

MOON 2020-03-27 19:30 Local CEST (UT+1), PHASE 3-DAY, ILLUM 10% WAXING CRESCENT

ZEISS 100/640 APQ

VENUS

3-DAY MOON

ZEISS IB MOUNT

*3-Day
MOON*

MOON, LIVE VIEW
CM3 @ 200x MAG.

TRSP. 4/7, SEEING 6/10. TEMP. 4°C, HUM. 84%, DEWPT. 1°C



THE 3-DAY MOON

ENDYMION - HUMBOLDTIANUM

The NE Part of the 3-4 -day moon is dominated by the pair or large pre-Nectarian craters: *De La Rue* and *Endymion* to the N, and by a row of three craters: *Messala* (pre-Nectarian), *Cleomedes* (Nectarian) and *Geminus* (Eratosthenian) towards the S.

Endymion is a relatively old pre-Imbrian impact that smacked into the S wall of an ancient (unnamed) pre-Nectarian crater, still “sticking out” up north and bordering on another PN crater: *De La Rue*. The floor of Endymion was lava flooded in upper Imbrium and to the S of Endymion is seen a pair of ancient (unnamed) PN-impacts that has been almost totally flooded by mare lava in the same epoch: *Lacus Temporis*.

Beyond Endymion towards the E is first seen the outer excavation boundary of the Nectarian epoch **Humboldtianum Basin**, then further E is seen the inner basin ring that holds the *Mare Humboldtianum*. The libration this evening is not favorable for the E lunar rim (-5° Long), but never the less the inner ring can be traced all around the mare lava to the far W side, right at the lunar horizon. The *Humboldtianum rings* have been named (informally, by Chuck Wood) as: outer 650 Km Ø *Andes Mts.* and inner 340 Km Ø *Bishop Mts.*

I've made a couple of **transects**: T1 across the **Humboldtianum Basin** and T2: across the **Endymion crater complex**. In general, this is a low lying area with the *Mare Humboldtianum* at level -4 Km, rising to -3 Km between the inner and outer ring, and then up to around -1 Km average height for the Basin ejecta carpet outside the Mts. Alpes scarp, where Endymion is located. The ancient Endymion floor is at -1.8 Km while the later Endymion lava-covered floor is at -3 Km. The area offers quite a dramatic sight in the telescope at this young crescent moon!

CLEOMEDES

Cleomedes is a 125km wide crater with a smooth floor from lava that has covered all but the tip of the central peak in the basin; Five smaller impacts have since (in Imbrian-Copernican) pitted the lava floor, the smallest being *Cleomedes J* (12km diameter), which I can *just* glimpse in the mediocre seeing tonight. The central part of the lava fill has been pushed up by the lava below giving rise to several arcuate fractures/rimae (which I cannot see tonight, -- and they are probably beyond reach on any night for my 7" instrument).

Between *Endymion* and *Messala* is a group of relatively smooth lava-filled plains, including **Lacus Temporis** and **Lacus Spei**. Charles Wood speculates that these dark smooth patches may indicate a “**crypto mare**”, where an ancient dark lava plain has been mostly covered by later impact craters and ejecta carpets. If so, it would be like the ancient Mare Australe, but even more impact pummeled and covered by crater ejecta. East of Endymion, towards the lunar limb, I can see the almost edge-on multi-ring lava-filled impact basin: **Humboldtianum**, including its outer ring (#2) close to the E rim of Endymion, and the inner ring (#1) surrounding the dark mare lava.

CRISIUM

The central E limb of the 3-4 -day moon is dominated by the Crisium basin. The relatively young (Nectarian) **Crisium Basin** shows a massive rim of up-tilted crust, -- most well defined towards the W. This indicates an oblique impact in a W->E direction, which has ejected excavated material as a hummocky carpet, preferentially fanning out towards the E.

A **transect of Crisium** shows the W basin rim to be significantly higher (4-5 Km) than the E rim (~1 Km), with a shelf covered by shallow mare basalt just inside the rim. The shelf is delimited by an inner ring of wrinkle ridges (dorsae), inside which the thick central mare has subsided by ~500m. Several craters on the higher bench have been only partly flooded by lava (*Lick*, *Yerkes*, *Eimmart C*), while any lower-Imbrian craters on the central lava floor have been fully submerged by the ~3 Km thick lava cover.

PETAVIUS

The SE limb of the 3-4 -day moon is a heavily cratered highland with few mare plains. The largest plain is the E part of the pre-Nectarian **Fecunditatis** lava-covered basin, featuring a couple of wrinkle ridge dorsae (*Morson* and *Andrusov*), a triplet of small Imbrian craters plus the large craters: pre-Nectarian *Vendelinus* and Eratosthenian *Langrenus* at the far E end of the basin. Two far-side pre-Nectarian impact basins, each with its Nectarian mare, are also extending over the eastern lunar limb: *Mare Smythii* to the N and *Mare Australe* towards the S.

Petavius is an interesting large, uplifted and floor-fractured crater (FFC) with a major straight and wide crack from the central massifs to the SW rim (Rima Petavius), plus volcanic pyroclastic dark matter deposits (DMD) at the N end of the crater floor.

