

*Mars Returns!*



Capella

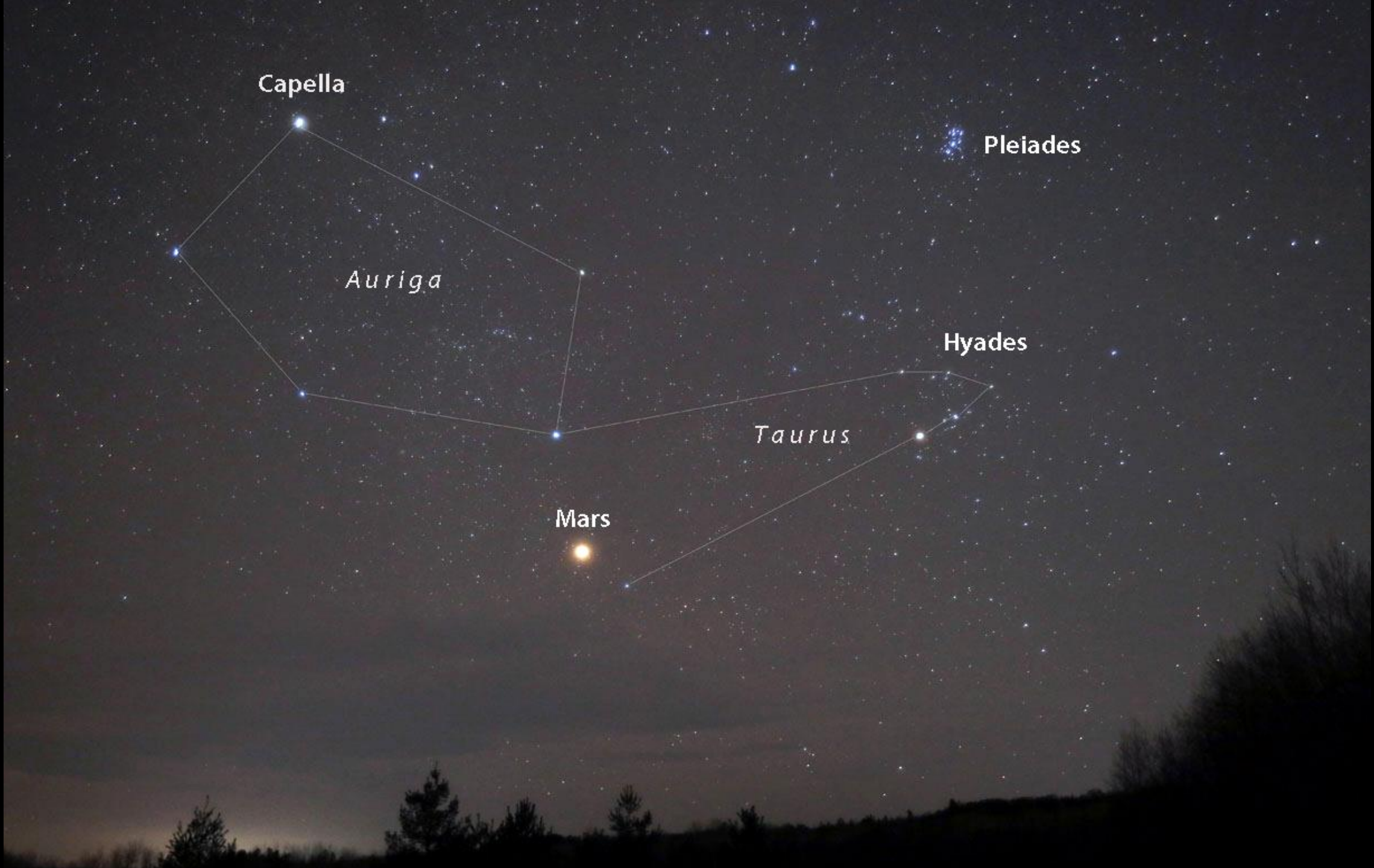
Pleiades

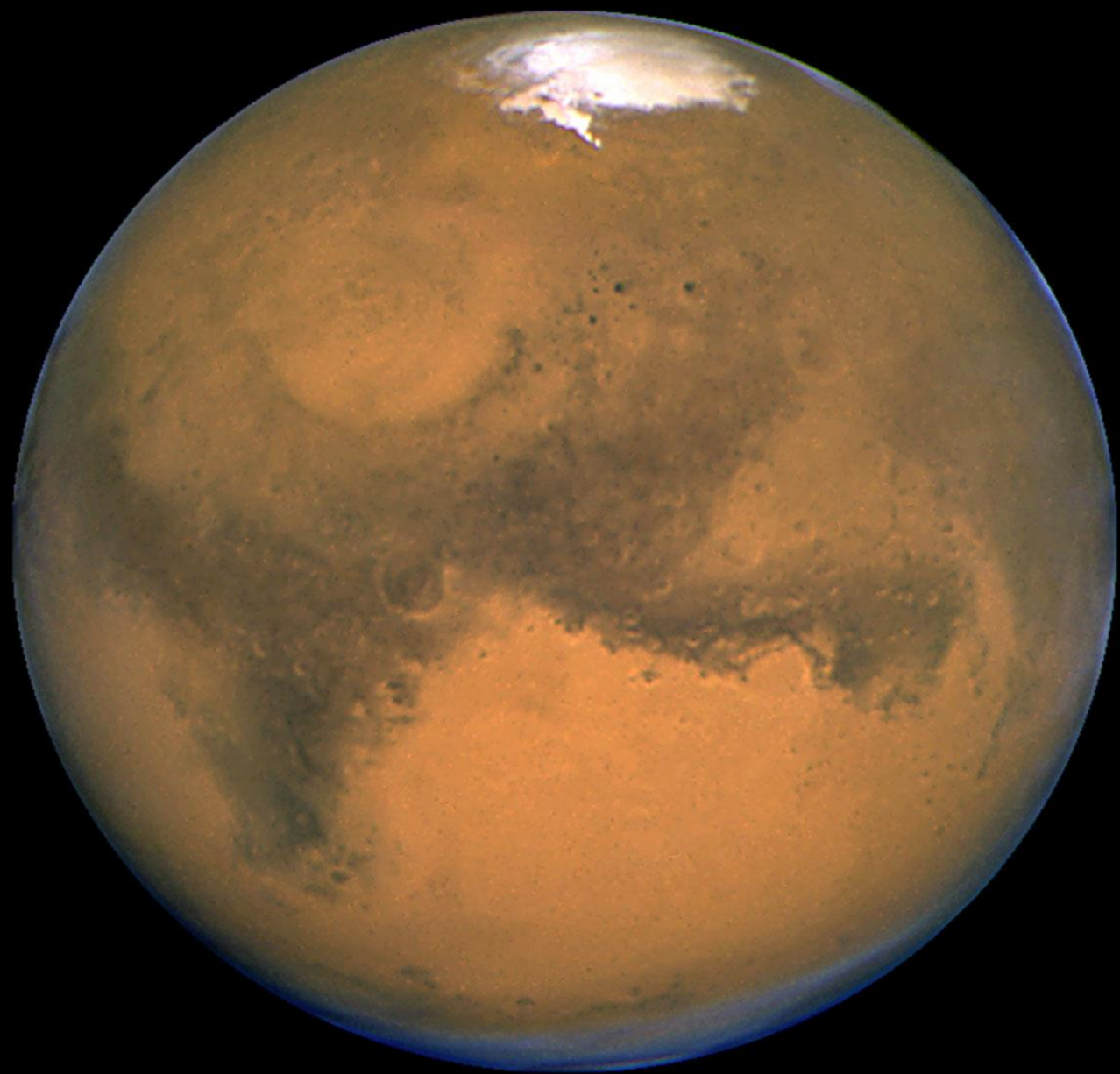
*Auriga*

Hyades

*Taurus*

Mars





## *Mars facts:*

- Average temp. -60° F
- Earth average 57°F
- 96% CO<sub>2</sub> atmosphere  
less than 1% that of Earth

