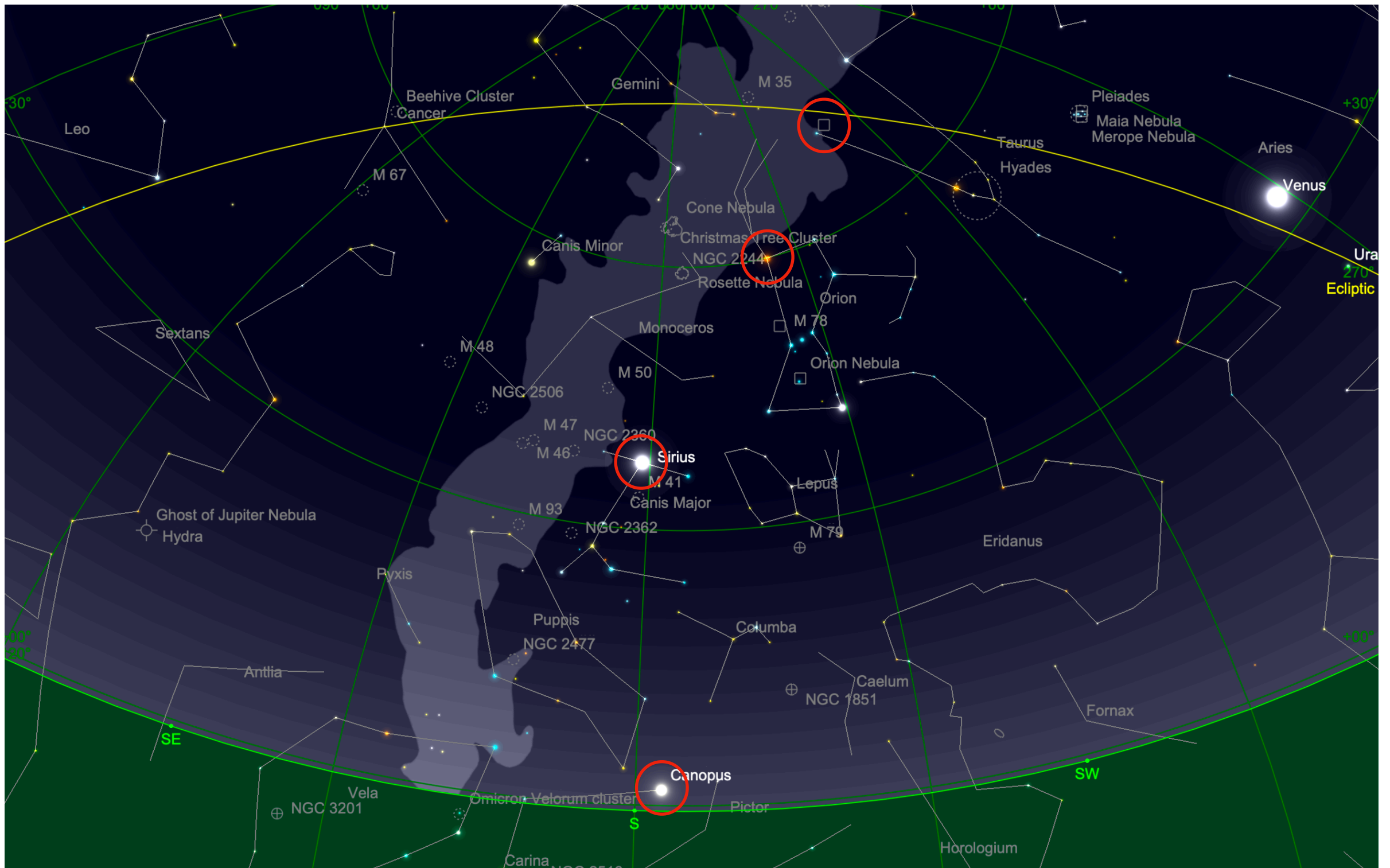


# **March Night Sky & Recent, Random Popular Astronomy Topics**

Santa Fe Star Gazers  
18 March 2020

# The Late-Spring Sky



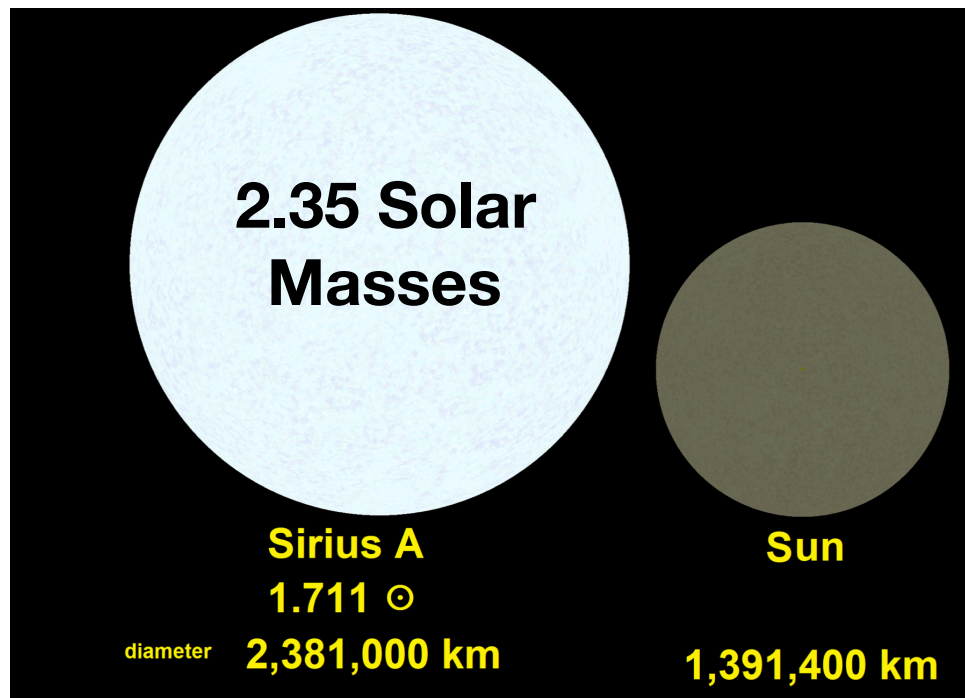
**Looking South 1 hr. after sunset**

# Sirius

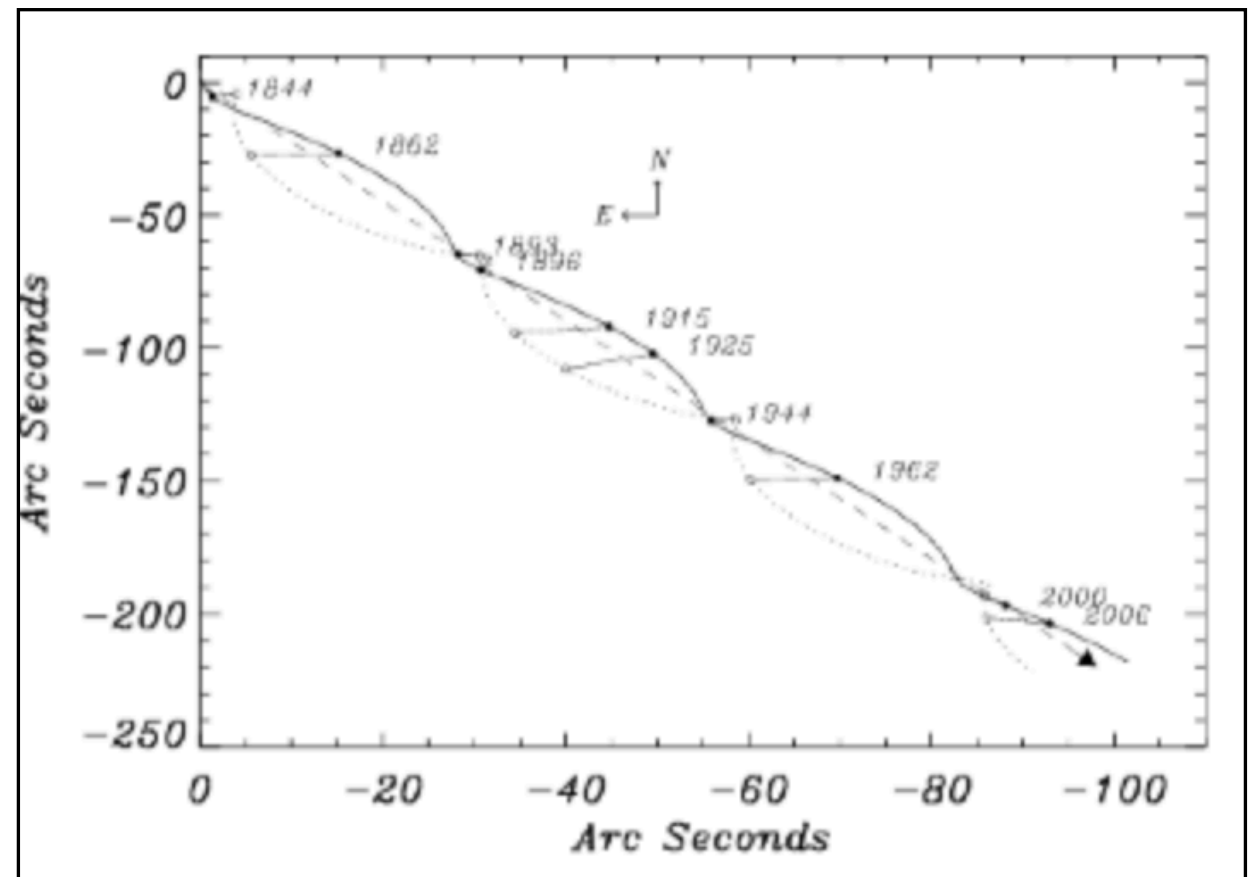
- Brightest star in the sky (mag -1.46)
- 5th closest star to the Sun (8.7 ly)
- Mass 2.35 suns and luminosity 23 suns
- Contains the 1st discovered white dwarf star (Sirius B, “The Pup”)