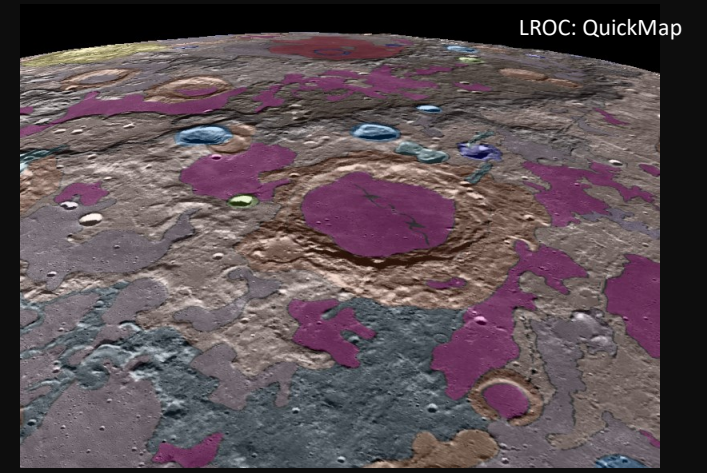
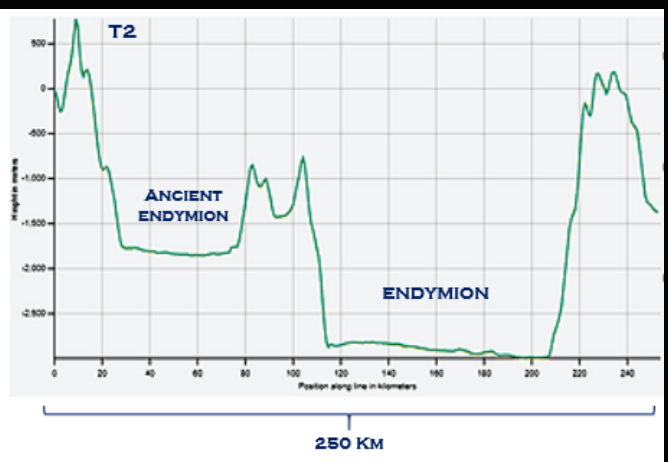
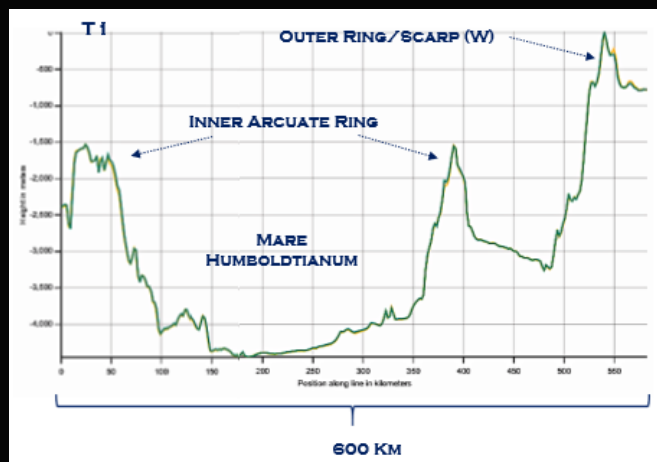
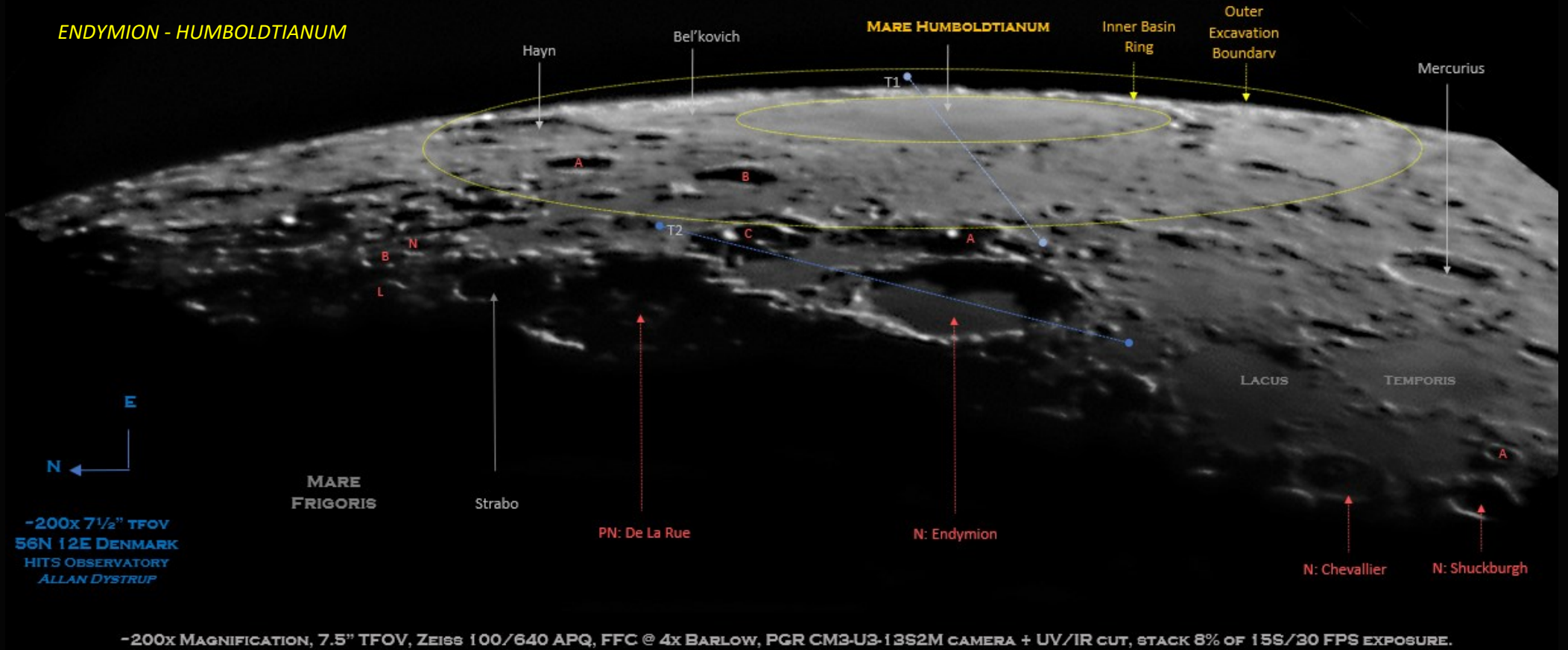
Petavius shows a tight central ring of mountain massifs plus an unusually wide crater rim (50-100KM at the top), almost as an early stage of becoming a double-ringed impact. On the transect I made (see below) it is also evident that the crater floor is domed up with the rille probably being a tension fracture (i.e. a trench/graben).

M. Smythii is contained within a multiring basin (like M. Crisium): the inner ring (#1) obviously surrounds the mare proper, and the outer ring (#2) can be glimpsed (imagined?), enclosing the craters *Gilbert* and *Kästner*. As can be seen on Lunar Reconnaissance Orbiter (LRO) photographs, **the Australe basin** is clearly of ancient pre-Nectarian origin without obvious ring or ejecta structures, but mostly appearing as a circular assemblage of many old lava-filled craters, a couple of which (*Oken*, *Lyot*) can *just* be spotted (literally) as dark patches on the SE lunar limb.

