The Sky This Month

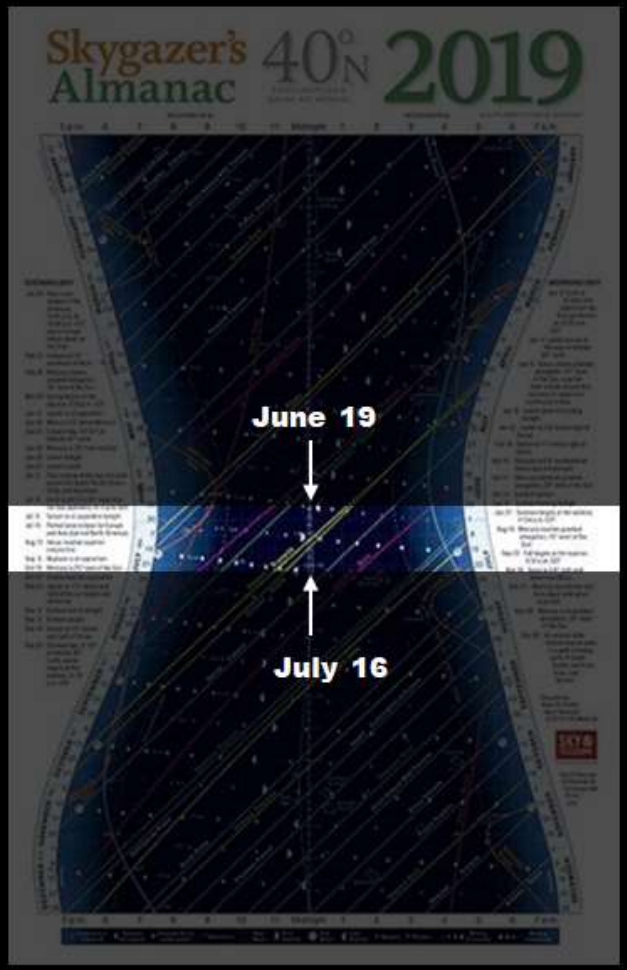
June 19 – July 16, 2019

- **Summer Solstice & Constellations**
- **The Solar System**
- **Deep Space**
- **Jupiter and Saturn: *changes happening!***
- **Citizen Science**

Arnold Brody

Summer Solstice

Friday, June 21 at 11:54 EDT

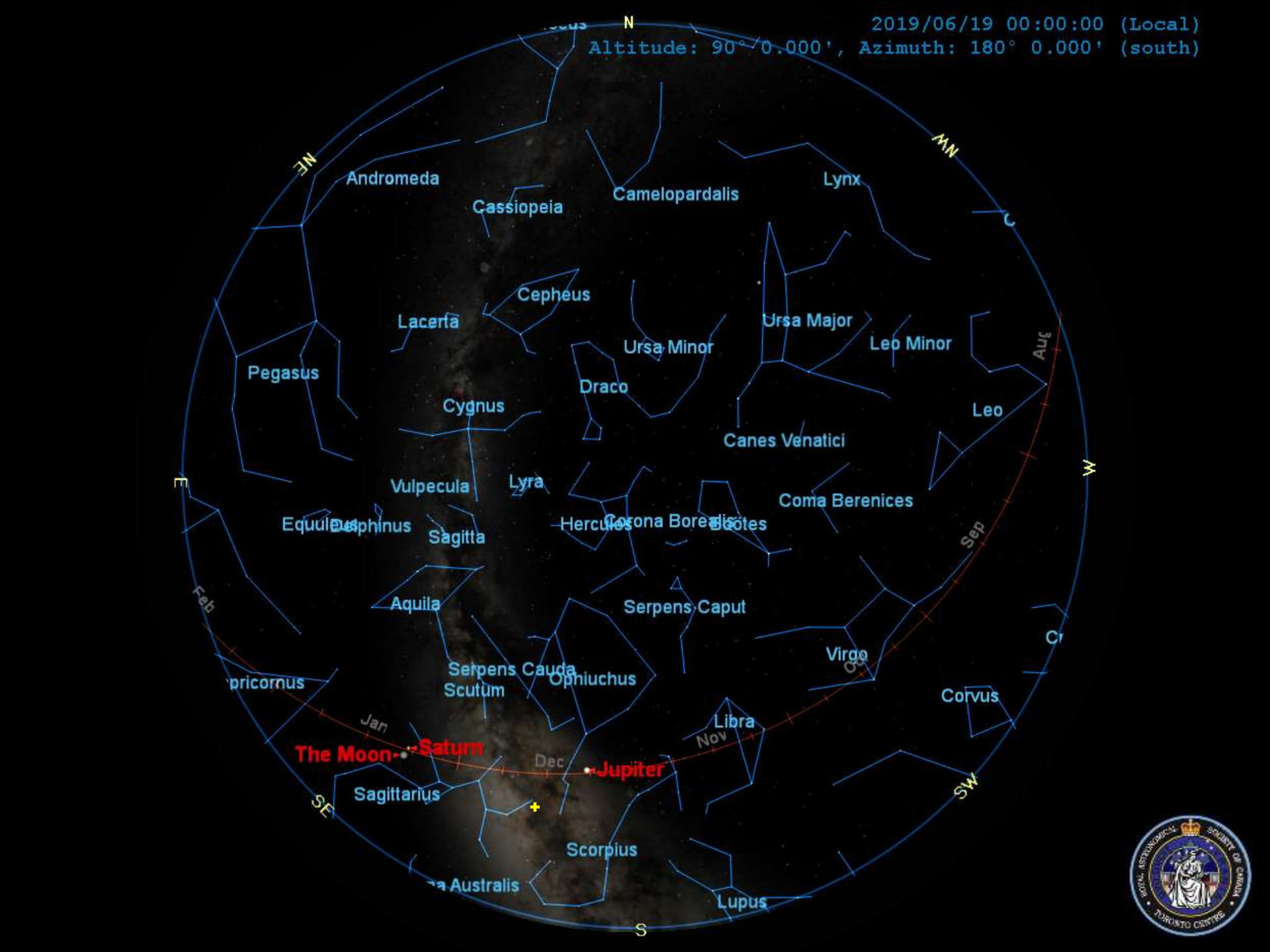


2019 Skygazer's Almanac by Sky & Telescope

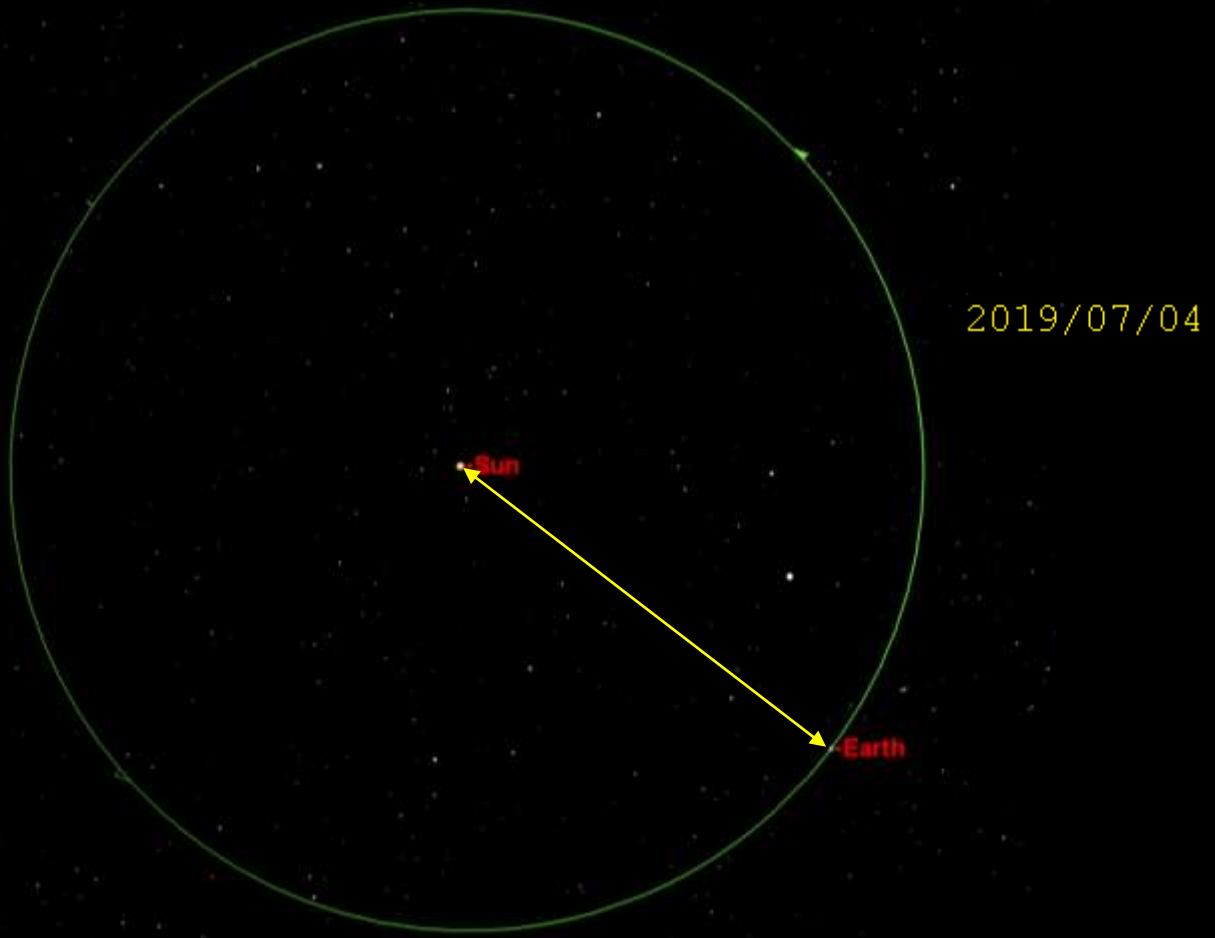
Night:
When the Sun is 18° or more below the horizon

Date	Night Begins	Night Ends	Duration
June 19	23:25	03:08	3 hr. 43 min.
June 21	23:26	03:09	3 hr. 43 min.
July 16	23:07	03:36	4 hr. 29 min.

Date	Astro. Twlght Starts	Astro. Twlght Ends	Duration
June 19	22:25	04:09	5 hr. 44 min.
July 16	22:14	04:29	6 hr. 15 min.

