The Sky This Month

July 7 – August 3, 2021

Ojibwe star lore

Ajiijaak – Crane

Noondeshin Bemaadizid – Exhausted Bather

Madoodiswan – Sweat Lodge

Jiibay Zuibi – River of Souls

Nanaboujou – hero figure

Arnold Brody

The Royal Astronomical Society of Canada, Toronto Centre

July 7, 2021

Observing

RASC Observing programs

https://rasc.ca/certificate-programs

Explore the Universe*
introductory observing program

Explore the Moon
introductory lunar observing

Messier Catalogue
intermediate level

Finest NGC
intermediate level

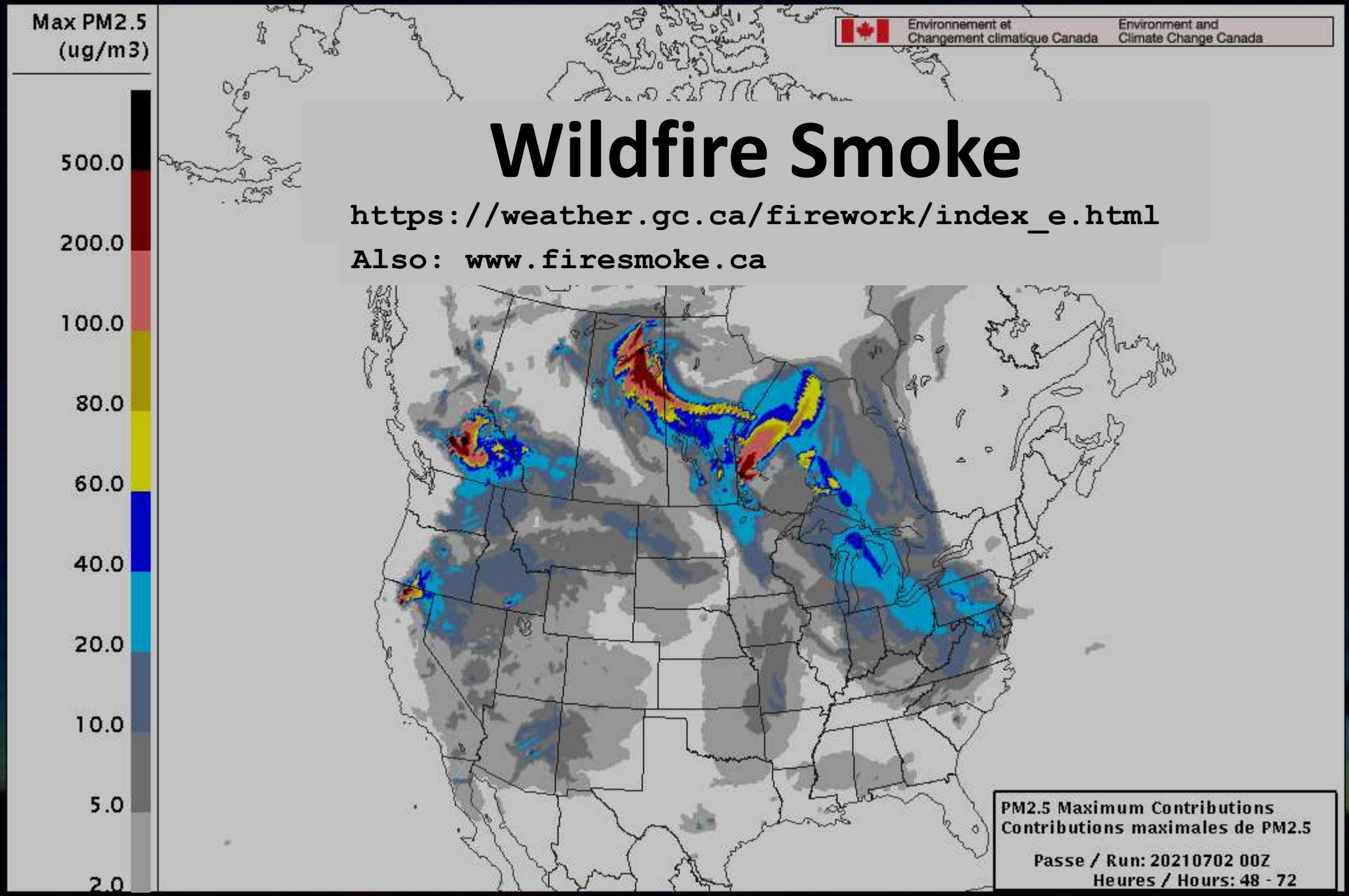
Double Stars
intermediate level

* open to non-members

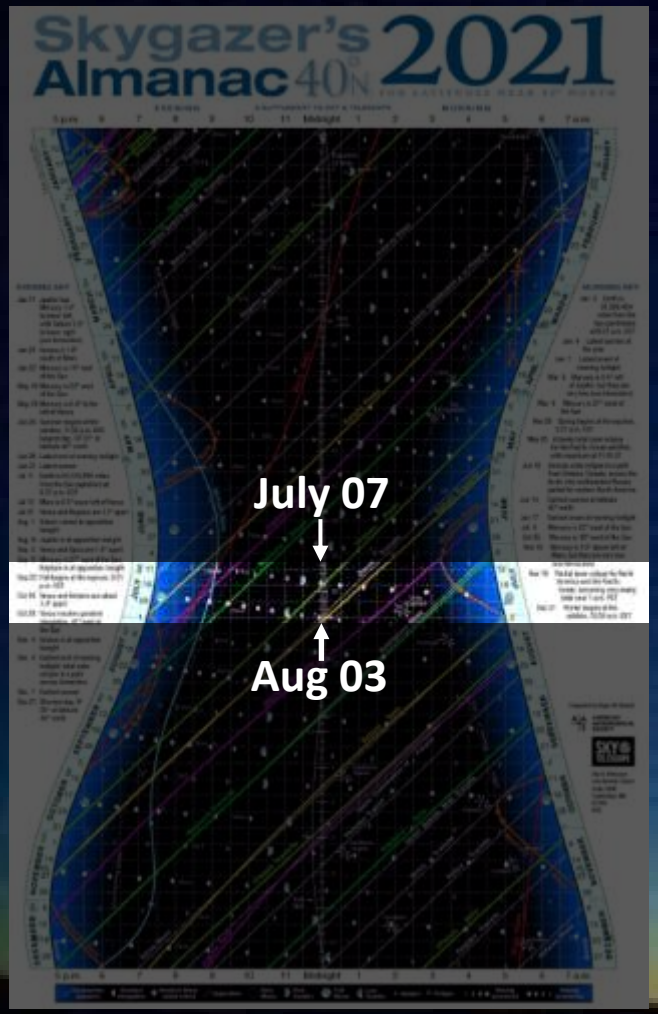
Wildfire Smoke

https://weather.gc.ca/firework/index_e.html

Also: www.firesmoke.ca



Tight (but growing) Night Window

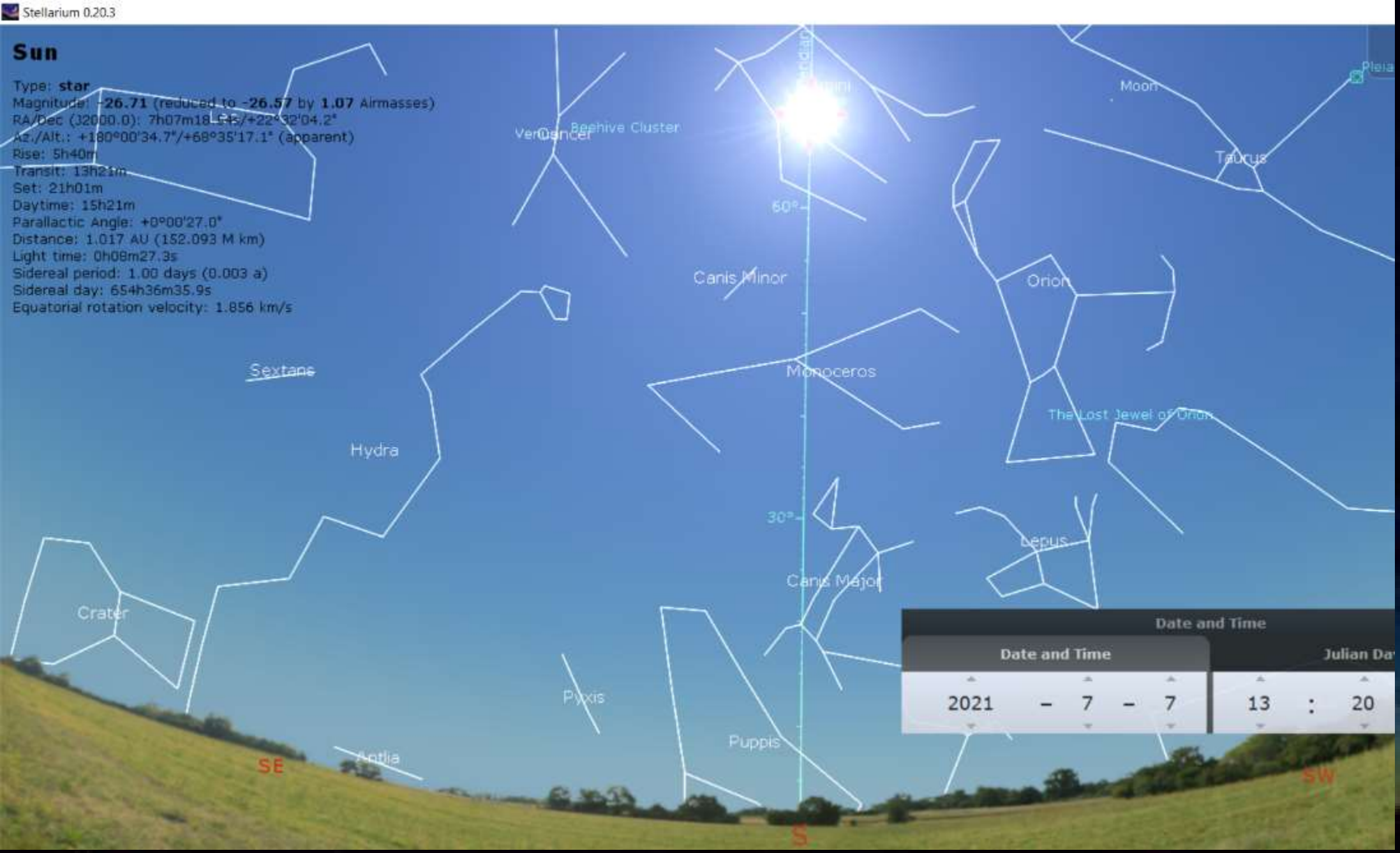


Night: When the Sun is 18° or more below the horizon

Date	**Astronomical Twilight** begins	**Astronomical Twilight** ends	Duration
July 7 - 8	**22:20 EDT**	**04:20 EST**	**6 hr. 00 min.**
Aug 3 - 4	**21:49 EST**	**04:54 EST**	**7 hr. 05 min.**

Date	**Night** begins	**Night** ends	Duration
July 7 - 8	**23:19 EDT**	**03:22 EDT**	**4 hr. 03 min.**
Aug 3 - 4	**22:35 EST**	**04:09 EDT**	**5 hr. 34 min.**

2021 Skygazer's Almanac by Sky & Telescope



Sun's position in the sky

Alt. 68°35′ tomorrow (July 8) at local noon

Viewing through 1.07 airmasses.

Excellent opportunity to view or image spots, filaments, etc.

Space Weather Prediction Centre
Subscription Service

From: SWPC Product Subscription Service <SWPC.Products@noaa.gov>
Date: Sun, Jul 4, 2021 at 11:36 PM
Subject: Space Weather Outlook
To: <arnbrody@gmail.com>

Official Space Weather Advisory issued by NOAA Space Weather Prediction Center
Boulder, Colorado, USA

SPACE WEATHER ADVISORY OUTLOOK #21-29
2021 July 4 at 9:31 p.m. MDT (2021 July 5 0331 UTC)

**** SPACE WEATHER OUTLOOK ****

Summary For June 28-July 4

R3 (Strong) Solar Radiation Storms were observed on 03 Jul.
R1 (Minor) Solar Radiation Storms were observed on 04 Jul.
No other space weather storms were observed during the summary period.