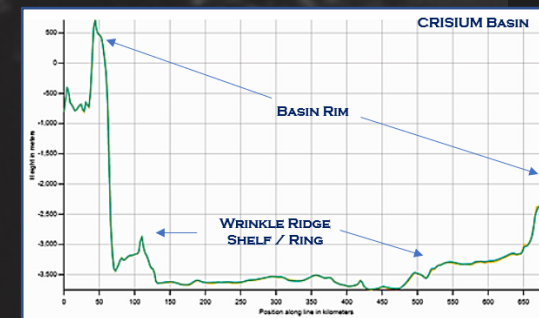
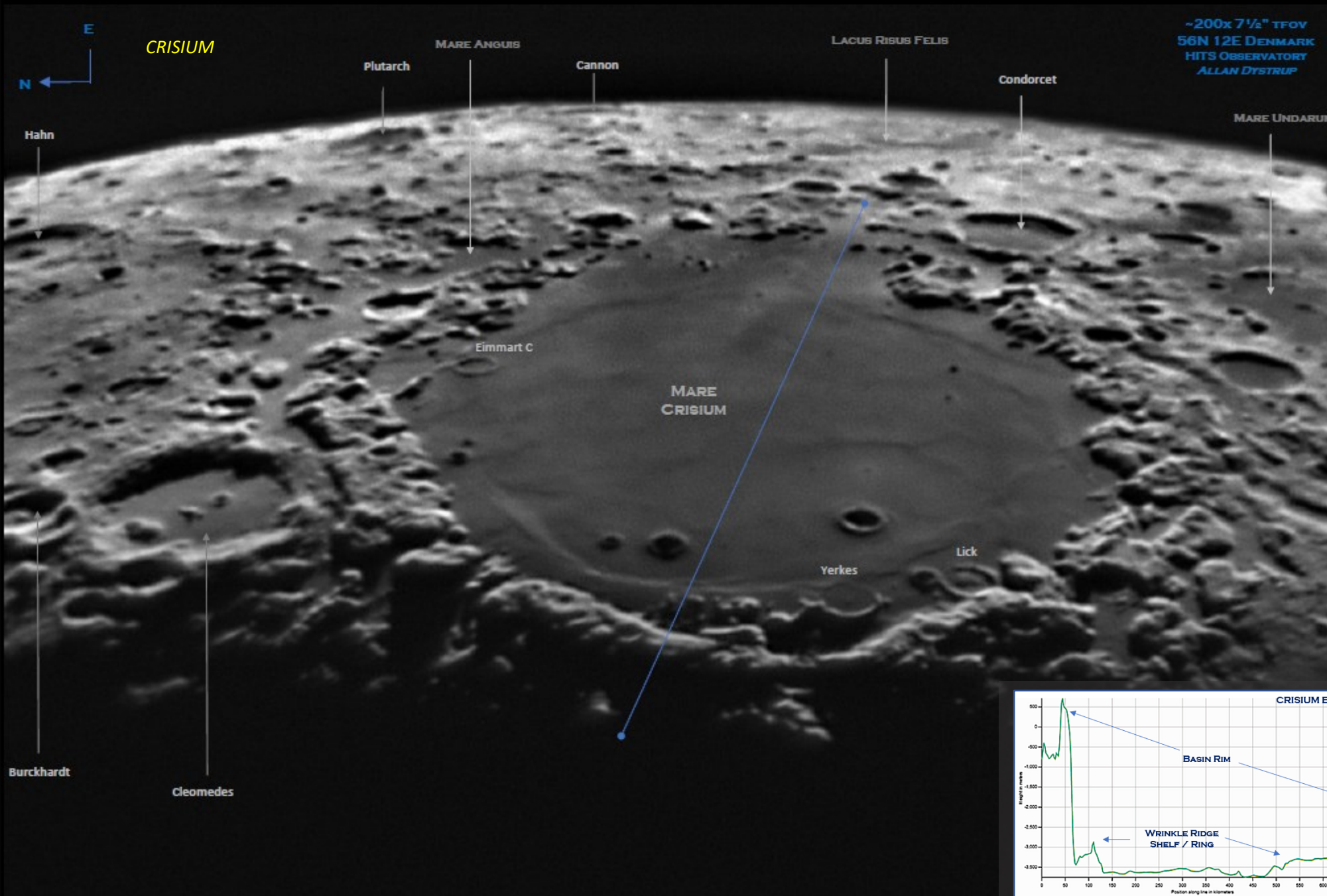
A dominant feature in the SE highlands of the 4-day moon is the radial sculpture of **the Snellius and Rheita valleys**, -- crater chains formed by ejecta from the nearby Nectaris basin impact. On either side of the Snellius Valley is a large crater: the young Lower-Imbrian *Petavius* to the N, and old pre-Nectarian *Furnerius* to the S. **Petavius** has thrown a splendid ejecta carpet up into M. Fecunditatis, and I can glimpse the floor fracturing from uprising magma under the crater (*Rimae Petavius*).

MOON 2020-03-27 19:30 LOCAL CEST (UT+ 1). PHASE 3-DAY, ILLUM 10% WAXING CRESCENT, TRSP. 4/7, SEEING 6/10. TEMP. 4°C, HUM. 84%, DEWPT. 1°C

ENDYMION - HUMBOLDTIANUM



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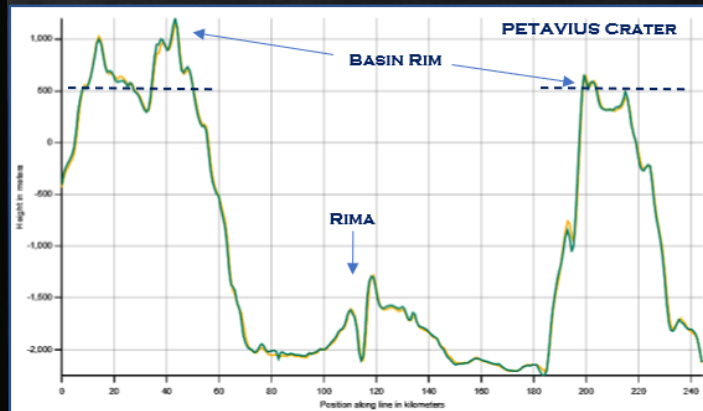
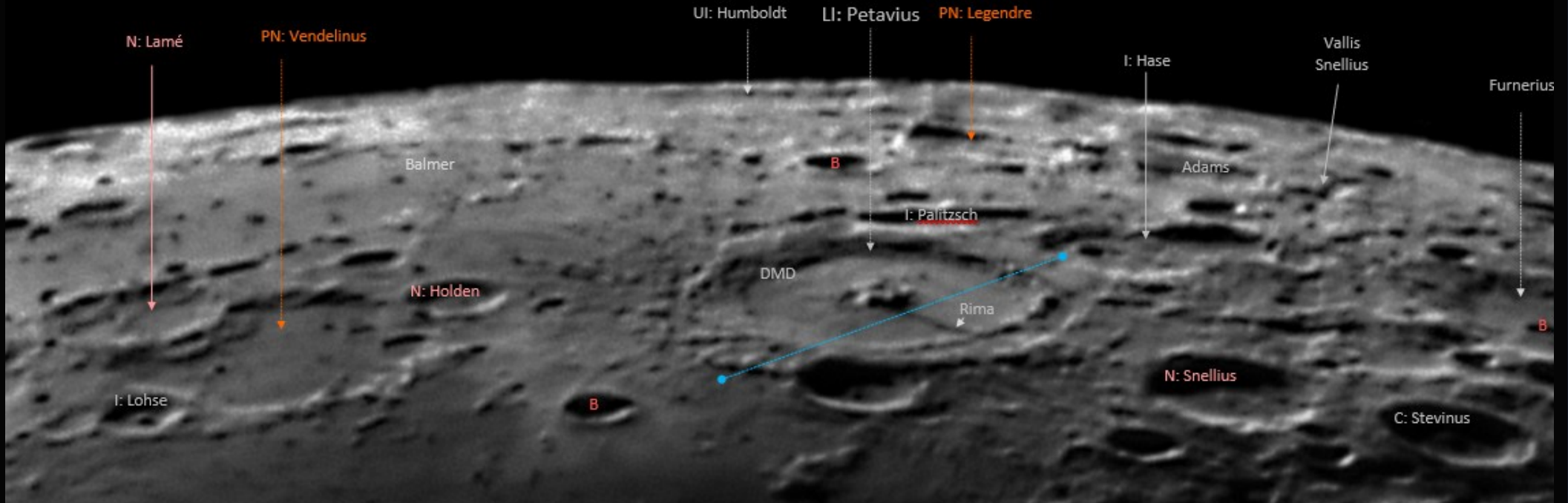