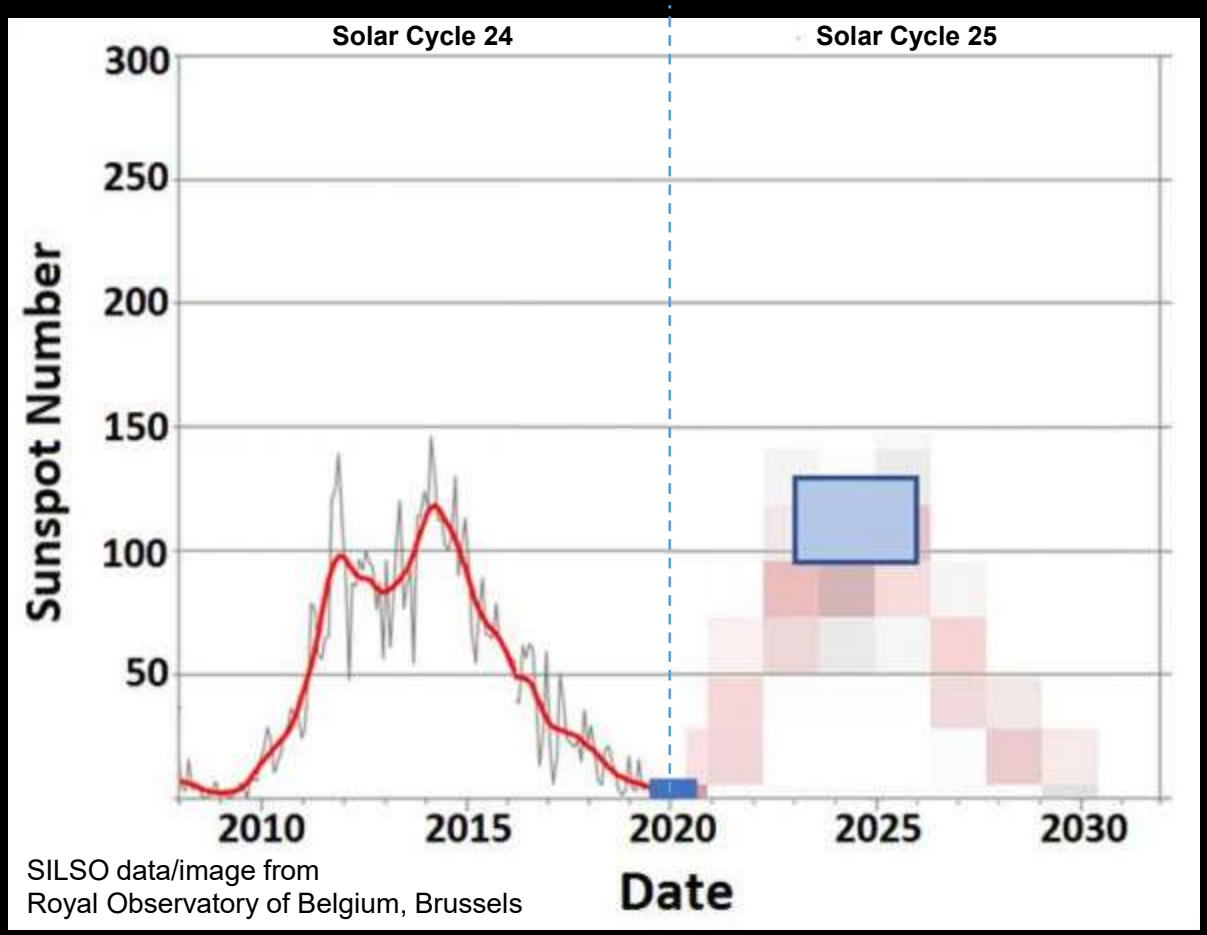

2019/06/19 00:00:00 (Local)
Altitude: 90° 0.000', Azimuth: 180° 0.000' (south)
N
NE
NW
E
W
SE
SW
S
Andromeda
Cassiopeia
Camelopardalis
Lynx
Cepheus
Lacerta
Ursa Major
Ursa Minor
Leo Minor
Pegasus
Draco
Cygnus
Leo
Canes Venatici
Vulpecula
Lyra
Coma Berenices
Equuleus
Delphinus
Sagitta
Hercules
Corona Borealis
Boötes
Aquila
Serpens Caput
Virgo
Serpens Cauda
Ophiuchus
Scutum
Corvus
Libra
Jan
Feb
Sep
Nov
Dec
The Moon
Saturn
Jupiter
Sagittarius
Scorpius
Lupus
Australis

Our Sun



July 4: Earth is at aphelion, farthest from the Sun for 2019,
at a distance of 152,104,285 kilometers.
The average distance is 149,597,871 kilometers (the AU)

We're at or near Solar Minimum

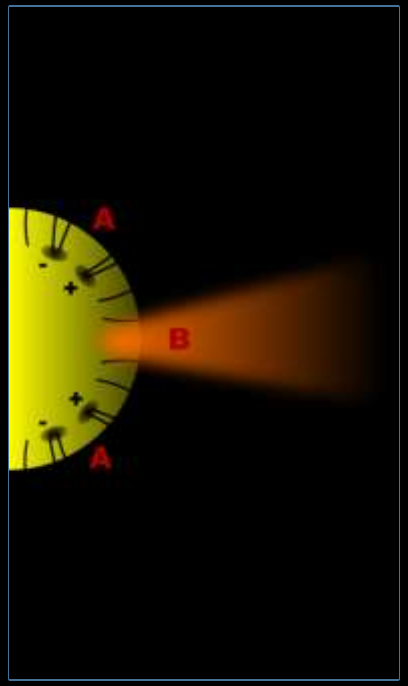


SILSO data/image from
Royal Observatory of Belgium, Brussels

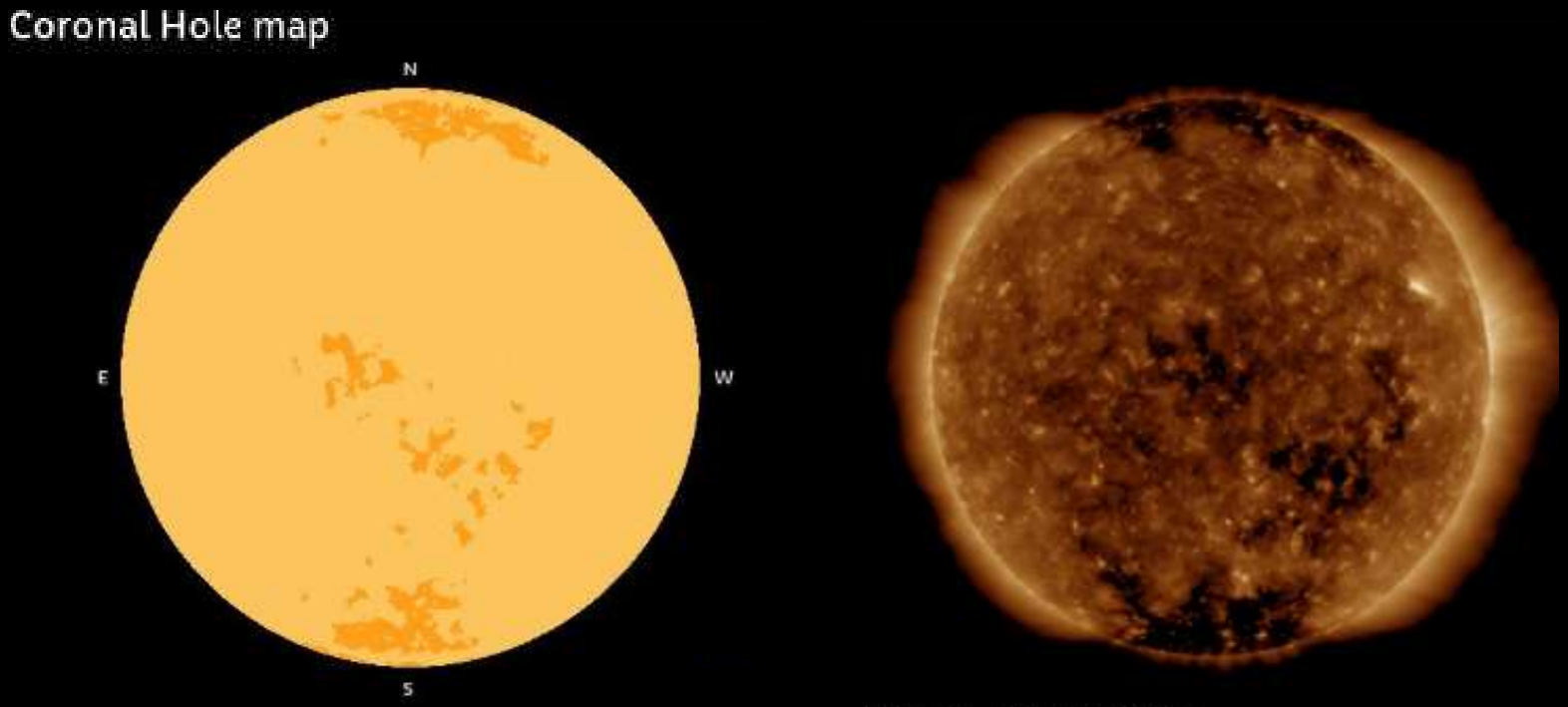
April 5, 2019: NOAA and NASA released a preliminary forecast for Solar Cycle 25, indicating that cycle 25 will most likely peak between 2023 and 2026 at a maximum sunspot number between 95 and 130, similar to SC24, which peaked at 116 sunspots in April 2014.

Solar Cycle 24 is expected to reach minimum between July 2019 and September 2020, giving SC24 a duration between 10.6 and 11.75 years.

Solar wind and coronal holes



Coronal Hole



June 15

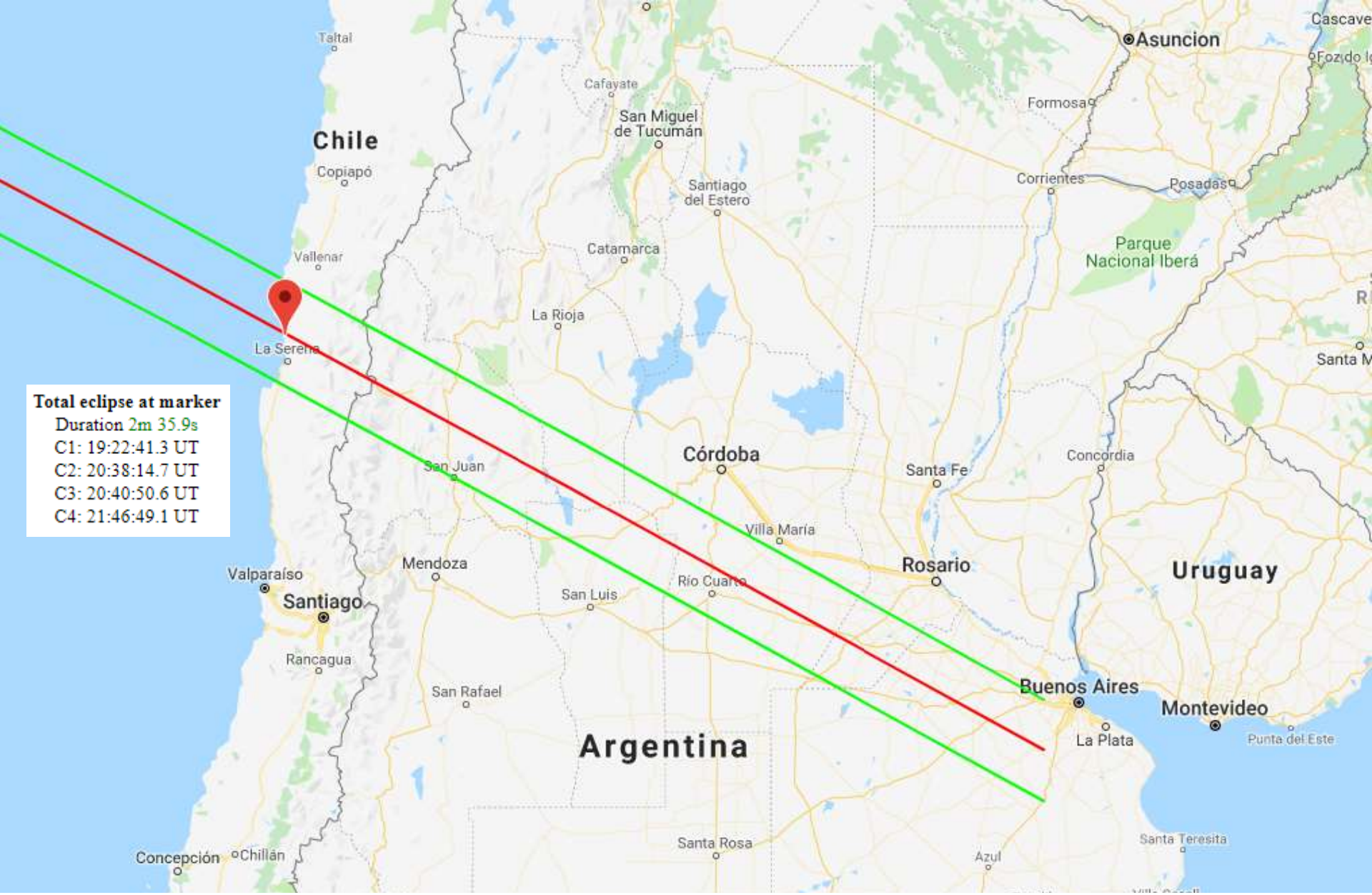
SpaceWeatherLive.com

Moon Phases

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
June 16	17 	18	19	20	21	22
23 Lunar Apogee 368,504 km	24	25 	26	27	28	29
30	July 1 	2 	3	4	5 Lunar Perigee 363,726 km	6
7	8	9 	10	11	12	13
14	15	16 	17	18	19	20