# Sirius B



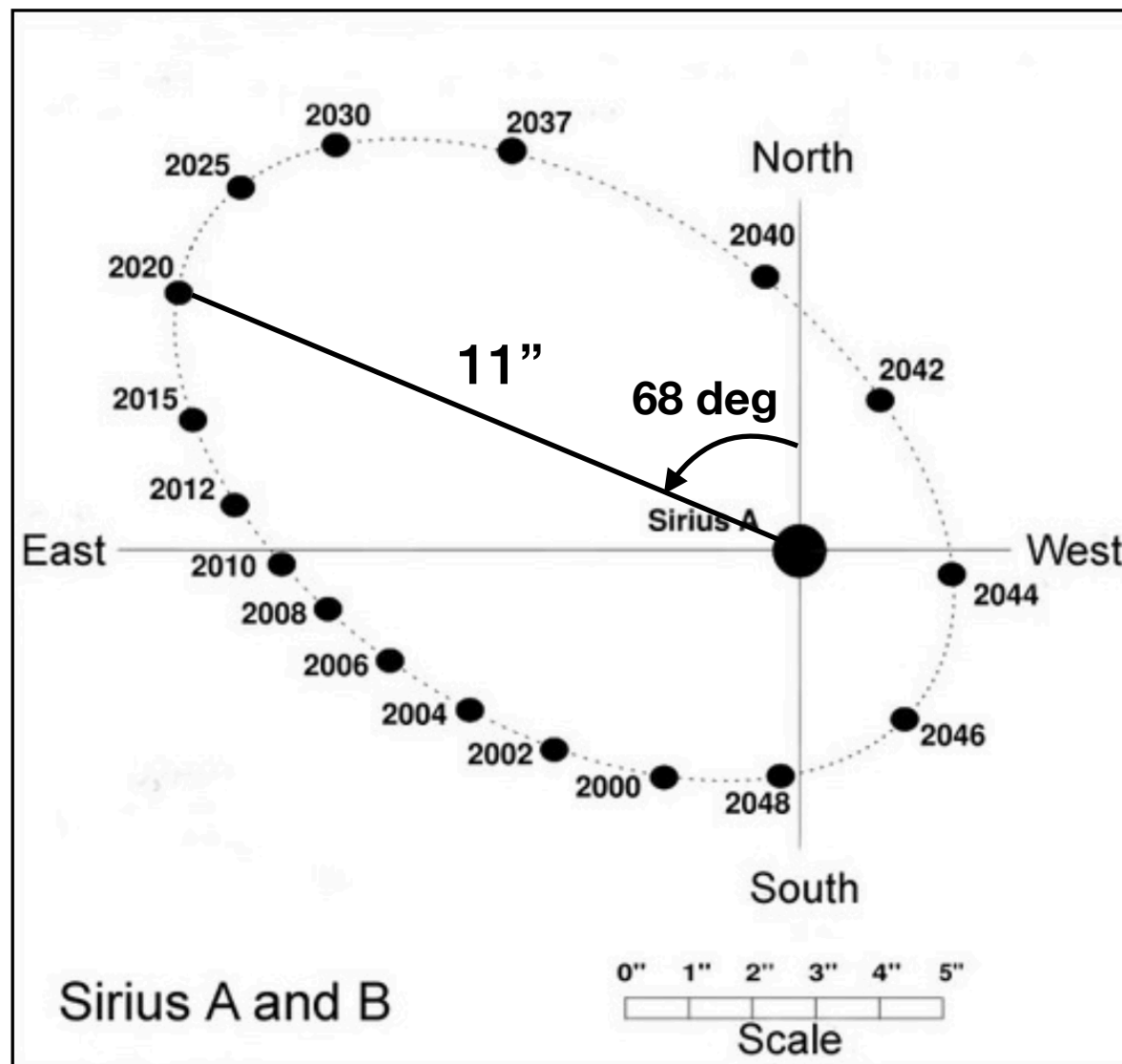
- In 1844, the German astronomer Friedrich Bessel deduced from changes in the proper motion of Sirius that it had an unseen companion.
- On January 31, 1862, American telescope-maker and astronomer Alvan Graham Clark first observed the faint companion, which is now called Sirius B, or affectionately "the Pup".



# White Dwarf Stars

- Medium-mass stars (.6 - 10 suns) burn hydrogen to helium to carbon & oxygen.
- As the helium core grows, so does the size of the star, eventually producing a red giant.
- Eventually the tenuous atmosphere of the red giant blows off, leaving a white dwarf and a planetary nebula.
- The core of the white dwarf contains crystalline carbon and oxygen, and might resemble a giant diamond.