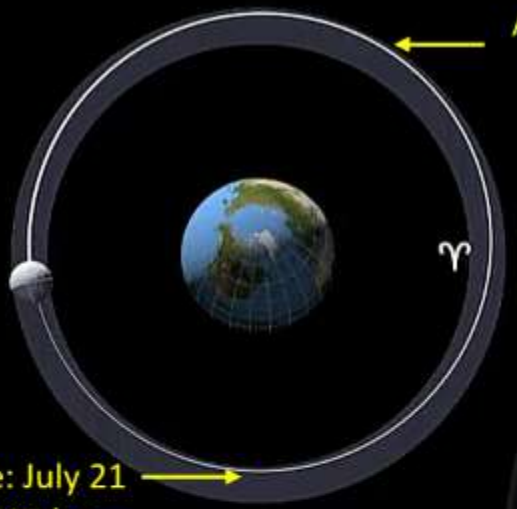
Outlook For July 5-11

No space weather storms are expected during the outlook period.

Data used to provide space weather services are contributed by NOAA, USAF, NASA, NSF, USGS, the International Space Environment Services and other observatories, universities, and institutions. More information is available at SWPC's Web site http://swpc.noaa.gov

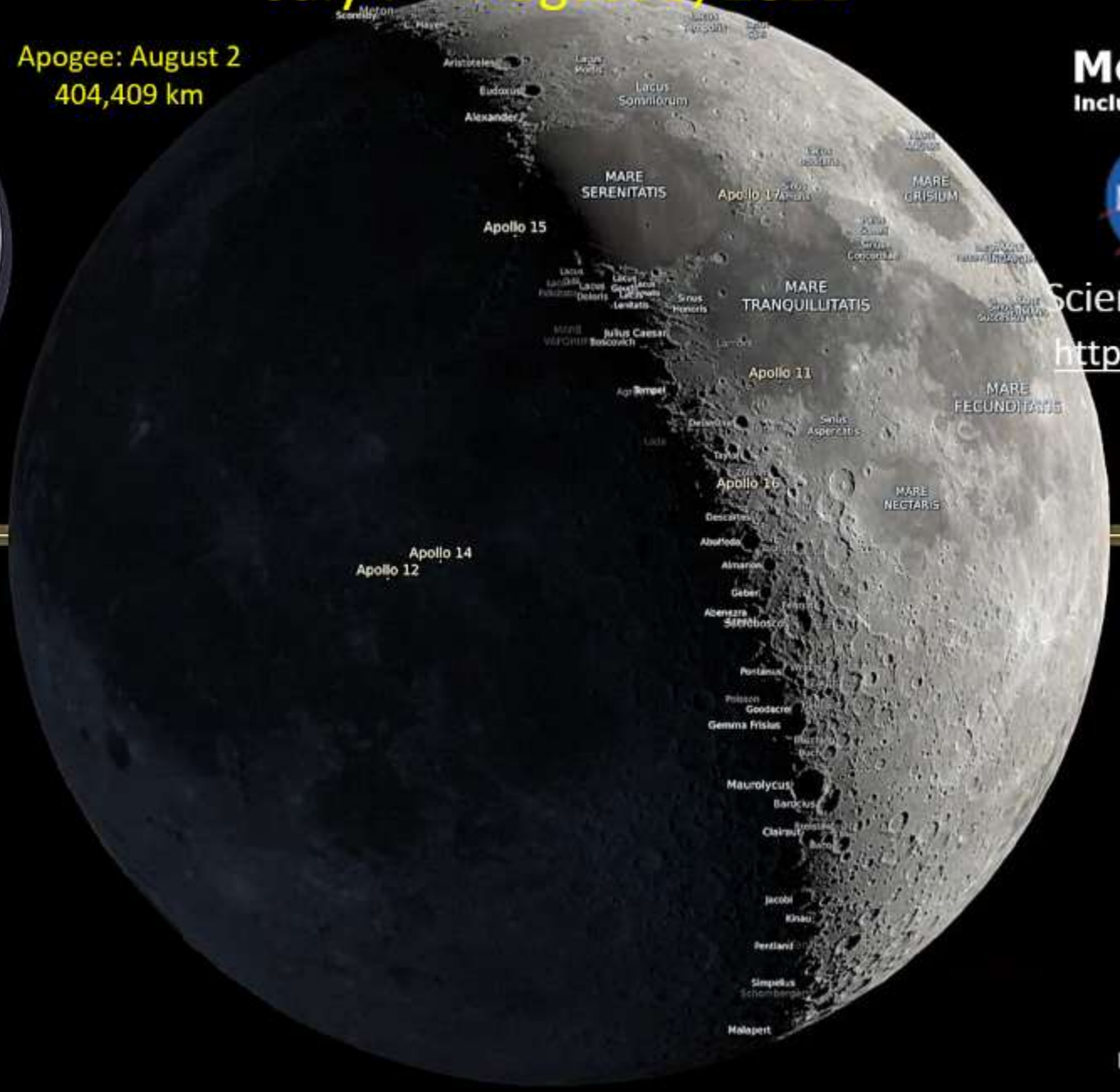
To Subscribe:
https://www.swpc.noaa.gov/content/subscription-services

July 7 – August 3, 2021



Apogee: August 2
404,409 km

Perigee: July 21
364,523 km



Moon Phases 2021

Including Libration and Position Angle

Scientific Visualization Studio
https://svs.gsfc.nasa.gov/4874

Perigee Apogee

Time	16 Jul 2021 03:00 UT
Phase	35.8% (6d 01h 43m)
Diameter	1902.2 arcseconds
Distance	376786 km (29.57 Earths)
Position	12h 32m 11s, 01° 31' 09"N
Subsolar	1.066°N 101.572°E
Sub-Earth	5.940°S 4.950°W
Pos. Angle	22.547°

Libration

July 8, predawn
southwest limb

July 22-24, after sunset
northeast limb

Moon at Perigee appears ≈12% larger than at Apogee. Same ratio as quarter and nickel coins!

Lunar Calendar
July 7 – August 3, 2021

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			July 7	**8** *	**9** New Moon	**10**
11 *	**12** *	**13** *	**14**	**15**	**16**	**17** First Quarter 
18	**19**	**20**	**21** Moon at Perigee 364,523 km	**22**	**23** Full Moon 	**24** *
25	**26** *	**27**	**28** *	**29**	**30**	**31** Last Quarter 
Aug 1	**2** Moon at Apogee 404,409 km	**3**				

Full Moon names

Buck Moon,
Thunder Moon

Globe at Night

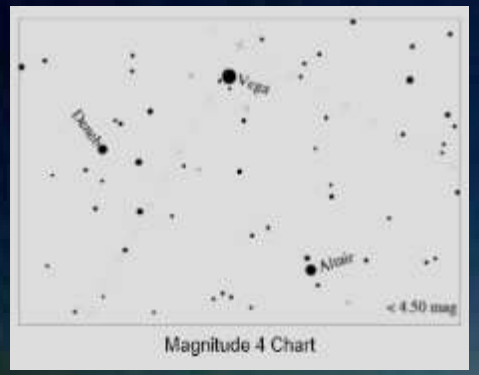
Cygnus July 30–August 8, 2021

Magnitude 0/Cloudy Sky

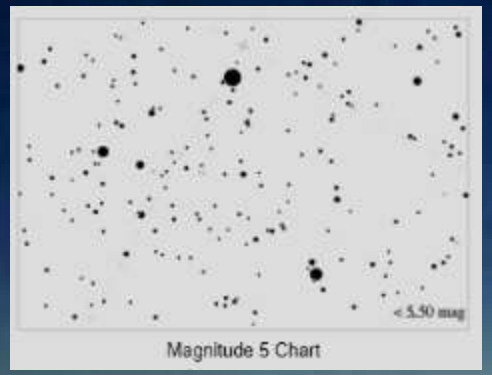
Magnitude 1 Chart

Magnitude 2 Chart

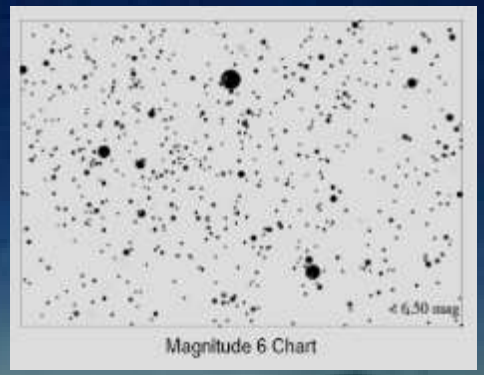
Magnitude 3 Chart



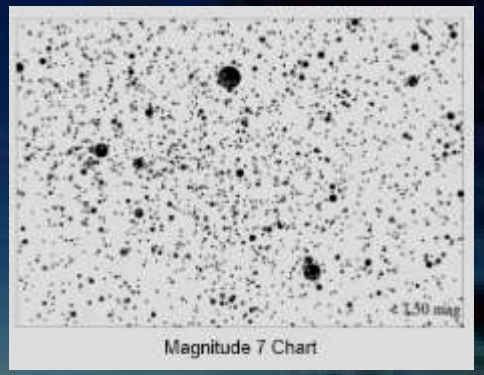
Magnitude 4 Chart



Magnitude 5 Chart



Magnitude 6 Chart



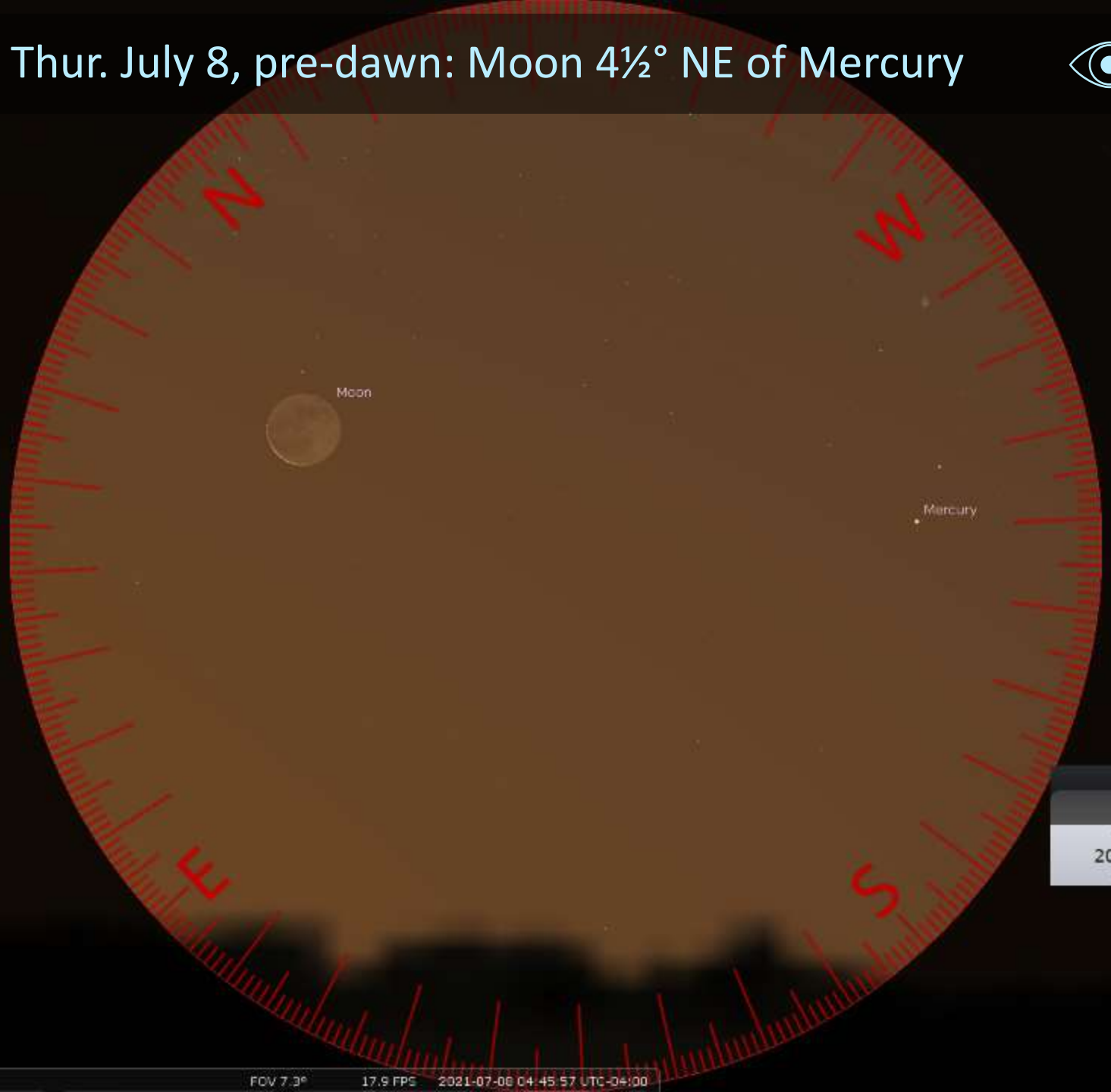
Magnitude 7 Chart

Get charts: www.globeatnight.org/magcharts/cygnus
(Be sure to select your latitude)