Partial Lunar Eclipse over Europe, Africa, central Asia, and the Indian Ocean

Total Solar Eclipse over Pacific Ocean, northern Chile, central Argentina



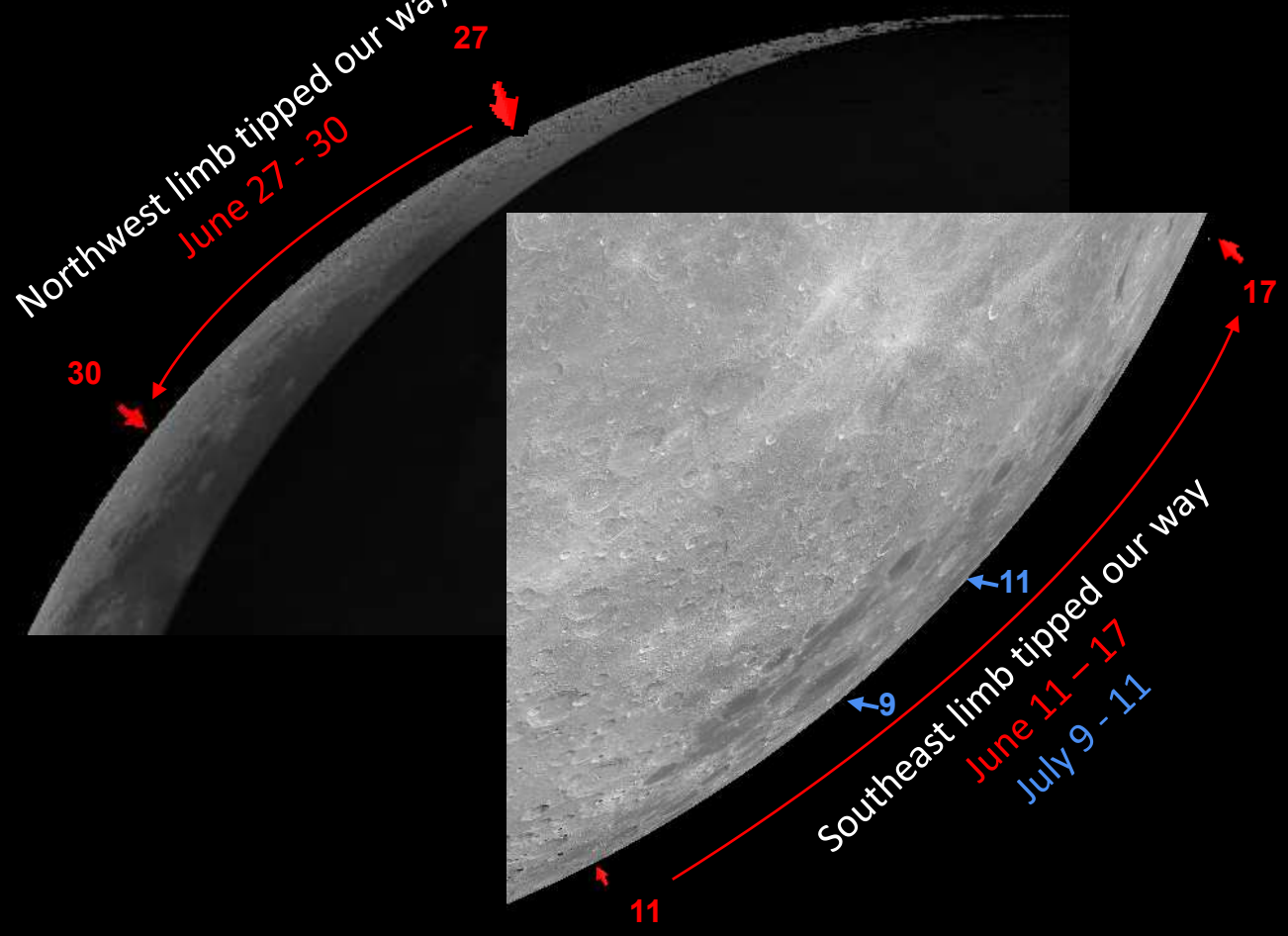
https://www.exploratorium.edu/video/total-solar-eclipse-live-july-2-2019

Observing the Moon

Lunar X & V

Sorry, not this month

Libration



Fortunately, whichever limb is tipped our way will be illuminated.

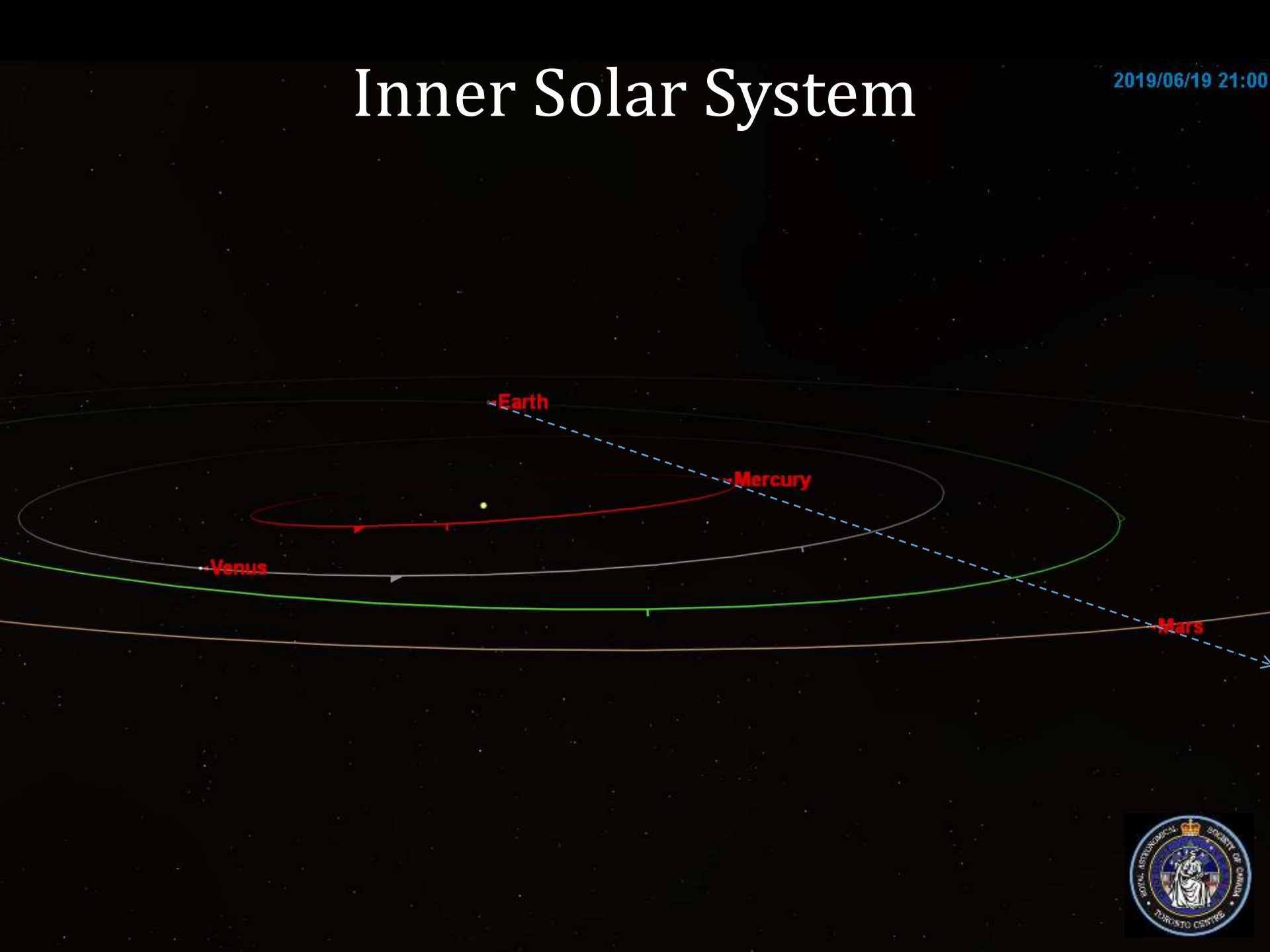
Moon dance


2019/07/15 22:48:00 (Loc
Jupiter
Antares
Saturn
The Moon
ROYAL ASTRONOMICAL SOCIETY OF CANADA
TORONTO CENTRE