# Currently Near Maximum Separation

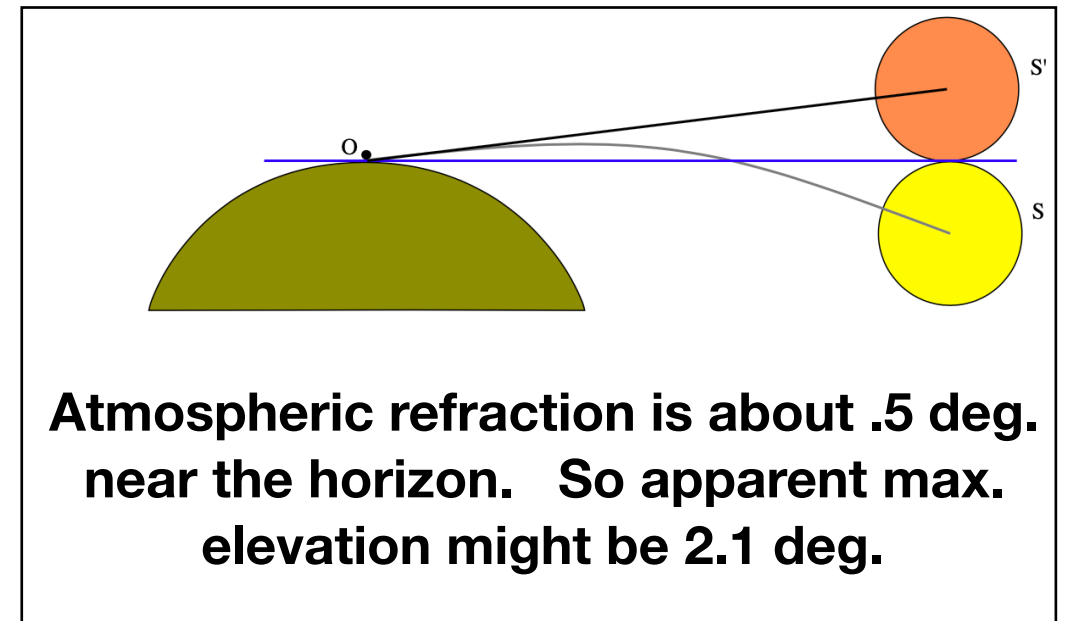
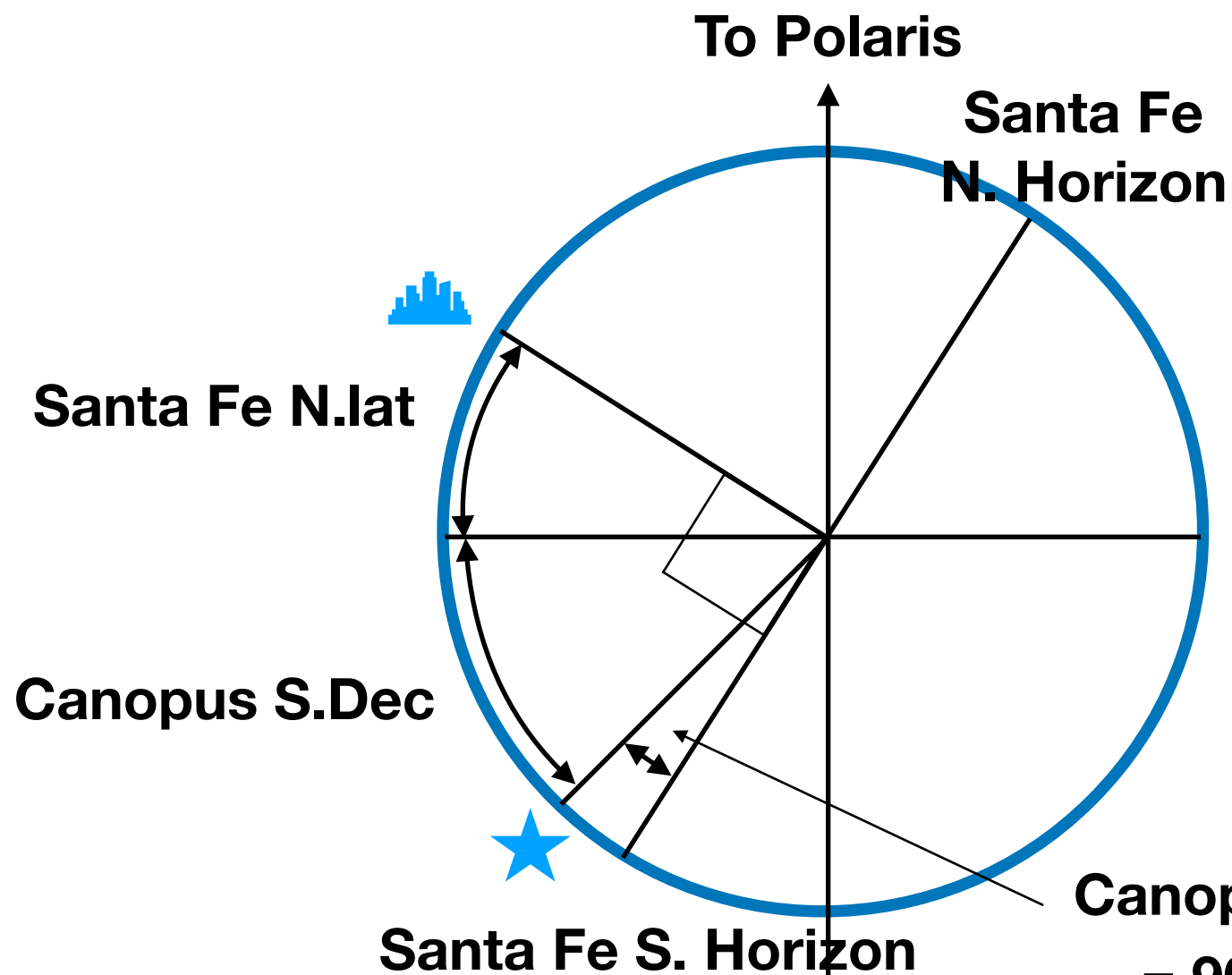


**Splitting Sirius has been reported in telescopes as small as 4".**

# Canopus

- 2nd brightest star in the sky (mag  $-1.10$ )
- Appears about 50% of Sirius' brightness, but is, in fact, a much bigger and brighter star. (HW question: Canopus is .74 magnitude units dimmer than Sirius. How does that translate into being approx. 50% as bright?)
- Mass 8 suns, luminosity 13,500 suns (visual), and distance 310 ly ... a big star on the verge of being large enough to eventually become a supernova.

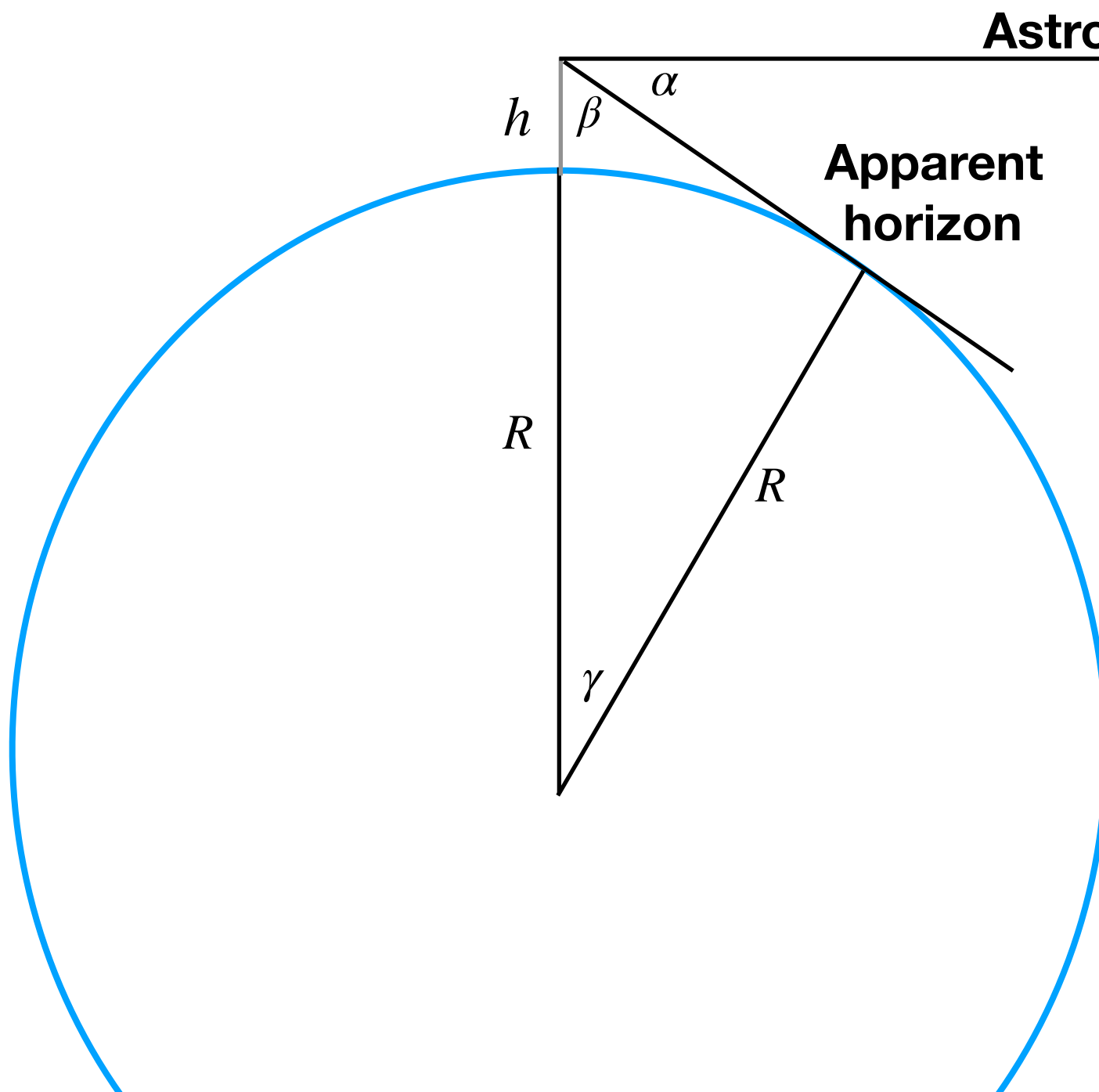
# What Will be the Altitude of Canopus When it Transits at Santa Fe?



$$\begin{aligned}
 &\text{Canopus max. altitude. above horizon} \\
 &= 90^\circ - \text{SF N.Lat} - \text{Canopus S.Dec} \\
 &= 90 - 35.69 - 52.71 \\
 &= 1.6 \text{ deg}
 \end{aligned}$$

# But Wait! There's more.

Suppose your observatory was at an altitude of 1 mile.  
How much higher would Canopus appear?