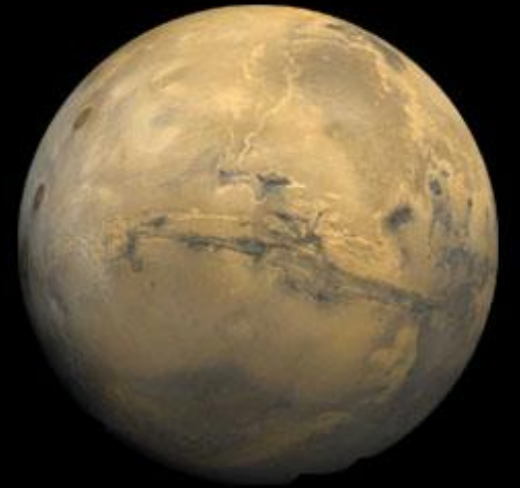
Axis tilted: 25°

Day length: 24 hours 38 mins

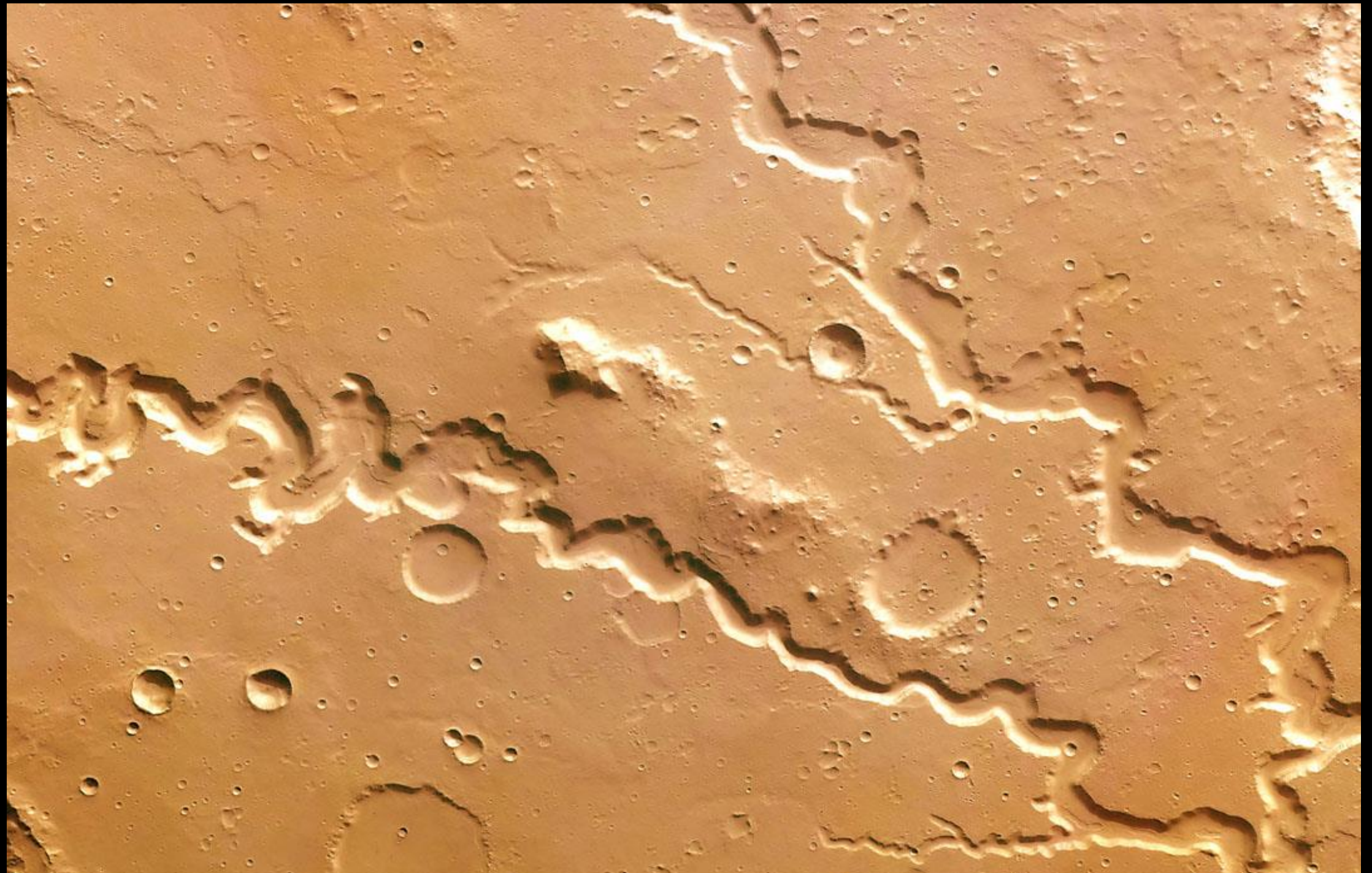
*Only planet with a visible surface*

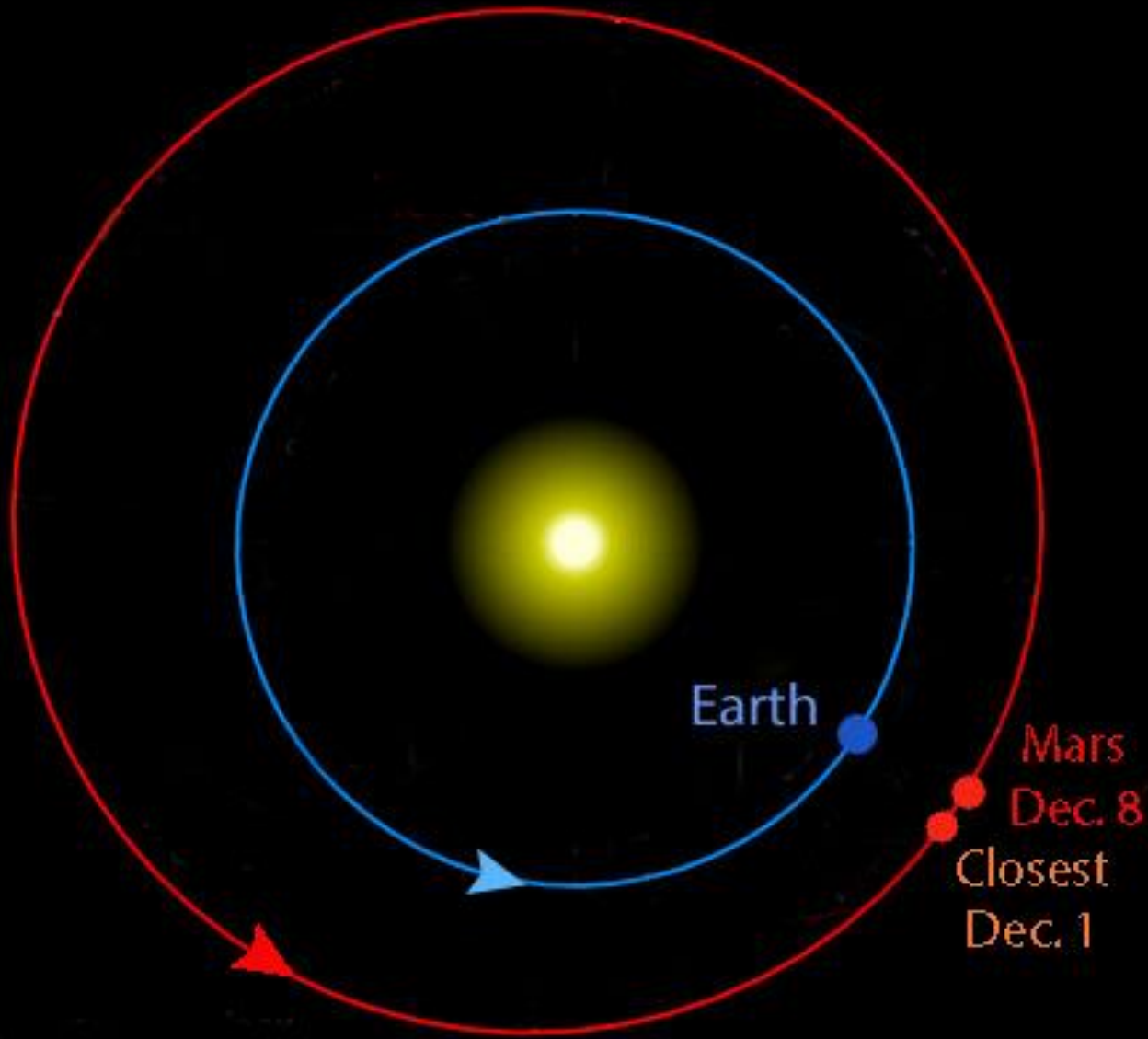


7,917 miles



4,212 miles





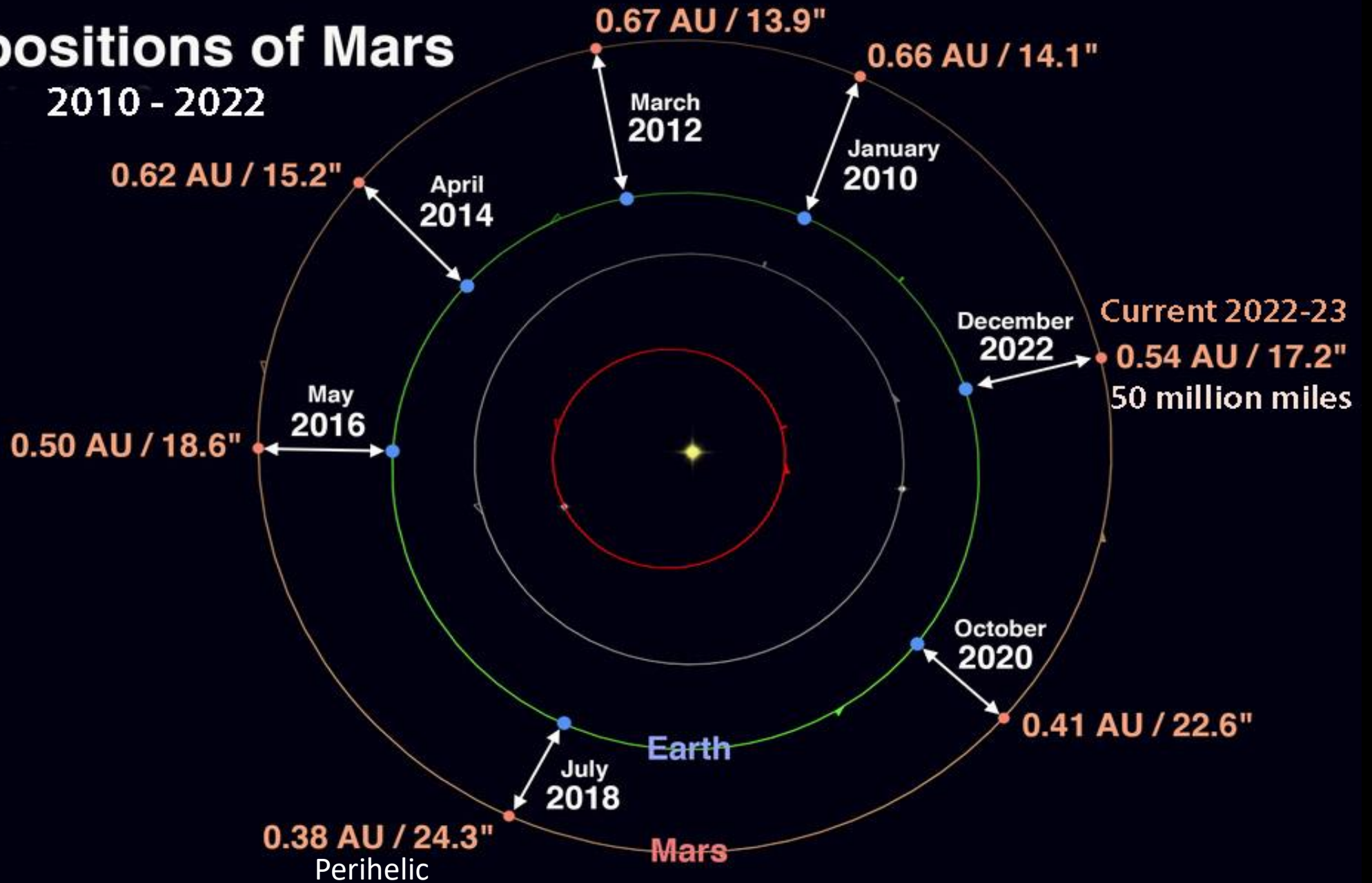
*Every 2.1 years, our faster planet overtakes Mars at **opposition***