-200x MAGNIFICATION, 7.5" TFOV, ZEISS 100/640 APQ, FFC @ 4x BARLOW, PGR CM3-U3-1352M CAMERA + UV/IR CUT, STACK 10% OF 155/30 FPS EXPOSURE.

PETAVIUS

Petavius is an interesting large uplifted and floor-fractured crater (FFC) with a major straight and wide fracture from the central massifs to the SW rim (*Rima Petavius*) plus volcanic pyroclastic dark matter deposits (DMD) the N end of the crater floor. Petavius shows a tight central ring of mountain massifs plus an unusually wide crater rim (50-100KM at the top), almost as an early stage of becoming a double-ringed impact. On the transect I made (below) it is also evident that the crater floor is domed up with the rille probably being a tension fracture (i.e. a trench/graben).

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MARE FECUNDITATIS

UI: Monge

E
N ←

-200x 7 1/2" TFOV
56N 12E DENMARK
HITS OBSERVATORY
ALLAN DYSTRUP

-200x MAGNIFICATION, 7.5" TFOV, ZEISS 100/640 APQ, FFC @ 4x BARLOW, PGR CM3-U3-13S2M CAMERA + UV/IR CUT, STACK 7% OF 15S/30 FPS EXPOSURE.

A photograph of a crescent moon, showing its characteristic curved shape and numerous craters. The moon is set against a dark, black background. A thin yellow circle is drawn around the moon, framing it. The text "4-Day MOON" is centered within the circle, with "4-Day" on the top line and "MOON" on the bottom line, both in a white, sans-serif font.

4-Day
MOON

It's an early evening at the end of November (2019-11-30, 17:30 local). This has been the most overcast and wettest November month (as indeed the whole autumn season) in Danish meteorological history, -- i.e., the past 150 years since systematic recordings started the mid 1800 century. Last time we had clear skies was a month ago (2019-10-28), so climate change is indeed unfolding here in Europe. 😞

I have embarked on a small Moon project with the aim of studying and **understanding the main lunar landforms**, i.e., observing the geomorphological and geological units on the (nearside) lunar surface, as observable from my suburban backyard using modest 4-7" telescopes. I'm observing visually, and documenting my observations by taking smartphone and machine-camera snapshots along the way. Neither my telescopes nor cameras are of perfect optical quality for this purpose, but they are quite good, and so -- as we used to say when I worked in test automation and QA of software development --, "when the error rate goes below your set and measured quality level: SHPIT!". 😊

The Moon tonight is a **waxing crescent, the lunation is around 4 days** (4.1dy age, 18.2% illumination), and the longitudinal libration is close to $4\frac{1}{2}^\circ$, which is favorable for observing the Maria peeking out from the lunar far side at the E limb. The temperature is around the freezing point (0°C), and the humidity is relatively low (85%). The transparency and seeing are both just above medium with some atmospheric wavering, as I'm passing from astronomical dusk into proper night with a suburban/rural transition NELM of ~ 6.4 .

The 4-day moon is dominated by the central, **old pre-Nectarian impact basin of Mare Fecunditatis and the younger Nectarian multi-ring basin of Mare Crisium**. M. Crisium is surrounded by several Nectarian craters that -- like the basin itself -- has been flooded and filled by basalt in the upper Imbrian epoch, notably: *Cleomedes*, *Condorcet*, *Neper*, *Firmicus*, *Dubyago*, *Apollonius*. Of the Maria at the E limb, *Marginis*, *Smythii* and *Australe* are all pre-Nectarian, while *Humboldtianum* is Nectarian (same as M. Crisium). The lava fill of the limb-Maria took place mostly in upper Imbrian, as was indeed the case for the other major impact basins on the Moon (apart from *central Imbrium-Procellarum*, which was lava flooded later, in the Eratosthenian period). The northern highland of the 4-day crescent moon is dominated by several old pre-Nectarian craters (*De La Rue*, *Endymion*), while some younger, lower Imbrium craters decorate the southern highlands: *Petavius* and *Furnerius*. A pair of really young craters are found at the E border of M Fecunditatis: The Eratosthenian *Langrenus* and the Copernican *Taruntius*.

MOON 4.1dy (18.2%) Waxing crescent, Alt: 7°

2019-11-30, 17:30 CEST UT+1, Astronomical dusk

Temp.: 1°C , Hum.: 85%, DewPt.: -1°C

LP: SQM 20.7 (NELM 6.4), Rural/Suburban trans.