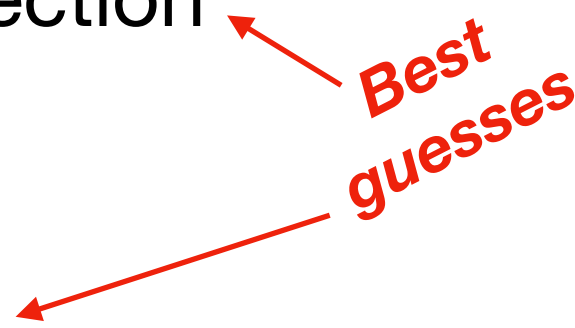
$\alpha$  is the difference between the astronomical horizon and the apparent horizon when the height of eye is  $h$ .

$$\alpha = \gamma = \cos^{-1} \frac{R}{R + h}$$
$$= \cos^{-1} \frac{4000}{4000 + 1} = 1.28^\circ$$

# Betelgeuse 1

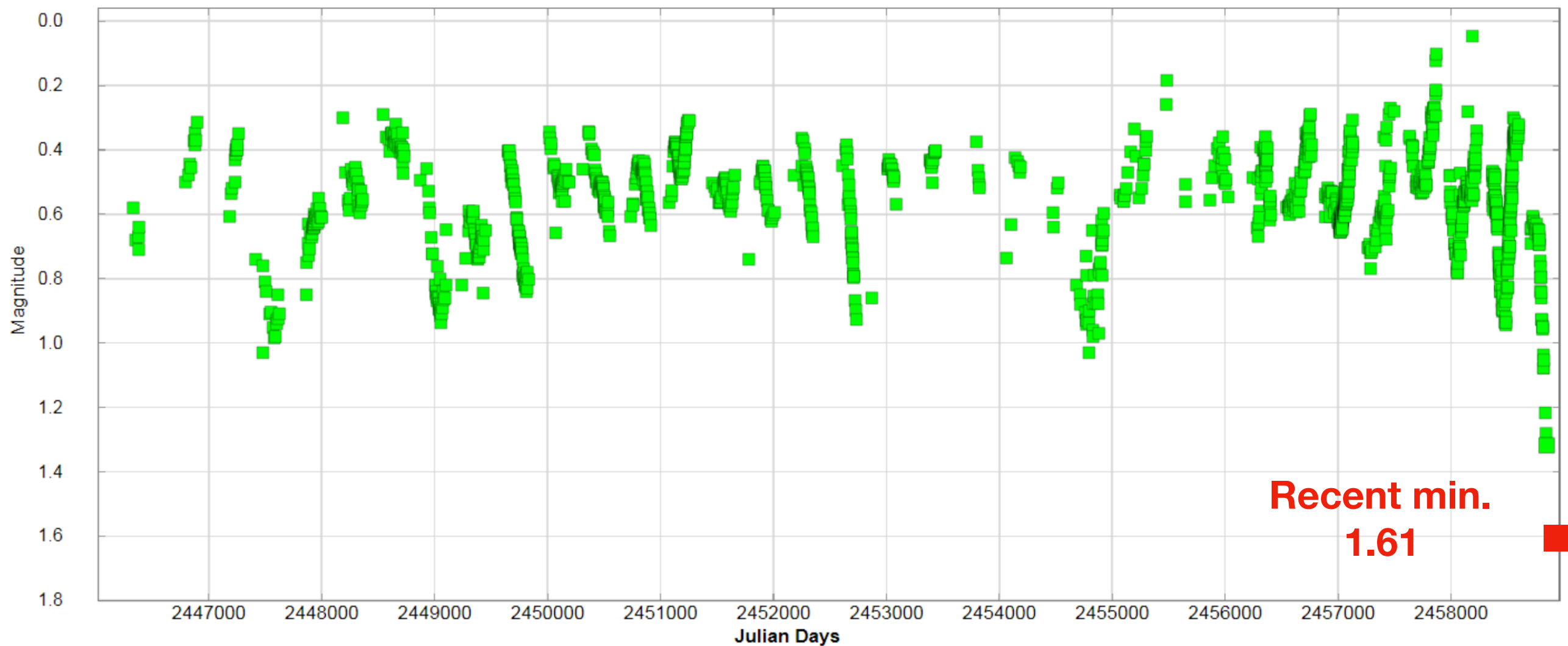
- Very large red supergiant star
- Irregular, pulsating variable, usually magnitude .45 - 1.3
- Currently a dim 1.6, but brightening.
- Called  $\alpha$  Orionis, but is now dimmer than  $\beta$  Orionis (Rigel).
- ~500 - 600 ly distant
- 15 -17 solar masses, so will eventually explode as a Type II supernova

# Betelgeuse 2

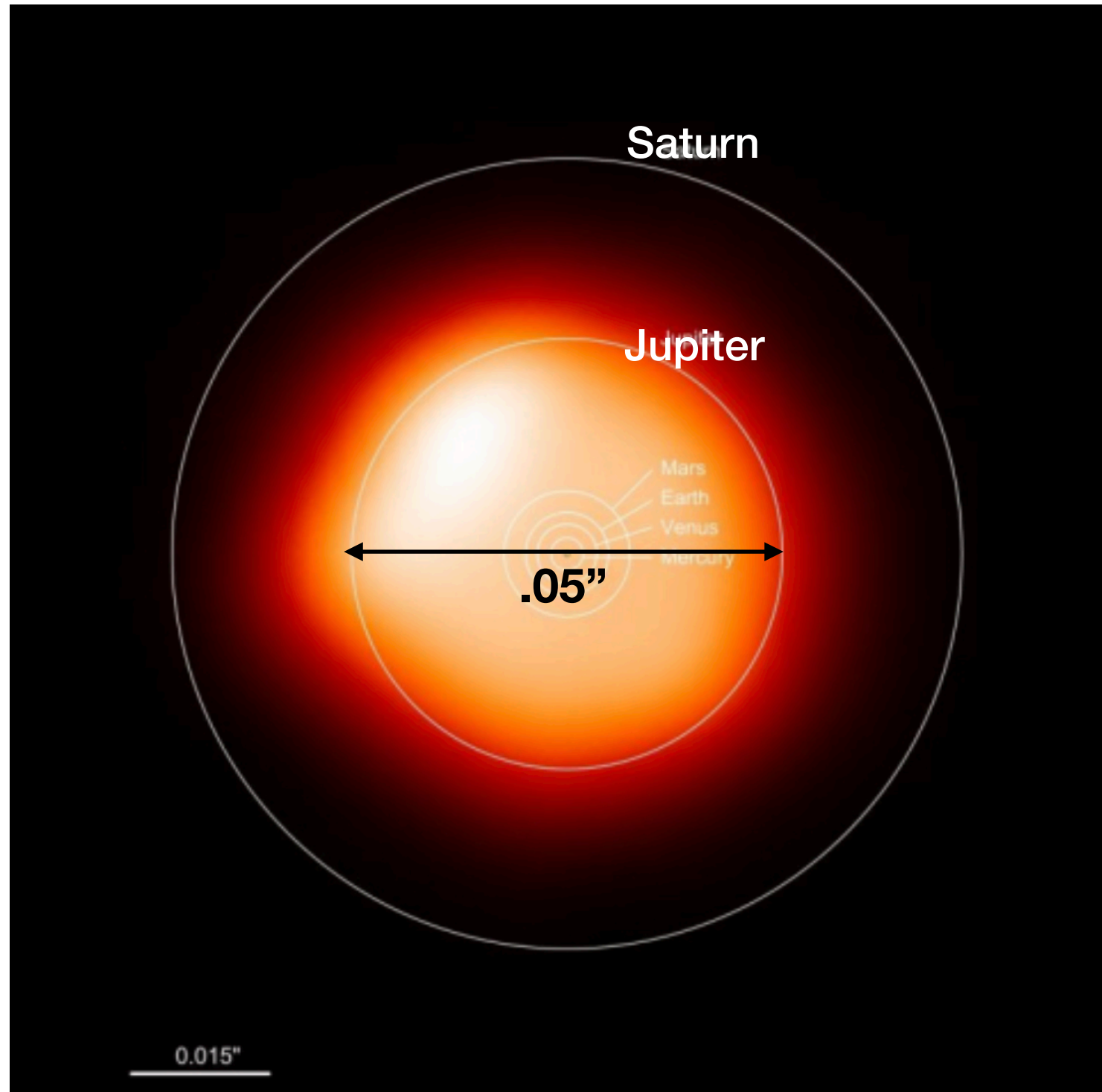
- Has several overlapping cycles ... none particularly regular.
  - Three theories for current extreme minimum:
    1. Dust ejected in our direction
    2. A very large star spot
    3. Just another minimum
    4. Type II supernova imminent
- 
- Best guesses*