Observing the Moon

June 18: Moon & Saturn less than 1° apart as they rise around 22:45 EDT

Inner Solar System

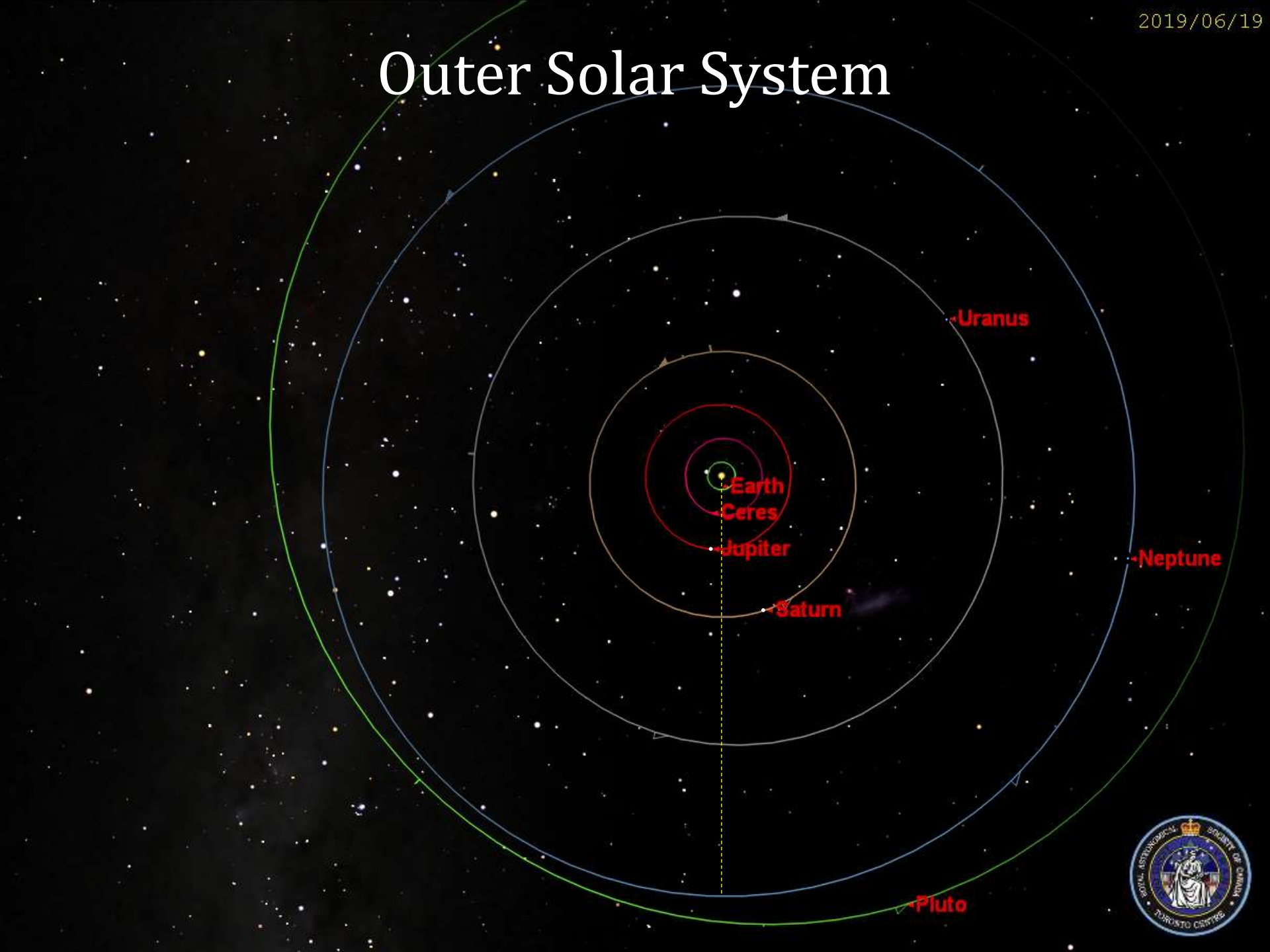


Mercury & Mars

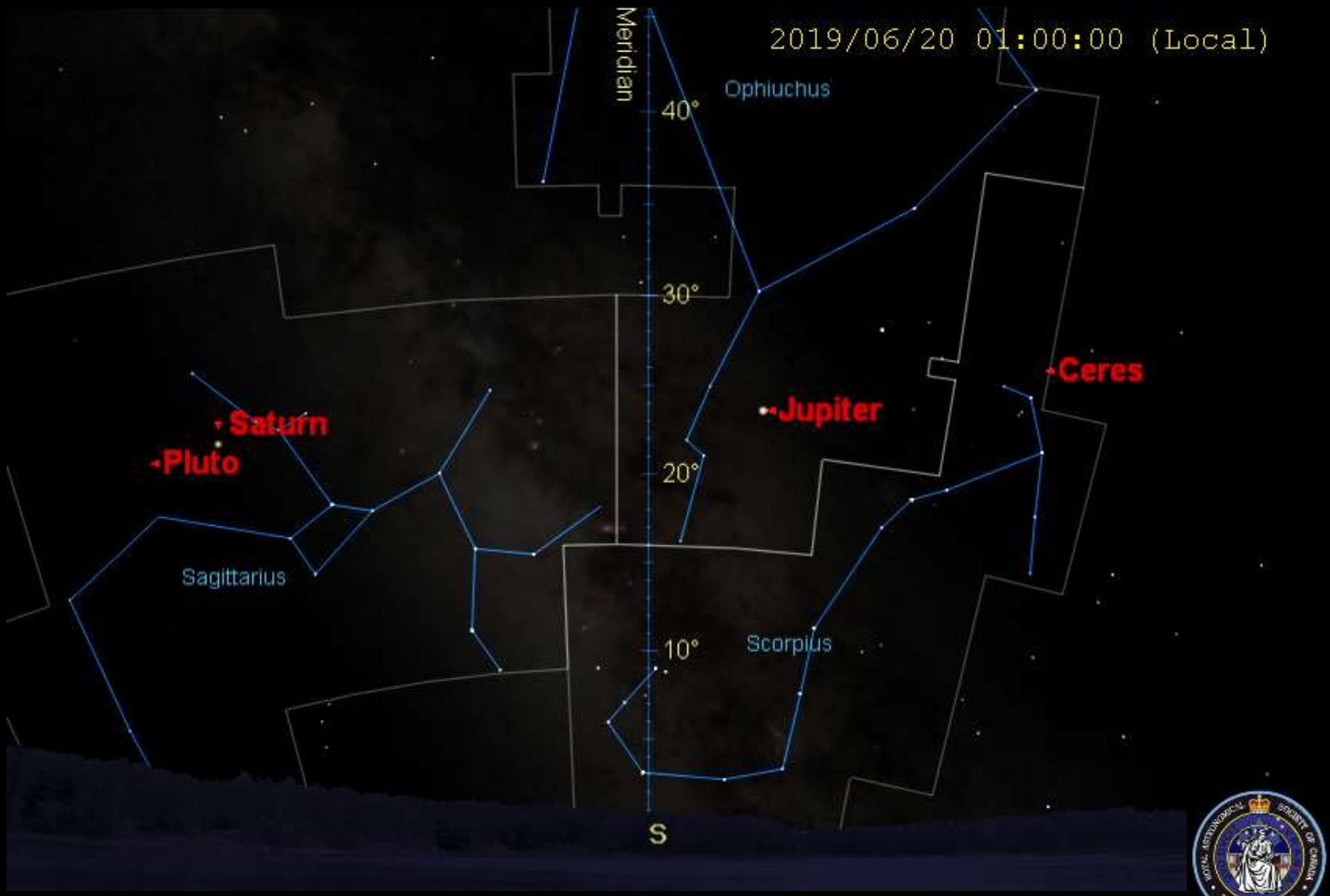
Mercury & Mars

Venus

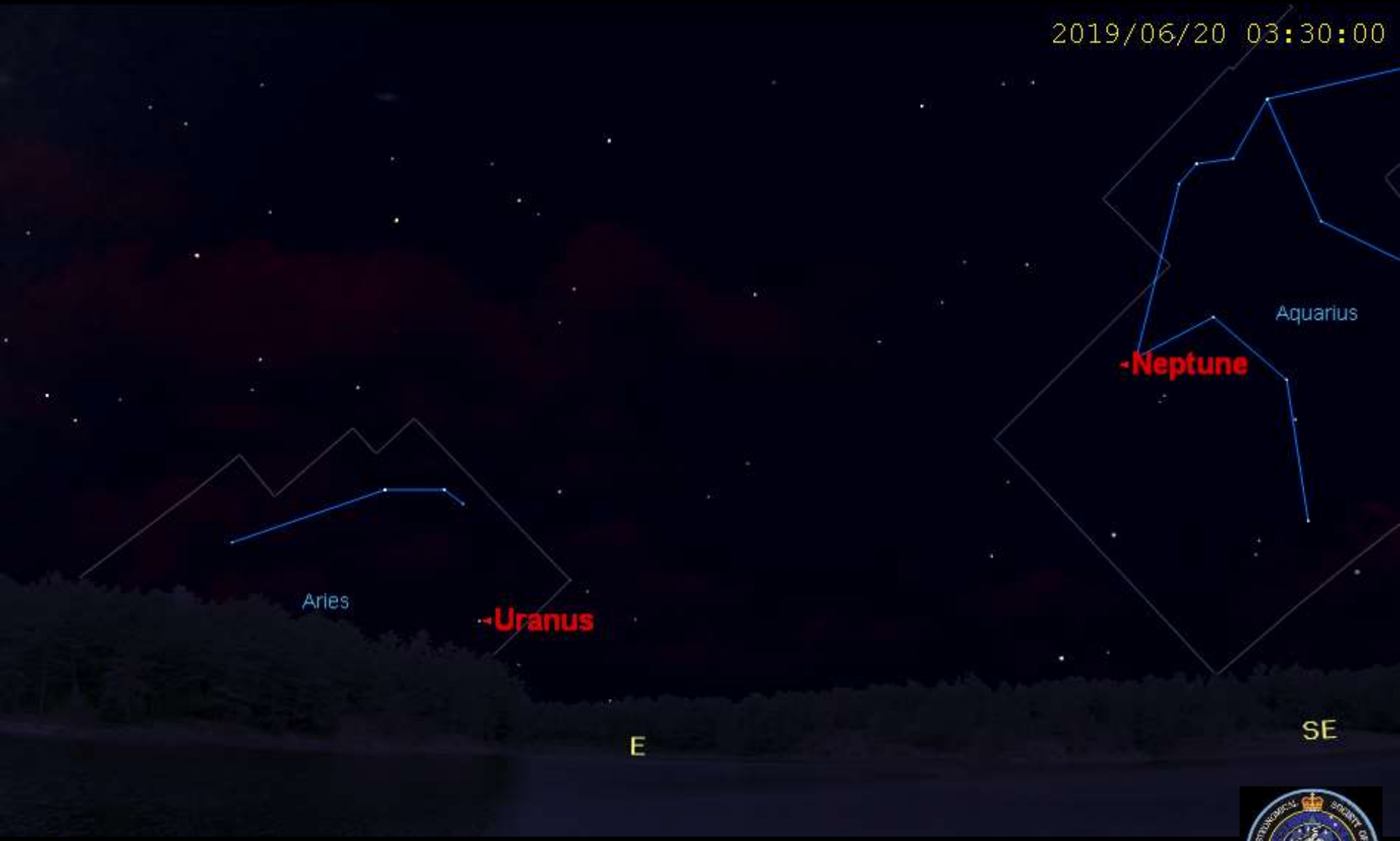
Outer Solar System



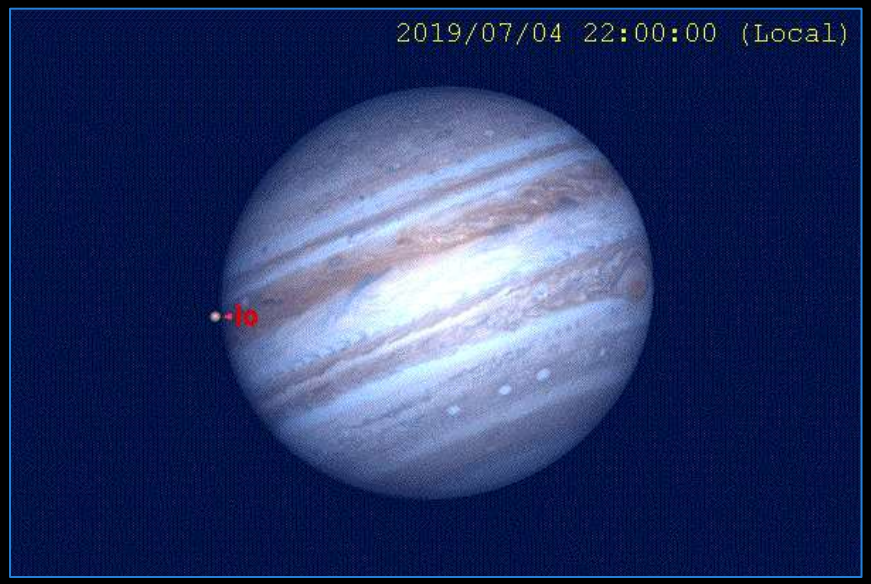
Looking south around local midnight



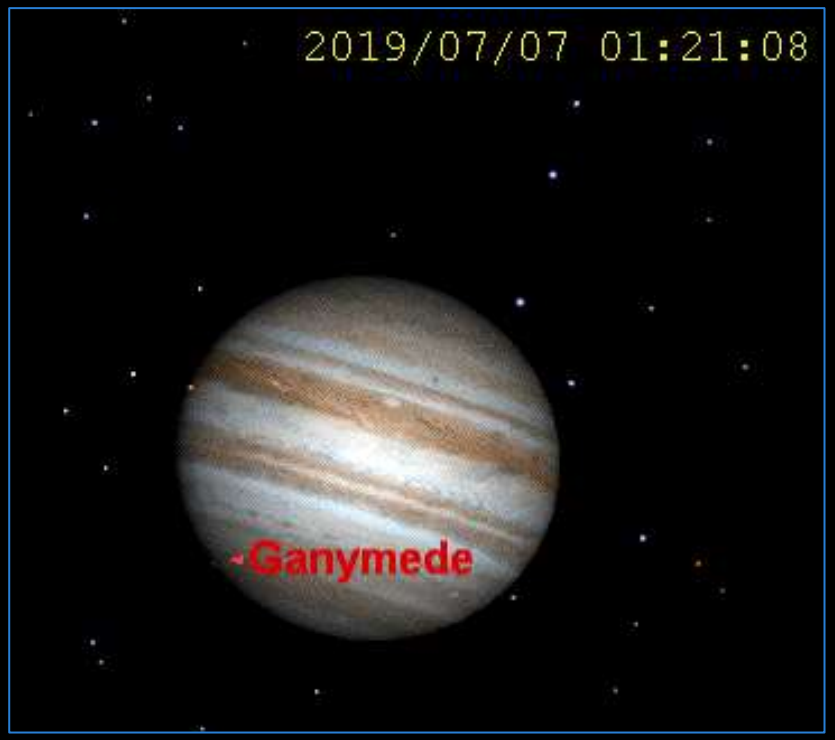
The Ice Giants



Shadows of Jupiter & its moons



Thursday, July 4 @ 10 pm
Io transits Jupiter
- Io' shadow follows



Sunday, July 7
Ganymede plays peek-a-boo
- 01:20 - Ganymede begins to reappear from behind Jupiter
- 01:35 – Ganymede begins hiding in Jupiter's shadow

Saturn at opposition
July 9

Simulation of Saturn at opposition
courtesy of Starry Night Pro 6

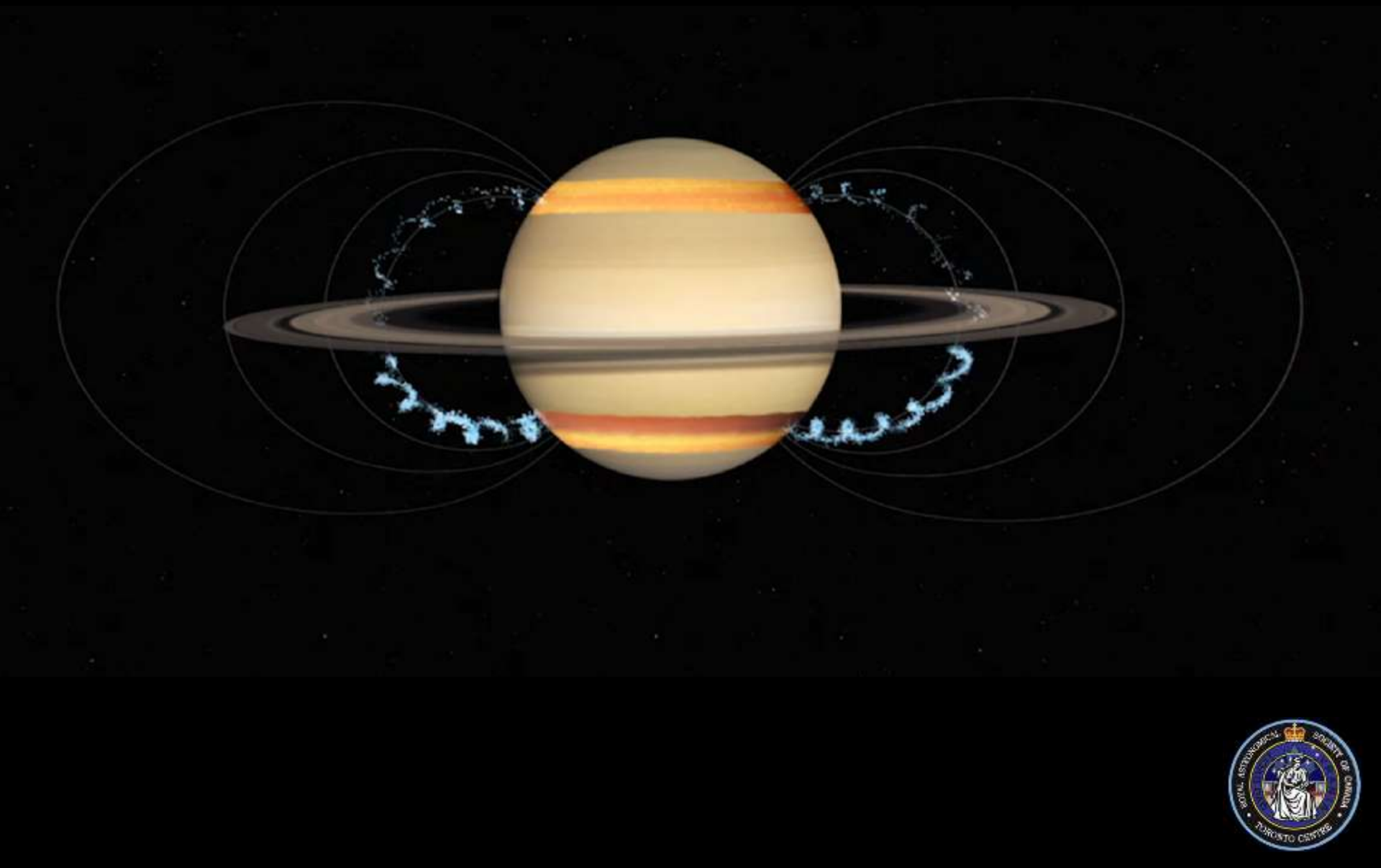
How Saturn appears through an amateur telescope.
Image by Ian Wheelband

In Sagittarius

Angular size: 18 arc-seconds for Saturn globe
42 arc-seconds including rings

Apparent magnitude: 0.05, which includes light from the rings

Saturn's rings are raining down



Saturn's rings are raining down

Changes in Jupiter's belts & GRS

Classic "text book" image of Jupiter taken Dec. 7, 2000 by the Cassini spacecraft enroute to Saturn.

