

# The Solar System

# Last time

- Moon phases

# The new moon rises at approximately:

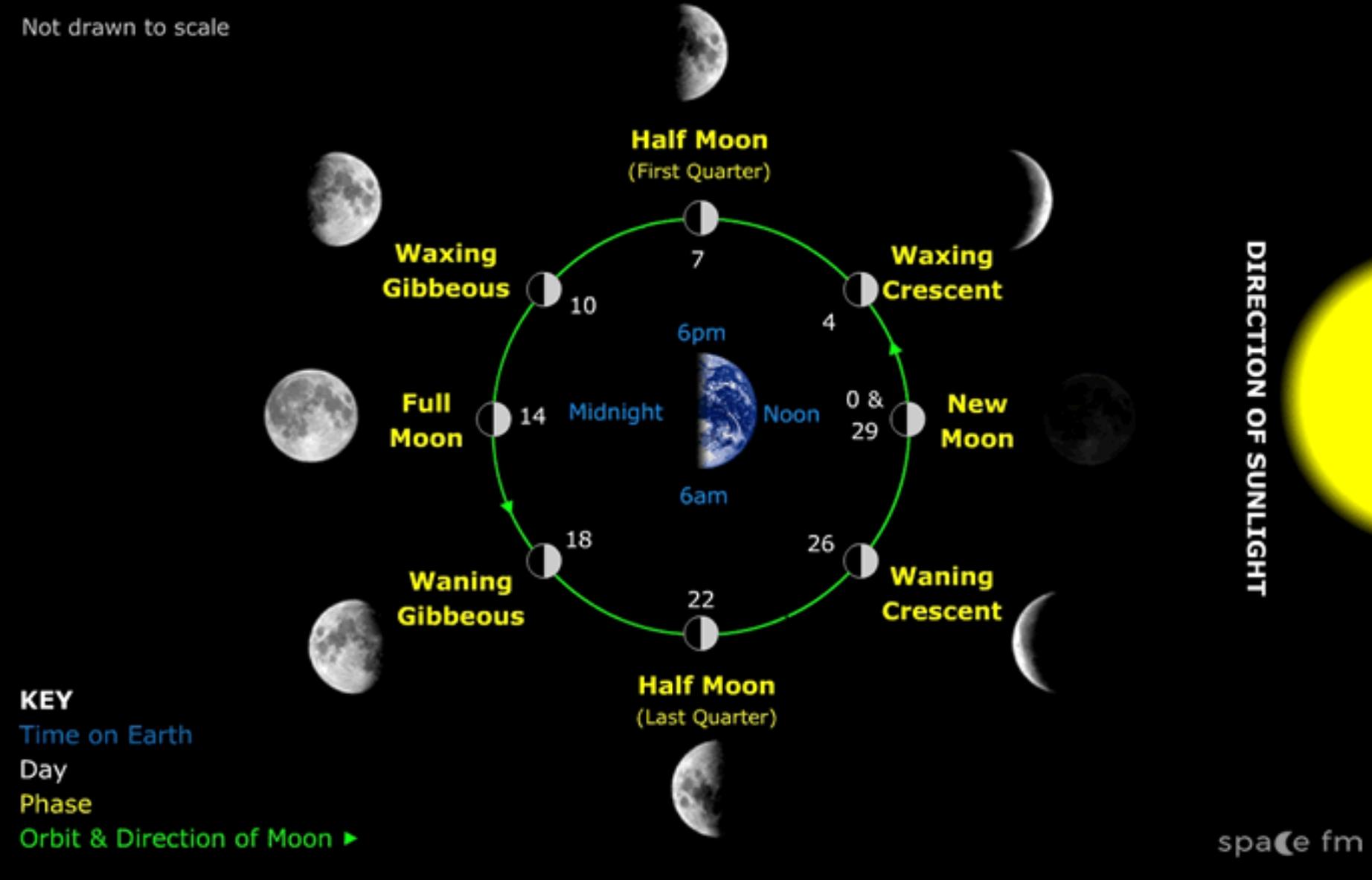
1. Midnight
2. Sunset
3. Sunrise
4. 9 or 10 p.m.
5. It rises at different times during the year

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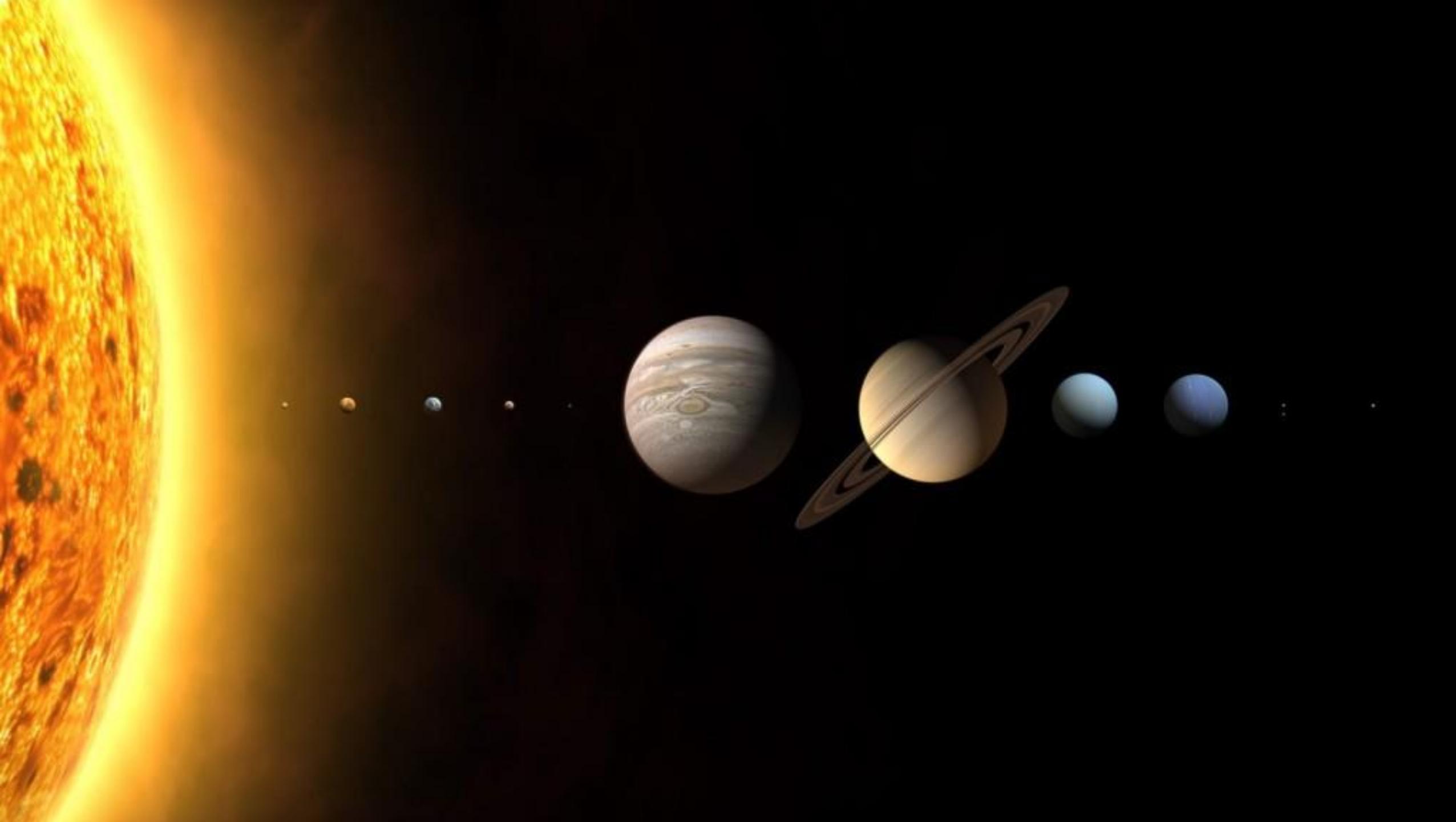
# PHASES OF THE MOON