*This year's opposition, on Dec. 8, is transitional between perihelic and aphelic*

Mars and Earth orbits

# Oppositions of Mars

2010 - 2022



*Not a close opposition  
but higher altitude improves seeing*

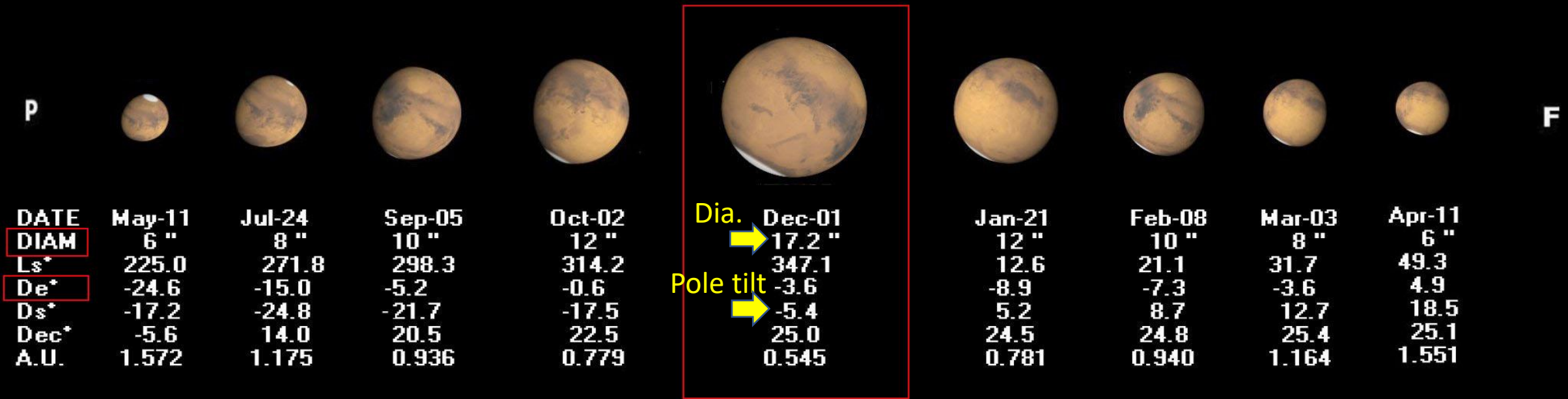
*We'll take it!*





# Closest approach

South is up



Mars won't be this close or bright again until *June 2033*

More about the 2022-23 apparition go to: <https://bit.ly/30i3rQg>

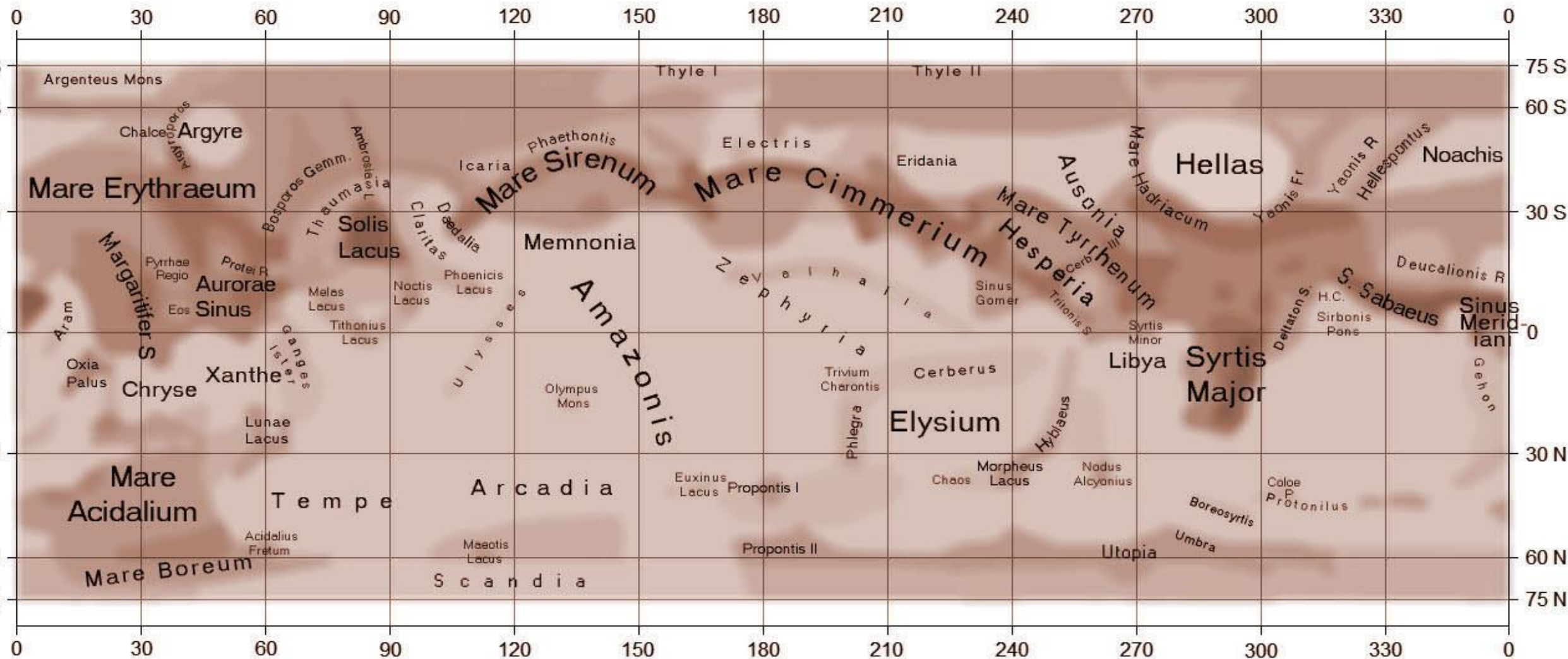
11 p.m. November 18-26

Mars spins from celestial east to west like most other planets but appears to slowly turn in the opposite direction over time because its day (a Sol) is about 38 minutes longer than Earth's

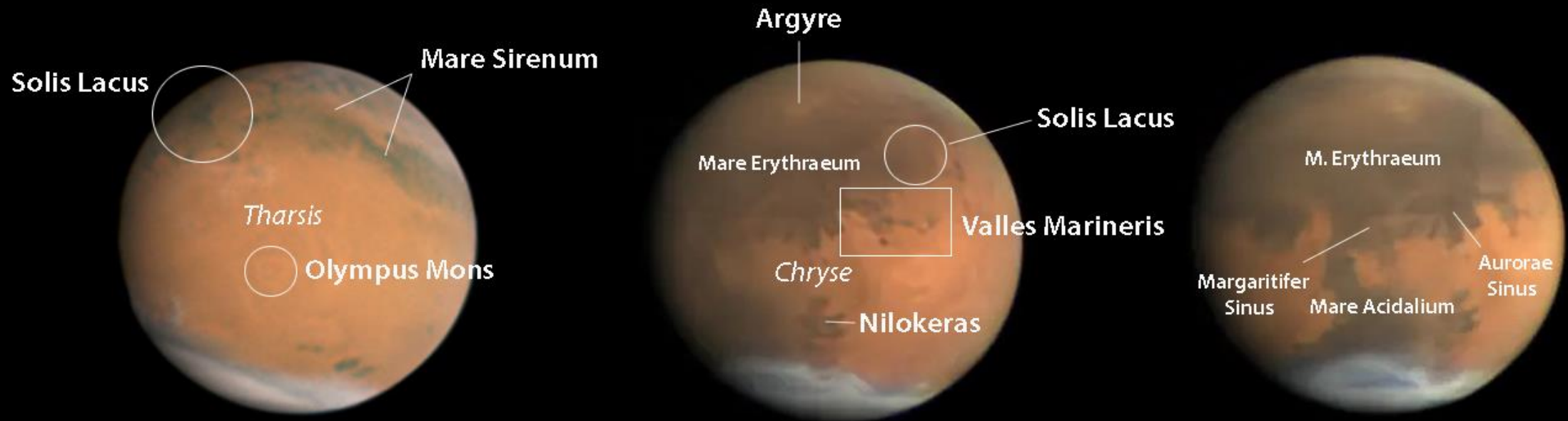
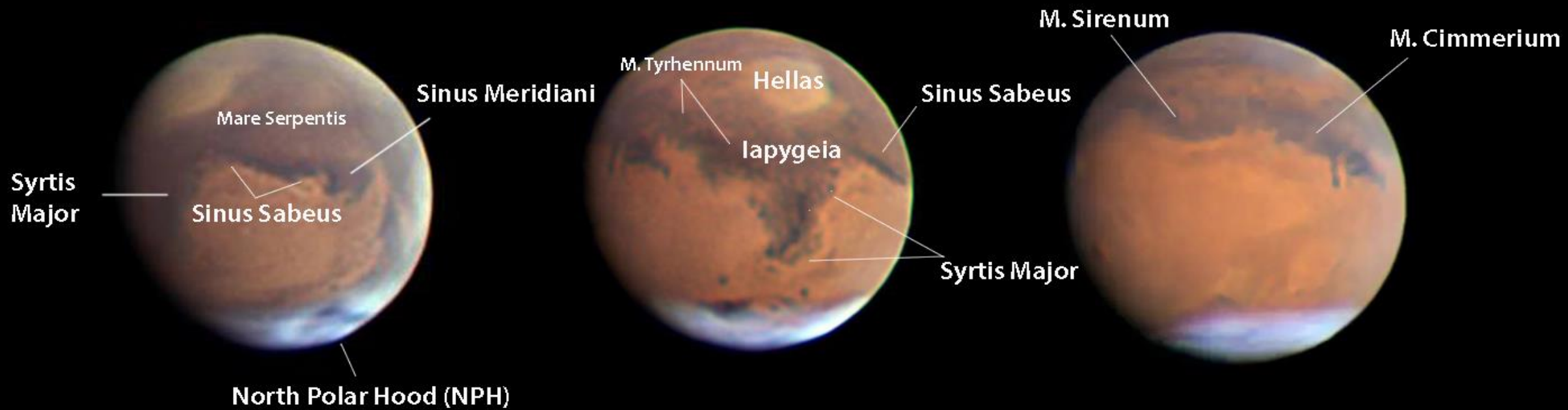
After 41 days, the same hemisphere faces Earth again



