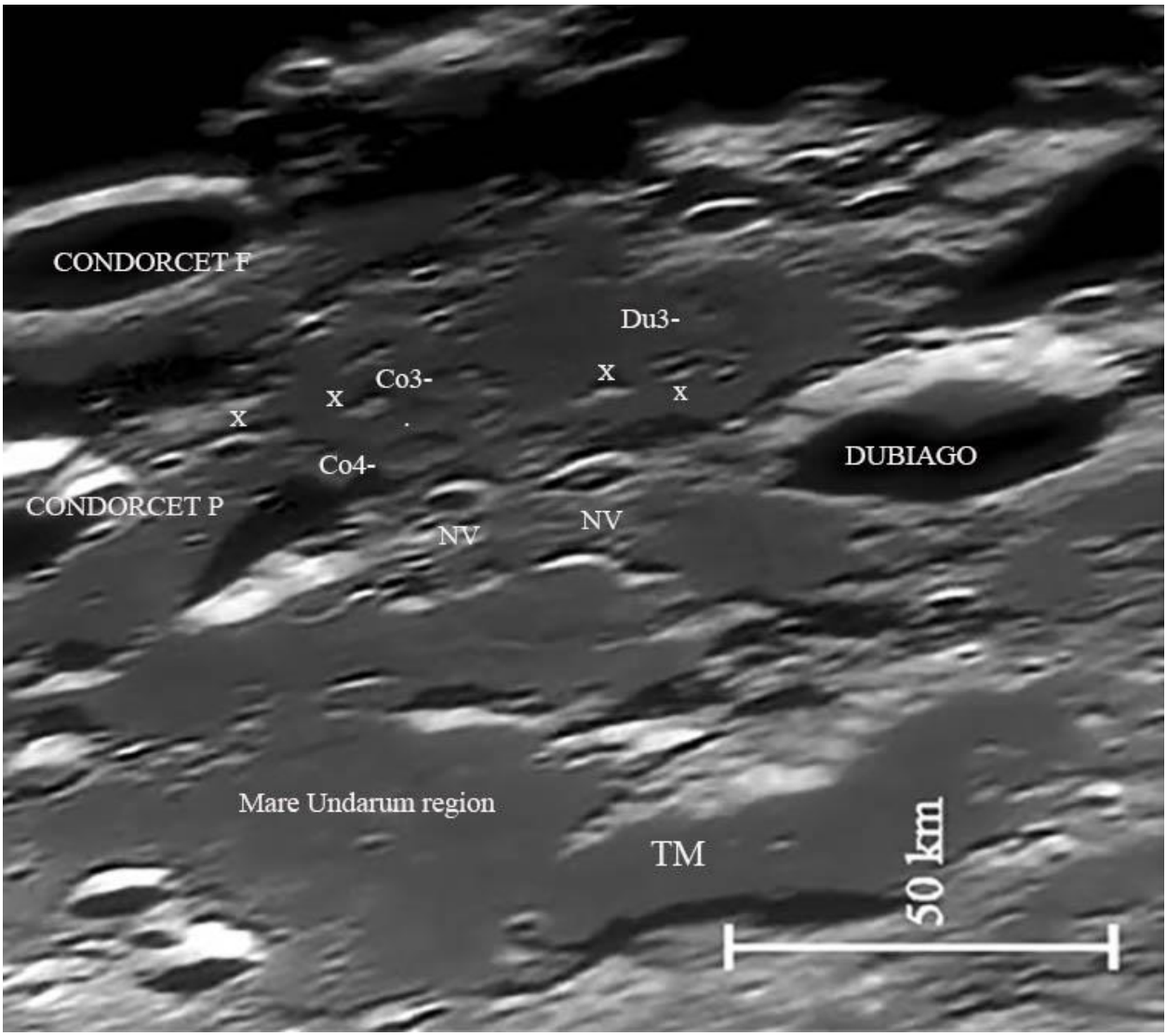
MARE CRISIUM. Wayne Bailey, Three Points, Arizona USA. February 8, 2022 02:10 UT, Seeig 7/10, Transparecy 6/6, Colongitude 350.0 deg. 8" f/12 Classical Cassegrain. W58 Green filter, Skynyxx_2-1M.