Not drawn to scale



# The Solar System

*Can we learn the history of the Solar System from what we see today?*



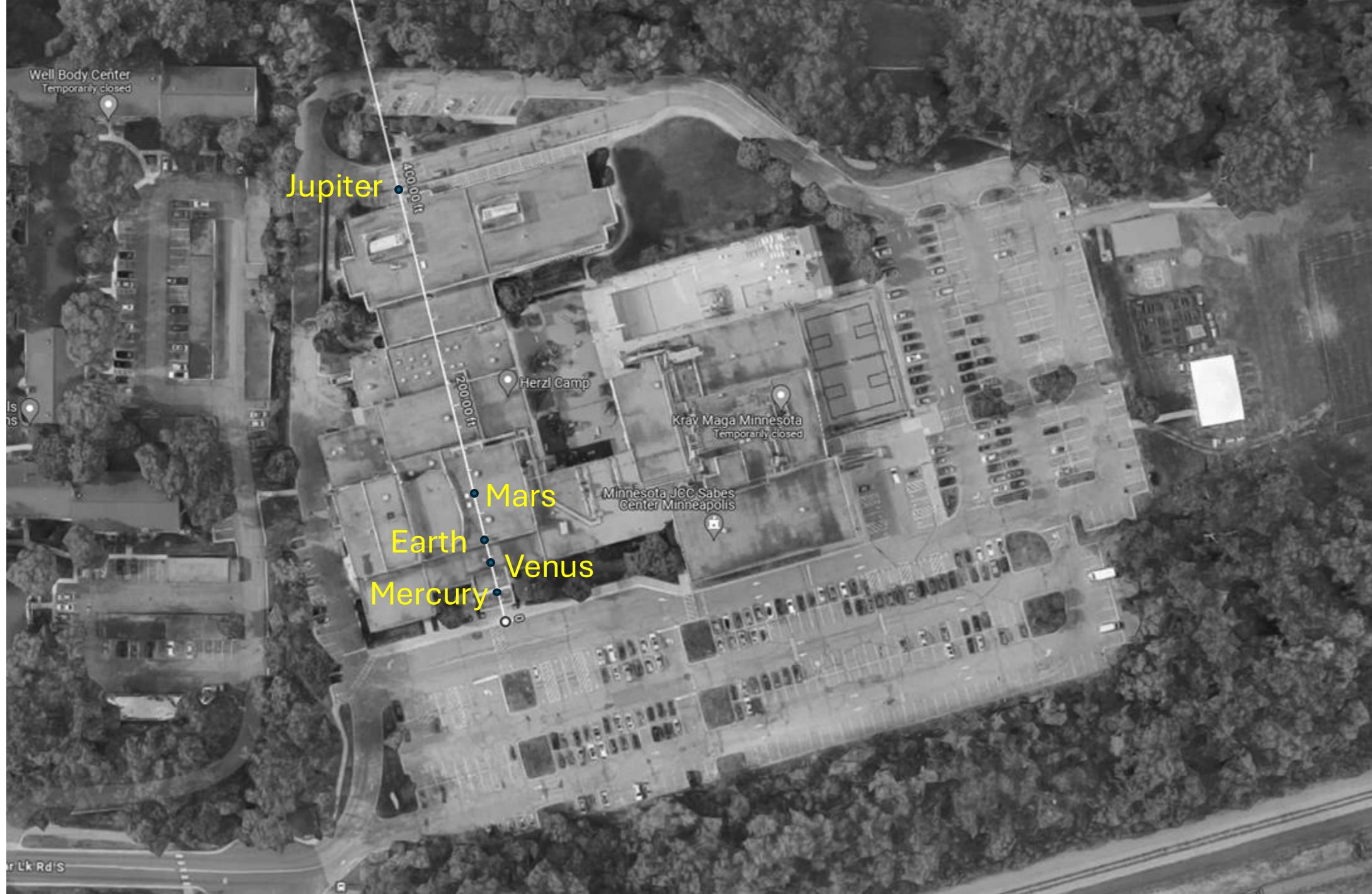


# Analogy: Scales of the Solar System

- Mass
  - *What is the most massive object in the Solar system?*
- Distances
  - *How far apart are planets from each other?*
- Sizes
  - *How do the planets sizes compare to each other?*