Map at: <https://bit.ly/3tGoWkj>



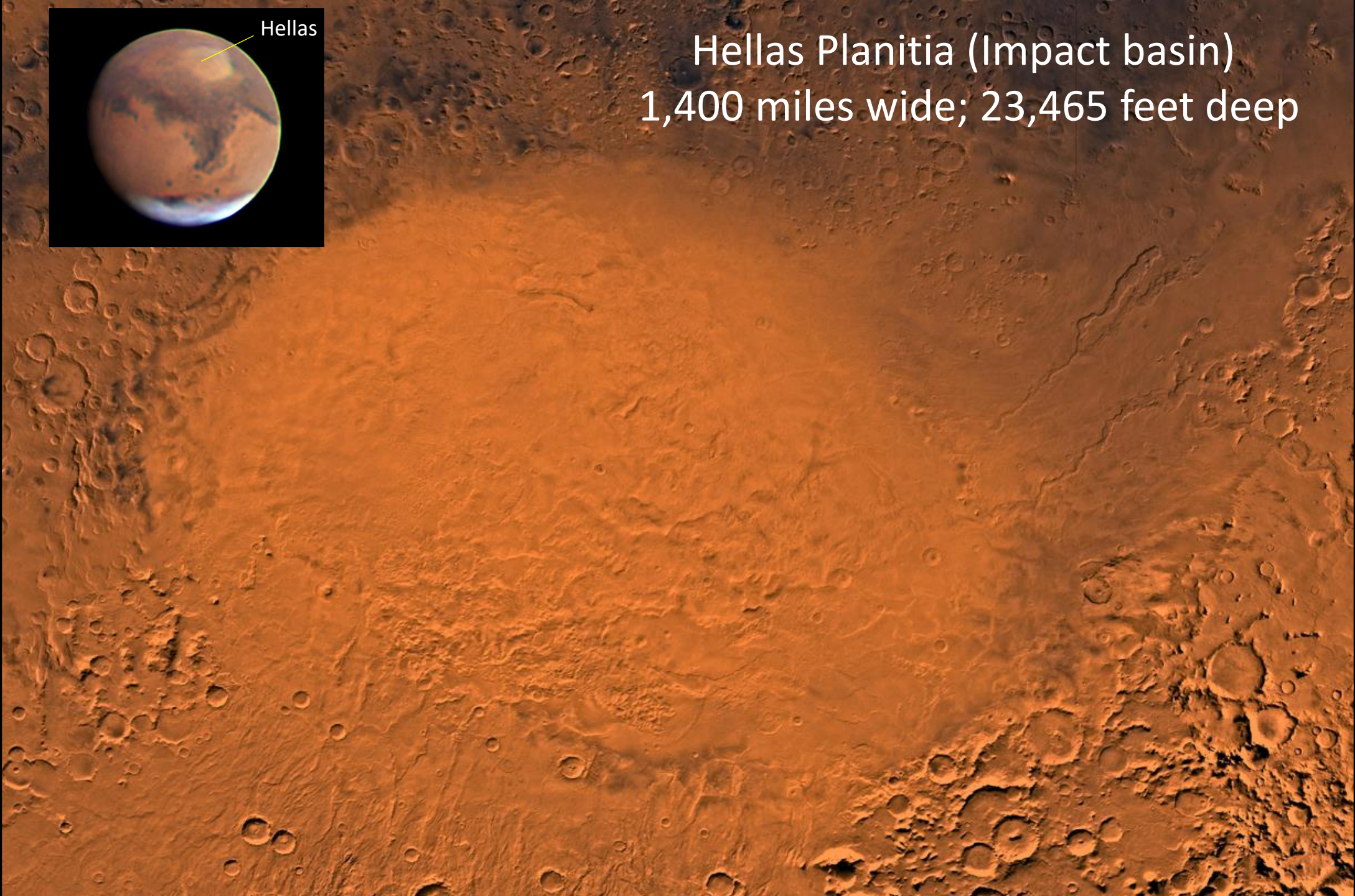
ALPO Mars map (south up)



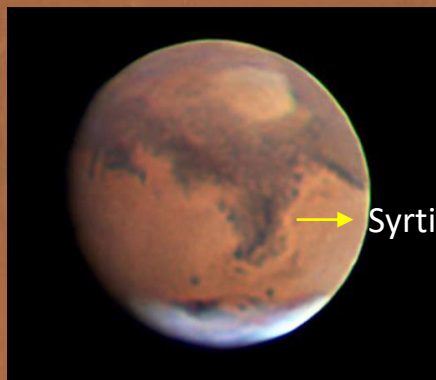
(all images south up)