Submit report: www.globeatnight.org/webapp/

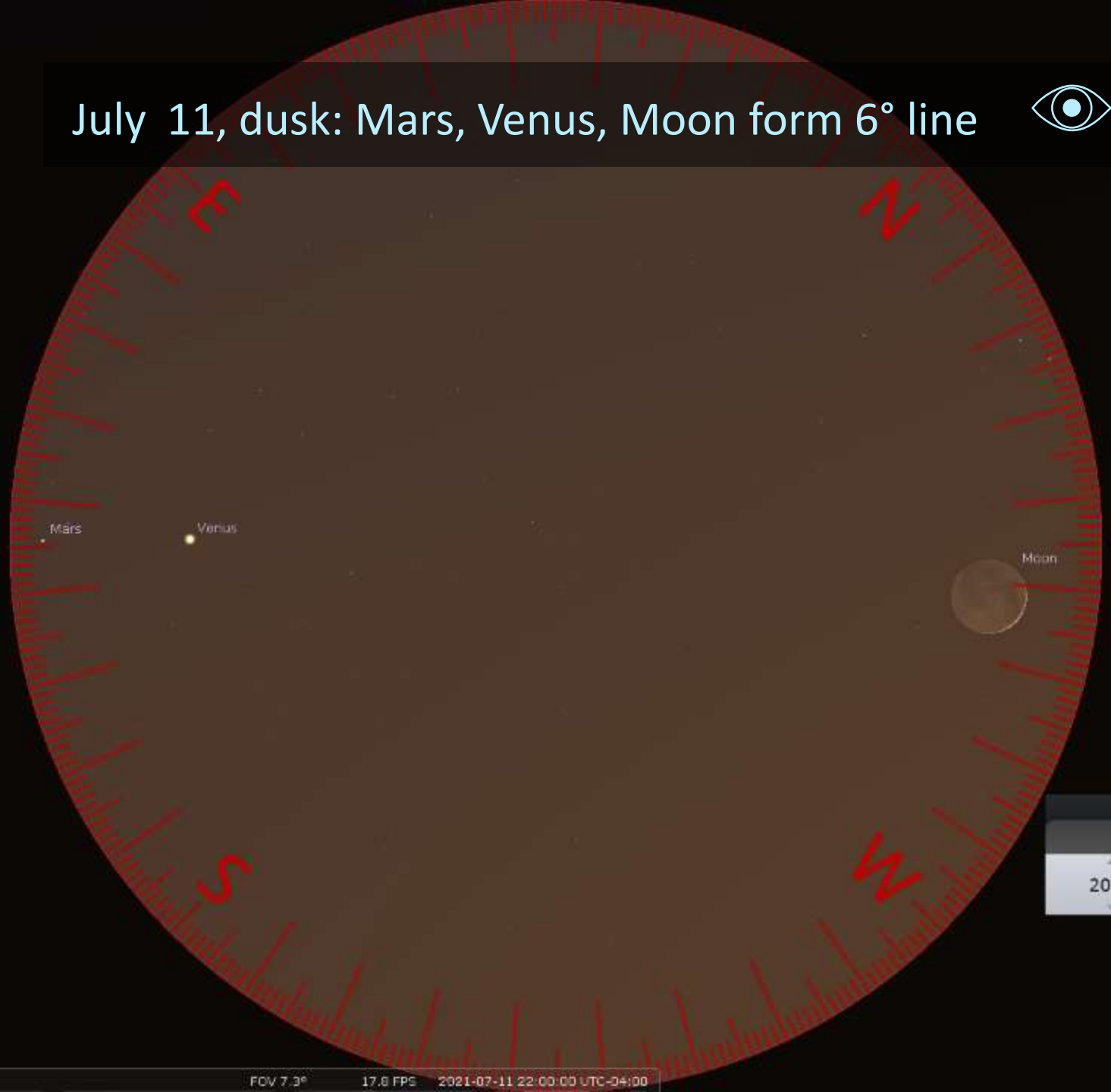
Thur. July 8, pre-dawn: Moon 4½° NE of Mercury

10 x 50 binocular view



July 11, dusk: Mars, Venus, Moon form 6° line

10 x 50 binocular view



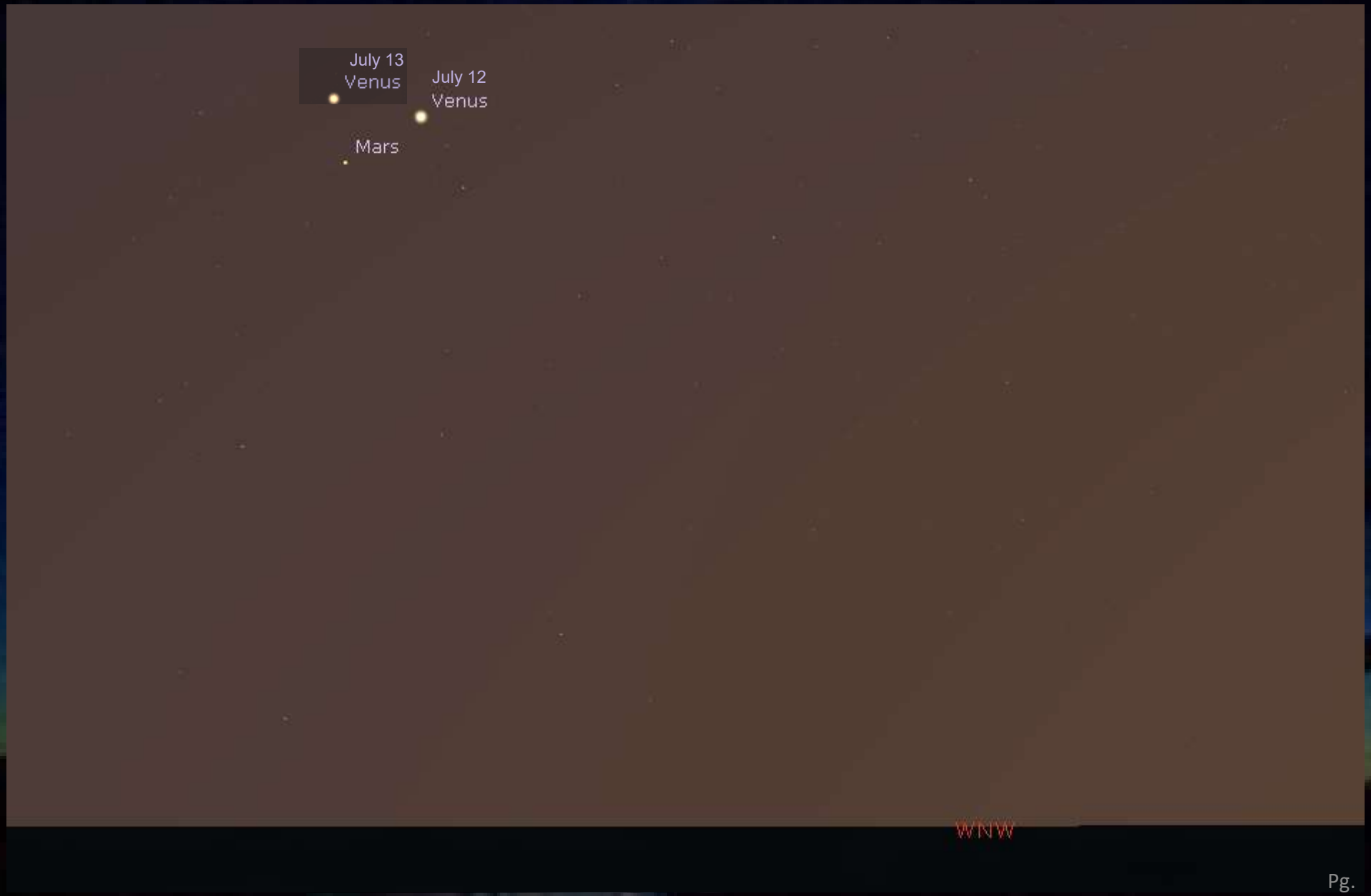
Binocular #15: Jenoptem 10x50W
Magnification: 10.0× (0.05D)
Exit pupil: 5.00 mm
FOV: 7.3000°

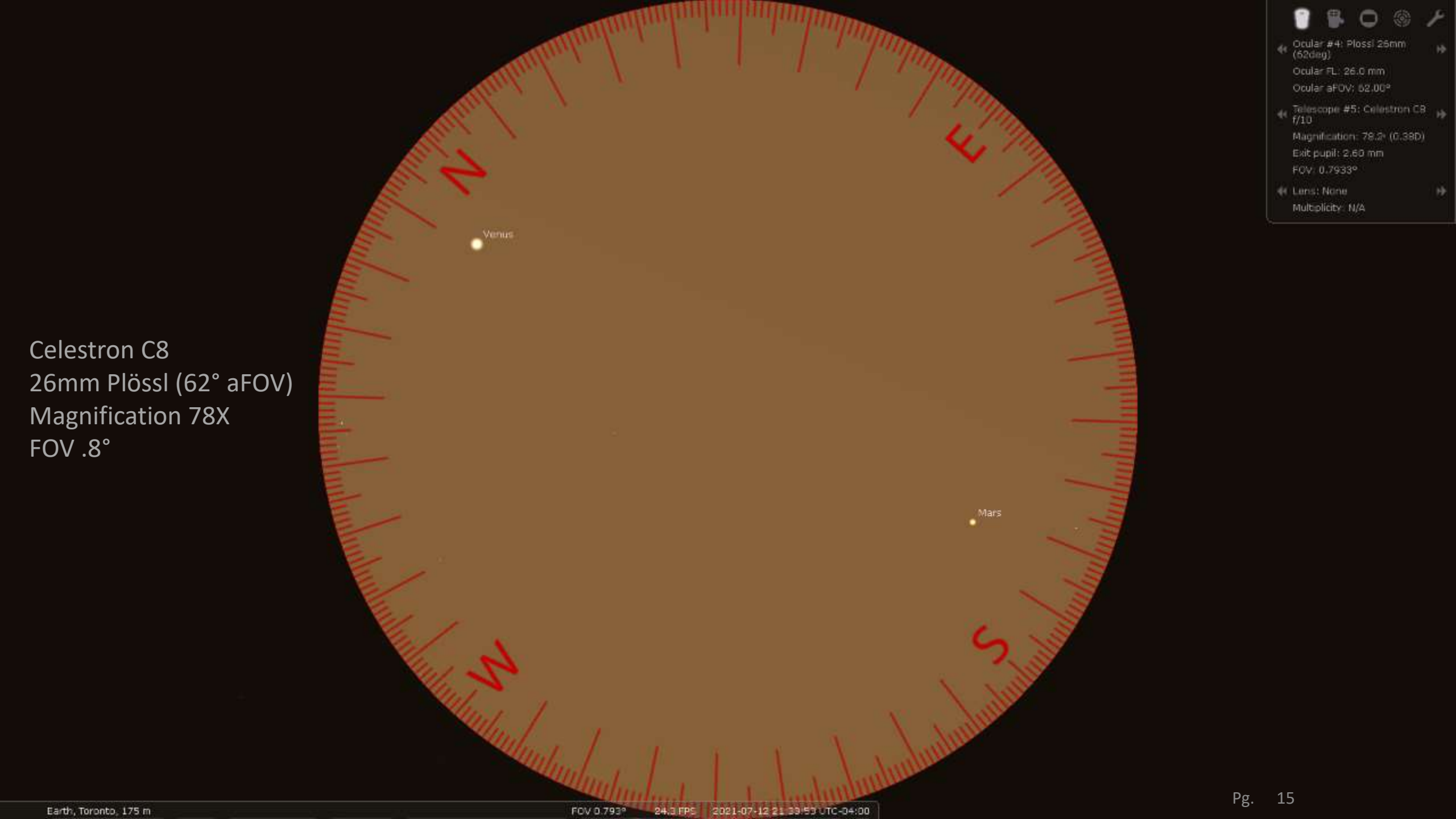
Date and Time
Date and Time
Julian Day
2021 – 7 – 11
22 : 0