# 1,000 most massive objects in the Solar System

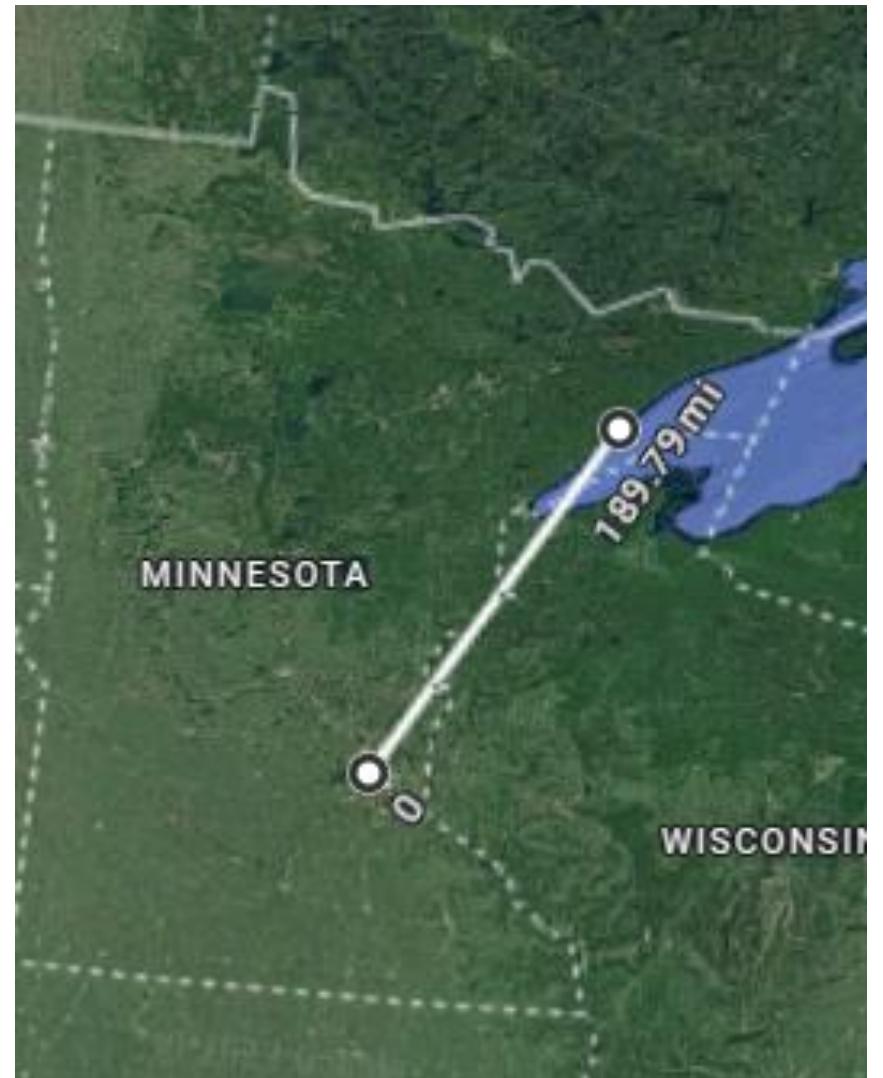
# Size scale

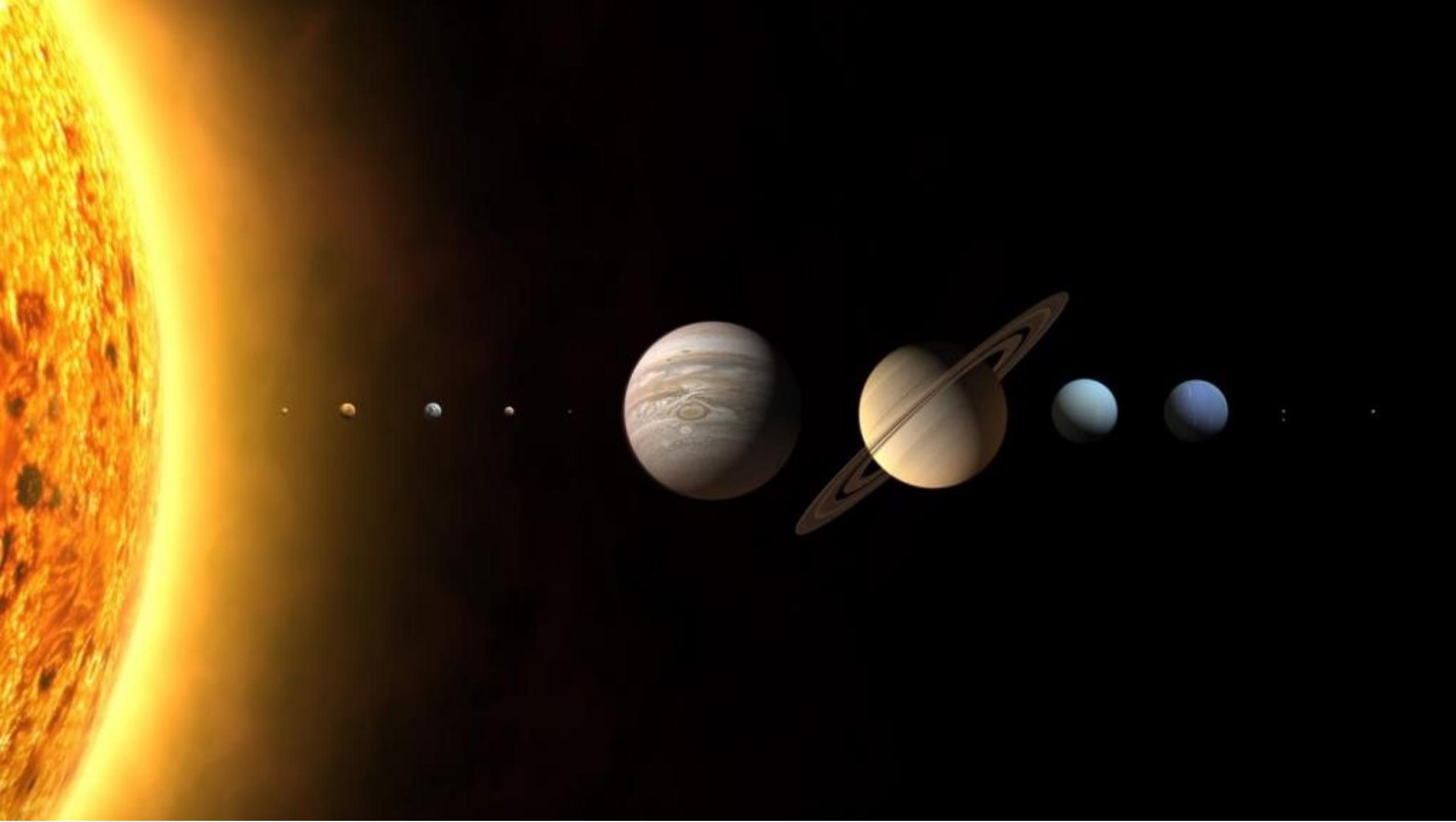


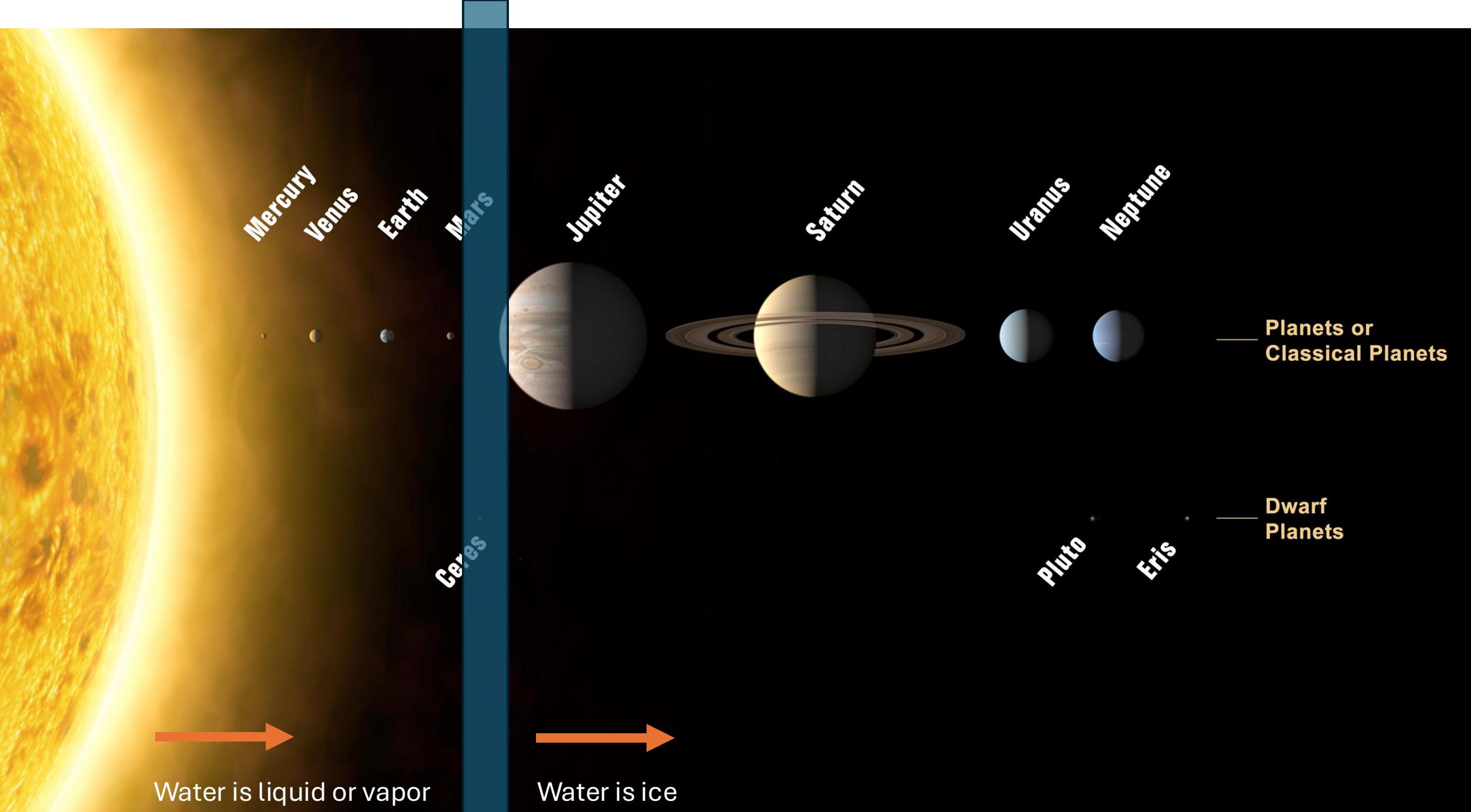


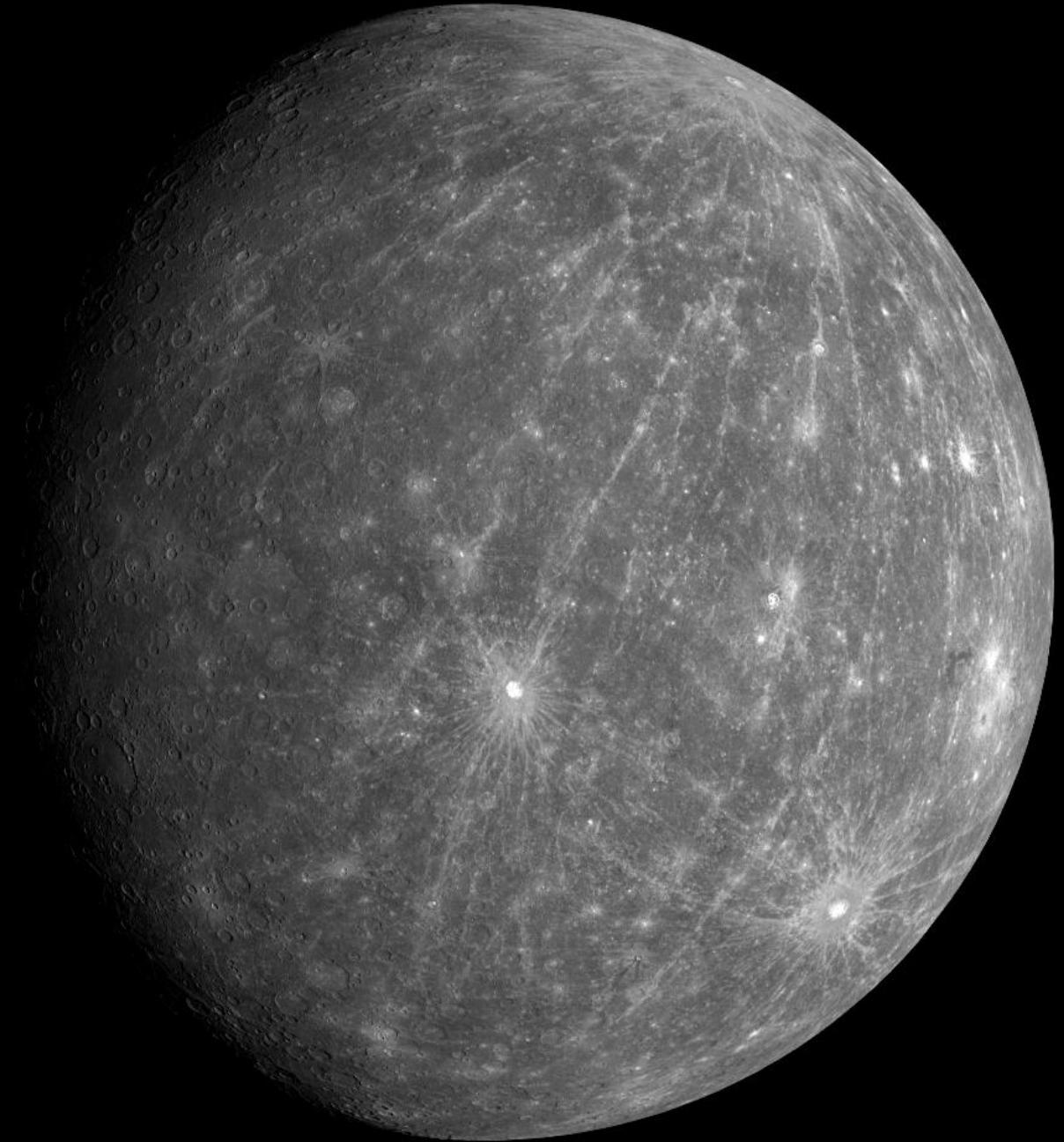
# On this scale...