Transparency: 5-6/7, Seeing: 6/10

Endymium

Cleomedes

Crisium

Fecunditatis

86x Magnification, 1.2° TFOV

Zeiss 7" f/10 Mak, 21mm ETH EP

iPhone XS, NightCap v 9.7 App

Exposure: 1/25s, ISO-24

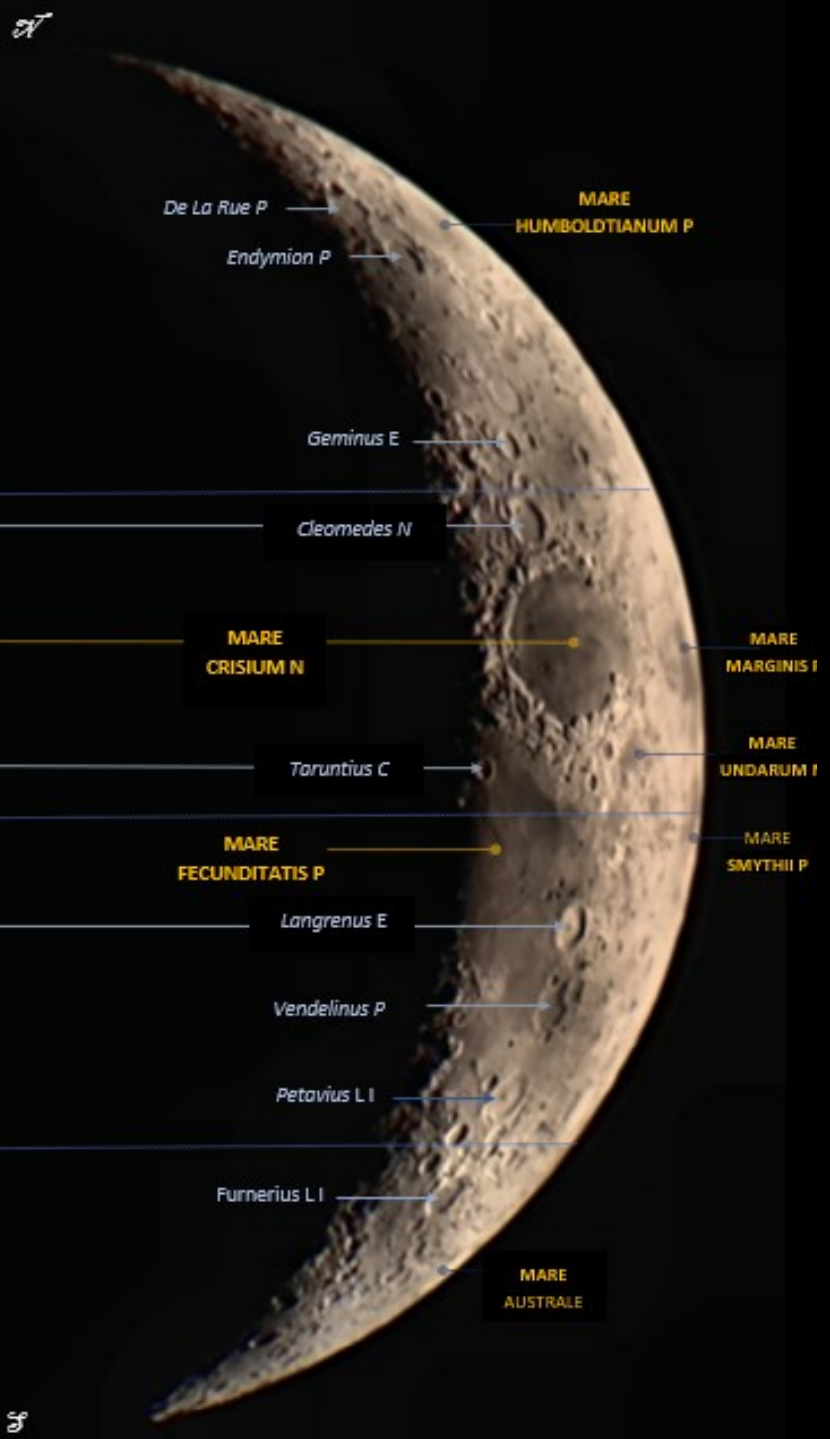
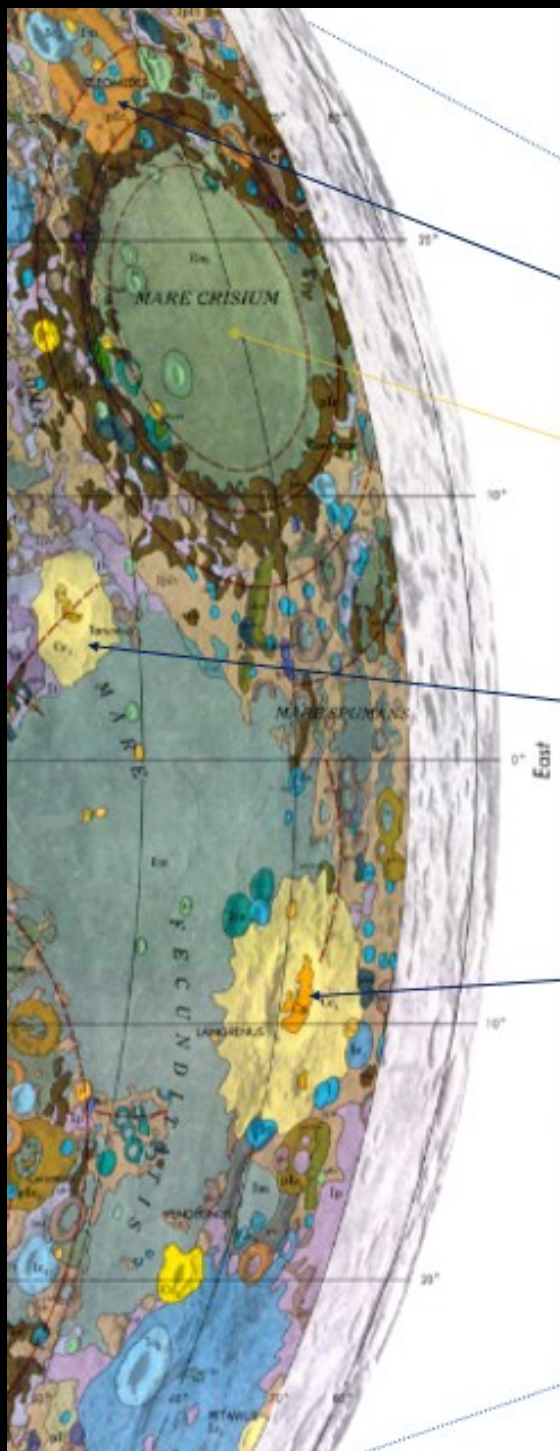
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86x Magnification, 1.2° TFOV

7" f/10 Mak, 21mm ETH EP

iPhone XS. NightCap v 9.7 App

MOON 4.1dy (18.2%) Waxing crescent, Alt:7°

HITS Observatory, 56N 12 E Denmark
2019-11-30, 18:30 Astronomical dusk.
Temp.: 1°C, Hum.: 85%, DewPt.: -1°C
LP: SQM 20.7 (NELM 6.4), Rural/Suburban
Transparency: 5-6/7, Seeing: 6/10