- Dark North & South Equatorial Bands
- Bright Equatorial Zone
- Football-shaped Great Red Spot

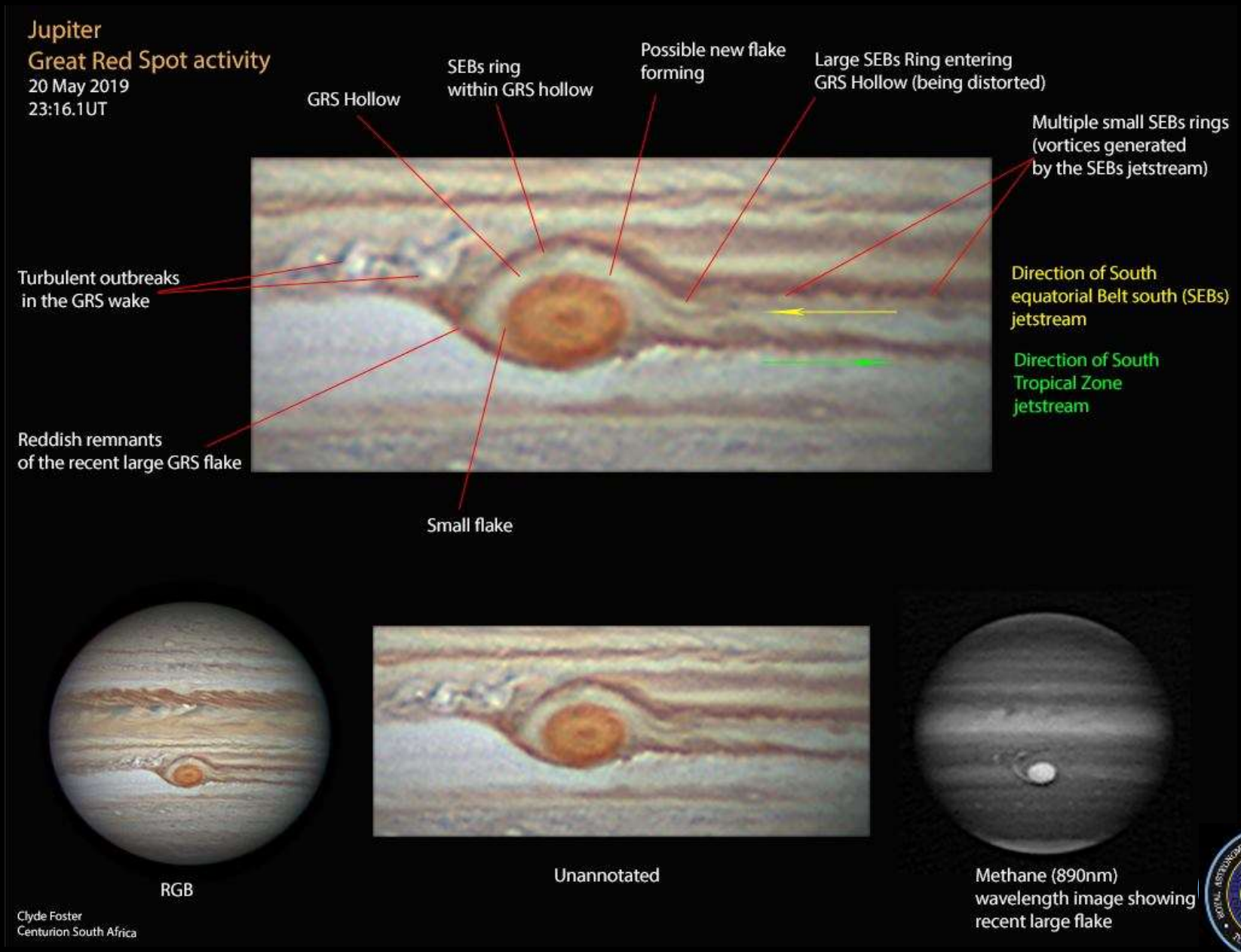
Recent image of Jupiter taken May 29, 2019 by Christopher Ho, from Cebu City, Philippines.

- Equatorial Zone filled with orange clouds
- South Equatorial Belt turned pale
- GRS darker colour, rounder
- New dark stripes surrounding and stretching from GRS

Red flakes peeling off the GRS

The Great Red Spot
2019.05.27
© Chris Go (Cebu, Philippines)

Diagram by Clyde Foster notes details seen around the Great Red Spot



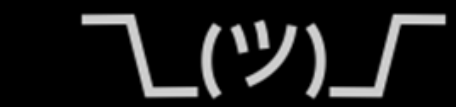
Great Red Spot is getting taller, not faster

The Jupiter Abyss

NASA/JPL-Caltech/SwRI/MSSS
Gerald Eichstädt/Sean Doran

Image by Juno spacecraft during close flyby in May.
Next close pass will be in July.

Meteor Showers



Sorry, none at this time.
Please check back next month.

Comets

My deepest regrets, but I'm afraid there are no easily- observable comets at this time.

Auroras

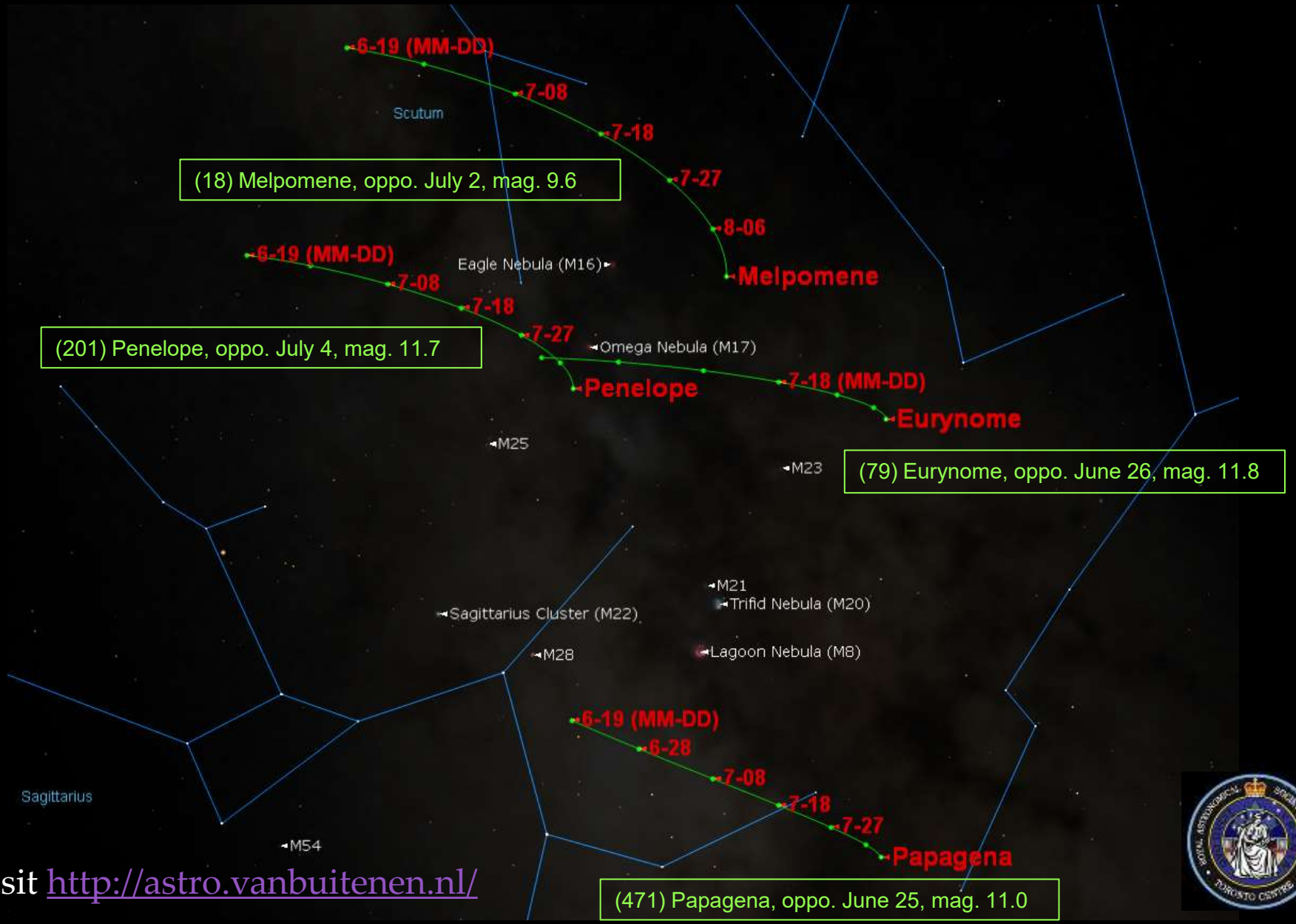
About 90 – 400 km up

- Solar minimum
  - Few or no sunspots, magnetic loops, CMEs
  - Chance if coronal hole returns to Earth-facing side
- Space weather reports, forecasts:
  - SpaceWeatherWoman.com
  - auroraforecast.com

From movie by Ian Wheelband

Lunar & Asteroid Occultations

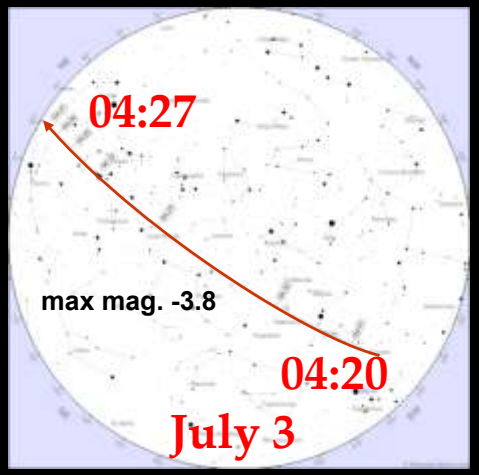
Asteroids in opposition

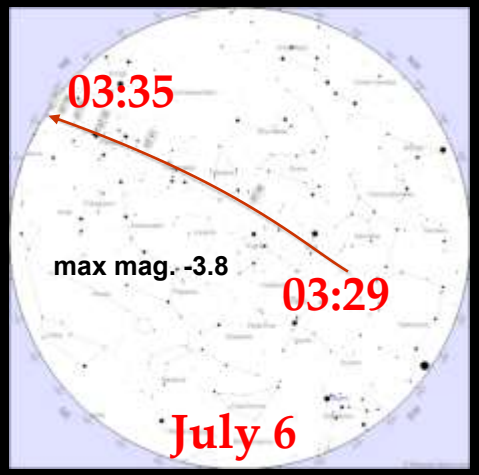


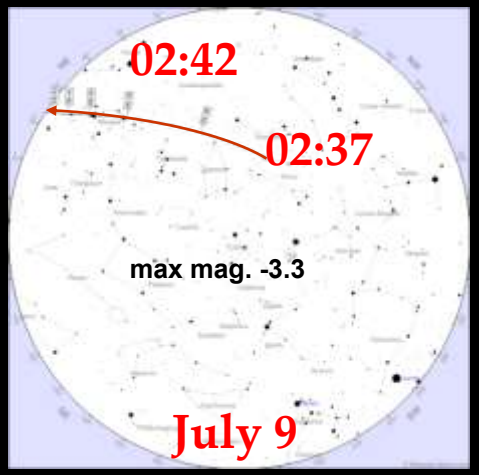
Visit http://astro.vanbuitenen.nl/

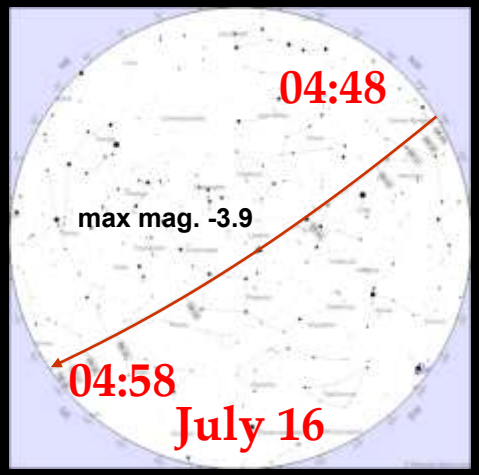
ISS – Visible Passes

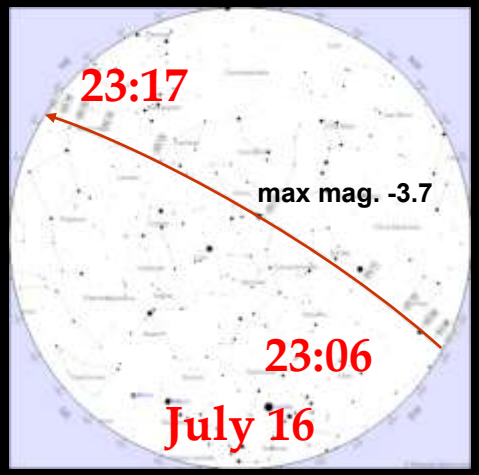
Some of the higher passes from now to July 16