- Alpha Centauri = 190mi
- Andromeda galaxy ~ Neptune's orbit.

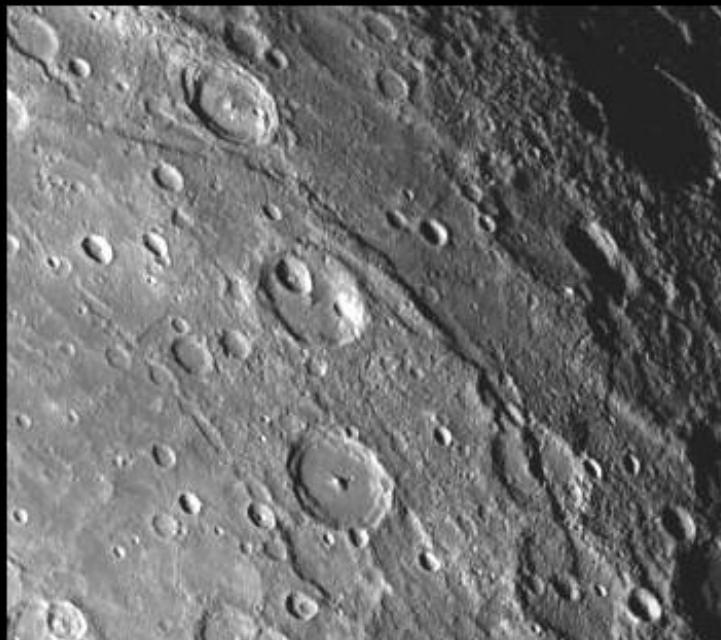


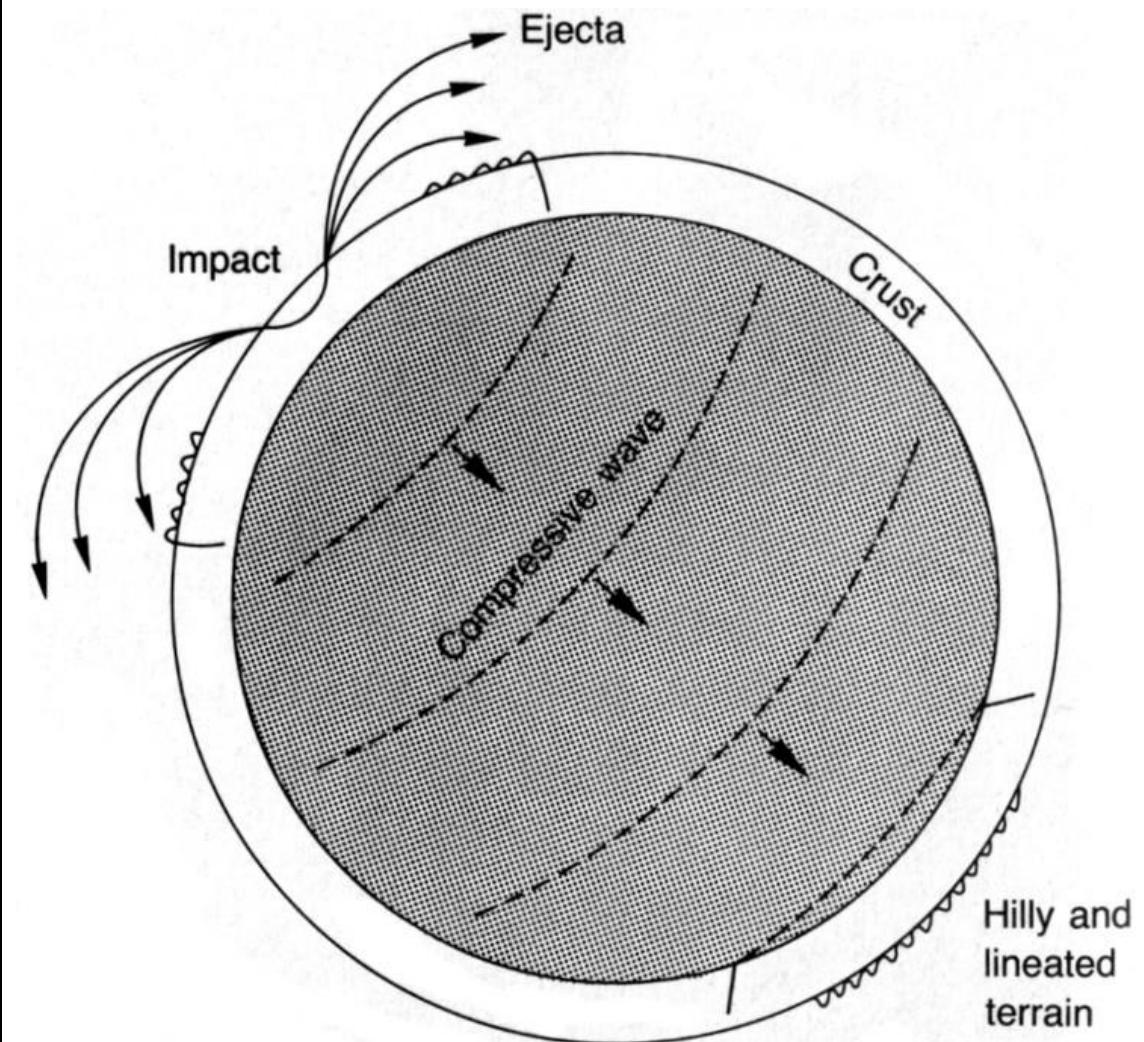
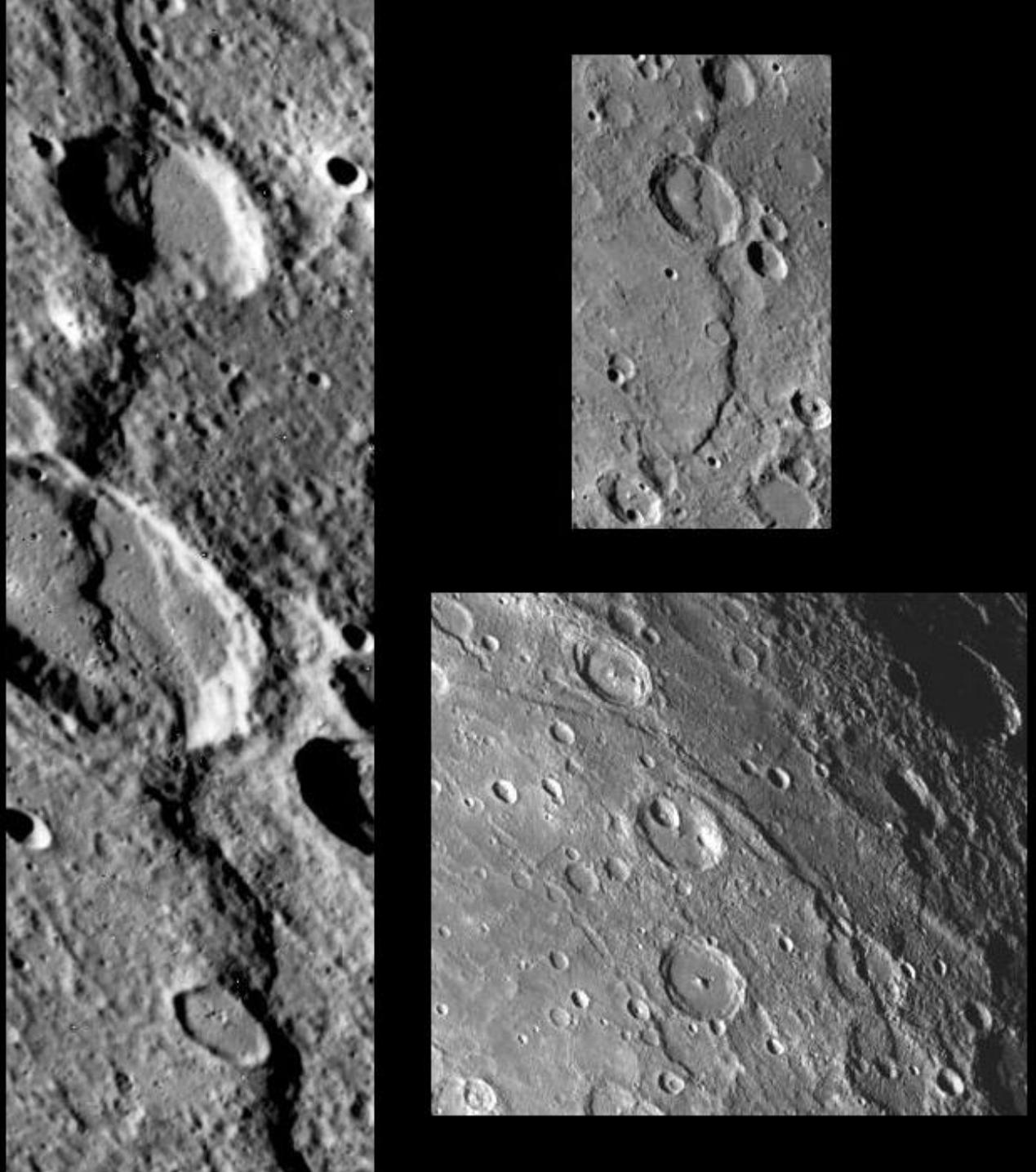