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 ,Co-longitude 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.

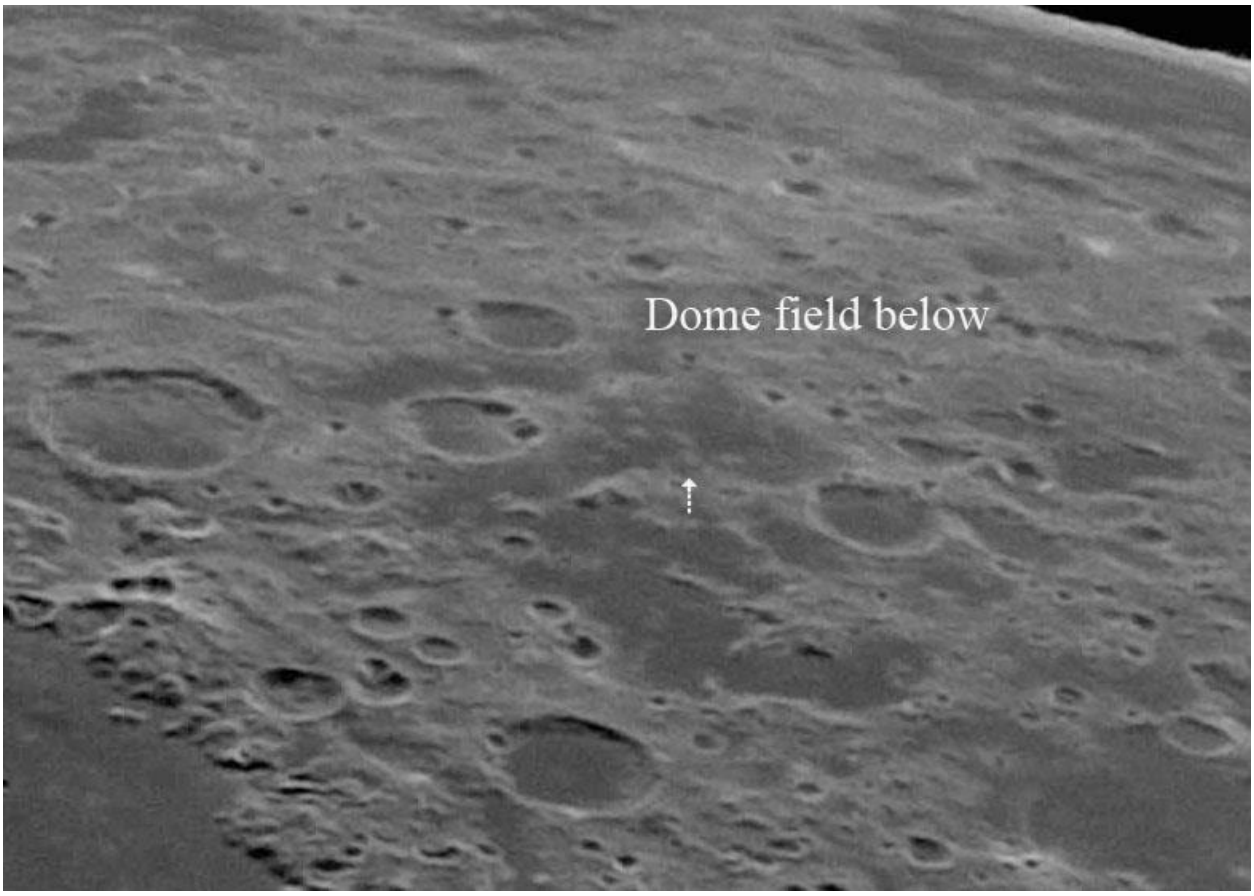
Condorcet 4 and Condorcet 3—resolved as close double with shapes of each visible at 156x best
Dubyago 3-reflection visible as point of light.
X-defines features visible.
NV defines features without shadow visible.
Point dot defines not visible dome Condorcet 2.
Condorcet 1 is not marked.



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 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 Co-longitudes and images may reveal more information of the visibility of all the Condorcet and Dubyago 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 35km 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 TiO2 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 12km. 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 dikes.