ISS Solar & Lunar Transits

Using https://transit-finder.com

1. Set your location (latitude, longitude, elevation)

Ground location: The OSC

φ=	43.7169	°
λ=	-79.33865	°
h=	137	m

2. Set the time span of calculation (start and end dates)

2019-06-19 — 2019-07-13

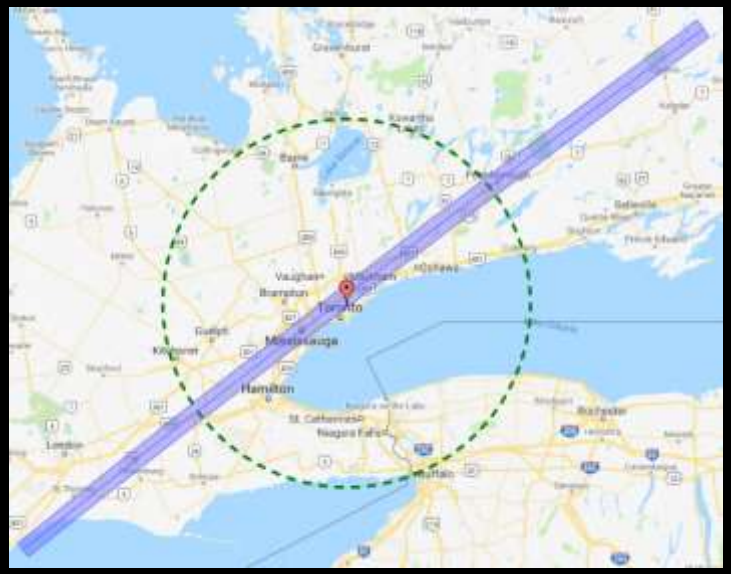
3. Set your preferred travel distance (kilometers)

80 km

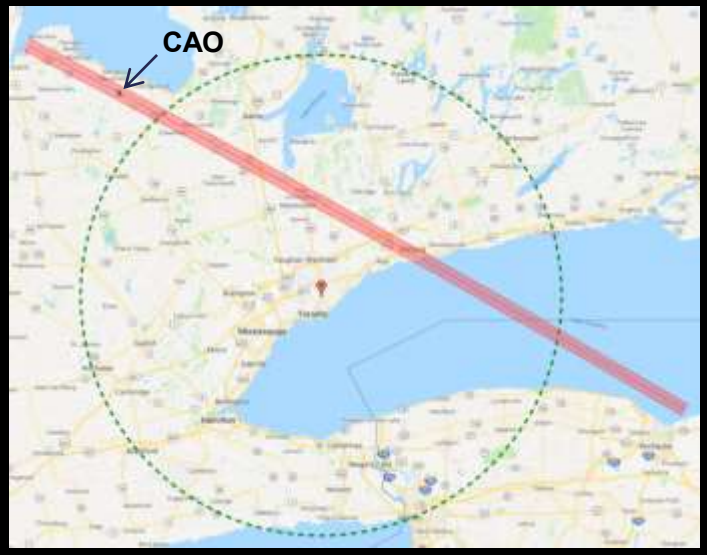
CALCULATE

Visit https://transit-finder.com to see more transits and details

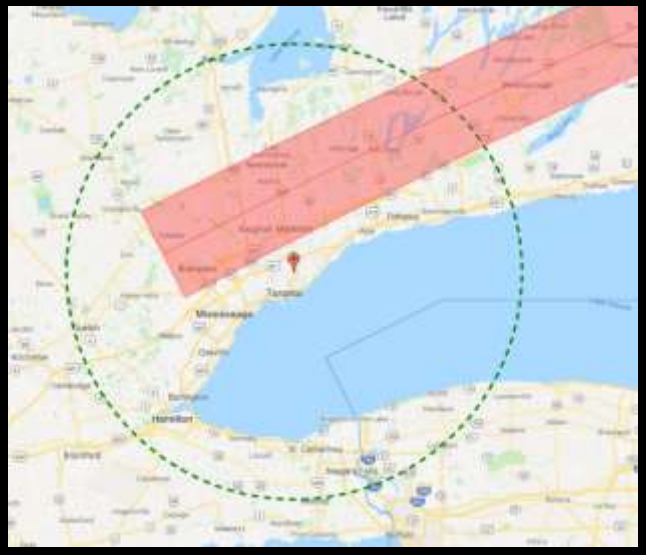
1. Solar transit on June 19, 9:30 am
   Brighton, Grimsby, Port Dover