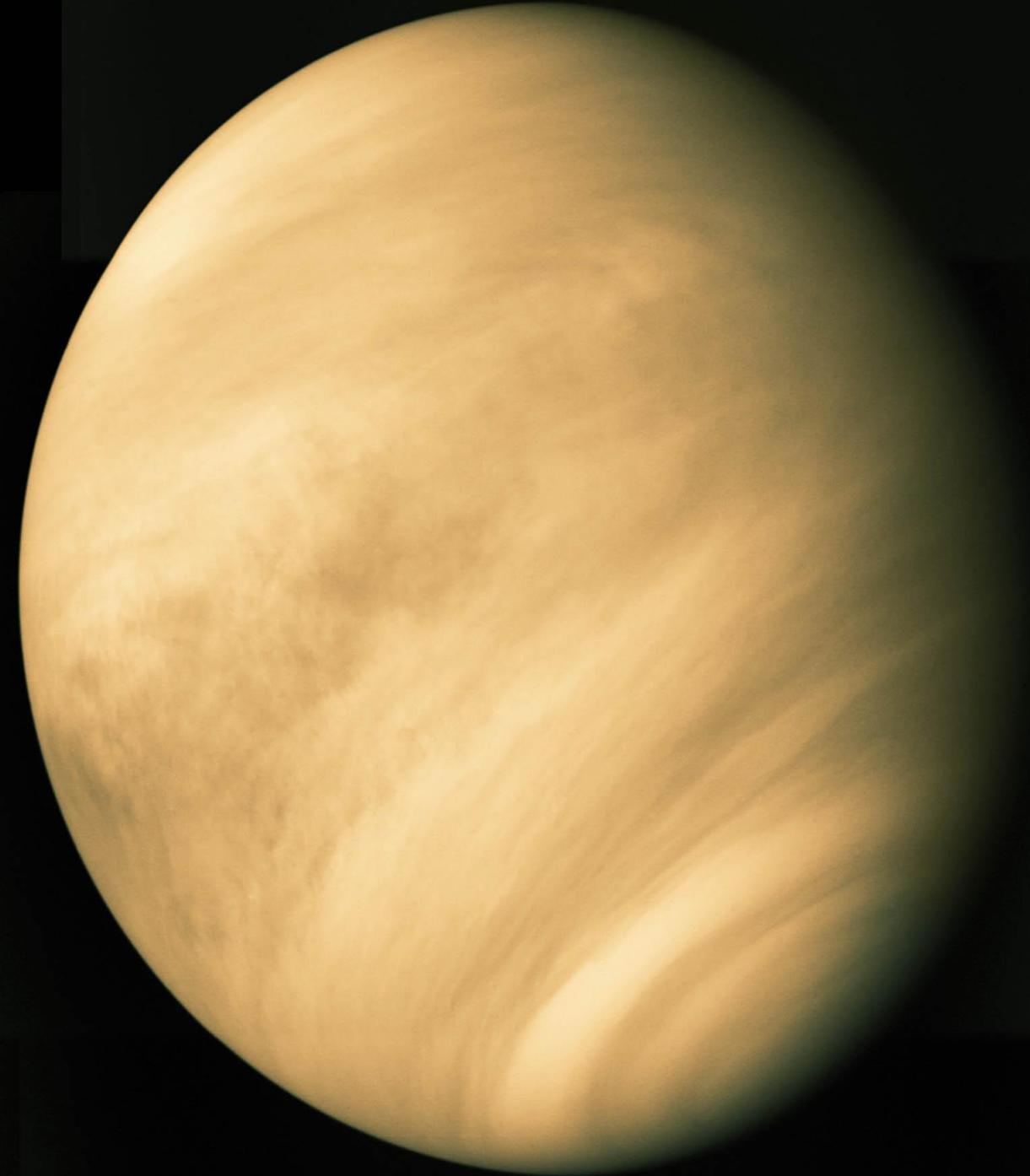


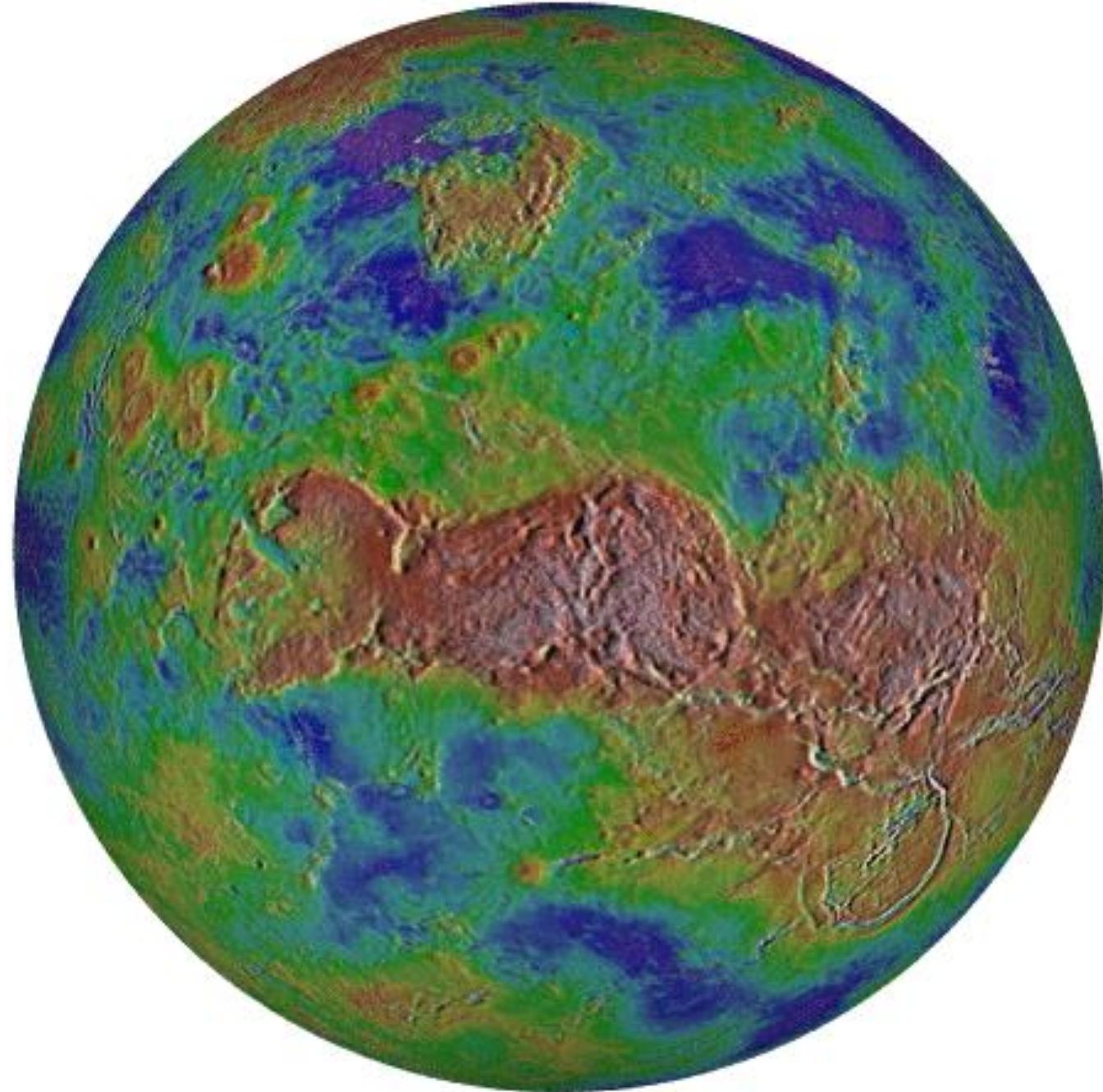


# Scarps