After sunset (9 pm)

Earth, Toronto, 175 m FOV 7.3° 17.8 FPS 2021-07-11 22:00:00 UTC-04:00

July 12, 13 at dusk: Mars, Venus only 1/2° apart





Celestron C8
26mm Plössl (62° aFOV)
Magnification 78X
FOV .8°

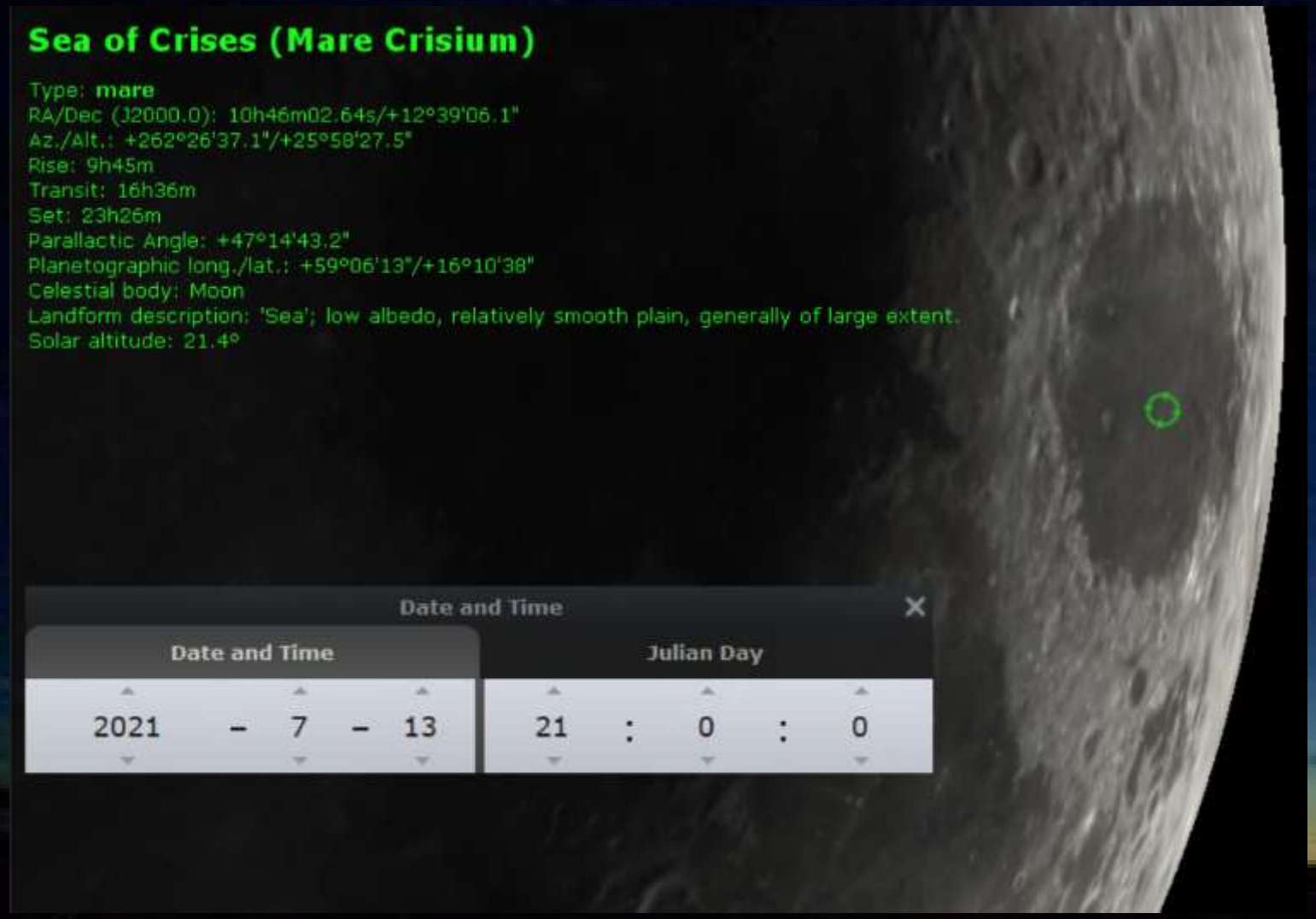
July 24, all night: Saturn 9° from the Full Moon

July 26, all night: Jupiter 4° north of the gibbous Moon

10 x 50 binocular view

July 28, 03:18: 30 Piscium reappears from lunar occultation

Moon Targets



Targets are from the RASC
Explore the Moon – Telescope
Observing Program

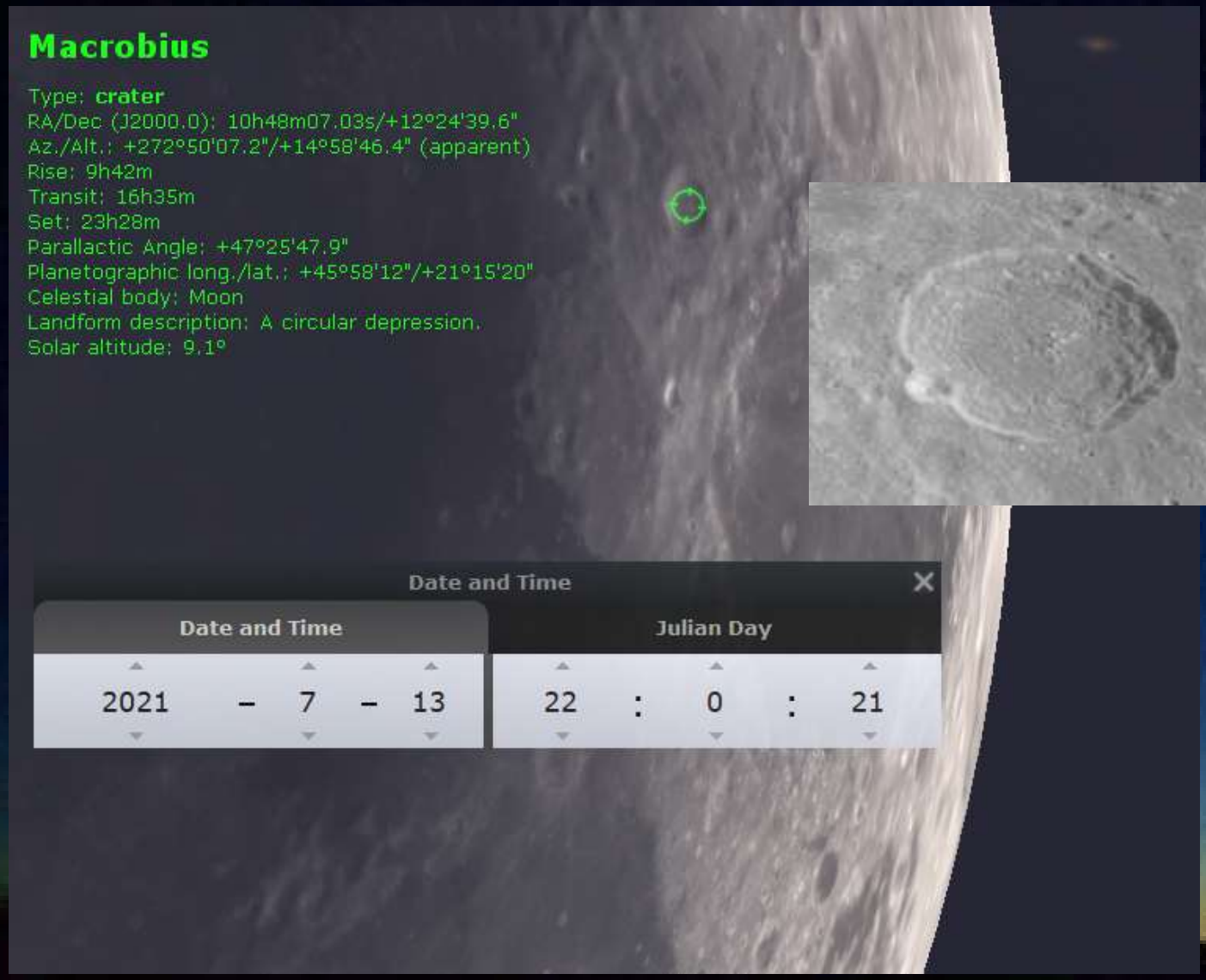
Explore the Moon – Telescope
Target #3 – Mare Crisium

- Very flat floor
- 556 km wide
- Location of a mass concentration in centre of basin

Best opportunity to study near terminator:

- Waxing: Tue. July 13 after sunset
- Waning: Mon July 25, 11 pm & overnight

Moon Targets

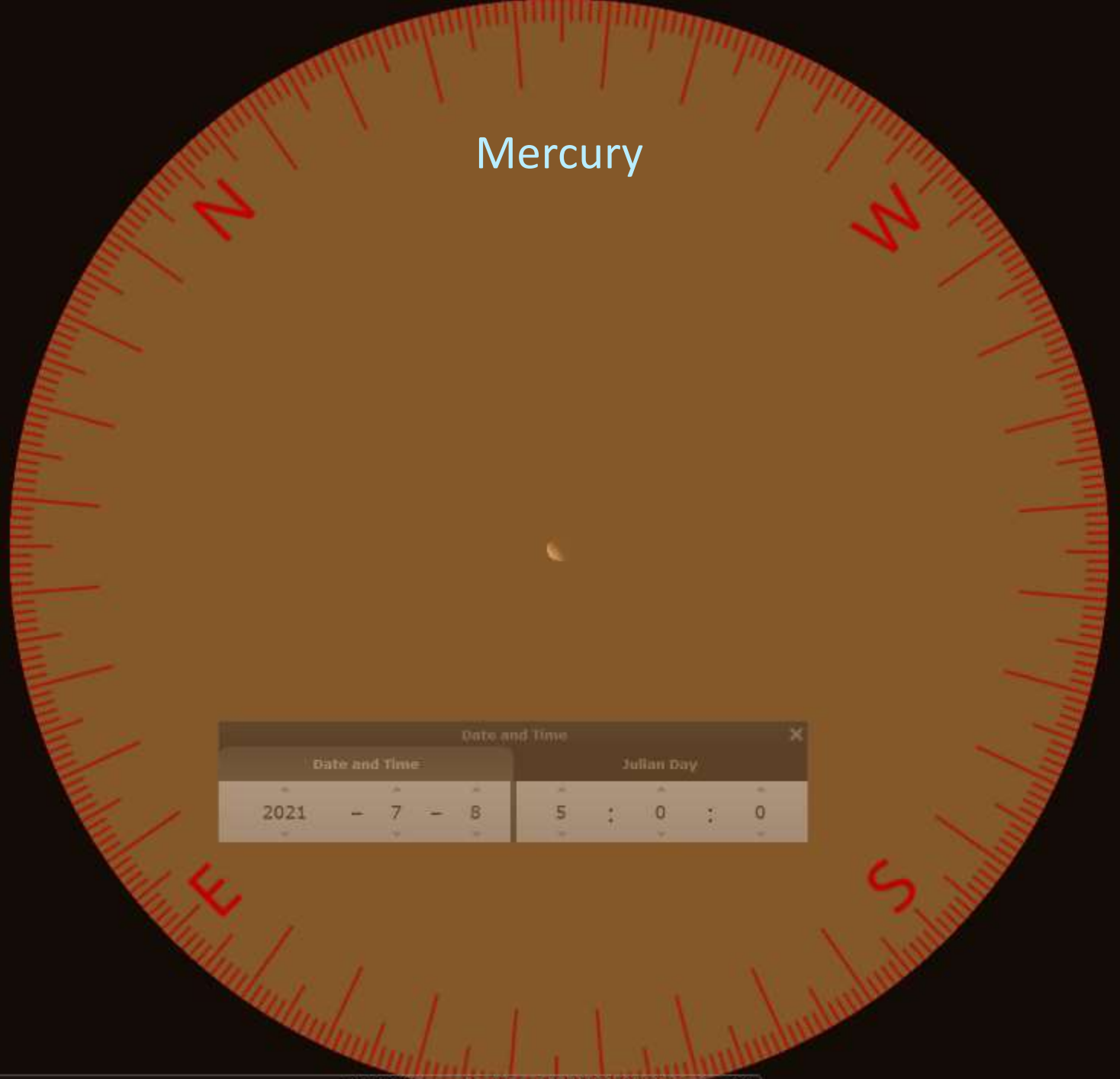


Explore the Moon – Telescope
Target #11 – Macrobius crater

- 63 km-wide impact crater
- Macrobius B – small crater on western wall
- Terraced walls
- Central peaks