2. Lunar transit on June 22, 8:36 am (daytime)
   Peterborough, the OSC, Mississauga, Port Stanley

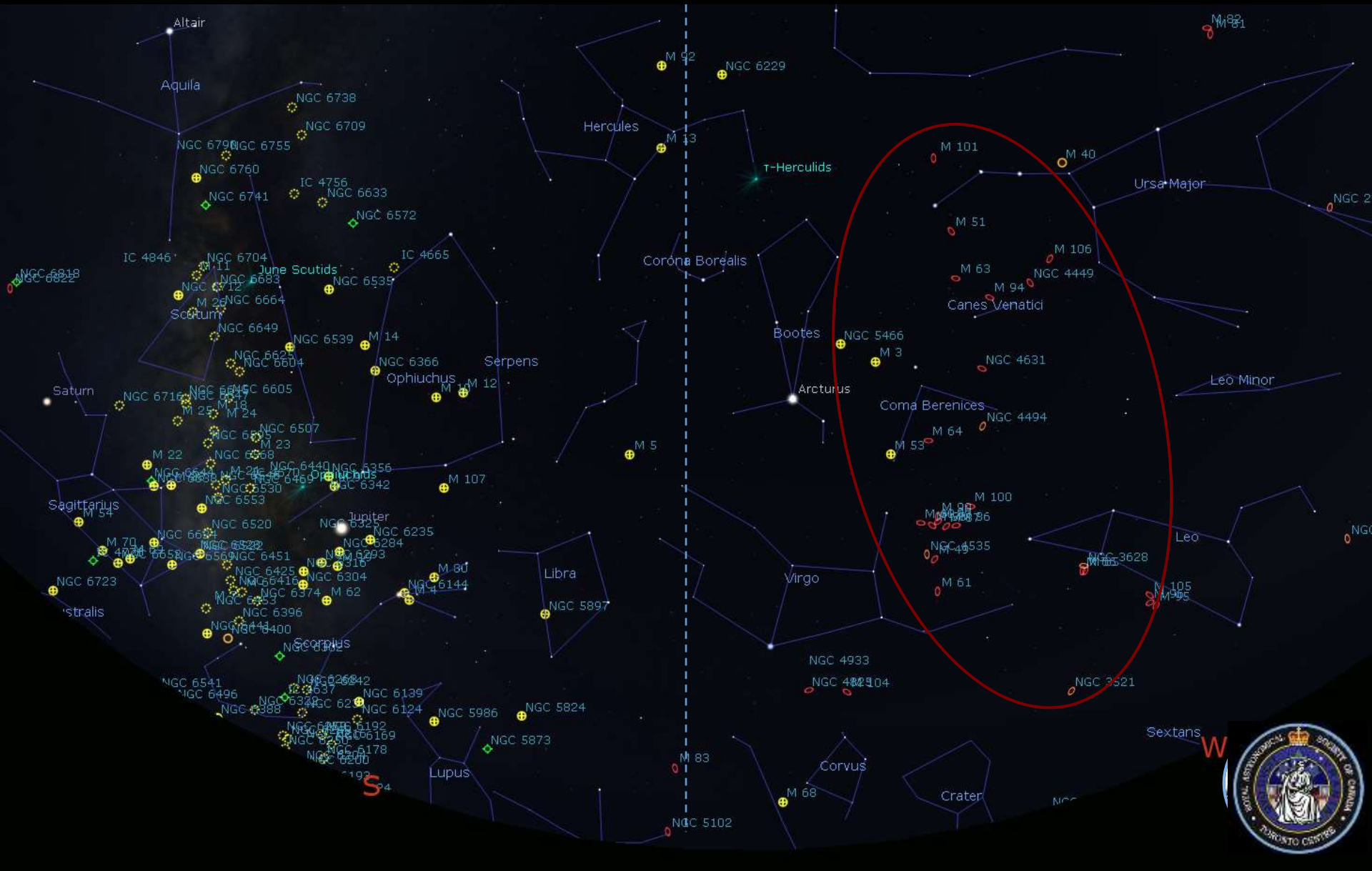


3. Solar transit on July 2, 10:05 am
   CAO, East Gwillimbury, Whitby/Oshawa

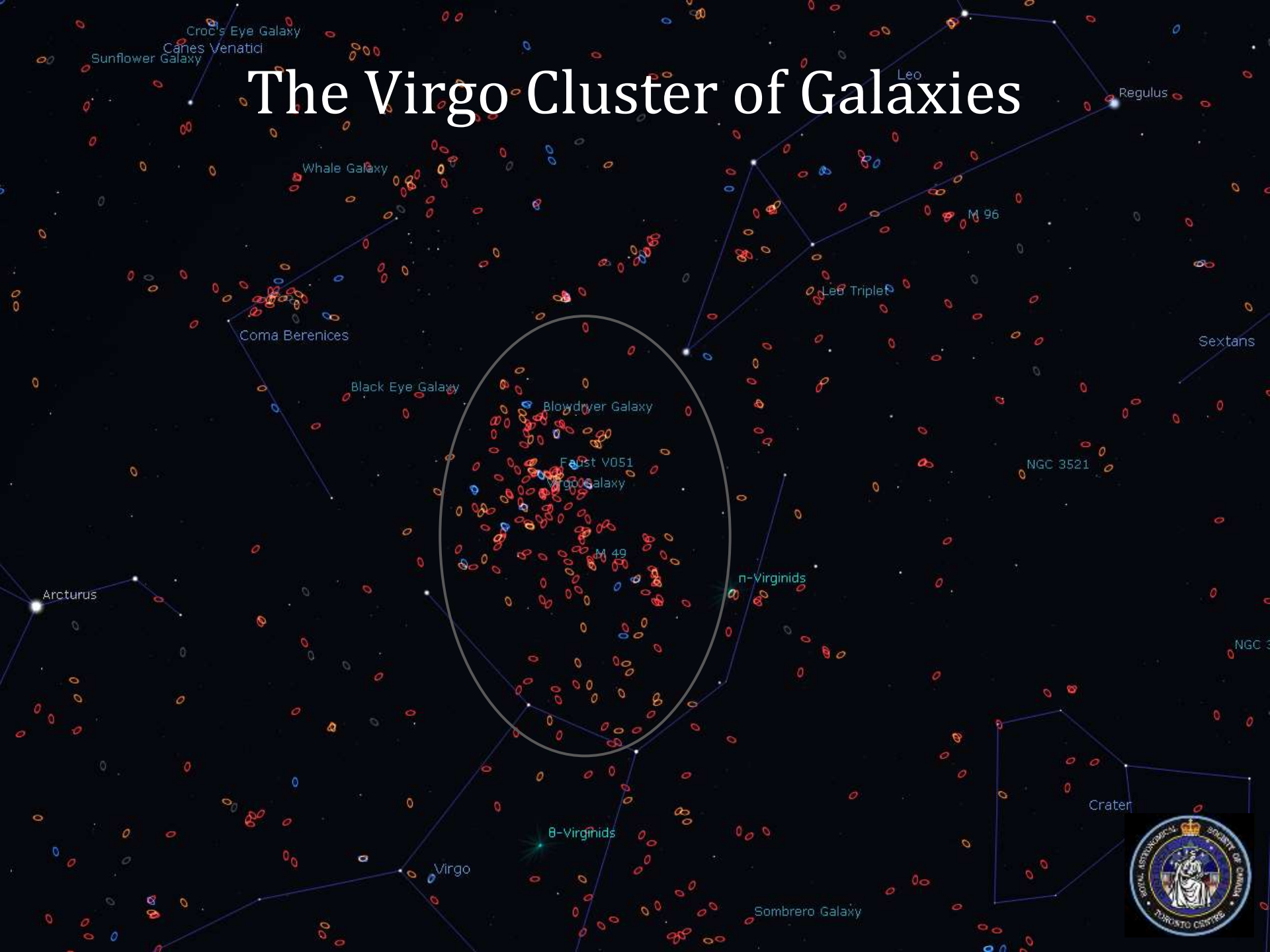


4. Solar transit on July 7, 6:02 am
   Caledon, Port Perry, Peterborough

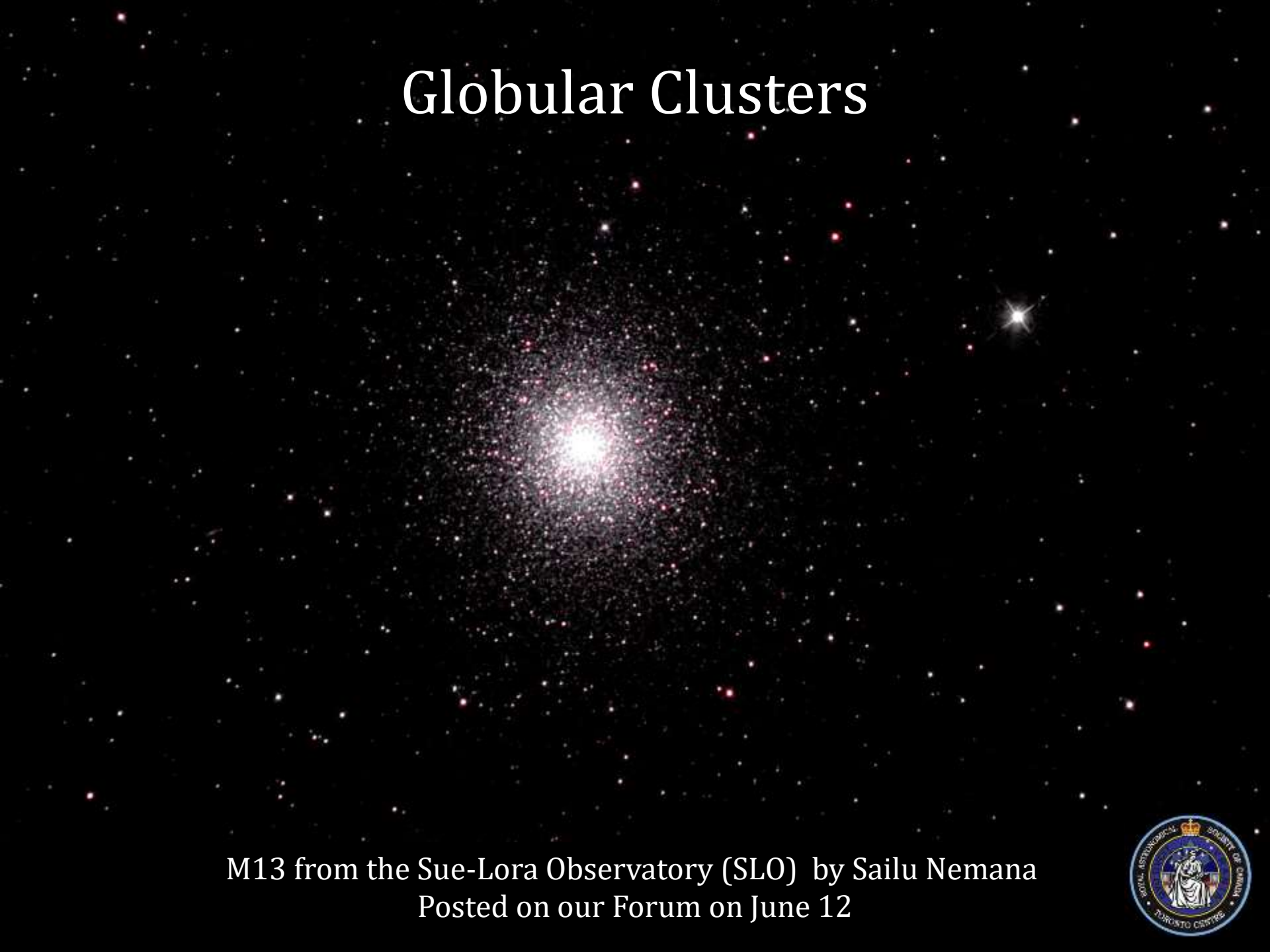
Deep Sky Objects



The Virgo Cluster of Galaxies

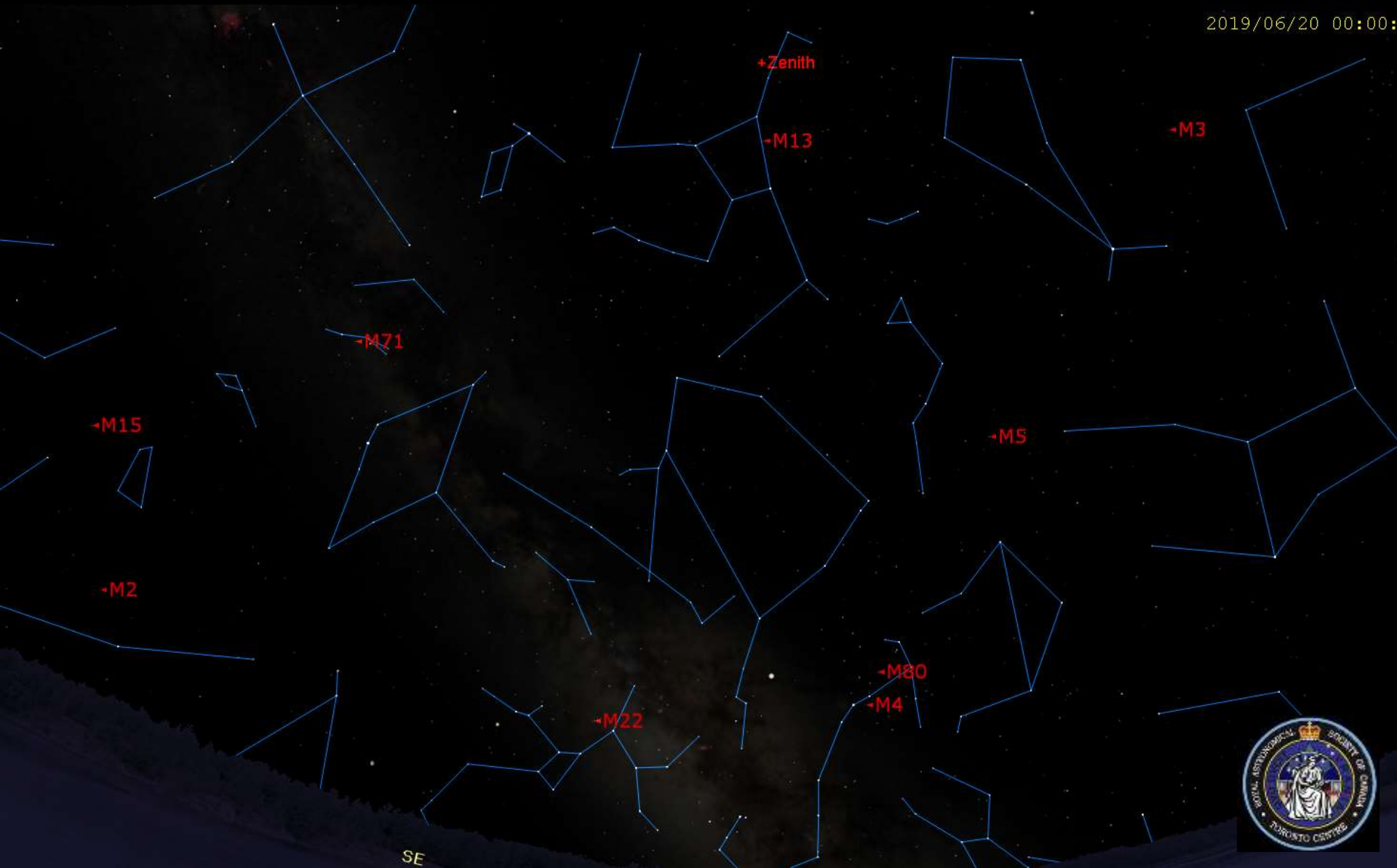


Globular Clusters



M13 from the Sue-Lora Observatory (SLO) by Sailu Nemana
Posted on our Forum on June 12

Globular Clusters



Globular Clusters

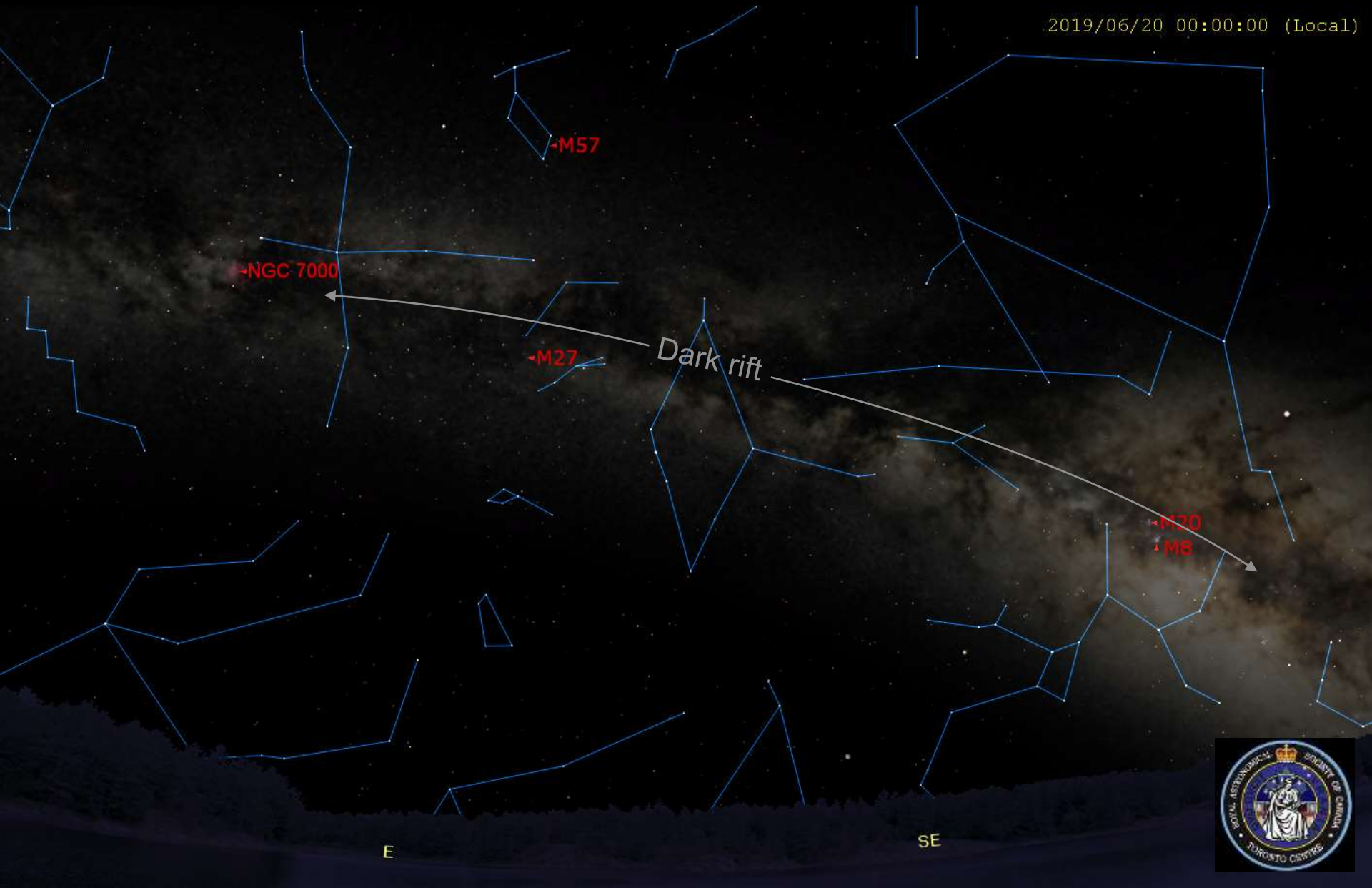
Designation	Const.	R.A.	Dec.	Notes	When
M5	Serpens Caput	15h 19m	+02° 01′	mag 5 26,000 ly Excellent. 13B yrs. old!	Spring, Summer
M4	Scorpius	16h 24m	-26° 34′	mag 6.5 7,200 ly (only) Immed. W of Antares.	Summer
M22	Sagittarius	18h 37m	-23° 53′	mag 6 10,000 ly Spectacular! ½ mil. stars	Summer
M2	Aquarius	21h 34m	-00°45′	mag 7 35,700 ly 13 B yrs old! Huge: 75% wider than others	Fall
M13	Hercules	16h 42m	+36°26′	mag 5 25,000 ly 1 of the best in north.	Summer, Fall
M15	Pegasus	21h 30m	+12° 14′	mag 6 33,600 ly One of oldest.	Summer, Fall
M3	Canes Venatici	13h 43m	+28° 18′	mag 6 33,900 ly ½ million stars!	Spring, Summer
M80	Scorpius	16h 18m	-23° 00′	mag 8 32,600 ly Very dense core.	Spring, Summer
M71	Sagitta	19h 54m	+18° 50′	mag 6 13,000 ly Very loose cluster, was first classed as O.C.	Summer, Fall