De La Rue P

MARE
HUMBOLDTIANUM P

Endymion P

LACUS
TEMPORIS

LACUS
SPEI

Messala P

Gauss N

Berosus N

Hahn L I

Cleomedes N

MARE
MARGINIS P

MARE
HUMBOLDTIANUM P

Cleomedes

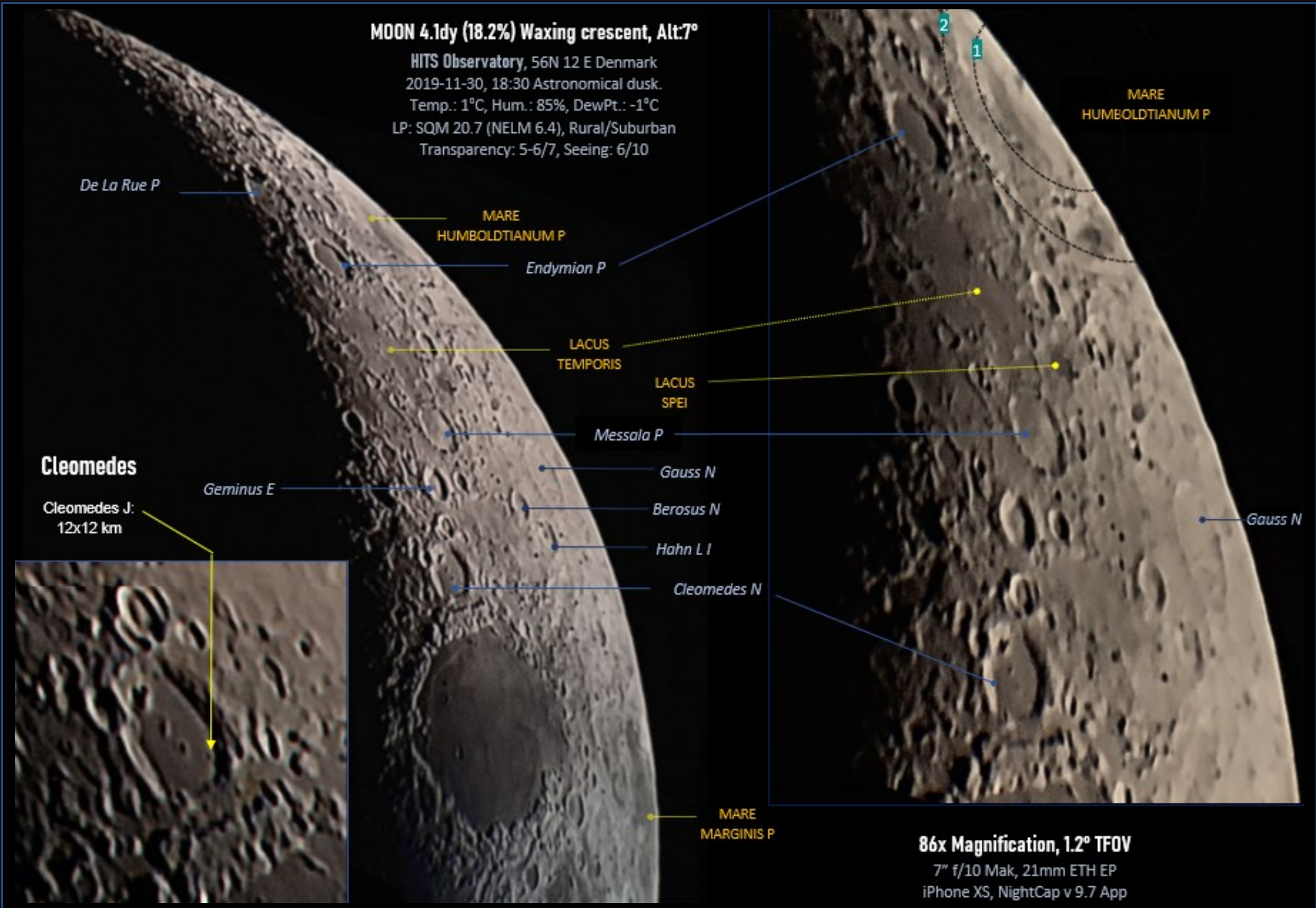
Cleomedes J:
12x12 km

Geminus E



86x Magnification, 1.2° TFOV