Best opportunity to study near terminator:
- Waxing: Tues. July 13 after sunset
- Waning: Mon. July 26 after 11 pm

Mercury

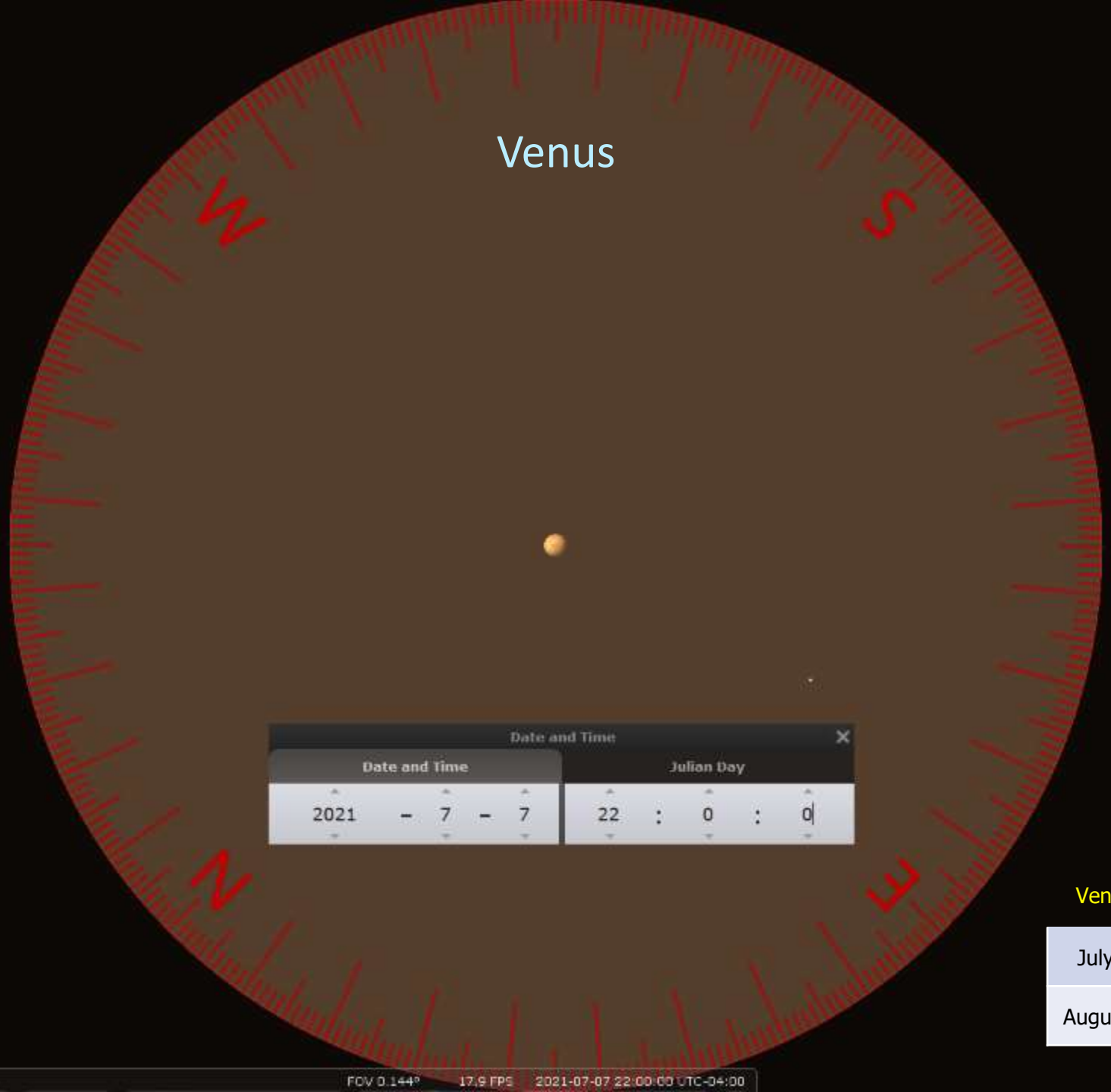


Celestron C11
3.5mm Delos (72° aFOV)
Magnification 800X
FOV .09°

Ocular #22: Televue Delos 3.5
Ocular FL: 3.5 mm
Ocular aFOV: 72.00°
Telescope #6: Celestron C11 f/10
Magnification: 800.0x (2.86D)
Exit pupil: 0.35 mm
FOV: 0.0900°
Lens: None
Multiplicity: N/A

Earth, Toronto, 175 m FOV 0.09° 26.1 FPS 2021-07-08 05:00:00 UTC-04:00

Venus



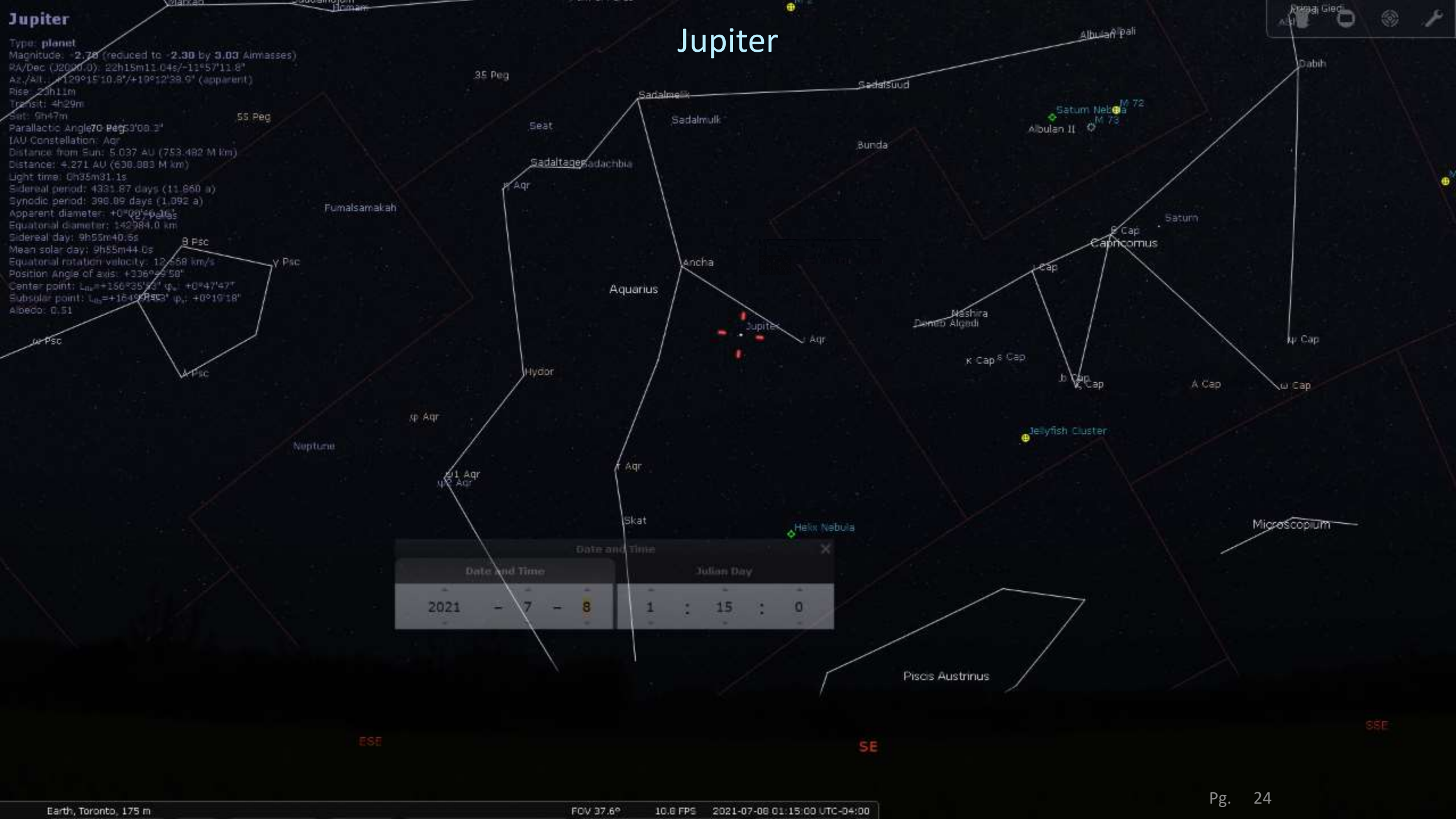
Sky-Watcher 10” Dob
6.9mm Plössl (50° aFOV)
2x Barlow
Magnification 348X
FOV .14°

Venus	Magni-tude	Illumina-tion	Angular size
July 7	-3.92	88%	11”
August 3	-3.95	81%	13”

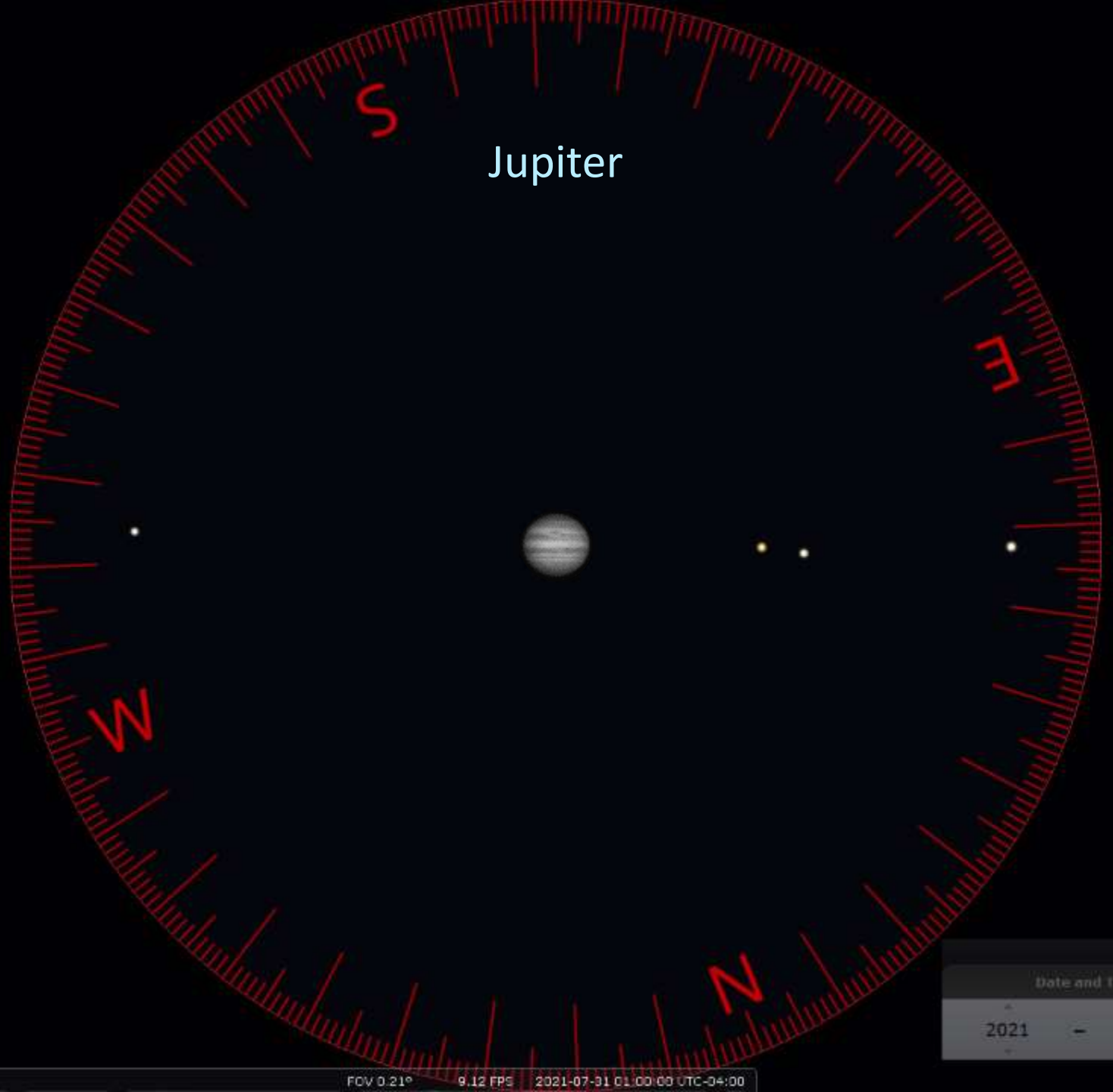
Mars

Sky-Watcher 10” Dob
6.9mm Plössl (50° aFOV)
2x Barlow
Magnification 348X
FOV .14°