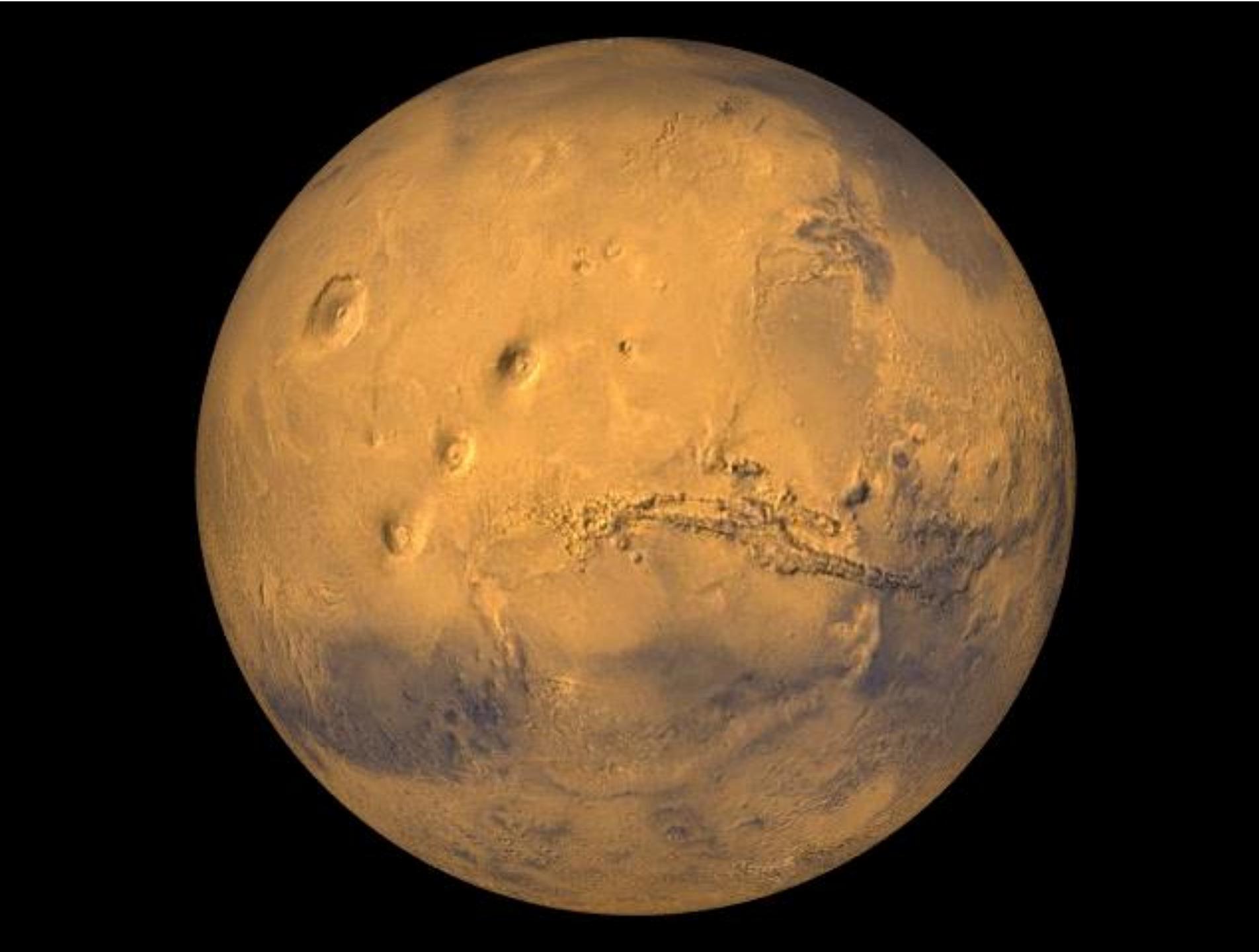


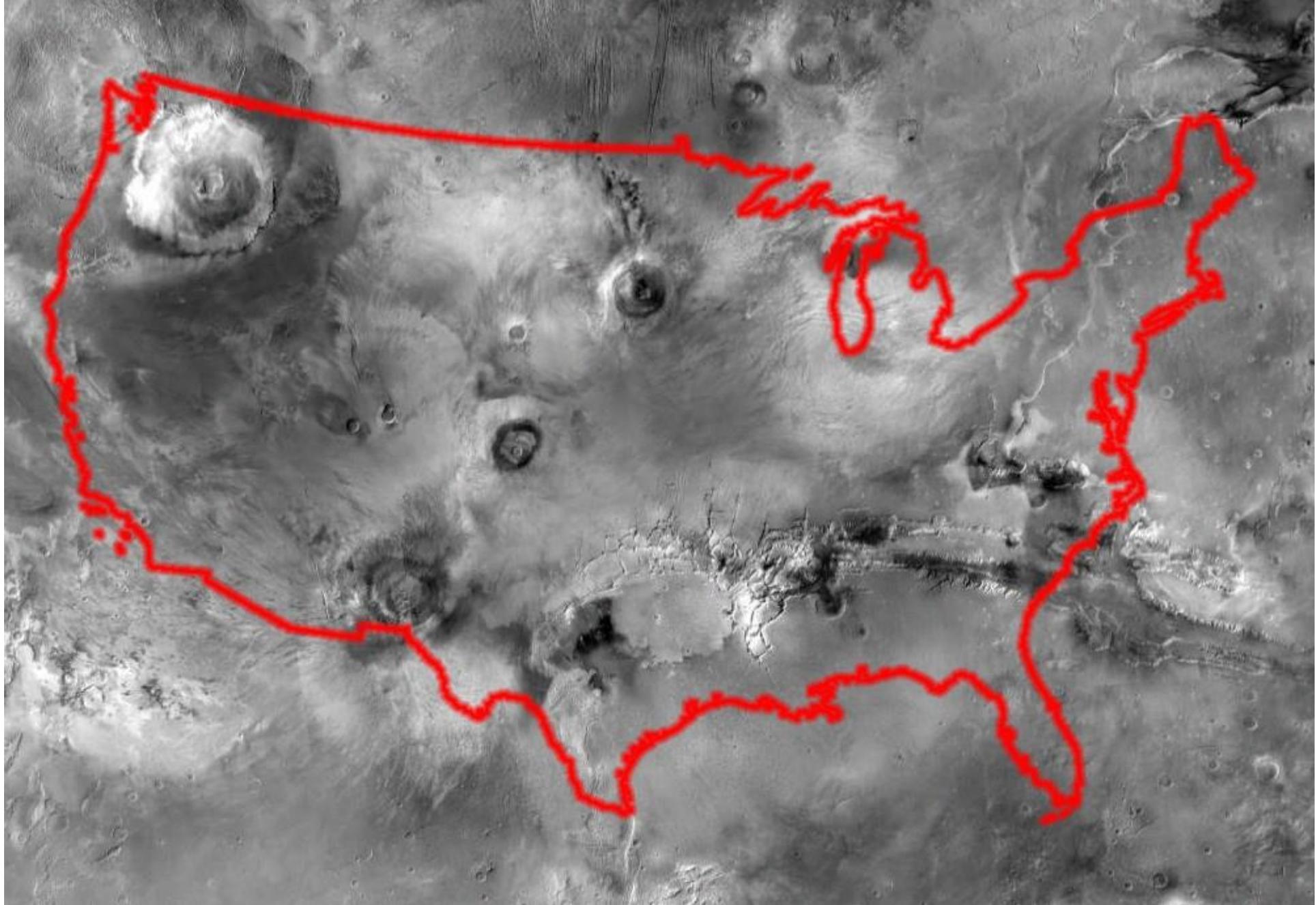




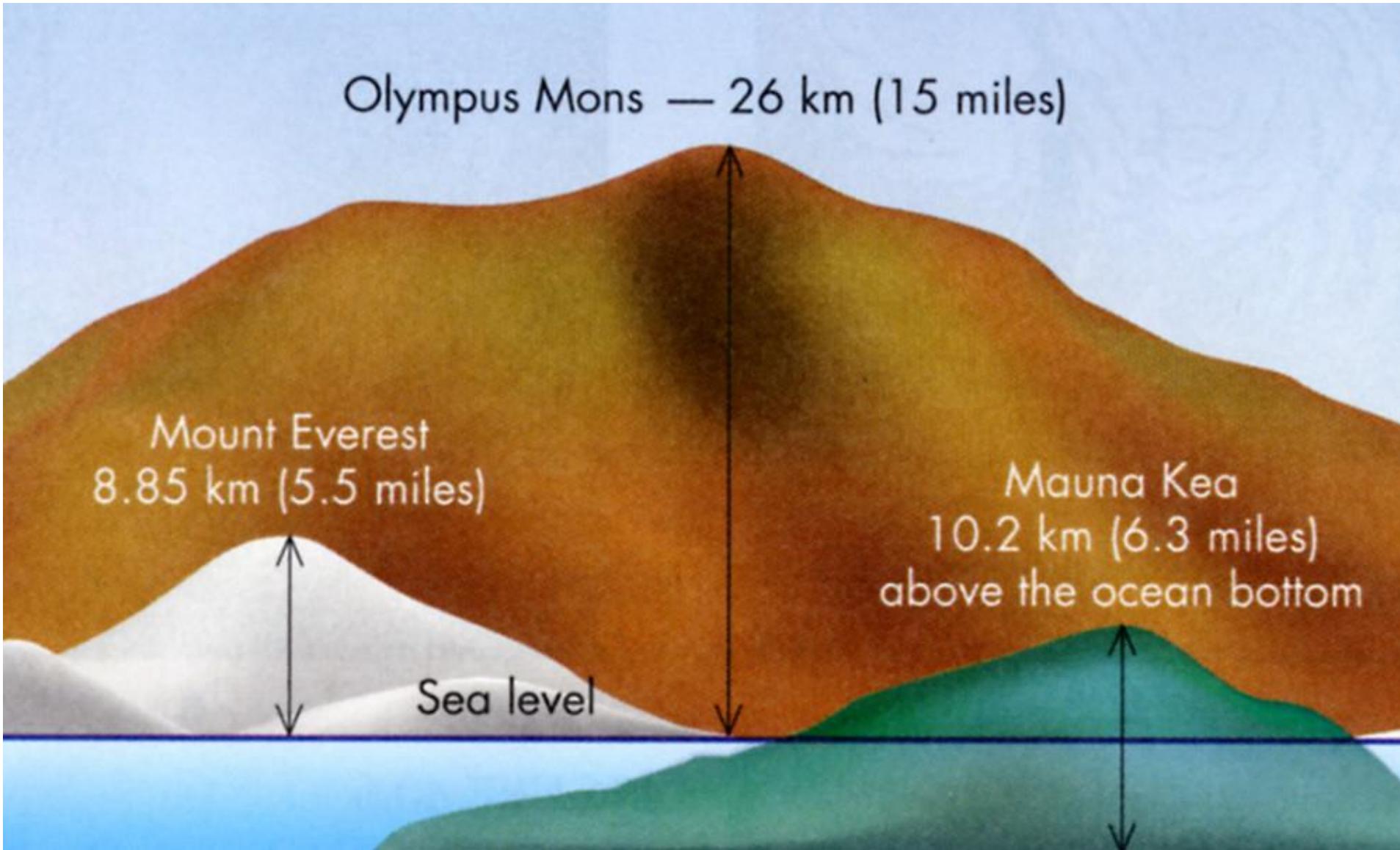