7" f/10 Mak, 21mm ETH EP
iPhone XS, NightCap v 9.7 App



MOON 4.1dy (18.2%) Waxing crescent, Alt:7°

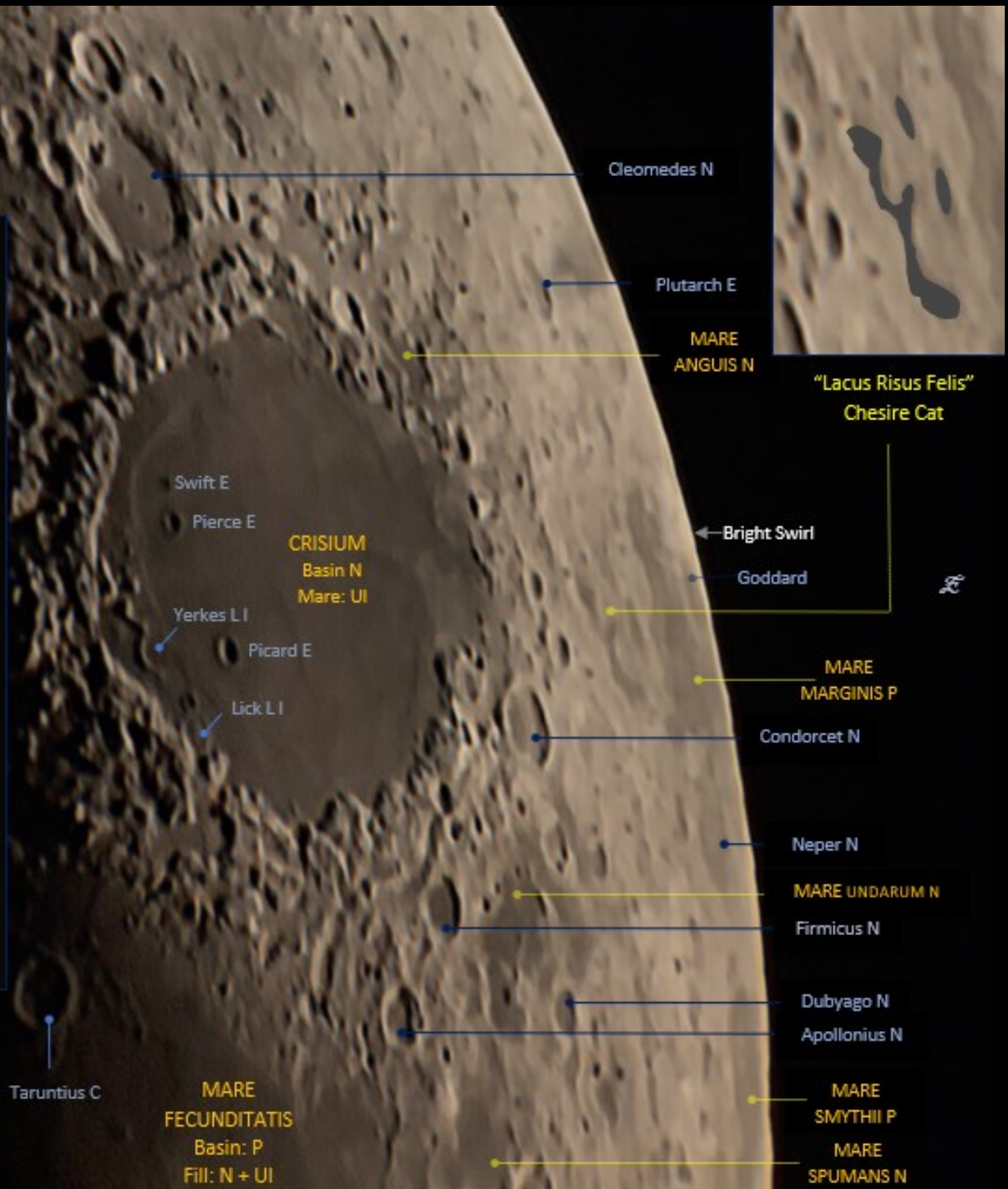
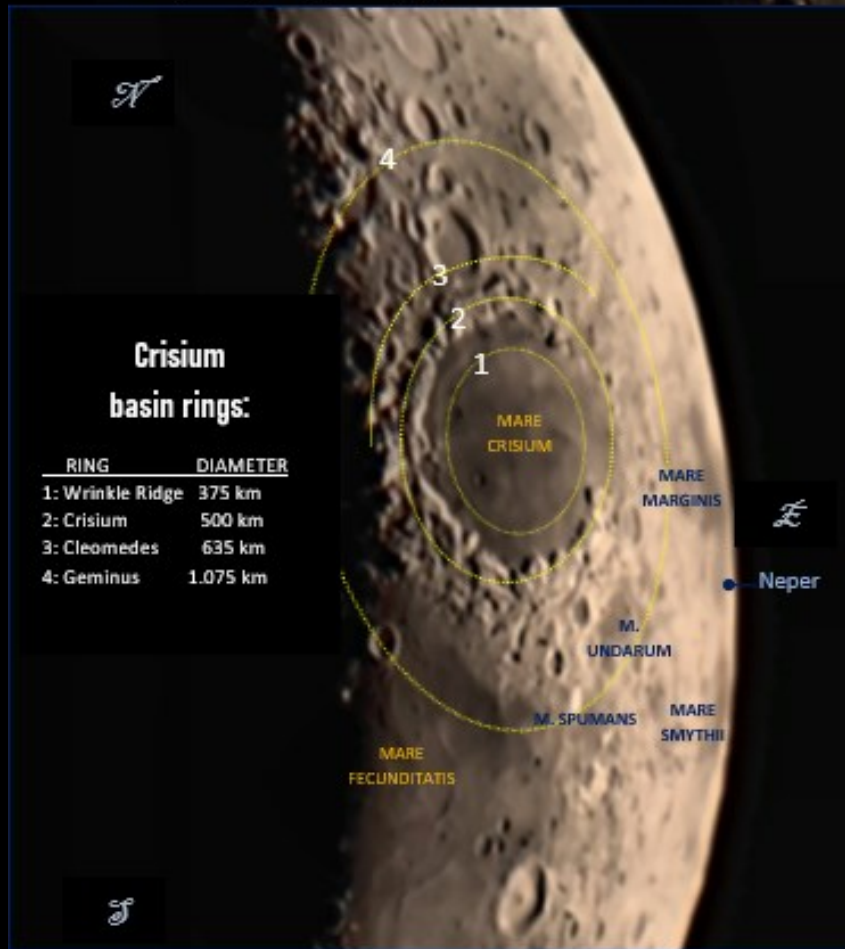
HITS Observatory, 56N 12 E Denmark

2019-11-30, 18:00 Astronomical dusk.