Mars	Magni-tude	Illumina-tion	Angular size
July 7	1.83	97.6%	3.8”
August 3	1.83	98.8%	3.6”


Jupiter
Jupiter
Type: planet
Magnitude: -2.78 (reduced to -2.30 by 3.03 Airmasses)
RA/Dec (J2000.0): 22h15m11.04s/-11°57'11.8"
Az./Alt.: +129°15'10.8"/+19°12'38.9" (apparent)
Rise: 23h11m
Transit: 4h29m
Set: 9h47m
Parallactic Angle: 53°08.3"
IAU Constellation: Aqr
Distance from Sun: 5.037 AU (753.482 M km)
Distance: 4.271 AU (638.883 M km)
Light time: 0h35m31.1s
Sidereal period: 4331.87 days (11.860 a)
Synodic period: 398.89 days (1.092 a)
Apparent diameter: +0°00'40.1"
Equatorial diameter: 142984.0 km
Sidereal day: 9h55m40.6s
Mean solar day: 9h55m44.0s
Equatorial rotation velocity: 12.558 km/s
Position Angle of axis: +336°39'58"
Center point: L_m=+156°35'43" φ_c: +0°47'47"
Subsolar point: L_m=+164°49'53" φ_s: +0°19'18"
Albedo: 0.51
35 Peg
55 Peg
70 Peg
Seat
Sadalmelik
Sadalsuud
Sadalmulk
Sadaltager
Sadachbia
β Aqr
Fumalsamakah
Bunda
Albulan I
Albulan II
Dabih
M 72
M 73
Saturn
β Cap
Capricornus
α Cap
Nashira
Deneb Algedi
ι Aqr
Ancha
Aquarius
Hydor
φ Aqr
Neptune
γ Aqr
ψ1 Aqr
ψ2 Aqr
Skat
Helix Nebula
Jellyfish Cluster
Microscopium
Piscis Austrinus
ESE
SE
SSE
Date and Time
Julian Day
2021 - 7 - 8
1 : 15 : 0
Earth, Toronto, 175 m
FOV 37.6°
10.6 FPS
2021-07-08 01:15:00 UTC-04:00

Jupiter



Sky-Watcher 10” Dob
Delos 3.5mm ep (72°aFOV)
Magnification: 343X
FOV 0.21°

July 7:
Mag -2.69
Size 46”

Aug 3:
Mag. -2.83
Size 48.6”

Ocular #22: Televue Delos 3.5
Ocular FL: 3.5 mm
Ocular aFOV: 72.00°
Telescope #24: Skywatcher Classic 10 inch Dob
Magnification: 342.9x (1.330)
Exit pupil: 0.75 mm
FOV: 0.2100°
Lens: None
Multiplicity: N/A

Date and Time
Date and Time
Julian Day
2021 – 7 – 31
1 : 0 : 0

Earth, Toronto, 175 m
FOV 0.21°
9.12 FPS
2021-07-31 01:00:00 UTC-04:00

Coloured filters for Jupiter

#11 Yellow-Green — Enhances darker details in belts

#21 Orange — Slight contrast enhancement

#82a Light Blue — Clouds stand out in contrast. Enhances spots

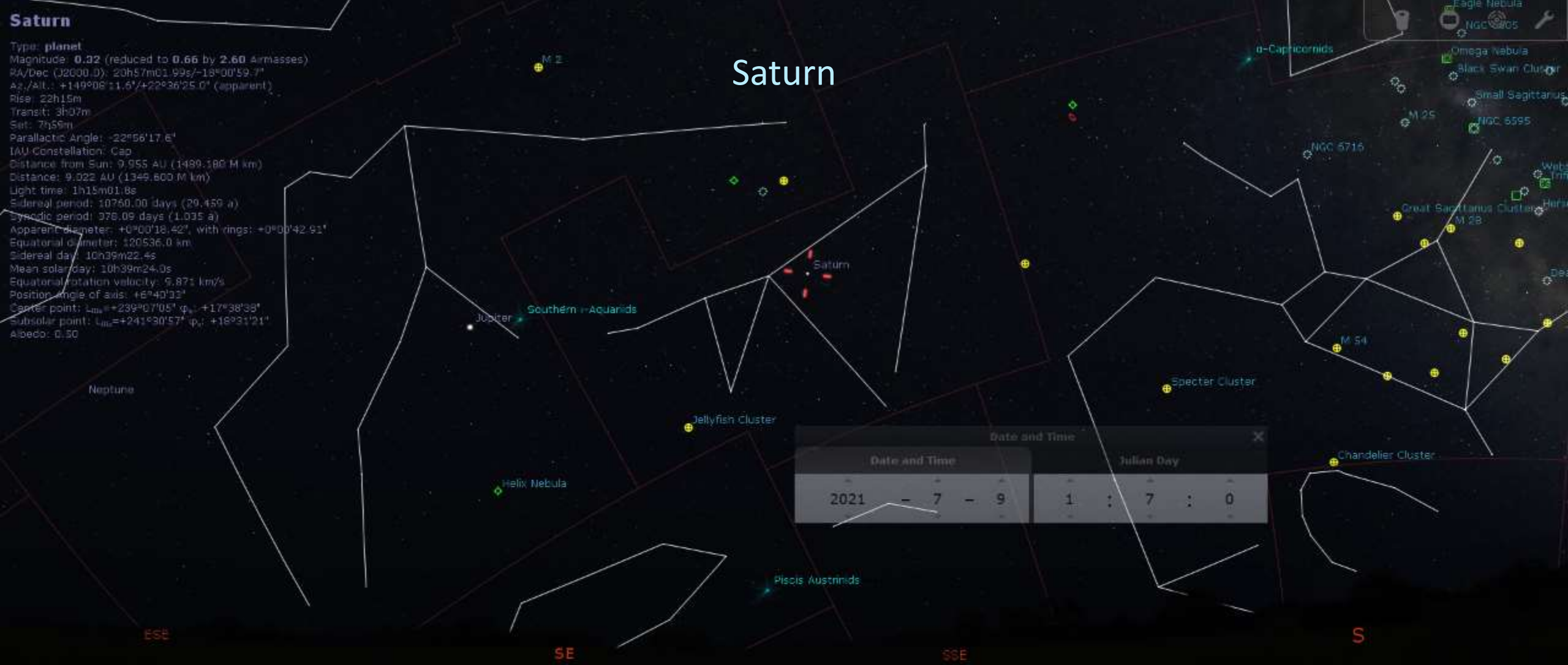
July 10-11 Jupiter moons events

2021/07/10 23:30:00 (Local)

When Jupiter rises at 23:30 Saturday, July 10, Europa's shadow will be transiting across Jupiter's equator. You won't see the shadow when Jupiter is close to the horizon, but the shadow transit continues for another 90 minutes, so you can wait for Jupiter to climb higher into Sunday morning to spot it. Meanwhile, Io's orbit is taking it behind Jupiter. But before disappearing behind Jupiter, Io seems to vanish into thin space as it enters Jupiter's shadow around 2 am, just as the Great Red Spot rotates into view. Good opportunity for a time-lapse movie.

rascto.ca

Saturn


Saturn
Type: planet
Magnitude: 0.32 (reduced to 0.66 by 2.60 Airmasses)
RA/Dec (J2000.0): 20h57m01.99s/-18°00'59.7"
Az./Alt.: +149°06'11.6"/+22°36'25.0" (apparent)
Rise: 22h15m
Transit: 3h07m
Set: 7h59m
Parallactic Angle: -22°56'17.6"
IAU Constellation: Cap
Distance from Sun: 9.955 AU (1489.180 M km)
Distance: 9.022 AU (1349.600 M km)
Light time: 1h15m01.8s
Sidereal period: 10760.00 days (29.459 a)
Synodic period: 378.09 days (1.035 a)
Apparent diameter: +0°00'18.42", with rings: +0°00'42.91"
Equatorial diameter: 120536.0 km
Sidereal day: 10h39m22.4s
Mean solar day: 10h39m24.0s
Equatorial rotation velocity: 9.871 km/s
Position angle of axis: +6°40'33"
Center point: L_m=+239°07'05" φ_c: +17°38'38"
Subsolar point: L_m=+241°30'57" φ_c: +18°31'21"
Albedo: 0.50
M 2
Saturn
Jupiter
Southern ι-Aquariids
Neptune
Jellyfish Cluster
Helix Nebula
Piscis Austrinids
α-Capricornids
Omega Nebula
Black Swan Cluster
Small Sagittarius
M 25
NGC 6595
NGC 6716
Great Sagittarius Cluster
M 28
M 54
Specter Cluster
Chandelier Cluster
Eagle Nebula
NGC 6605
Date and Time
Date and Time
Julian Day
2021 - 7 - 9
1 : 7 : 0
ESE
SE
SSE
S
Earth, Toronto, 175 m
FOV 50.0°
12.9 FPS
2021-07-09 01:07:00 UTC-04:00

August 2 - Saturn at opposition

Ocular #22: Televue Delos 3.5
Ocular FL: 3.5 mm
Ocular aFOV: 72.00°
Telescope #5: Celestron C8 f/10
Magnification: 580.6x (2.86D)
Exit pupil: 0.35 mm
FOV: 0.1240°
Lens: None
Multiplicity: N/A

Celestron C8
Delos 3.5mm (72° aFOV)
Magnification 580X
FOV .12°

Magnitude 0.18 (.47 thru 2.26 airmass)
Angular size 18.6”, with rings 42”