Hellas Planitia (Impact basin)  
1,400 miles wide; 23,465 feet deep



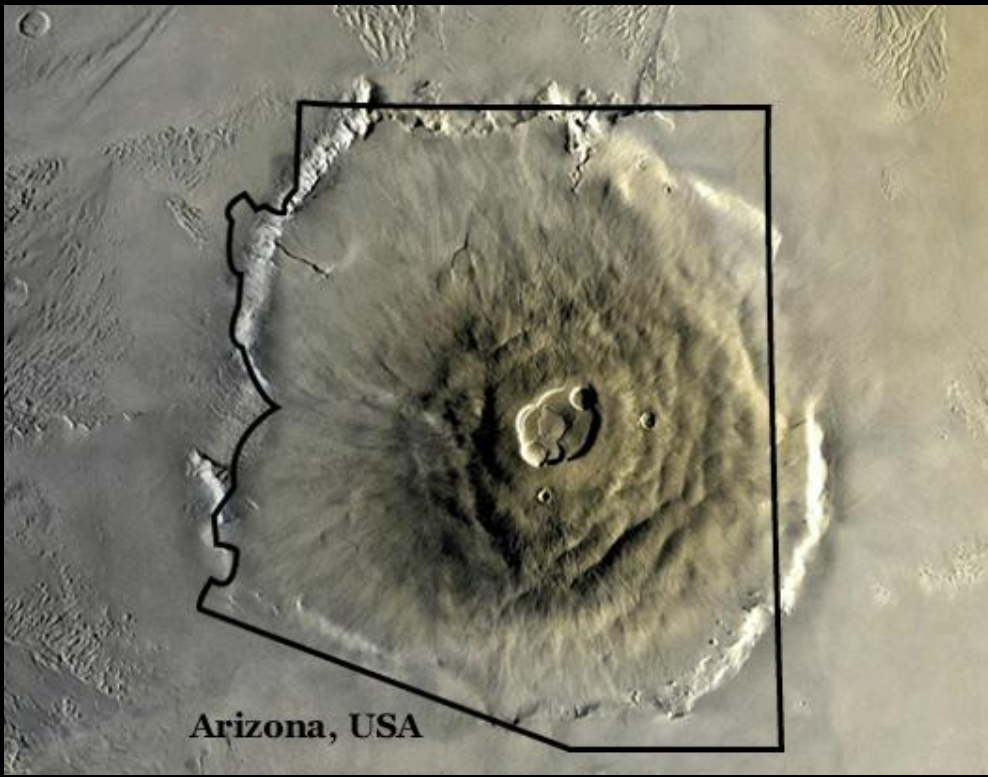
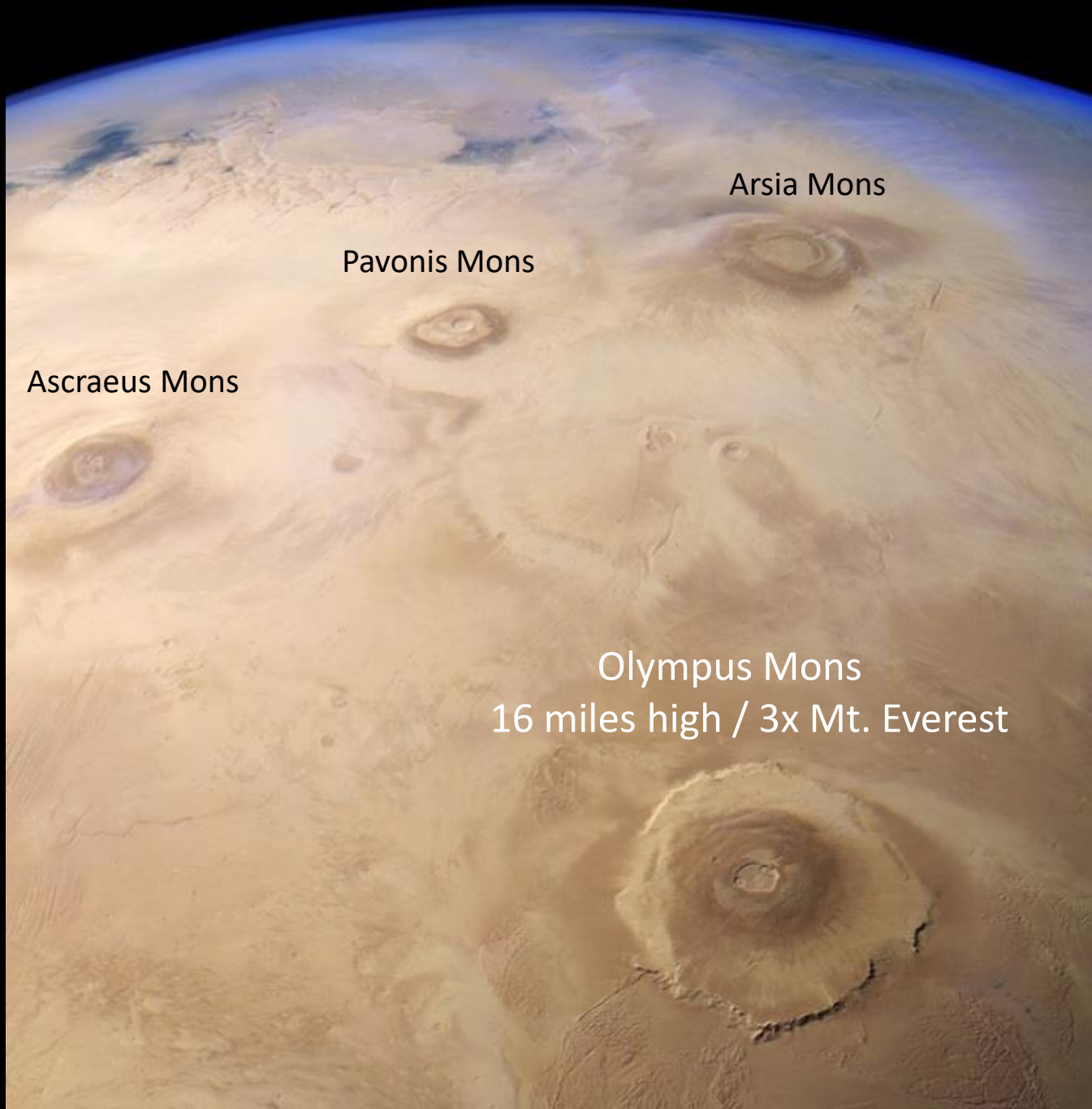
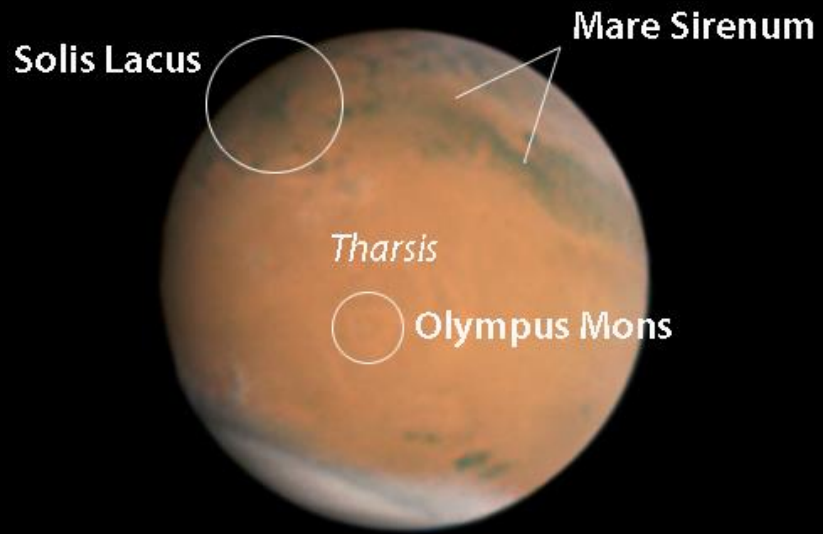
*Syrtis Major – low relief shield volcano, dark basaltic rock*



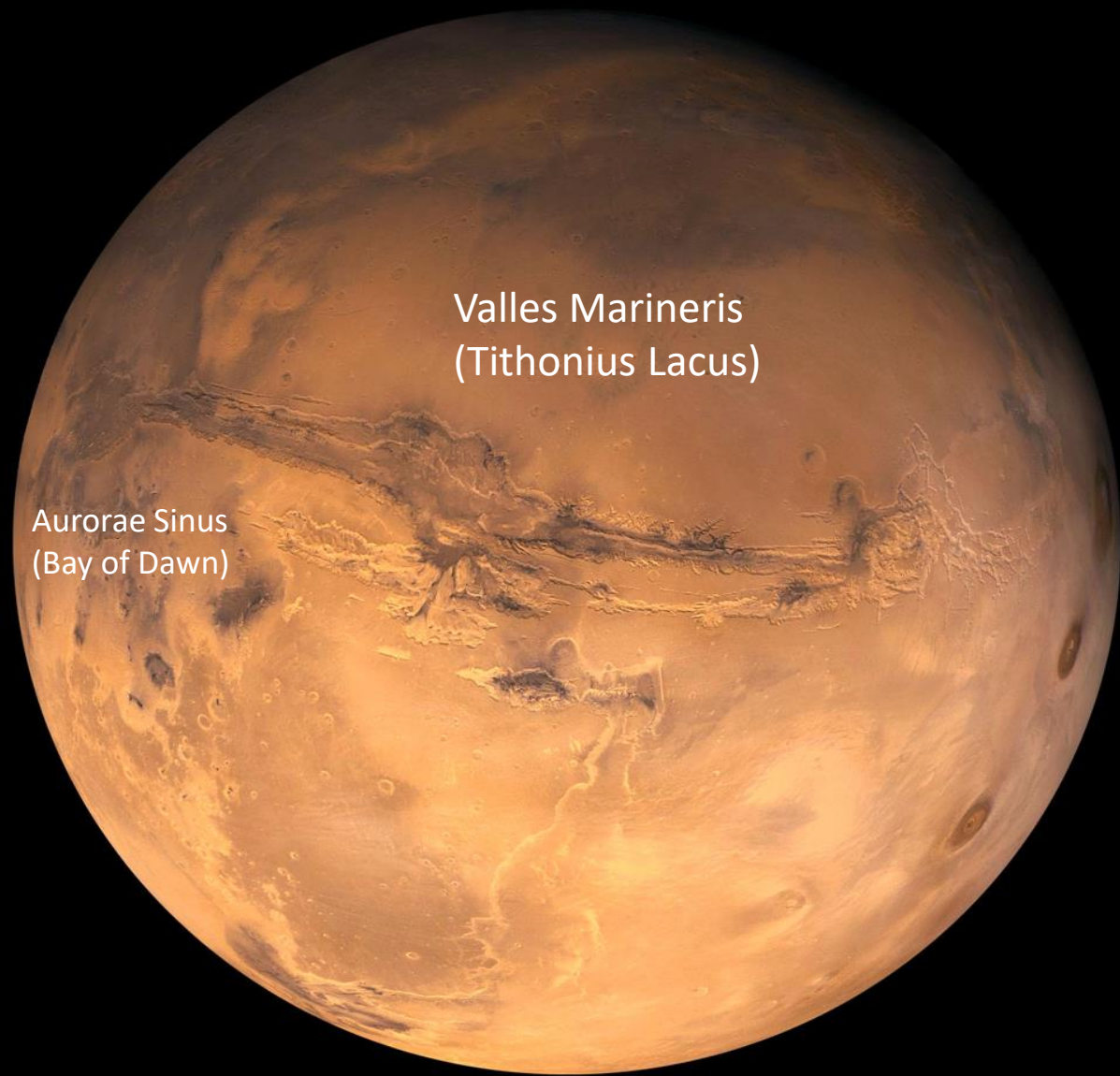
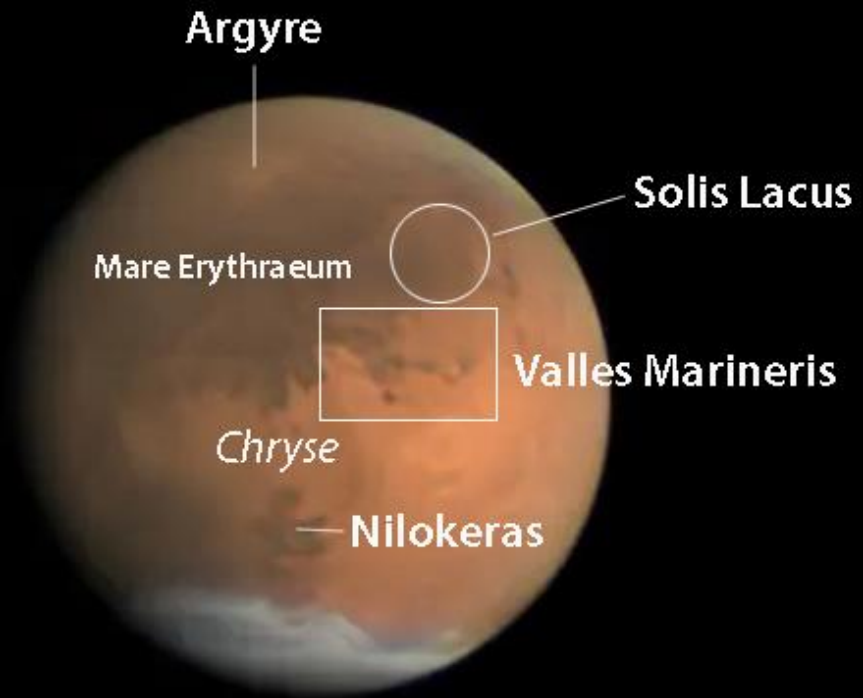
→ Syrtis Major