Temp.: 1°C, Hum.: 85%, DewPt.: -1°C

LP: SQM 20.7 (NELM 6.4), Rural/Suburban

Transparency: 5-6/7, Seeing: 6/10



171x Magnification, 35' TFOV

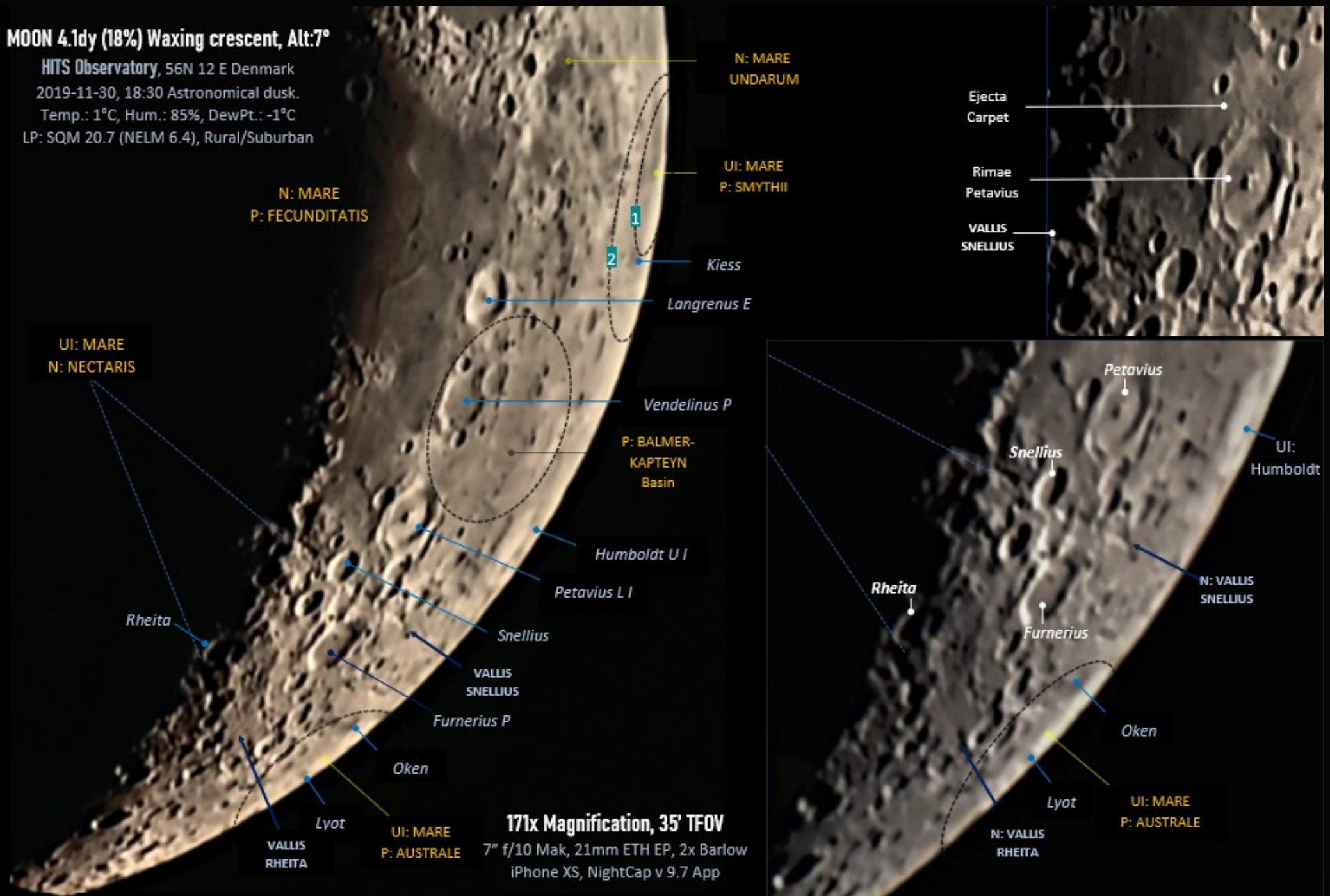
7" f/10 Mak, 21mm ETH EP

2x Barlow

iPhone XS, NightCap v 9.7 App

MOON 4.1dy (18%) Waxing crescent, Alt:7°

HITS Observatory, 56N 12 E Denmark
2019-11-30, 18:30 Astronomical dusk.
Temp.: 1°C, Hum.: 85%, DewPt.: -1°C
LP: SQM 20.7 (NELM 6.4), Rural/Suburban



N: MARE
P: FECUNDITATIS

N: MARE
UNDARUM

UI: MARE
P: SMYTHII

UI: MARE
N: NECTARIS

Kiess
Langrenus E

Vendelinus P

P: BALMER-
KAPTEYN
Basin

Humboldt U I

Petavius L I

Snellius

VALLIS
SNELLIUS

Furnerius P

Oken

UI: MARE
P: AUSTRALE

VALLIS
RHEITA

171x Magnification, 35' TFOV

7" f/10 Mak, 21mm ETH EP, 2x Barlow
iPhone XS, NightCap v 9.7 App

Ejecta
Carpet

Rimae
Petavius

VALLIS
SNELLIUS

Petavius

Snellius

UI:
Humboldt

N: VALLIS
SNELLIUS

Rheita

Furnerius

Oken

Lyot

N: VALLIS
RHEITA

UI: MARE
P: AUSTRALE

Mare Crisium Basin was created by a low-angle oblique impact of an asteroid coming in from the west back in the late *Nectarian* period (3.84 Billion years ago); The impact created an elliptic W-E elongated multi-ring system, with a massive main basin ring (#2: Crisium) surrounded by two lower outer rings: one passing just S of *Cleomedes* (#3) and the outermost passing S of *Geminus* (#4).

Later, in the *upper Imbrian* epoch (~3 Byr ago), **lava** penetrated from the lunar mantle up through fractures in the impact site and flooded the central basin (*Mare Crisium*) as well as low areas between the rings #2 and #3 (*Mare Anguis*, *Mare Undarum*). Nectarian lava also flooded some nearby Nectarian craters, notably: *Cleomedes*, *Condorcet*, *Firmicus*, *Apollonius* and *Dubyago*, all of which now show relatively smooth and dark crater floors. Note that the ancient basins further E towards the moon limb (the pre-Nectarian *Marginis* and *Smythii*) and also the large Nectarian craters *Neper* and *Goddard* were also flooded by lava in this lunar epoch.

The lava in the Crisium basin has formed a relatively smooth dark plain. Along the inside of M. Crisium can be seen **shelf/bench** of lava covering the inner sloping terrace of the basin; After the first lava flood the crust below the central **lava** plain subsided ~200m down, where after a secondary lava flooding pushed up against the basin bench forming the inner **"wrinkle ridge" ring** (#1). A pair of early Imbrian craters (*Yerkes*, *Lick*) have been partly submerged by this lava at the far SW edge, and a row of three younger Eratosthenian craters (*Picard*, *Pierce*, *Swift*) have since excavated some early, deeper and darker lava at the W side of the Mare.

Just **E of M. Crisium** can be seen some patches of dark mare looking somewhat the Chesire Cat smile (Charles Wood has christened this formation: "*Lacus Risus Felis*", aka the Cat's Smile Lake...). Further E still is *M. Marginis* with a lava filled crater to the S (*Neper*) and another one to the N (*Goddard*); At the northern rim of *Goddard* is a bright patch, -- a swirl (like *Reiner Gamma* in *Oceanus Procellarum*) extending from the far side of the Moon.

86x @ 1.2° FOV

7" f/10 Mak,
21mm ETH EP
iPhone XS,
NightCap v9.7

Crisium is a 400km wide impact basin with 2-5km high mountain massifs at the N and S shores, in combination with a relatively low W and E rim, which can be explained by an oblique impact of a comet or asteroid coming in low from the west.

The Crisium floor is relatively smooth, covered by a thick layer of old, dark (titanium-rich) basalt, which has also submerged the craters *Yerkes* and *Lick* at the SW border of the Mare. The central part of the floor has then caved in, leaving a ca. 25km wide, shallow bench at the edge; Younger lava flows have since covered the central part of Crisium, causing a system of wrinkle ridges at the shallow bench. I could clearly see the NE wrinkle ridge (*Dorsum Ooppel*) that curves from E of *Pierce* up towards *Cleomedes* F.