Earth, Toronto, 175 m FOV 0.124° 20.2 FPS 2021-08-02 01:07:00 UTC-04:00

Date and Time
Date and Time Julian Day
2021 – 8 – 2 1 : 7 : 0

Coloured filters for Saturn

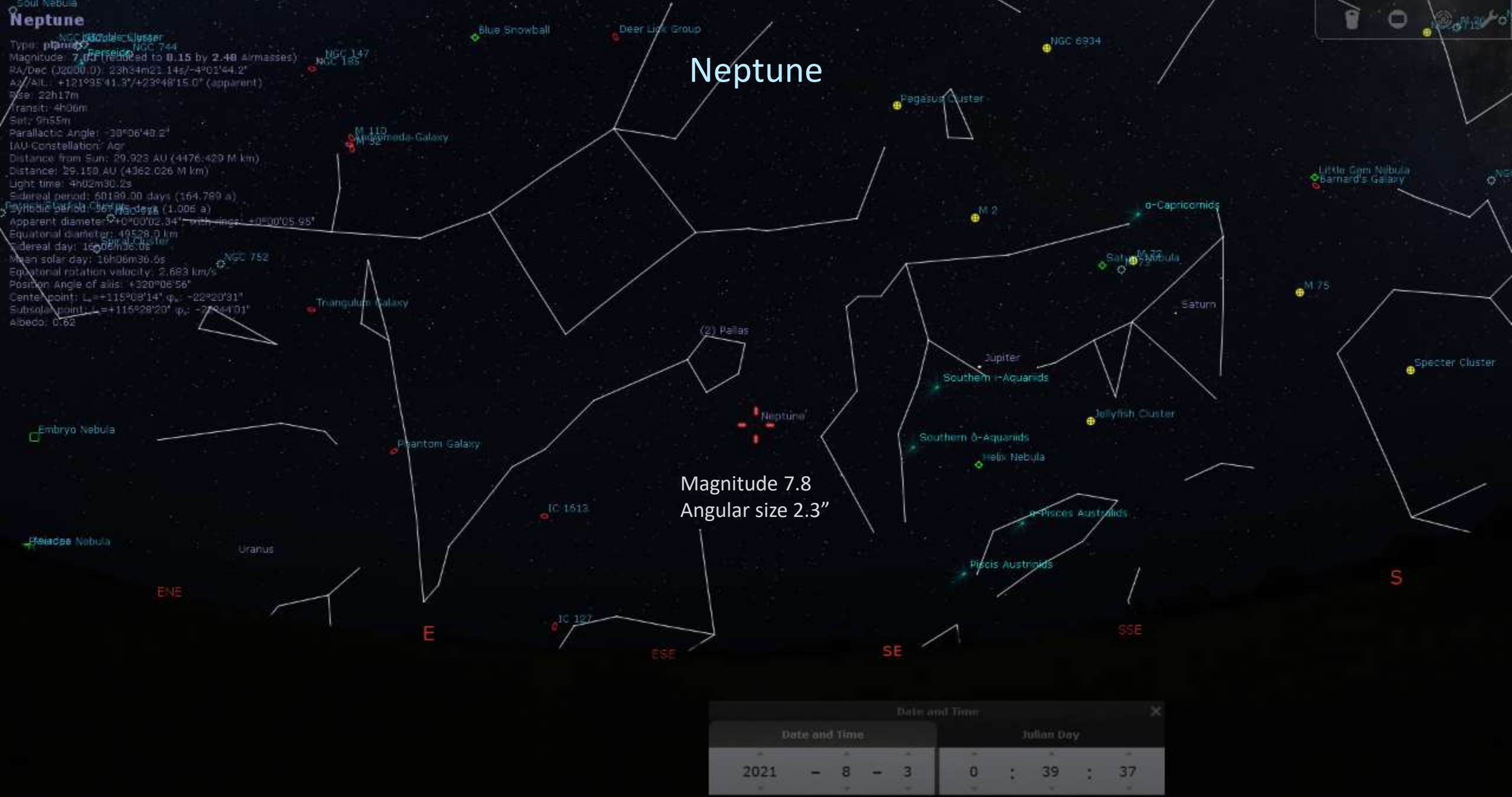
#8 light yellow

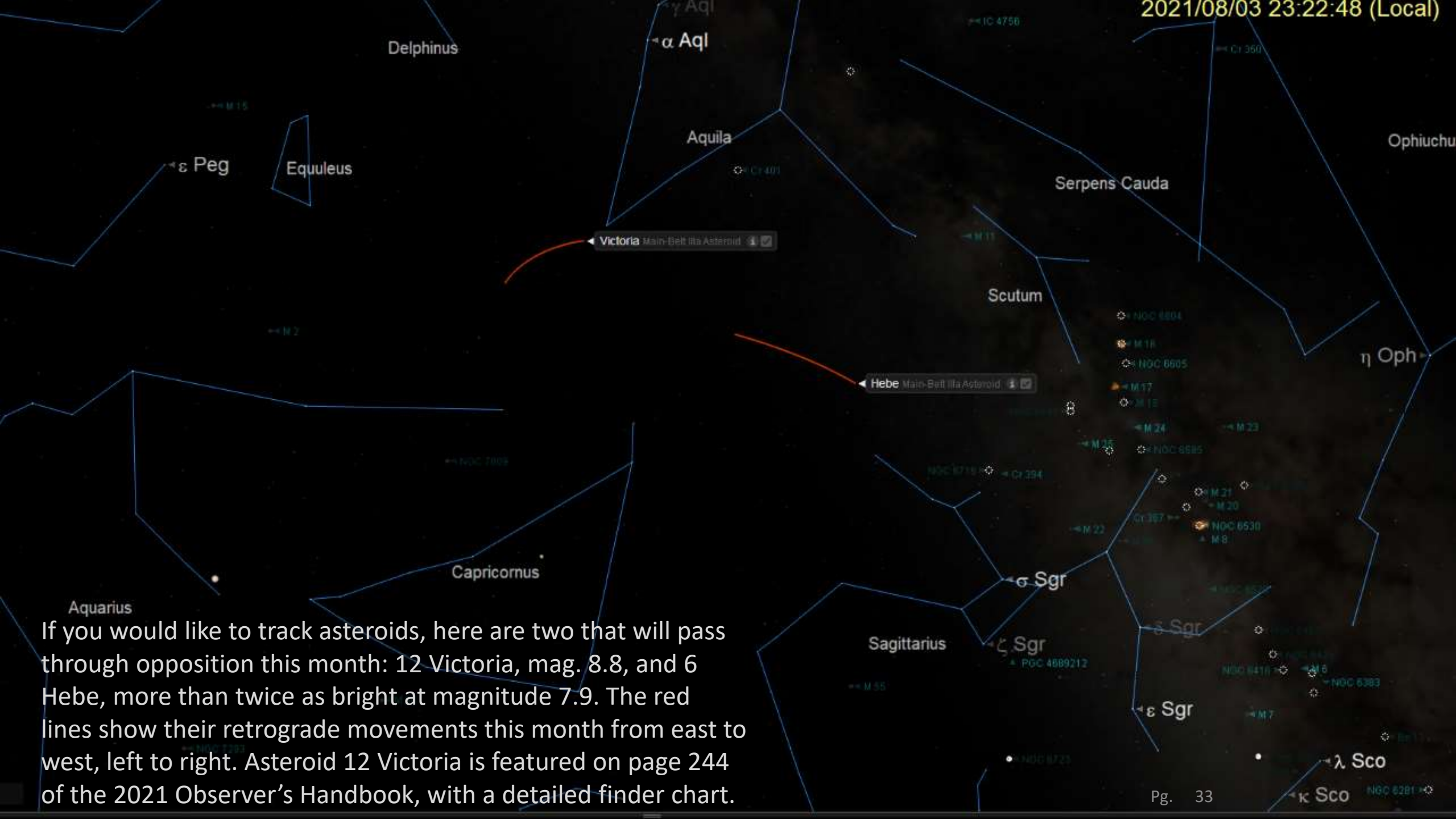
The light yellow filter can help increase the contrast in Saturn's faint cloud belts and polar regions.

Baader Neodymium

The Neodymium filter blocks yellow light, slightly enhancing cloud belts, similar to light yellow.

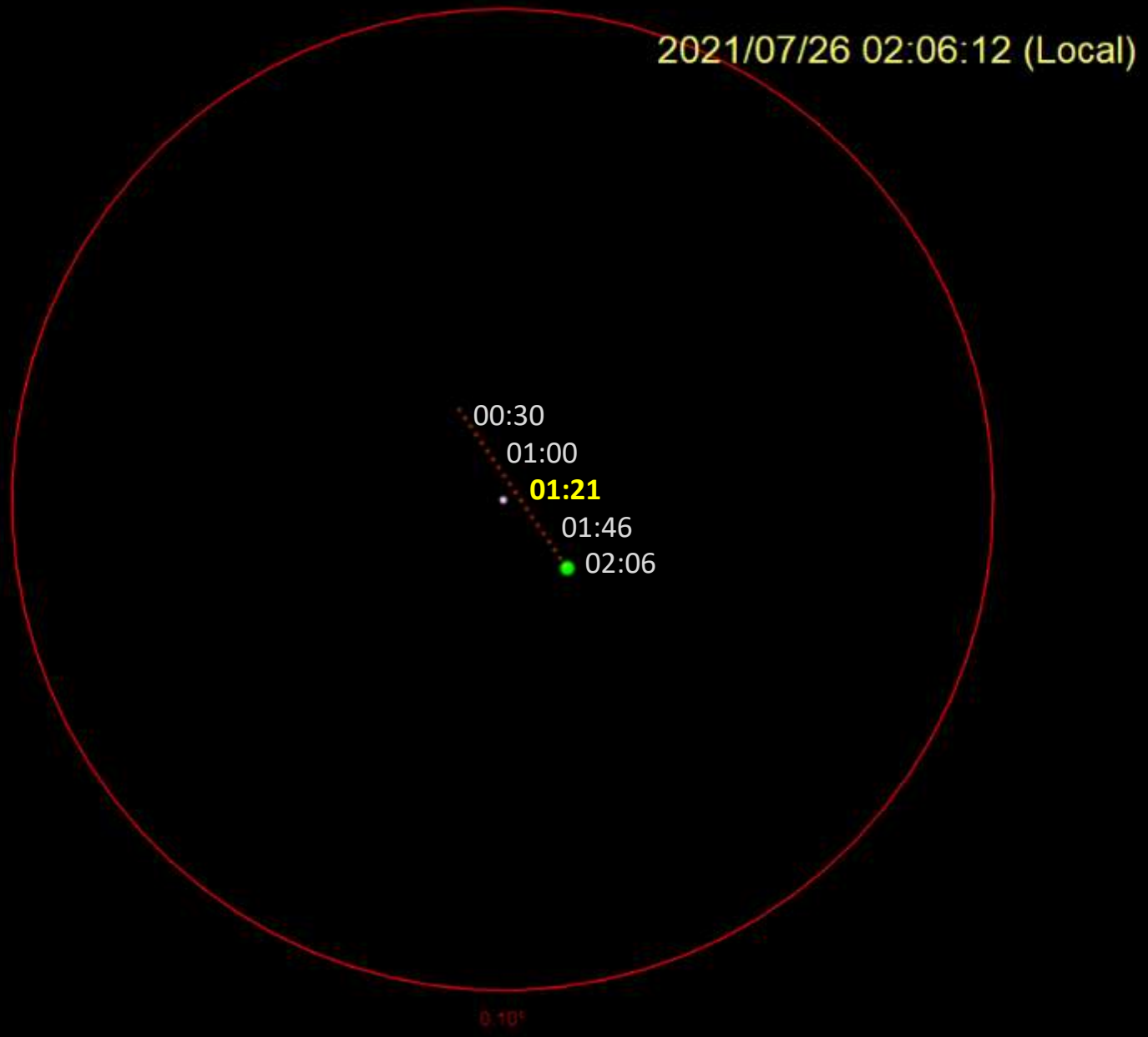
Magnitude 5.8
Angular size 3.5”


Neptune
Magnitude 7.8
Angular size 2.3”



If you would like to track asteroids, here are two that will pass through opposition this month: 12 Victoria, mag. 8.8, and 6 Hebe, more than twice as bright at magnitude 7.9. The red lines show their retrograde movements this month from east to west, left to right. Asteroid 12 Victoria is featured on page 244 of the 2021 Observer's Handbook, with a detailed finder chart.

Hebe passes within 5.5 arc-seconds of an 8.25 magnitude star on Monday July 26, at 1:21 in the morning. This close pass would make for an interesting time-lapse movie



Meteor Showers

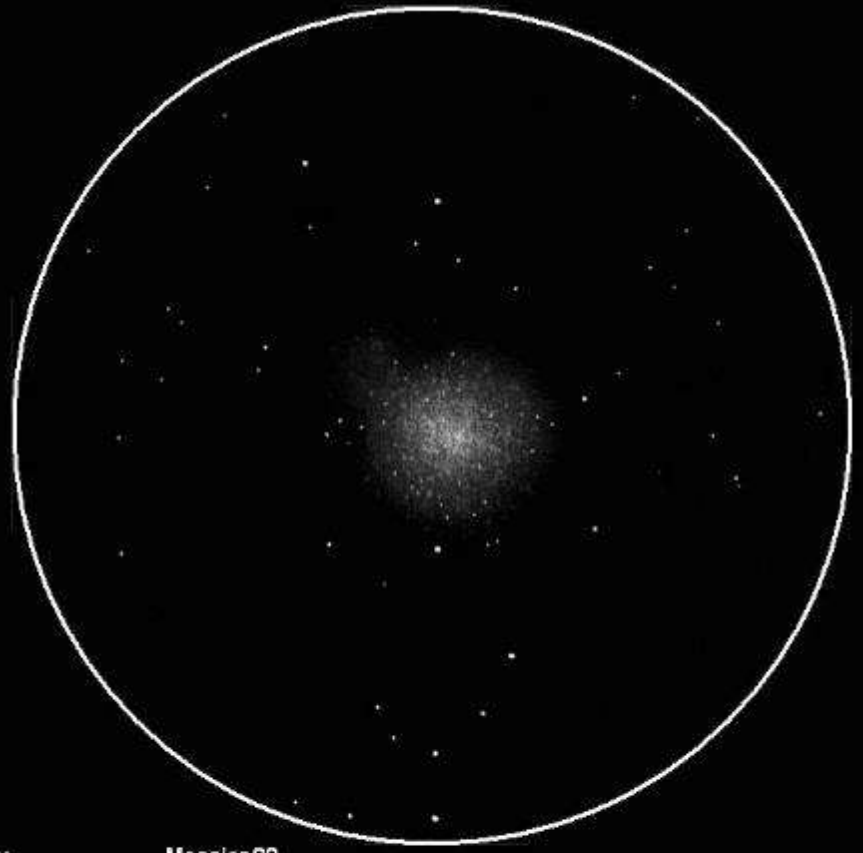
Earth begins to pass through the debris trail from Comet Swift-Tuttle in mid-July, signaling the start of the Perseid meteor shower which peak in mid-August.