# 35-Year Light Curve

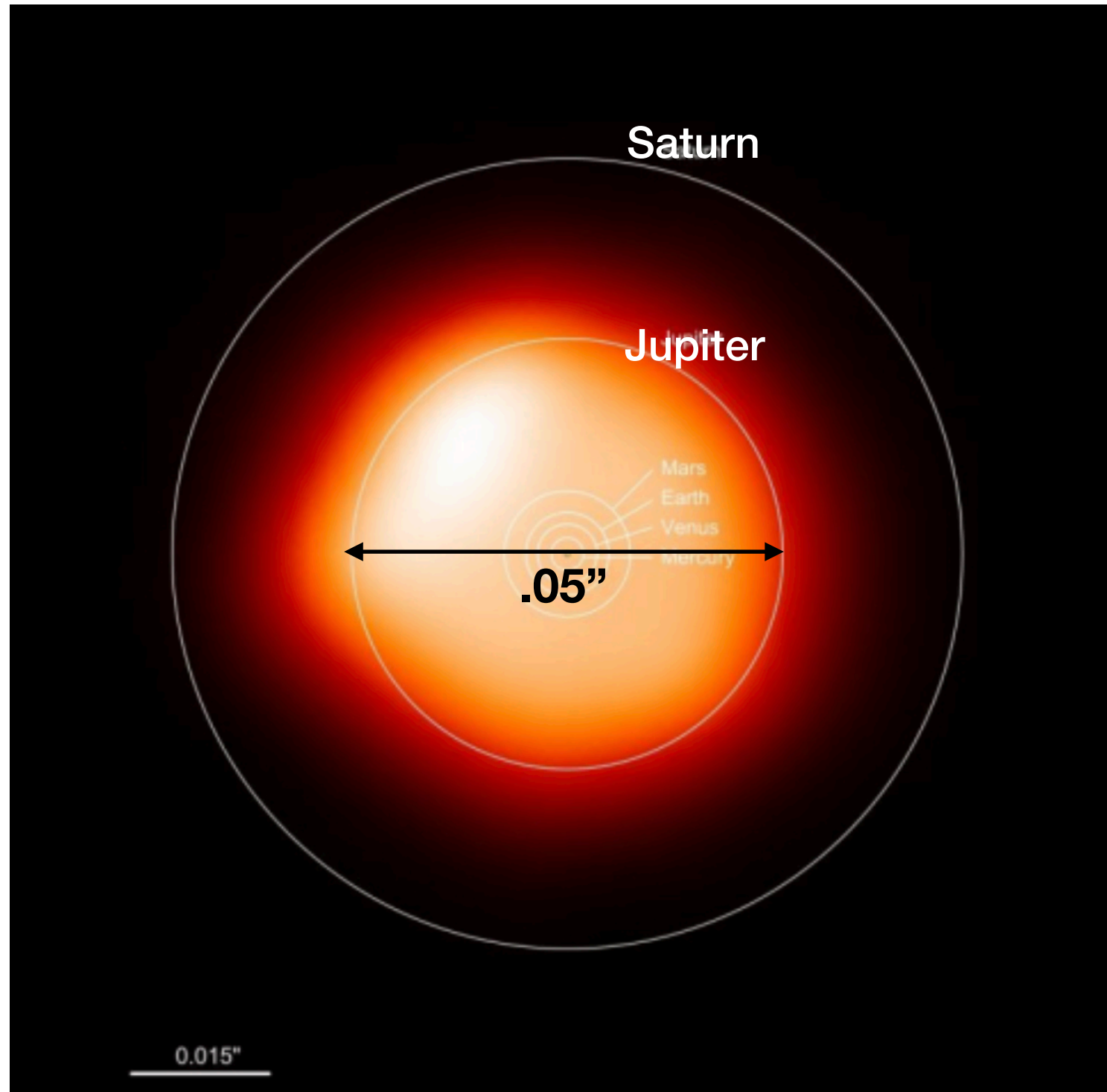


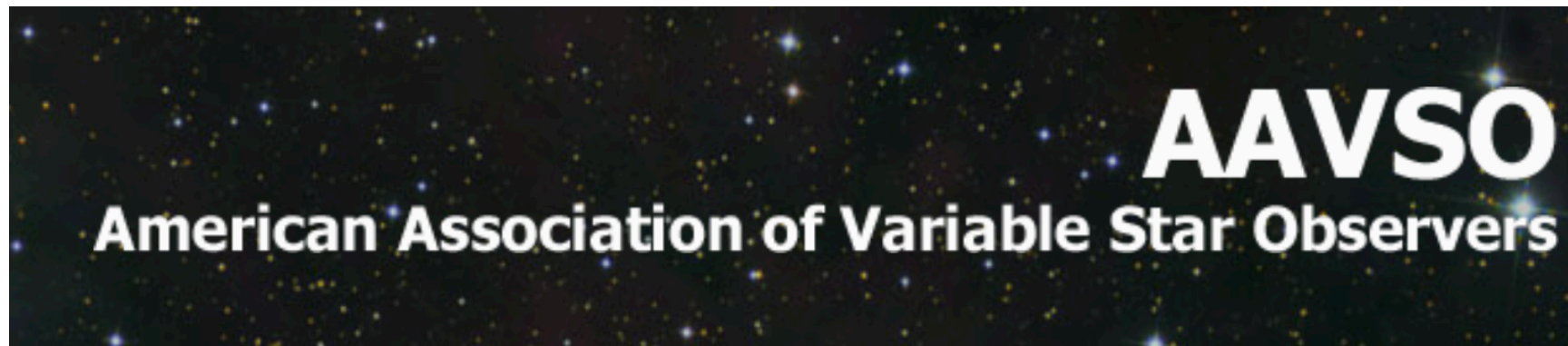
# Betelgeuse Size



- One of the largest stars known
- Physical size pulsates from about asteroid-belt-size to beyond-Jupiter's-orbit.
- Angular diameter first measured by Albert Michelson & Francis Pease in 1920 at Mt. Wilson Observatory using an interferometer.

# Betelgeuse Size

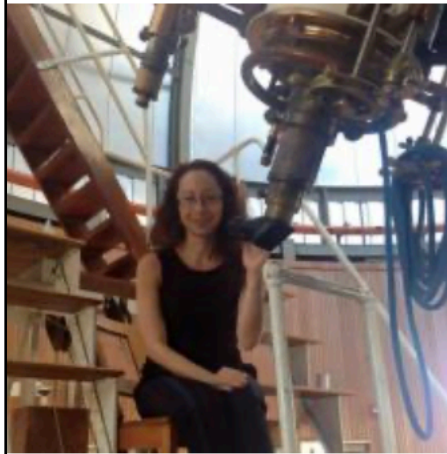




Tue, 12/24/2019 - 06:25

#1

**stellakafka**



## **Betelgeuse**

Friends,

Surely, you have noticed that Betelgeuse is fainting. Although this is not unusual for this irregular star, this seems to be a deeper "dip" than in previous years. Spectra are strongly encouraged, all resolutions and all wavelength ranges, as we try to follow the phenomenon with all means possible...

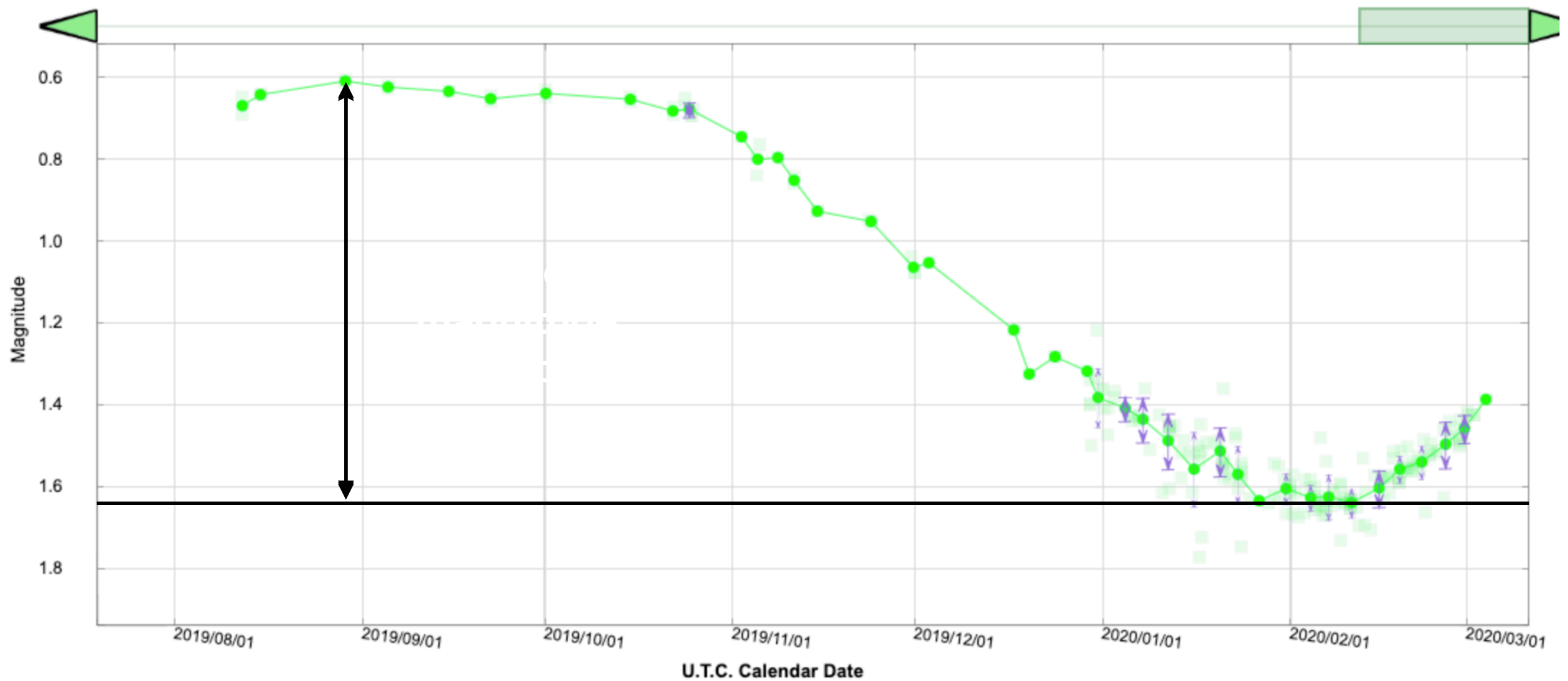
Thank you in advance for your consideration!