Open Clusters

Open Clusters

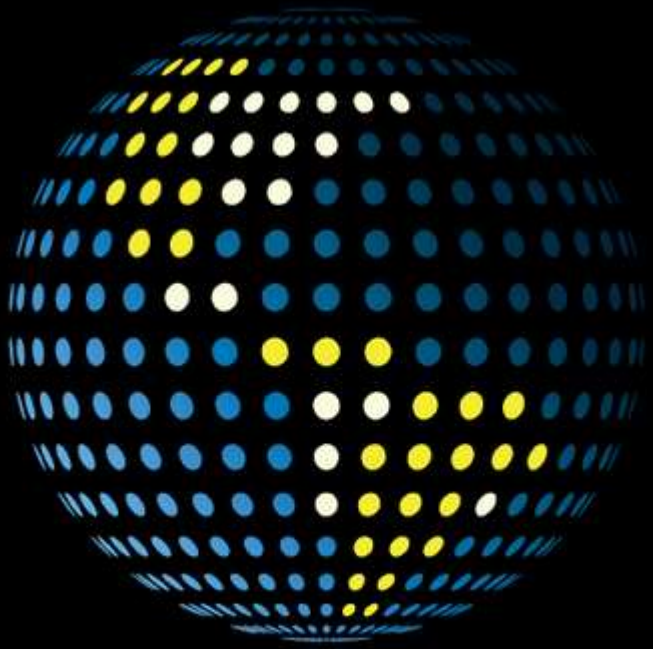
Designation	Const.	R.A.	Dec.	Notes	When
M7	Scorpius	**7h 54m**	**-34° 46'**	mag 3 (bright) 50 stars 1000 ly	Summer
M6 (Butterfly Cl.)	Scorpius	**17h 41m**	**-32° 16'**	mag 5 50 stars 2000 ly	Summer
M11 (Wild Duck)	Scutum	**18h 51m**	**-06° 15'**	mag 6 200 stars 5600 ly	Summer, Fall
M29	Cygnus	**20h 25m**	**+38° 33'**	mag 7 20 stars 3000 ly	Summer, Fall
M39	Cygnus	**21h 32m**	**+48° 34'**	mag 5 25 br. stars, open. 4200 ly	Summer, Fall
M52	Cassiopeia	**23h 25m**	**+61° 40'**	mag 6 100+ stars 7000 ly Draw line from α to β Cass. and cont. same distance to cluster	Circumpolar, best in Fall, Winter

Nebulae



Some Notable Summertime Nebulae

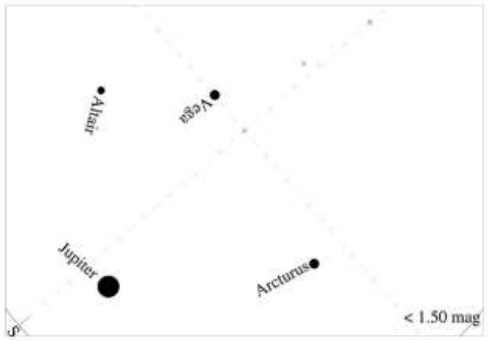
Designation	Const.	R.A.	Dec.	Notes	When
Dark Rift	**Throughout The Milky Way**				Summer, Fall
M27 (Dumbbell)	Vulpecula	**20h 00m**	**22° 46'**	Planetary. mag 7.5 1,250 ly	Summer, Fall
M57 (Ring Neb.)	Lyra	**18h 54m**	**33° 03'**	Planetary. mag 9 2,100 ly	Summer, Fall
M8 (Lagoon Nebula)	Sagittarius	**18h 05m**	**-24° 21'**	Emission neb. mag 6 5,000 ly Stellar nursery	Summer
M20 (Trifid Nebula)	Sagittarius	**18h 03m**	**-22° 57'**	Open Cluster with emission, reflection and dark nebulae. mag 5. 2,200 ly Dark lanes divide emission neb. into pedal-like shapes.	Summer
NGC7000 (North America Nebula)	Cygnus	**20h 59m**	**+44° 35'**	Emission neb, remarkable shape like N.A. Under dark sky can be seen naked eye looking thru UHC filter! Mag 4. *3° wide!* Use lowest magnification.	Spring, Summer, Fall



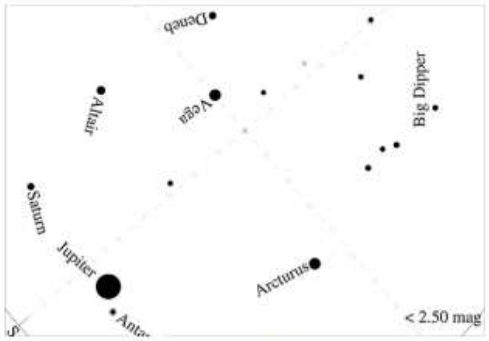
GLOBE at Night is an annual citizen-science campaign that encourages people all over the world to record the brightness of their night sky.

Hercules from June 24 through July 3

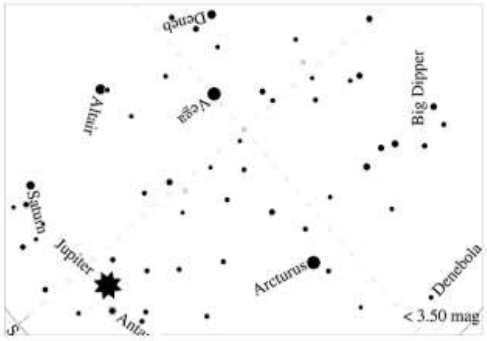
Magnitude 0/Cloudy Sky



Magnitude 1 Chart

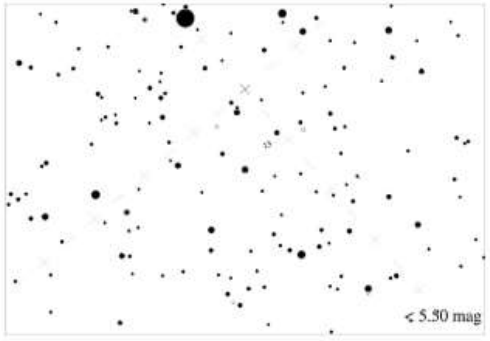


Magnitude 2 Chart

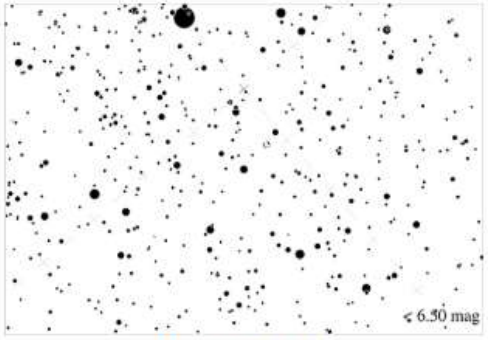


Magnitude 3 Chart

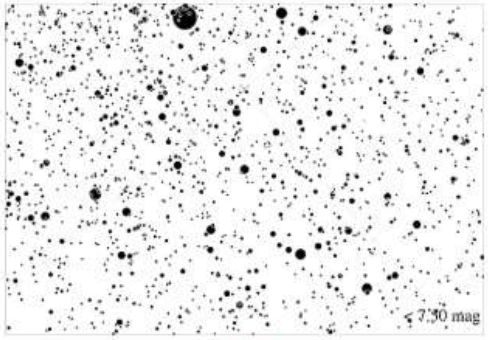
Magnitude 4 Chart



Magnitude 5 Chart



Magnitude 6 Chart



Magnitude 7 Chart

https://www.globeatnight.org/magcharts/hercules

Globe at Night

https://www.globeatnight.org/webapp/

1 When did you make your observations?

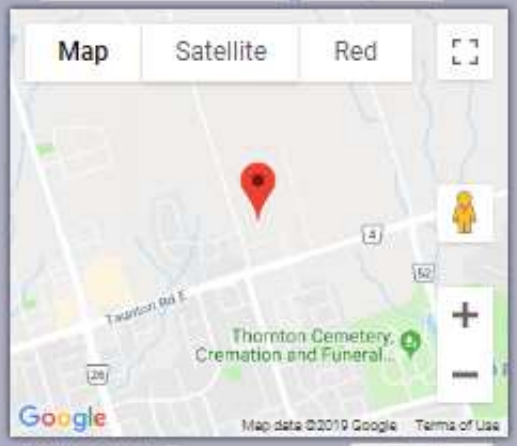
Observation Date (yyyy/mm/dd) yyyy/mm/dd

Observation Time (24 hour time) hh:mm

Switch to Nighttime version

2 Where did you make your observations?

Map it!



Location correct

Reset GPS

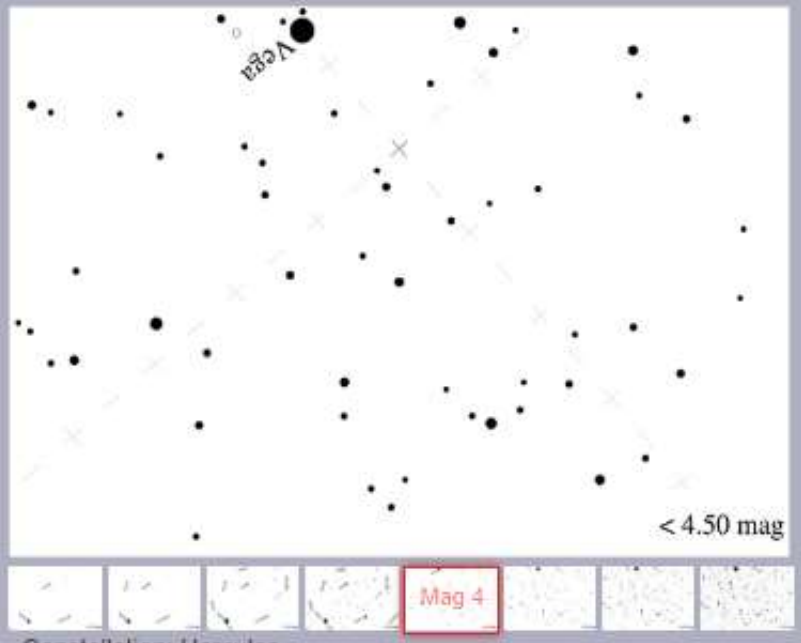
Latitude: 43.9262937
Longitude: -78.91749779999999
Elevation: 144.41 meters

Country:
Canada

Location comments

(E.g., Rural, suburban, or urban location; Snow cover? Number of streetlights, porchlights or other light sources (vending machines, etc.) in vicinity; Trees or structures in vicinity)

3 How dark was the sky that night?



Constellation: Hercules

4 What were sky conditions like that night?

Clear | ¼ of the sky | ½ of the sky | More than ½ of the sky

Sky condition comments

(E.g., Haze – direction? Clouds – type, direction? Sky glow/light dome – direction?)

Credits

- Sky & Telescope
- Sky graphics:
  - Starry Night Pro
  - Stellarium
  - Virtual Moon Atlas
- Solar cycle graph by Royal Observatory of Belgium, Brussels
- Goddard Media Studio: https://svs.gsfc.nasa.gov
- www.timeanddate.com
- https://www.spaceweatherlive.com/en/solar-activity/coronal-holes
- https://theskylive.com
- https://SpaceWeatherLive.com for Coronal Hole images
- https://in-the-sky.org
- https://lovethenightsky.com/virgo-galaxy-cluster-complete-guide/
- https://www.globeatnight.org/
- Images of Jupiter & Jupiter's Great Red Spot:
  - Christopher Go - http://astro.christone.net/
  - Clyde Foster - http://alpo-j.asahikawa-med.ac.jp/kk19/j190520r.htm
- https://transit-finder.com
- Jupiter Abyss image - NASA/JPL-Caltech/SwRI/MSSS, processed by Gerald Eichstädt & Sean Doran
- Photo of M13 by Sailu Nemana
- Photo of Saturn by Ian Wheelband
- Slide show prepared by Arnold Brody