The stream gets thicker as the month wears on, so as darker conditions return at the start of August, our chance of seeing Perseids is excellent.

The Southern delta-Aquariids peak on July 28-29. Unfortunately, as the radiant rises, so does a fat gibbous Moon right next door. The SDAs have a ZHR of 16 to 20. Hopefully some will strike near the zenith, away from the rising Moon.


Teapot
NGC 6712
NGC 6664
M 26
NGC 6539
NGC 6366
M 12
M 10
NGC 6649
ν Oph
NGC 6625
NGC 6604
M 16
NGC 6605
M 17
NGC 6645
NGC 6647
M 18
ξ Oph
NGC 6716
M 25
M 24
NGC 6507
η Sgr
NGC 6589
M 23
η Oph
M 107
NGC 6356
NGC 6440
M 9
NGC 6342
M 22
NGC 6642
M 21
NGC 6469
M 28
σ Sgr
τ Sgr
NGC 6553
NGC 6235
M 54
NGC 6522
NGC 6284
ζ Sgr
NGC 6293
M 19
NGC 6451
NGC 6316
M 80
NGC 6569
NGC 6425
NGC 6304
NGC 6144
Date and Time
Julian Day
2021 - 7 - 28
0 : 0 : 0
Earth, Toronto, 175 m
FOV 26.9°
19.9 FPS
2021-07-28 00:00:00 UTC-04:00

Messier 22 (NGC 6656)



Name:	Messier 22
Type:	Globular cluster
Date:	16.07.2007.
Lim mag:	6.10
Telescope:	200/1200 Dobson
Eyepiece:	10.5mm Hyperion
Field of view:	36'
Magnification:	114x

Sketch by Vedran Vrhovac
https://zvjezdopisi.com/category/galerija/

Messier Catalogue

Messier Catalogue
#22 – Globular Cluster

- Magnitude 5.1
- Distance 10.4 K LY
- RA 18h 36.4m
- Dec -23° 54’
- 32 arc-minutes wide
- Excellent in binoculars, low power telescope


NGC 6712
NGC 6664
M 26
NGC 6539
NGC 6366
M 12
M 10
NGC 6649
ν Oph
NGC 6625
NGC 6604
M 16
NGC 6605
NGC 6645
M 17
NGC 6647
M 18
ζ Oph
NGC 6716
M 25
M 24
NGC 6507
σ Sgr
NGC 6589
M 23
M 107
NGC 6356
NGC 6440
M 9
NGC 6342
M 22
NGC 6642
M 21
NGC 6469
M 20
NGC 6559
NGC 6530
τ Sgr
NGC 6553
NGC 6369
NGC 6235
M 54
NGC 6284
NGC 6293
M 19
GC
NGC 6451
NGC 6316
NGC 6589
NGC 6425
NGC 6304
NGC 6144
Date and Time
Julian Day
2021 - 7 - 28
0 : 0 : 0
Earth, Toronto, 175 m
FOV 26.9°
19.6 FPS
2021-07-28 00:00:00 UTC-04:00

NGC 6369 – The Little Ghost Nebula

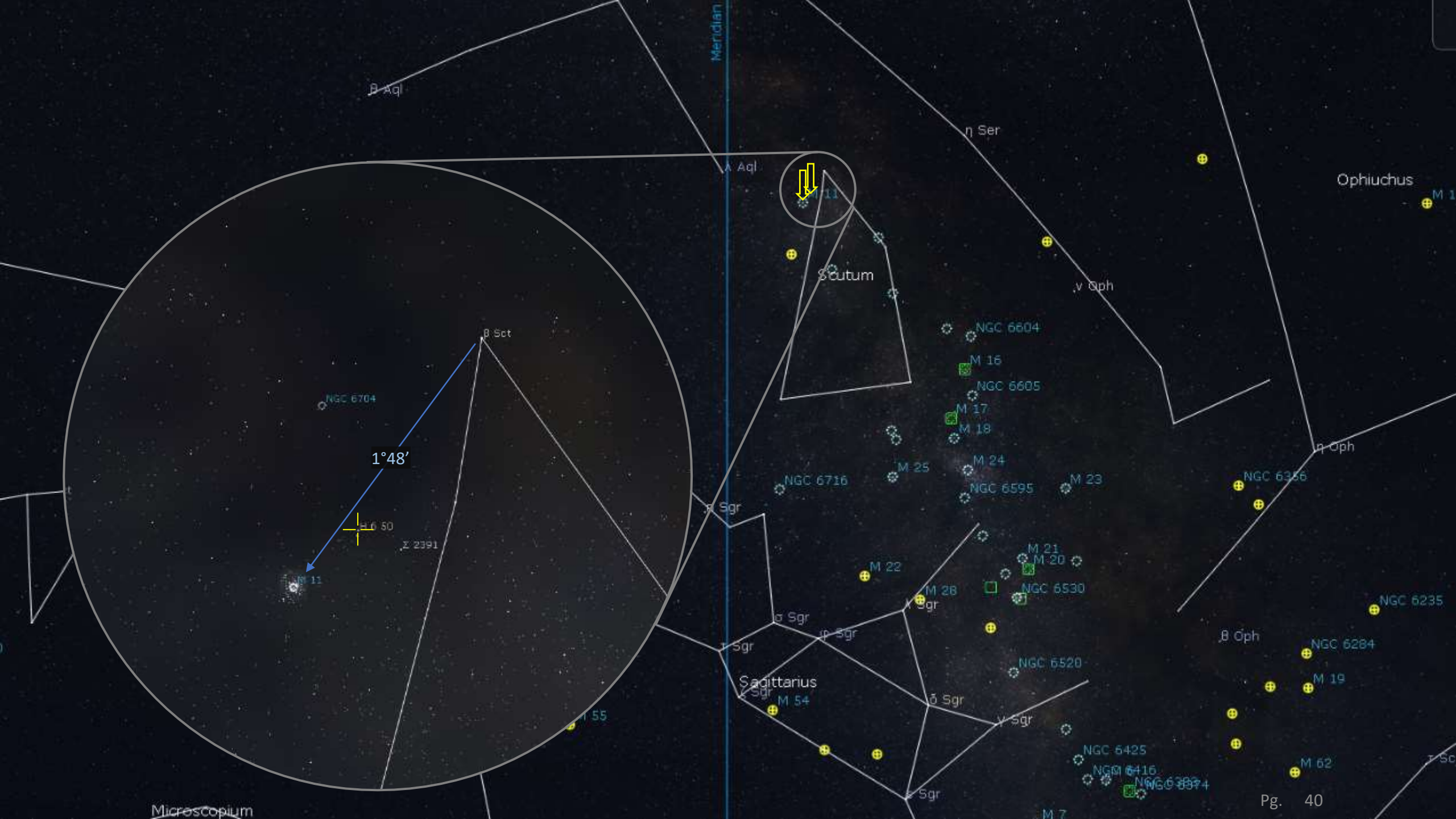
Finest NGC

Classic 10” Dob
9.6mm Plössl (62° aFOV)
Magnification 125X
FOV .96°

Finest NGC number 91
NGC 6369
Planetary Nebula

- Magnitude 11.4
- Distance 3,900 LY
- RA 17h 29.3m
- Dec -23° 46’
- 30 arc-seconds wide

Ultra High Contrast filter can help you see nebula by cancelling sky glow and allowing nebula emissions to pass through.


Meridian
β Aql
λ Aql
η Ser
M 11
Scutum
Ophiuchus
ν Oph
η Oph
β Oph
β Sct
NGC 6704
1°48'
H 6 50
Σ 2391
NGC 6604
M 16
NGC 6605
M 17
M 18
M 24
M 25
NGC 6716
NGC 6595
M 23
NGC 6356
M 22
M 21
M 20
M 28
NGC 6530
NGC 6235
σ Sgr
τ Sgr
φ Sgr
χ Sgr
NGC 6284
NGC 6520
Sagittarius
ζ Sgr
M 54
δ Sgr
γ Sgr
M 19
NGC 6425
M 62
ε Sgr
M 7
Microscopium

Messier 11 (NGC 6705) – The Wild Duck Cluster

Generic 8” (200mm) Dob
20mm Plössl (52° aFOV)
Magnification 60X
FOV 0.9° (52’)

© 2018 Ian Wheelband

Messier Catalogue

Messier Catalogue #11 – Open Cluster

- Magnitude 6.3
- Distance 6,200 ly
- Age: 220 million years
- RA 18h 51m
- Dec -6° 16’
- 14 arc-minutes wide
- Trumpler class’ II.2.r (detached from surround, little concentration, richly populated – over 100 stars)

HR 7083 – Double Star

1/2° NW of M11

Celestron Onyx 80EDF
15mm Plössl (52° aFOV)
Magnification 33X
FOV 1.56°

Double Stars

Double Star Observer
Log page 64

- Magnitude 6.0
- Separation 111.8 arc-seconds (1’ 51.8”)
- RA 18h 49.7m
- Dec -5° 55’

Messier 29 (NGC 6913) – The Cooling Tower Cluster

1° 45’ S of Gamma Cygni

© 2010 Ian Wheelband

Messier Catalogue

Messier Catalogue #29 – Open Cluster

- Magnitude 6.6
- Distance 4,000 ly
- Age: 10 million years
- RA 20h 40m
- Dec +38° 32’
- 7 arc-minutes wide
- Trumpler class’ III, 3, p, n
  - III - detached, no concentration
  - 3 - wide range of brightness
  - p - poor, less than 50 stars
  - n - some nebulosity

M29 is an extremely young cluster of stars, just 10 million years old. The cluster’s five most brilliant stars are supermassive B0 stars, 17 times more massive than our Sun, and *160,000* times more luminous. Stars this massive live for only 10 million years, putting an upper limit on the cluster’s age. As a cluster, it’s apparent magnitude is 6.6, but it would appear an amazing 1000 times brighter if not for extinction caused by leftover material from the cluster’s birth cloud and dust in the Milky Way arms.

NGC 6819 – The Foxhead Cluster

5° S of Delta Cygni

Finest NGC

Finest NGC number 96
NGC 6819
Open Cluster

- Magnitude 7.3
- Distance 7,200 ly
- Age: 2 Gyr
- RA 19h 41m
- Dec +40° 11’
- 5 arc-minutes wide
- Trumpler class’ I, 1, r
  I - well detached
  3 - stars of uniform brightness
  r - rich, more than 100 stars (150)

Classic 10” Dob
26mm Plössl (62° aFOV)
Magnification 46X
FOV 1.1°

HR 7529 – Double Star

2° 21’ NW of Eta Cygni

Double Stars

Double Star Observer Log page 72

- Magnitude 5.9
- Separation 14.8 arc-seconds
- RA 19h 45.7m
- Dec +36° 05.5’

SkyWatcher 10” Dob
9.6mm Plössl (52° aFOV)
Magnification 174X
FOV 0.29°

Credits and Resources

Slide	**Credit/Resource**
1	Ojibwe constellations: https://www.utoronto.ca/news/indigenous-star-lore-night-skies-over-turtle-island
3	Hubble “down”: https://hubblesite.org/contents/news-releases/2021/news-2021-040
4	Starliner: https://spaceflightnow.com/launch-schedule/
5	RASC Observing Programs: https://rasc.ca/certificate-programs
6	Wildfire Smoke: https://weather.gc.ca/firework/index_e.html
7	Twilight graphic: www.timeanddate.com
9	Solar images: https://sdo.gsfc.nasa.gov/data/
10	Sunspot astrophotograph: by Jeff Booth (RASC, Toronto Centre) July 1, 2021
11	SWPC subscription service: https://www.swpc.noaa.gov/content/subscription-services
12	Dial-A-Moon (Scientific Visualization Studio): https://svs.gsfc.nasa.gov/4874
16	Globe at Night: www.globeatnight.org Cygnus charts: www.globeatnight.org/magcharts/cygnus Submit reports: www.globeatnight.org/webapp/
45	Sketch of M22: Vedran Vrhovac, https://zvjezdopisi.com/category/galerija/
52	Astrophotograph of M29: by Ian Wheelband (RASC, Toronto Centre) 2010