Best wishes - clear skies,

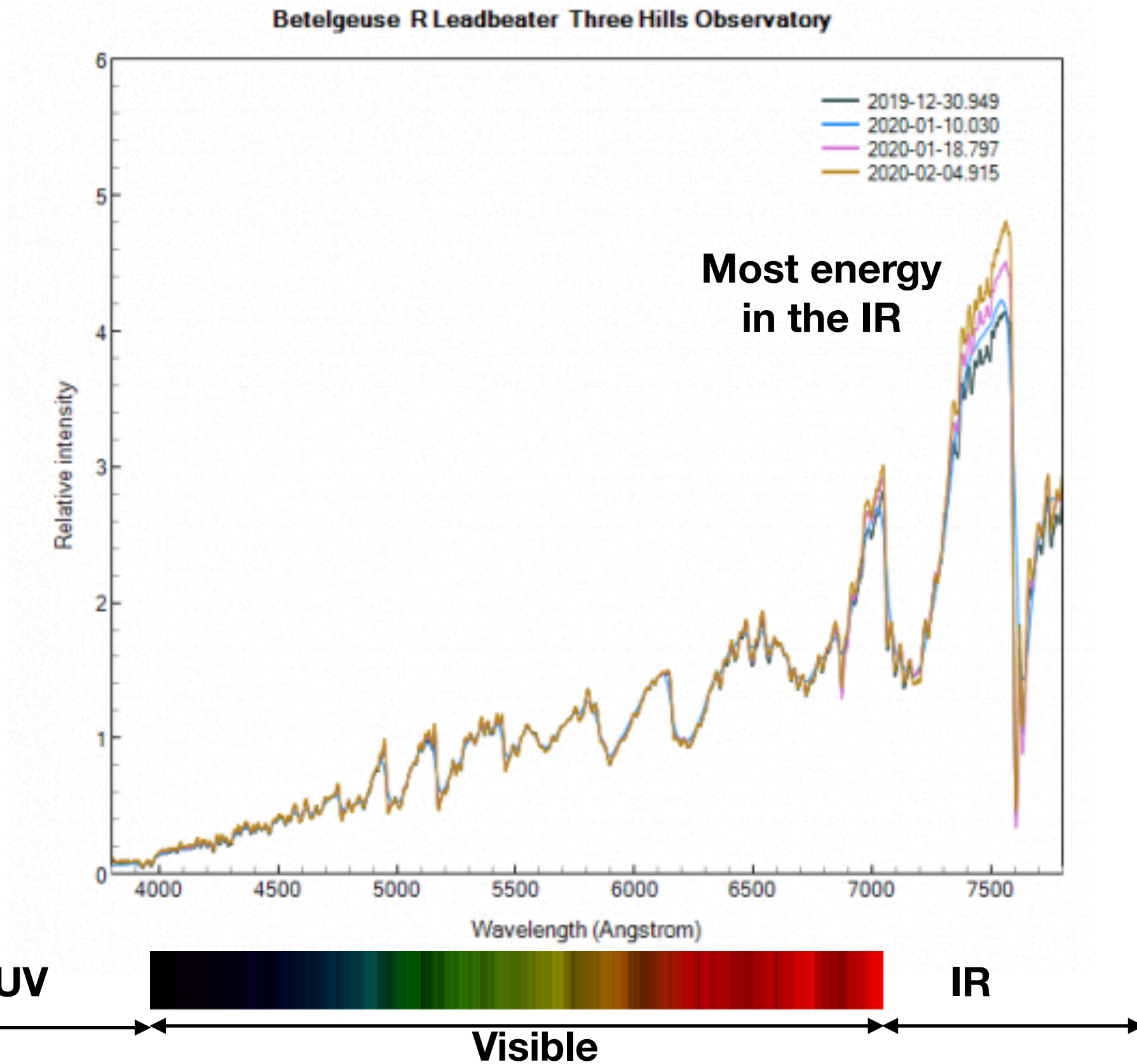
Stella.

# AAVSO

American Association of Variable Star Observers







# Crab Nebula (M1)

- Most famous and conspicuous supernova remnant.
- Noted by Chinese astronomers in 1054 and maybe by the Ancestral Puebloan culture at Chaco Canyon.
- Contains The Crab Pulsar, a neutron star rotating 30.2 times/sec.
- Charles Messier found it in 1758, and it begins his famous catalog.

# Back to Betelguese for a second ...

- What will the supernova remnant from Betelguese look like from Earth 1000 years after the explosion?
- Think of the Crab 10x closer to Earth.
- The Crab is currently  $6 \times 4 \text{ arcmin}^2$  with a total visual mag. of 8.39, and a distance of 6,000 ly. Betelguese is about 600 ly. distant.
- So if the Crab were 10 times nearer, the square-law says it would have a 100-fold increase in area (to  $60 \times 40 \text{ arcmin}^2$ ), and a 100-fold increase in total luminosity. This means ... well I'm not sure.