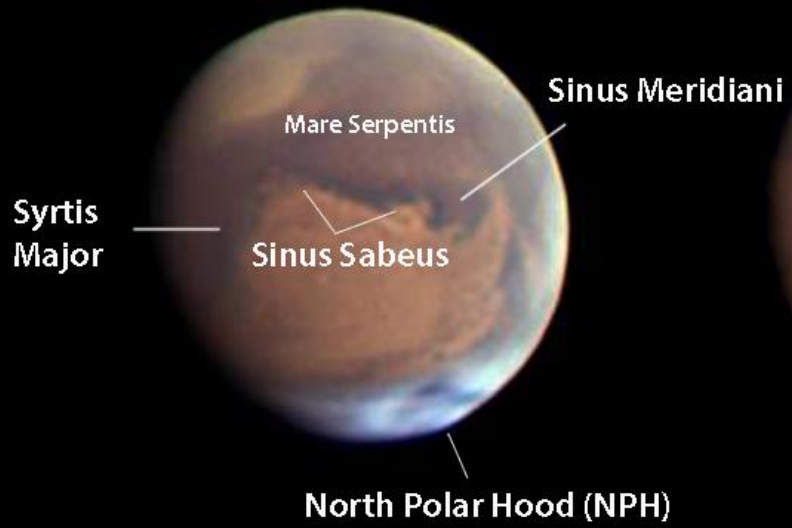
*Mauna Loa  
shield volcano*











*Sky & Telescope's  
Mars Profiler at  
<https://bit.ly/3Tlr71n>*

*Find out what side  
of Mars you're facing*

**SKY & TELESCOPE** Mars Profiler

This map depicts the Martian hemisphere facing Earth for the entered date, time, and telescope type. The red circle indicates the region of Mars pointed directly toward us.

Date:  Time:  UT  
(mm/dd/yyyy)

Time-zone offset from UT in hours (from your Web browser):

Telescope type: **Inverted view**

**Basic Data about Mars for telescopic observers:**

Apparent visual magnitude:	<input type="text" value="-1.8"/>	Angular diameter (arcsec):	<input type="text" value="17.2"/>
Distance from Earth (a.u.):	<input type="text" value="0.54"/>	Elongation from the Sun (°):	<input type="text" value="171"/>
Illumination (%):	<input type="text" value="100"/>	Central-meridian longitude (°):	<input type="text" value="293"/>
Position angle of north pole (°):	<input type="text" value="328"/>	Opposition 2020 countdown (days):	<input type="text" value="past"/>

## Mars calendar

Features squarely in view around 11 p.m. EST

Nov. 18: Mare Erythraeum (south) and Mare Acidalium (north)

Nov. 25: Sinus Sabaeus and Sinus Meridiani

Dec. 2: Syrtis Major, Hellas, Mare Tyrrhenum

Dec. 9: Mare Cimmerium

Dec. 16: Mare Sirenum

Dec. 23: Solis Lacus, Tharsis

Dec. 30: Aurorae Sinus, Mare Erythraeum

Jan. 6: Sinus Sabaeus, Syrtis Major

Jan. 13: Mare Tyrrhenum, Mare Cimmerium

### Seasonal markers:

Dec. 26: Start of northern spring / southern autumn

Jan. 12: North Polar Cap should start to become visible

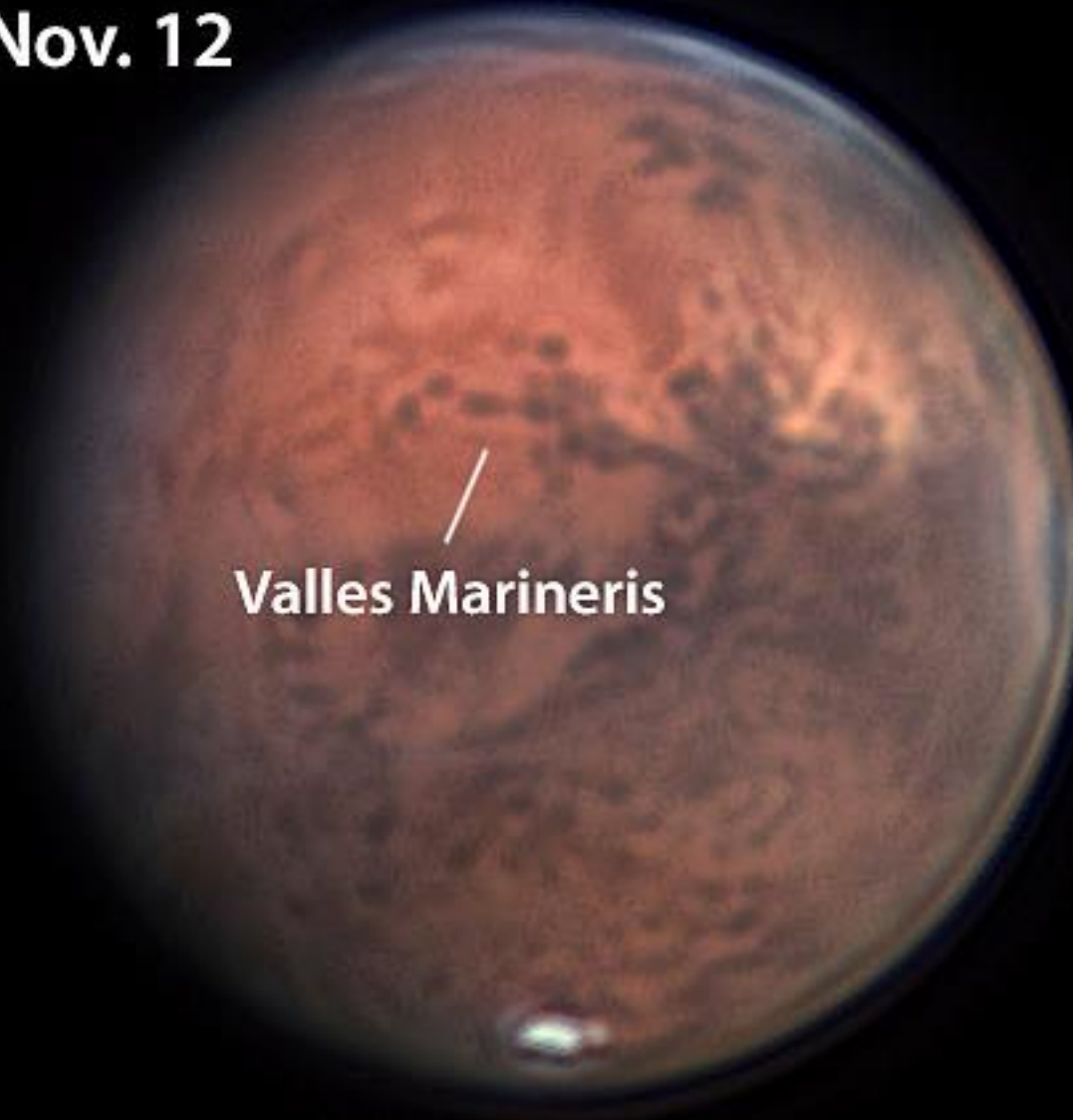
Hellas bright from frost?

Late January: North Polar Cap should be obvious




**Nov. 12**

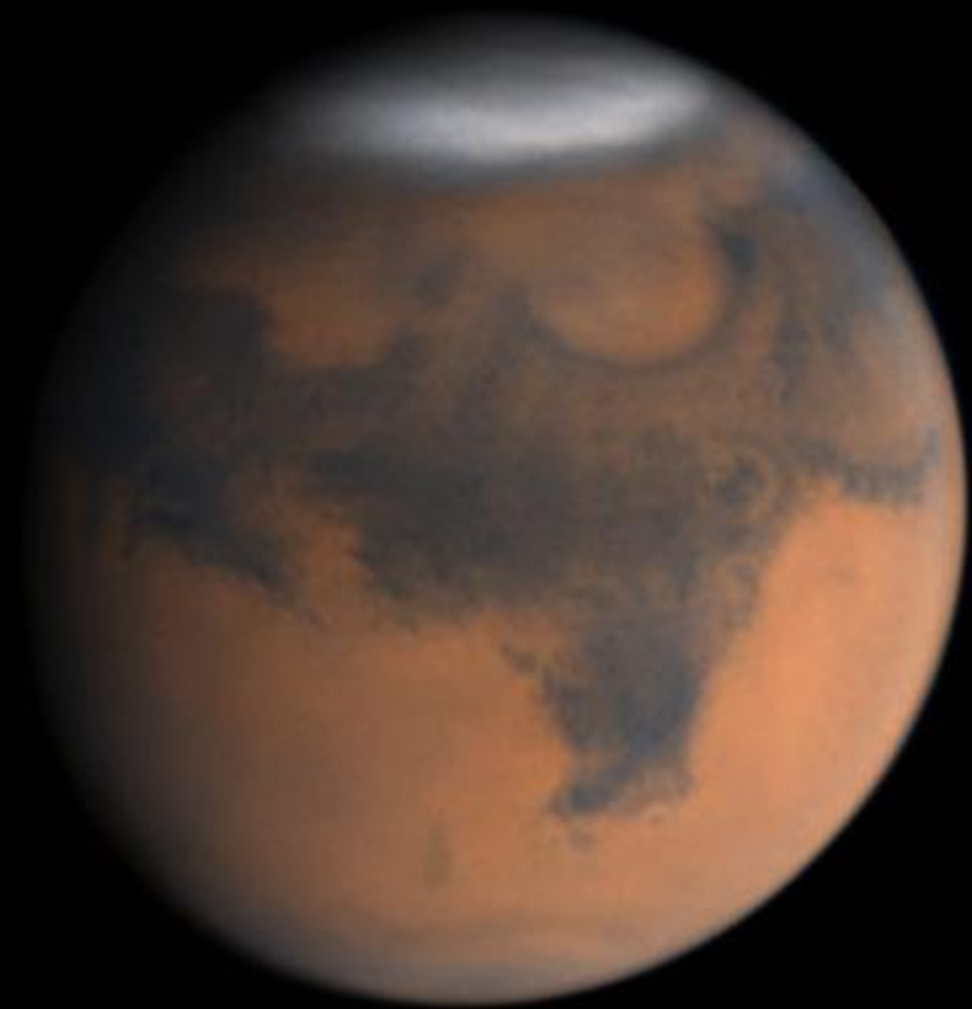
Valles Marineris

A circular image of Mars showing the reddish-orange surface. A white line points to a dark, linear feature in the northern hemisphere, identified as Valles Marineris. The southern hemisphere is darker and more textured. A small, bright white spot is visible at the bottom center of the image.