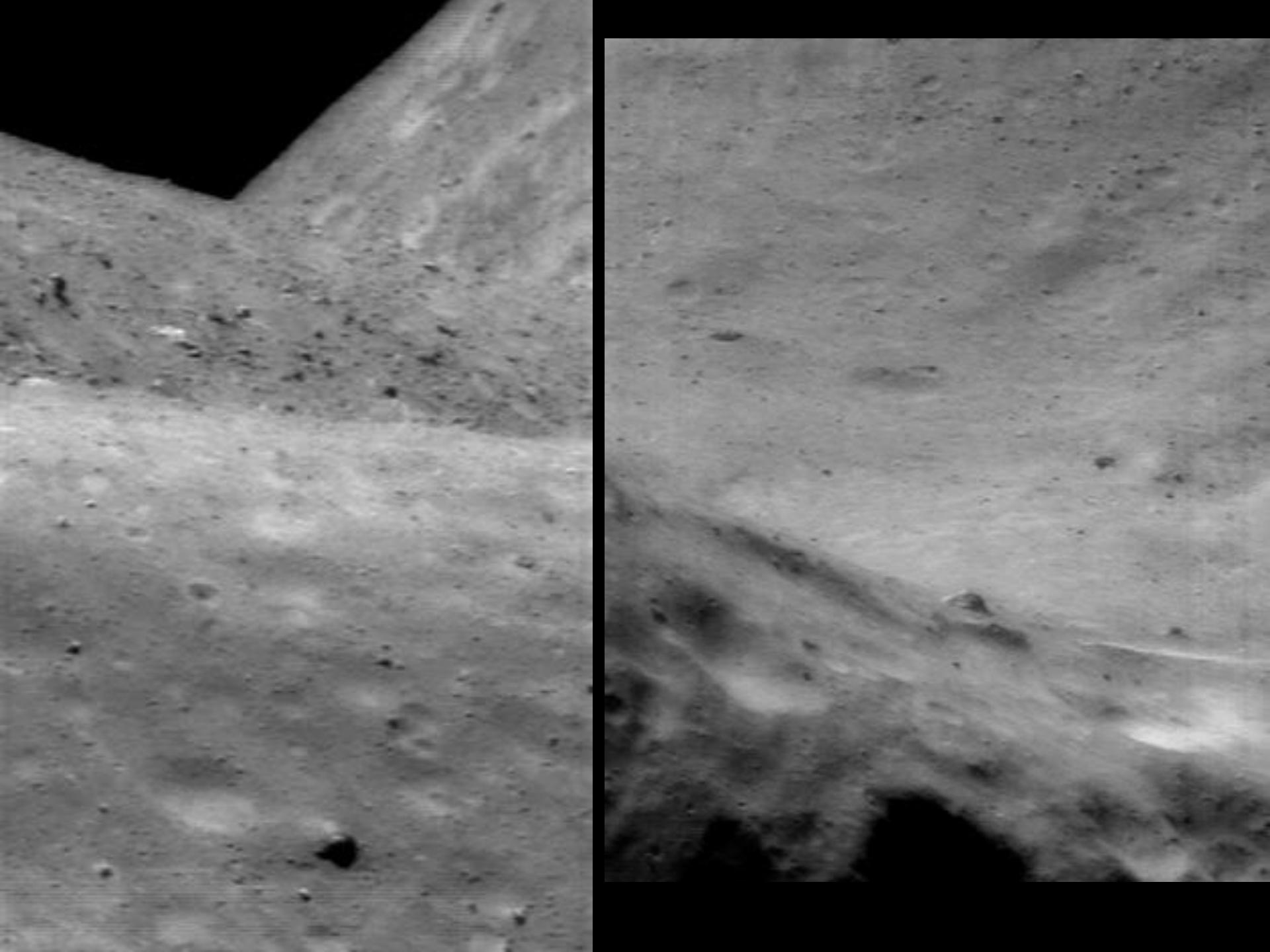




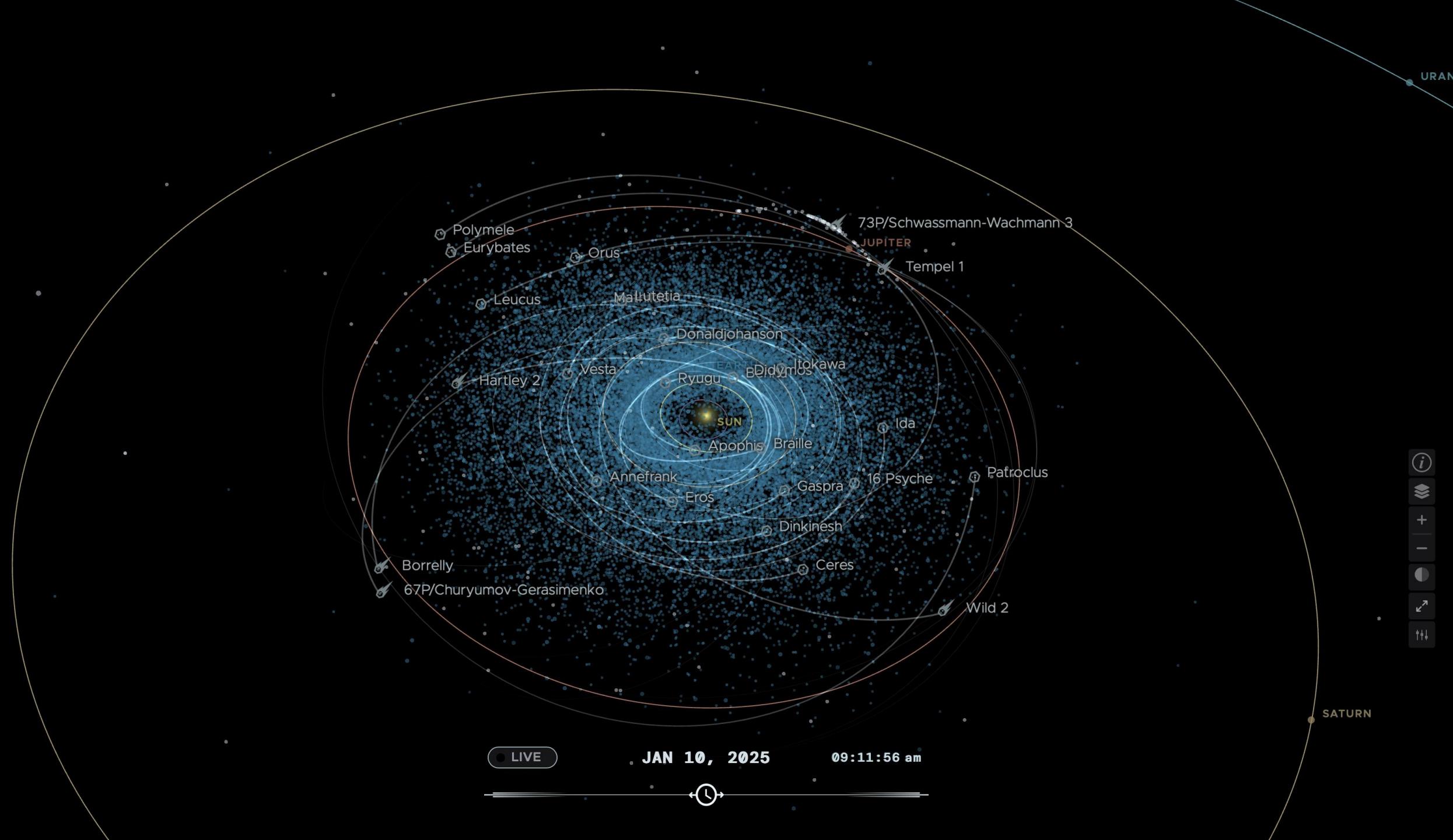