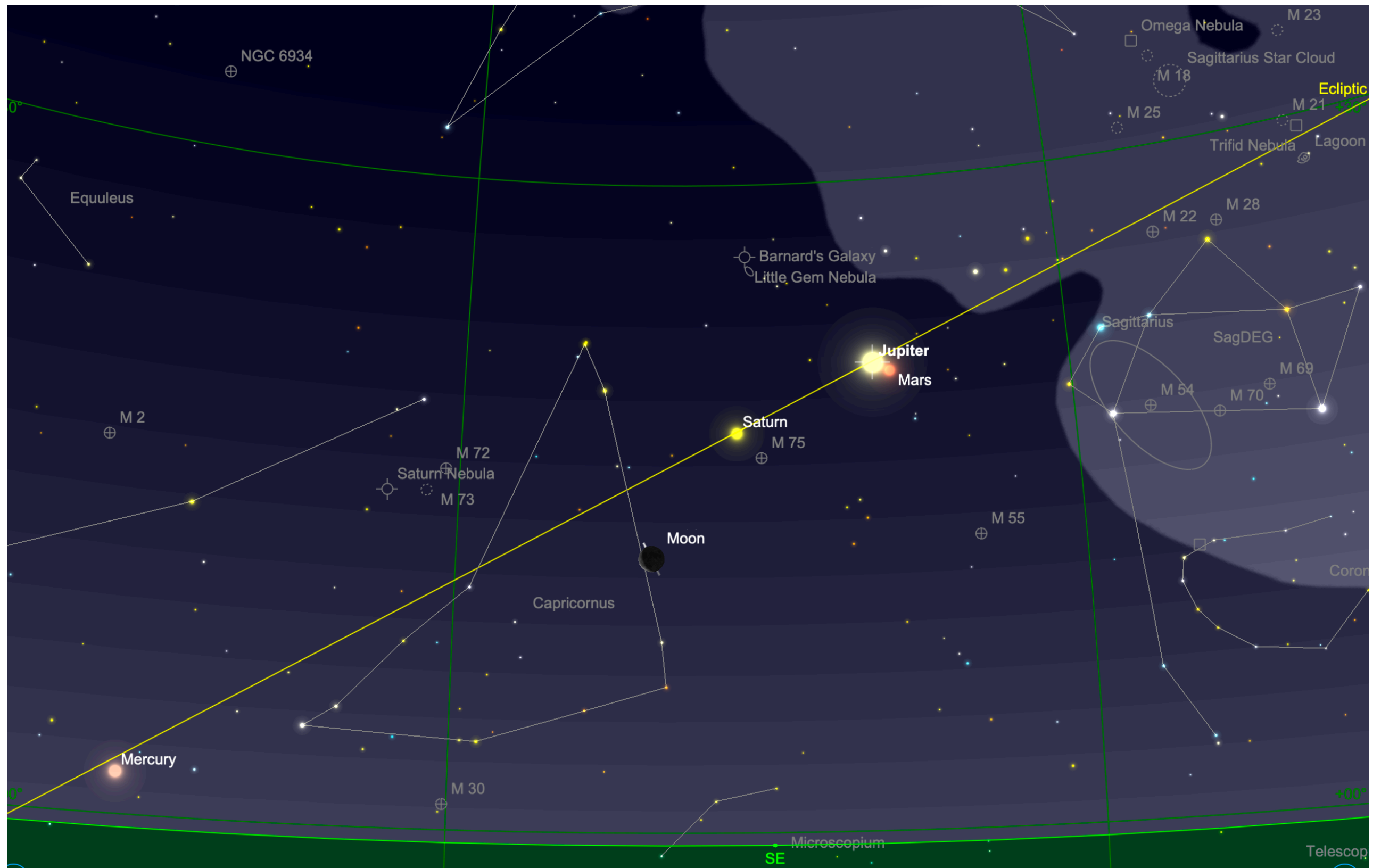




**Before**

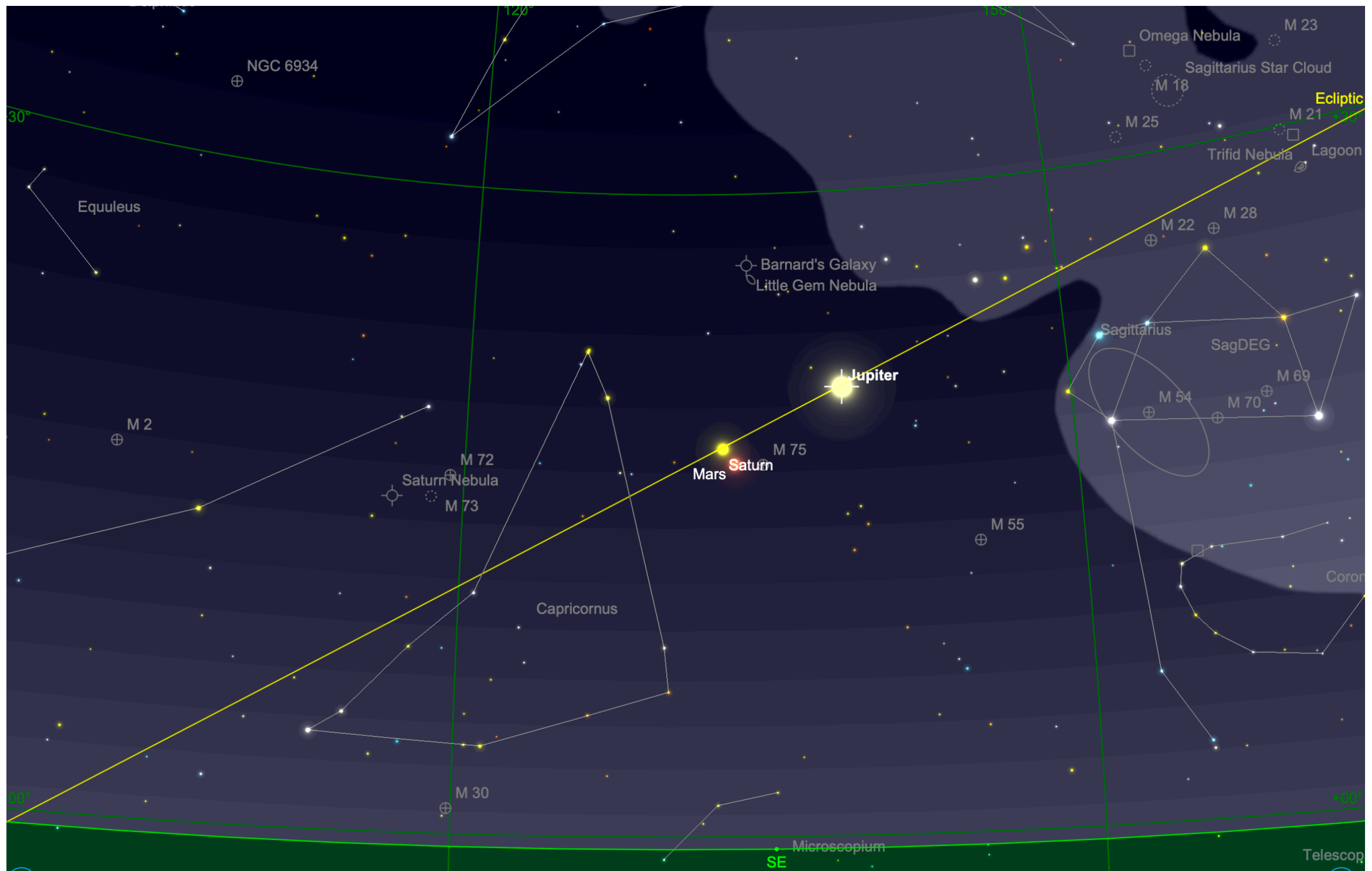


**After**



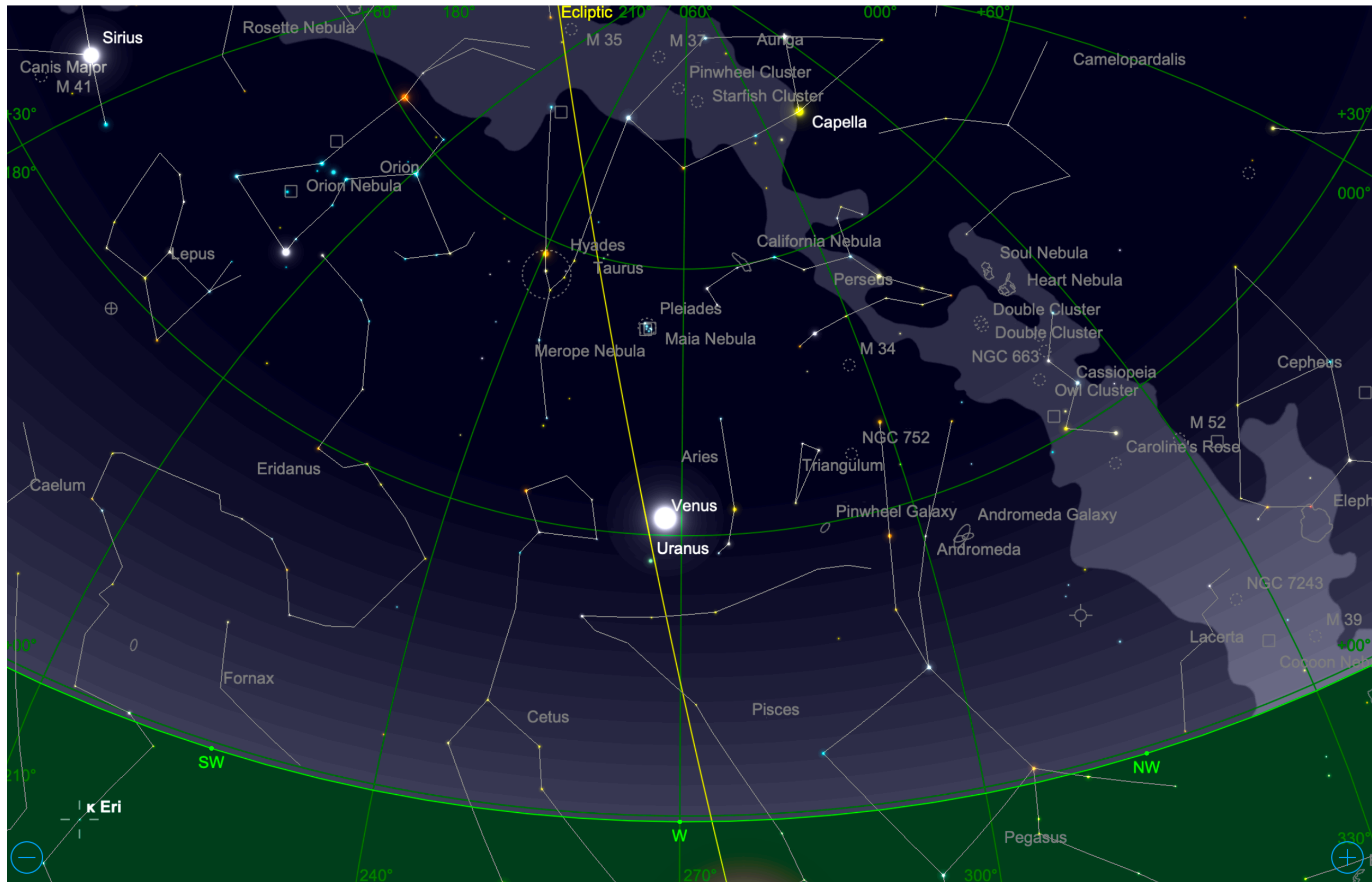
**Looking SE 1 hr. before sunrise on Thurs, 19 Mar 2020**