**Nov. 14**

Valles M. with dust

A circular image of Mars, similar to the one on Nov 12, but with a noticeable layer of dust covering the surface. A white line points to the same dark, linear feature as in the previous image, which is now partially obscured by the dust. The overall appearance is more hazy and less detailed. A small, bright white spot is visible at the bottom center of the image.



June 8, 2018



July 7, 2018



2005 storms

— Dust  
storm!

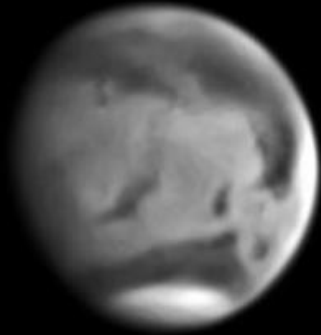
MARS - 11:15pm / 10" @ 318x

Dia = 19.7", CM = 29°, mag 2.0



## Red

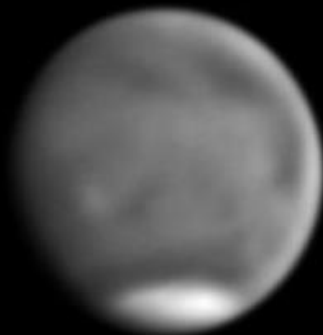
Red 625nm  
BWHM=125nm



07:03:59 UT

## Green

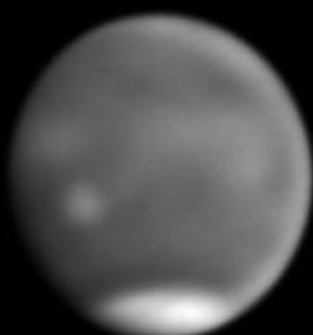
Green 520nm  
BWHM =75nm



07:01:37 UT

## Blue

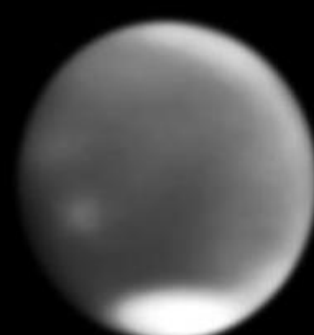
Blue 480nm  
BWHM=135nm



06:59:09 UT

## UV

UV Shuler-Johnson-Cousins  
Peak=365nm BWHM=60nm



07:15:46 UT

## Near-IR

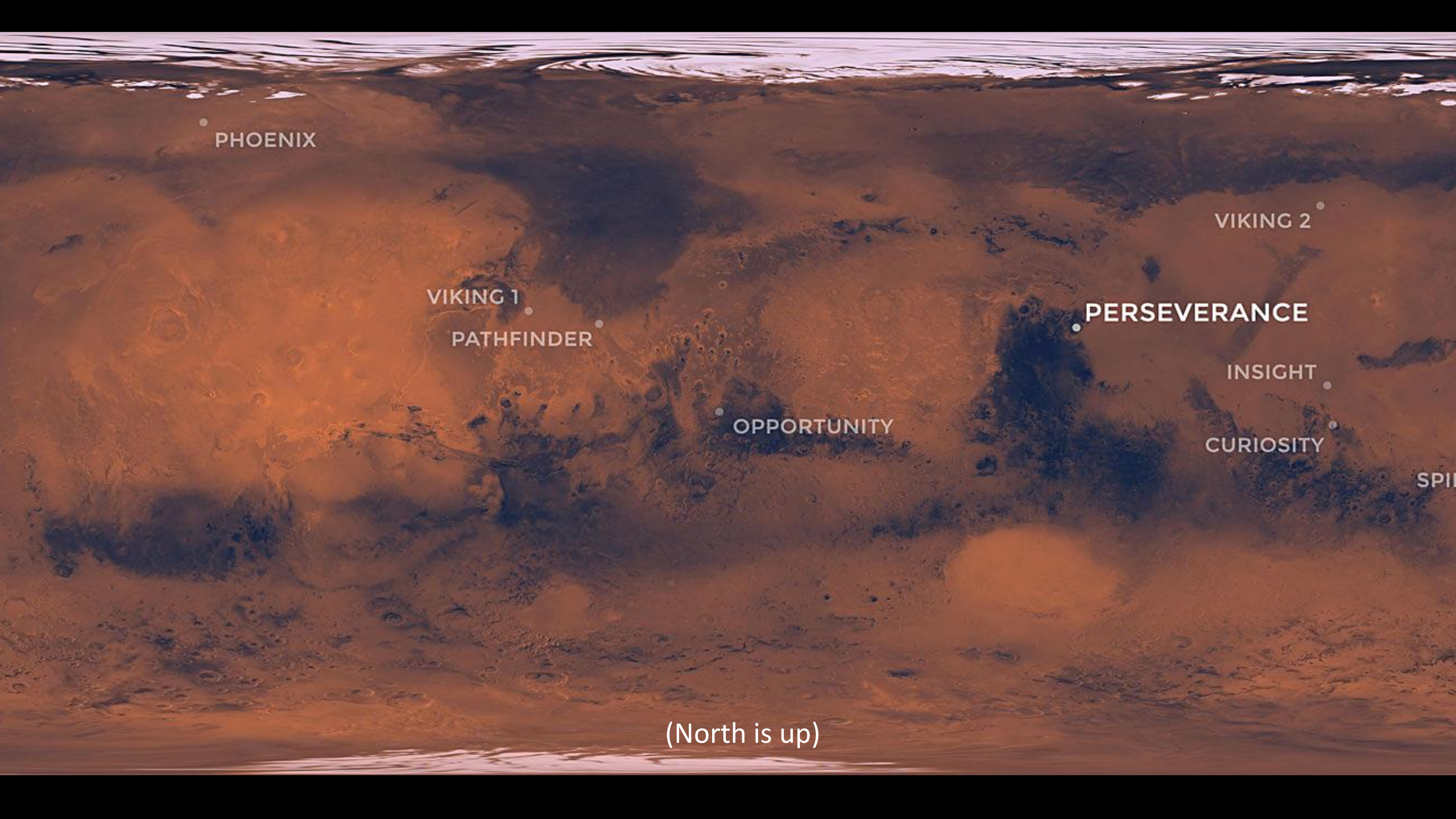
Longpass NIR 715nm  
Peak=790nm



07:21:30 UT

*My favorite Mars filters*





PHOENIX

VIKING 1

PATHFINDER

OPPORTUNITY

PERSEVERANCE

VIKING 2

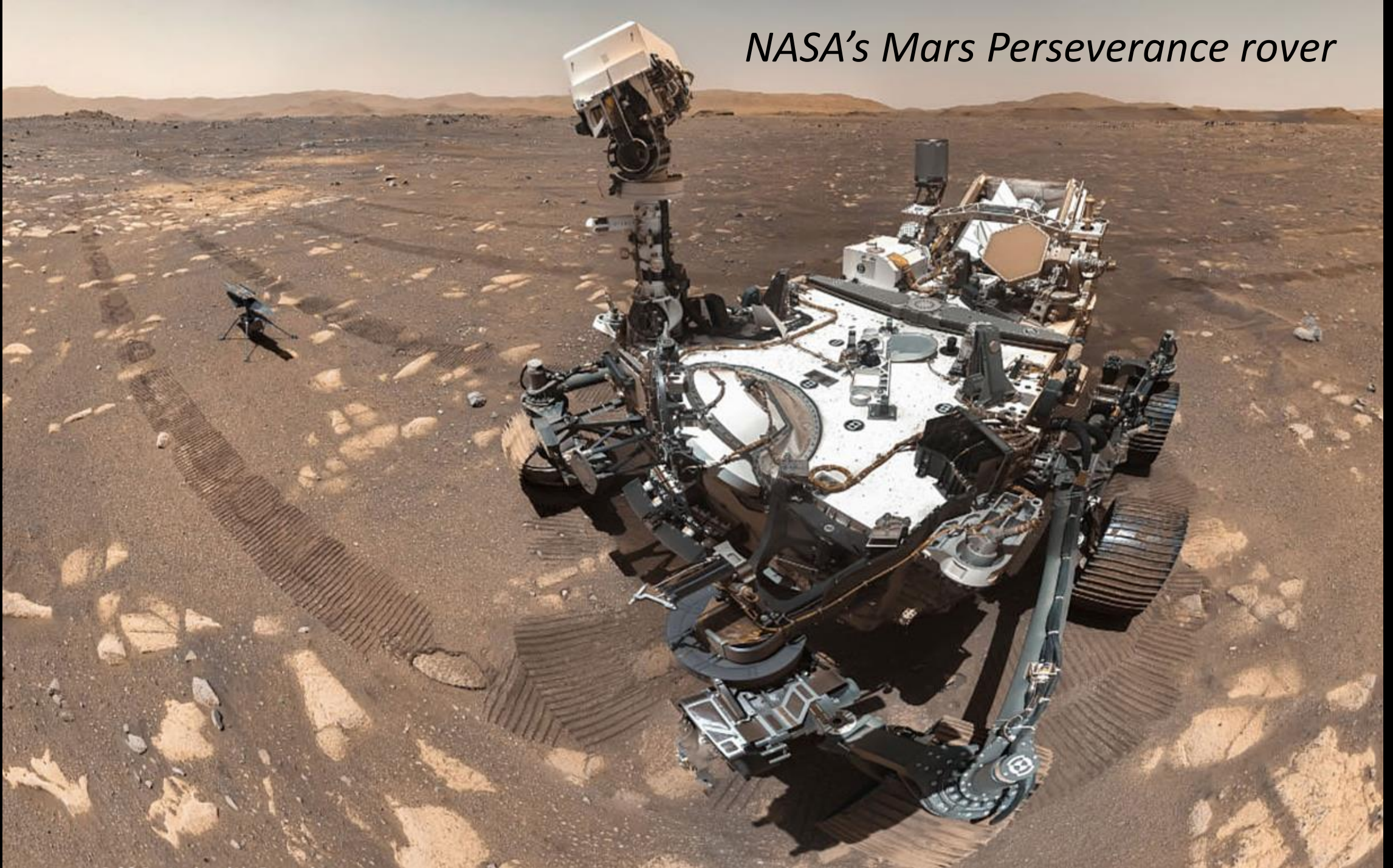
INSIGHT

CURIOSITY

SPIRIT

(North is up)

*NASA's Mars Perseverance rover*



Google *Perseverance raw images*  
for thousands more



*Ancient river bed*

*River delta*

*Jezero Crater  
28 miles wide*

● Present location  
Perseverance rover





*Perseverance drills into mudstone at Wildcat Ridge  
Rich in sulfates, organics and clays*





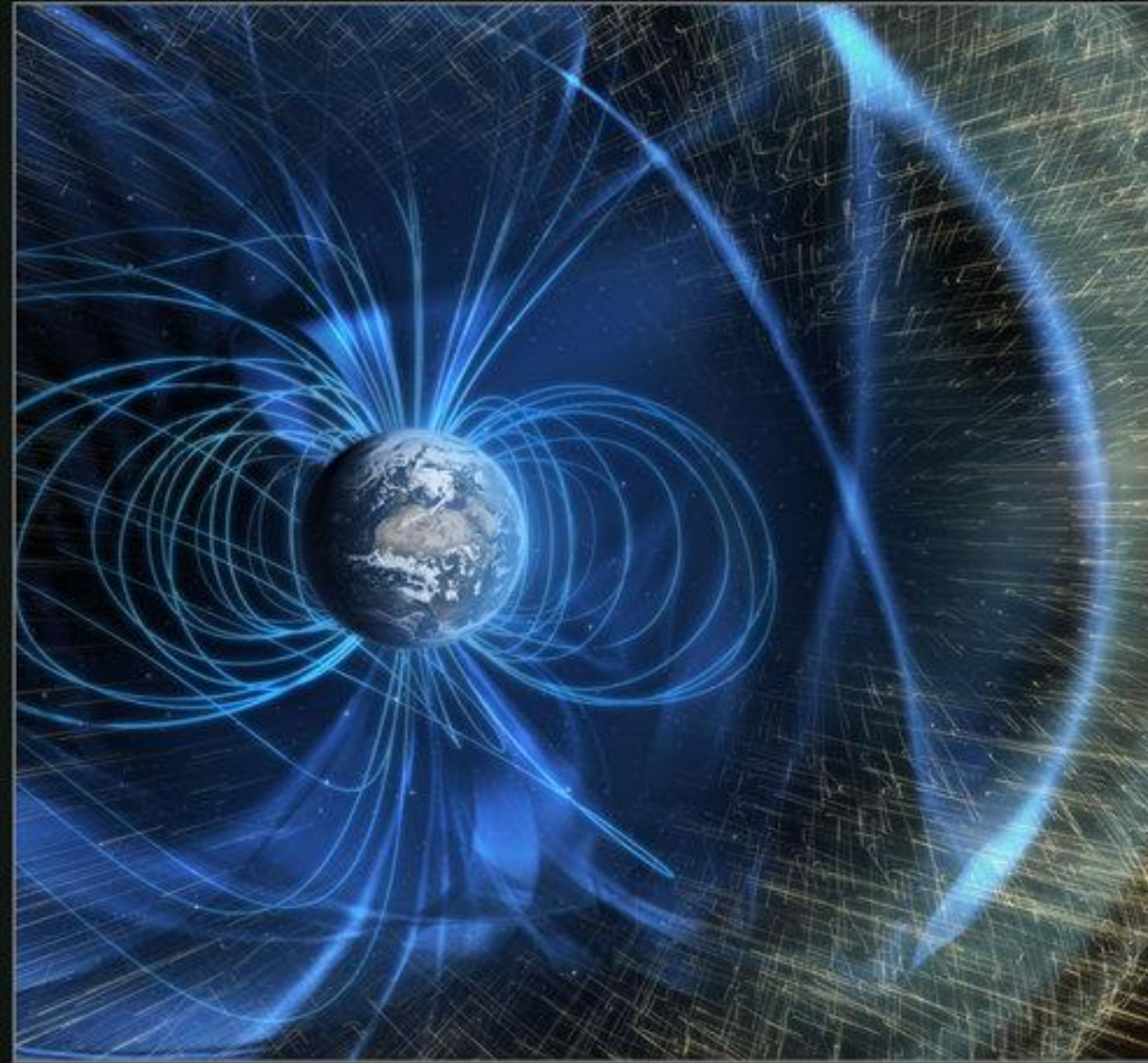
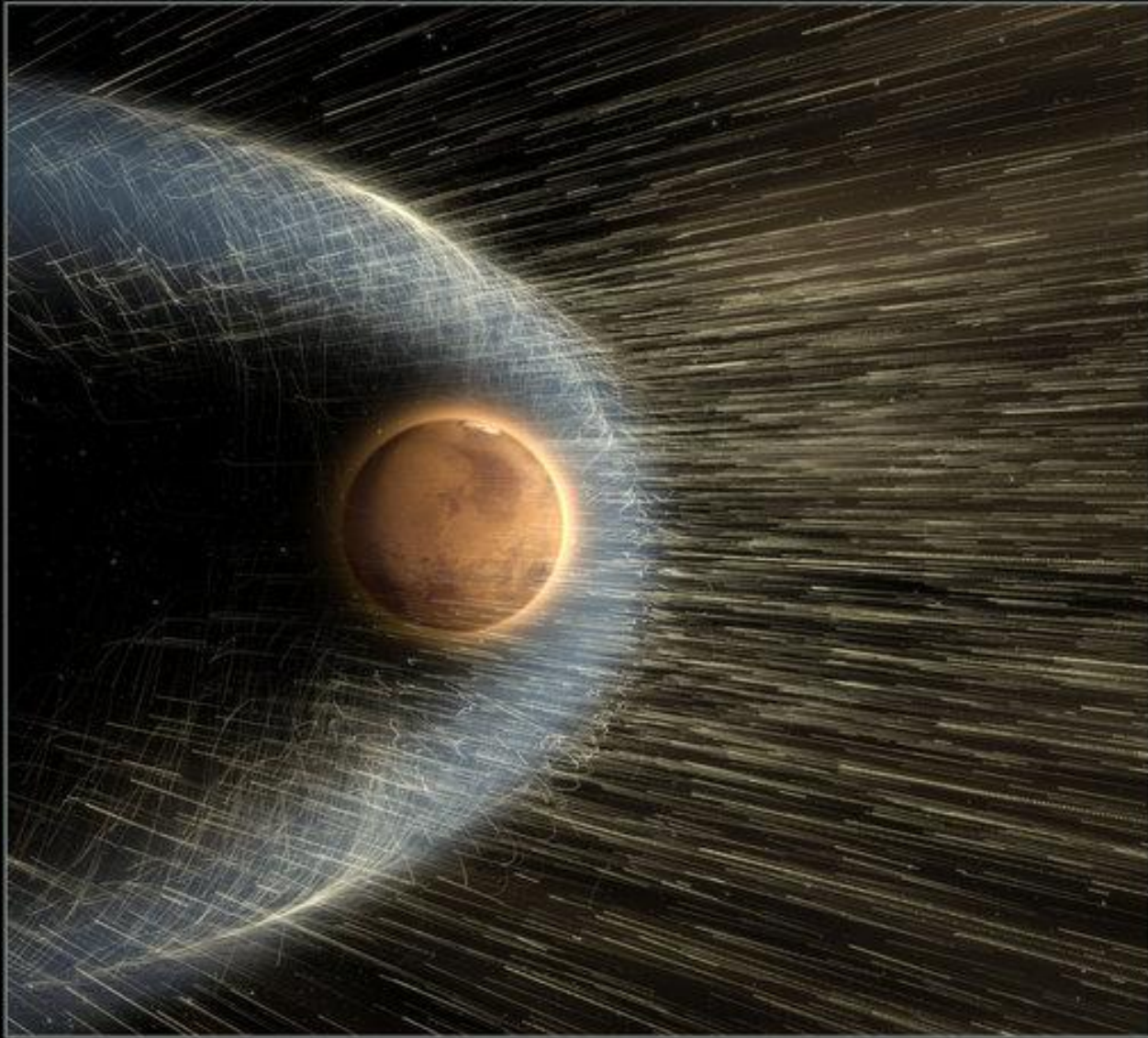
*Jezero Crater 3.5 billion years ago*



Mars today

Mars 3-4 billion years ago





*Mars has no protective magnetic field like the Earth*

Full Moon and Mars



*Hyades*

Aldebaran

Dec. 7, 2022  
View at 10:30 p.m. EST from Augusta



Mars

Augusta -- 4 arc-minutes south at 10:30 p.m. local time, Dec. 7



*View from Duluth, Minn. on Dec. 7, 9 p.m.*

*Jan. 31 about 1 a.m. local time in Augusta*



**Mars 1.8 arc-minutes  
north of the moon**

JMa)



Big Dipper



Leo

Regulus

Leonids



*Leonid meteor shower Nov. 17-18  
Bright, rich outburst expected 1-1:30 a.m. EST Sat. Nov. 19*























