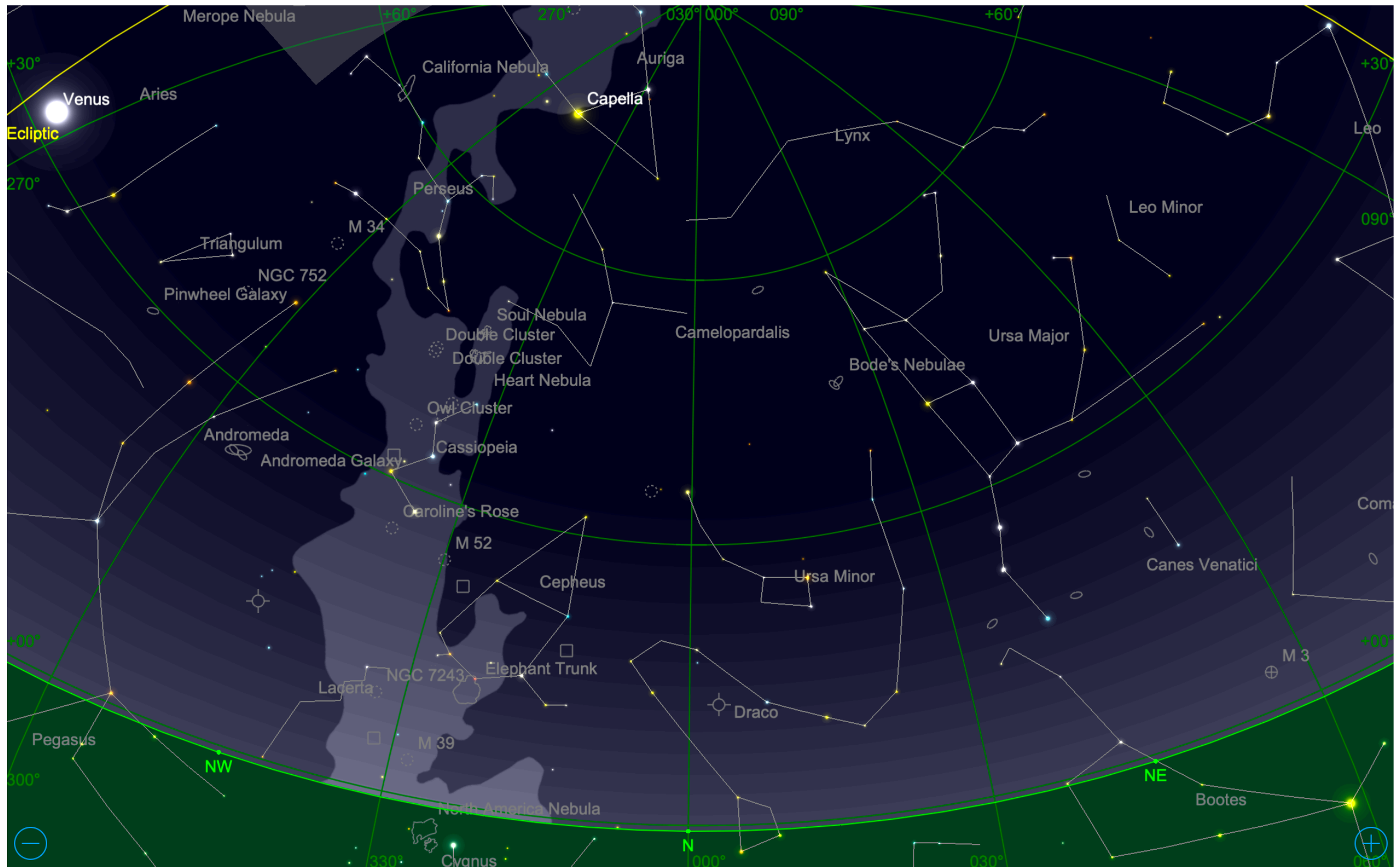


**Looking SE 1 hr. before sunrise on Tue, 31 Mar 2020**

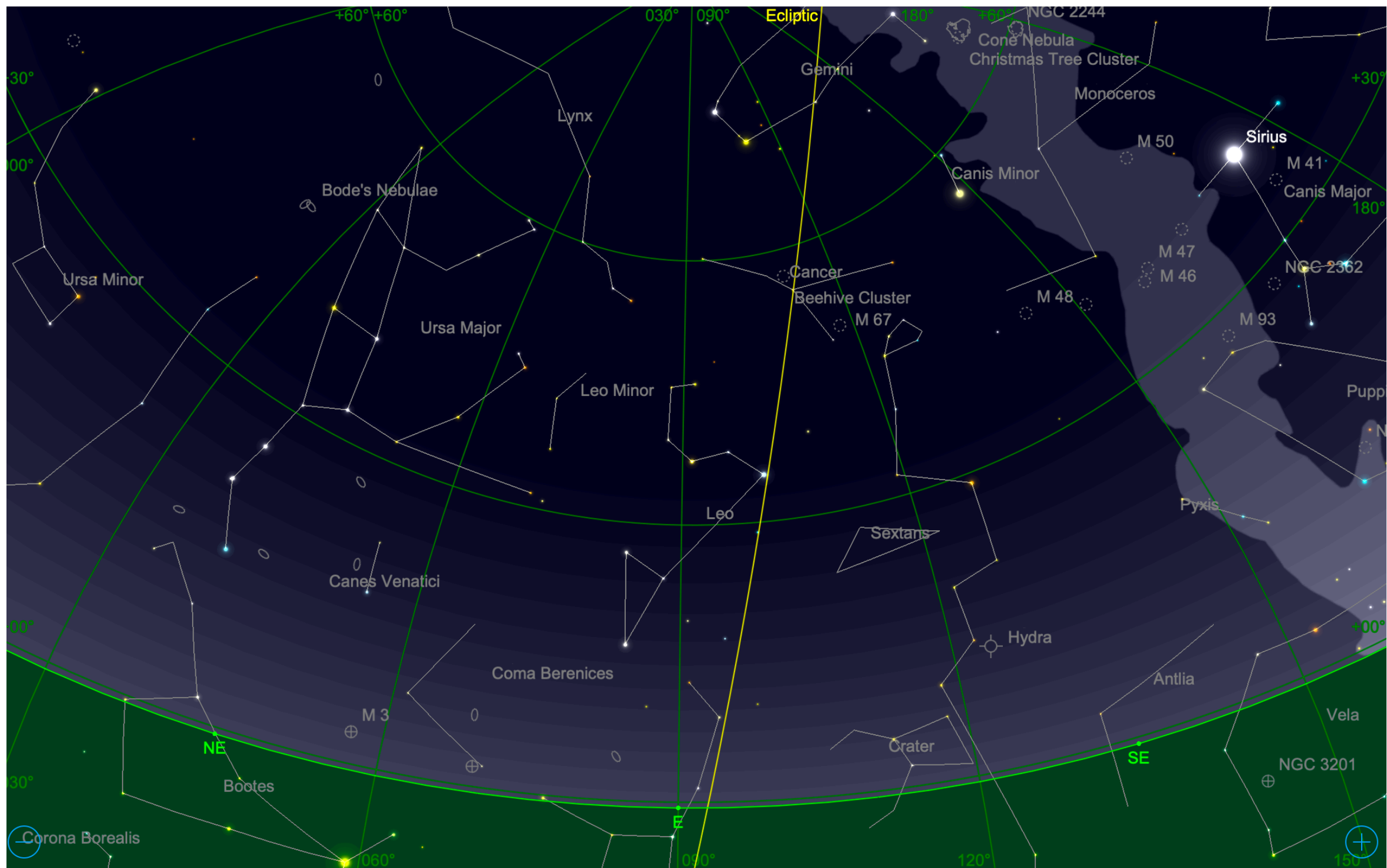
**The End**



**Looking West 1 hr. after sunset**



**Looking North 1 hr. after sunset**



**Looking East 1 hr. after sunset**