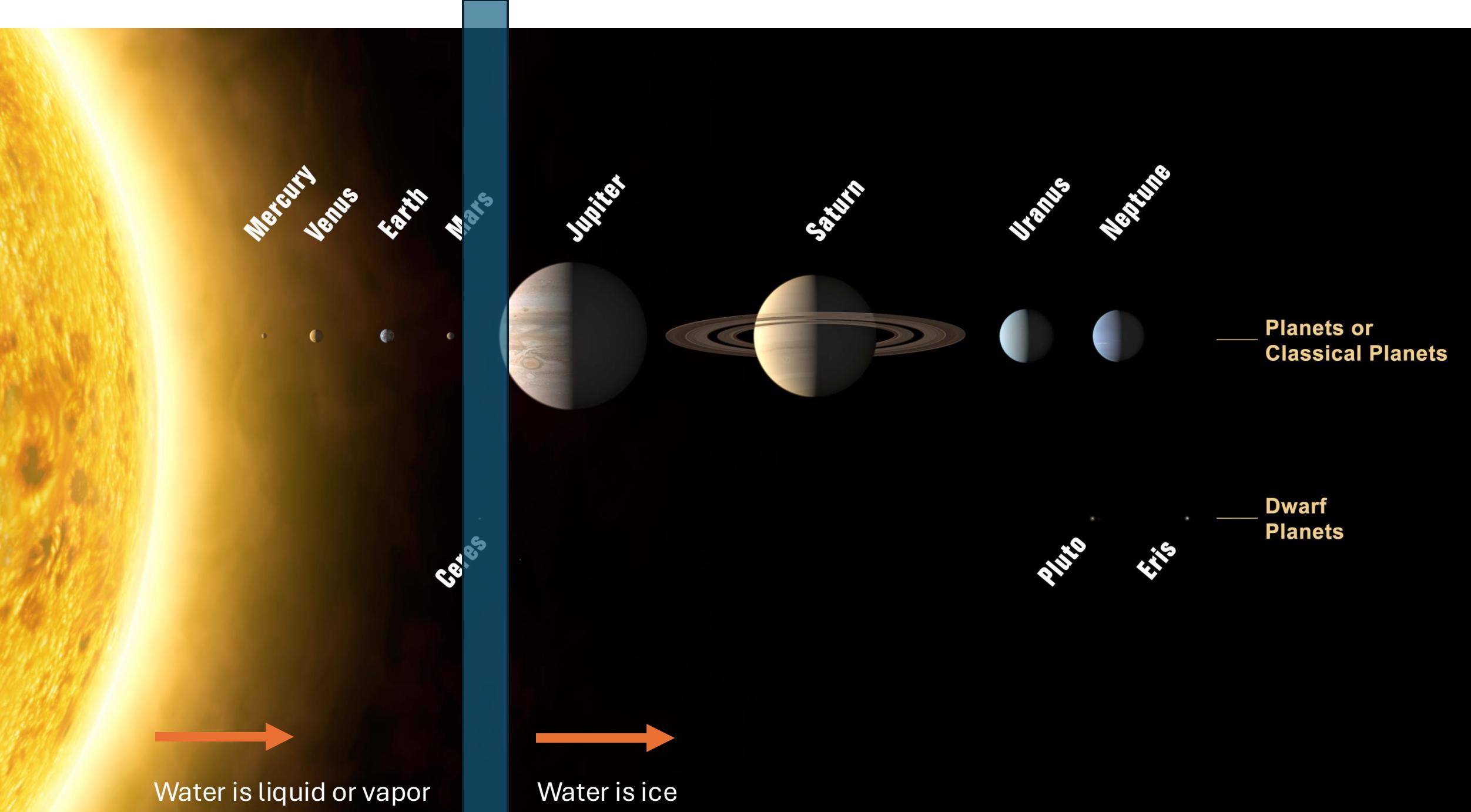
M0151295144F4

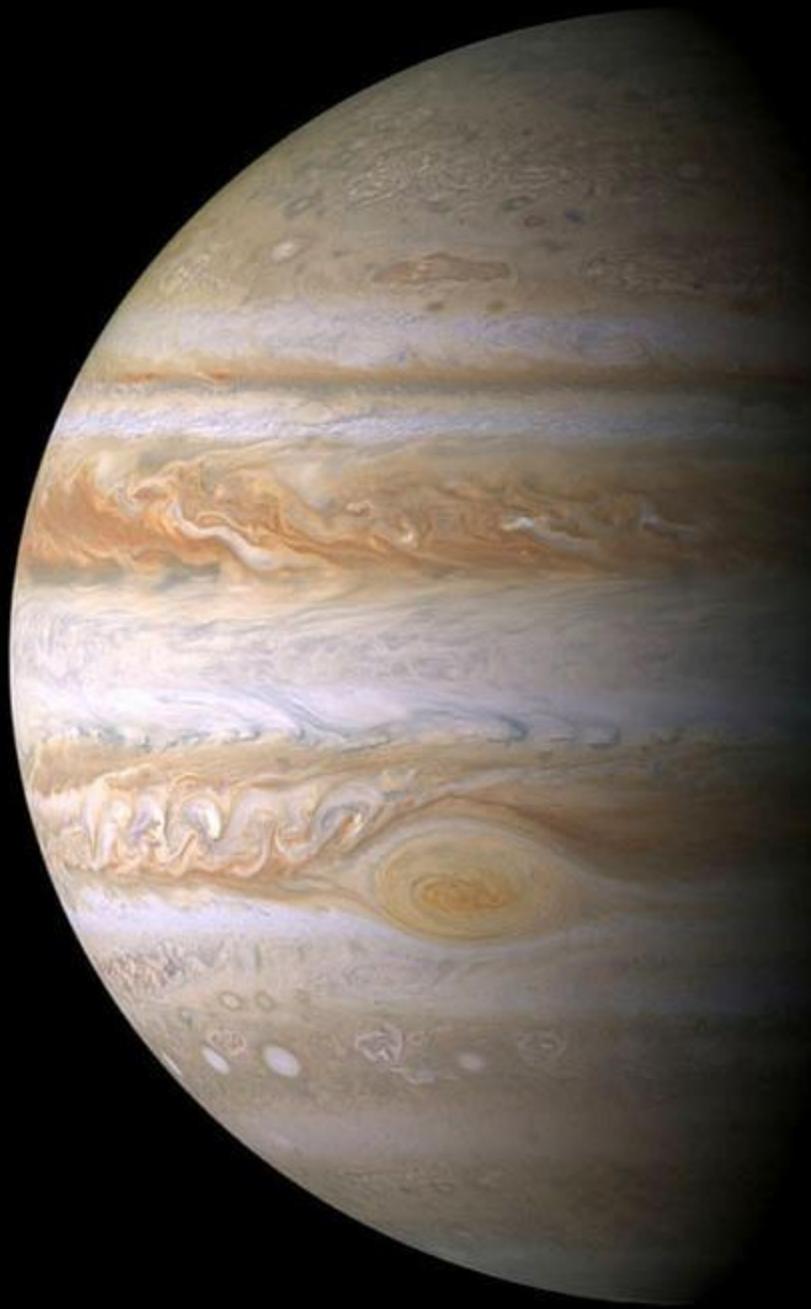
December 3 2000 23:08:30 21° 146°

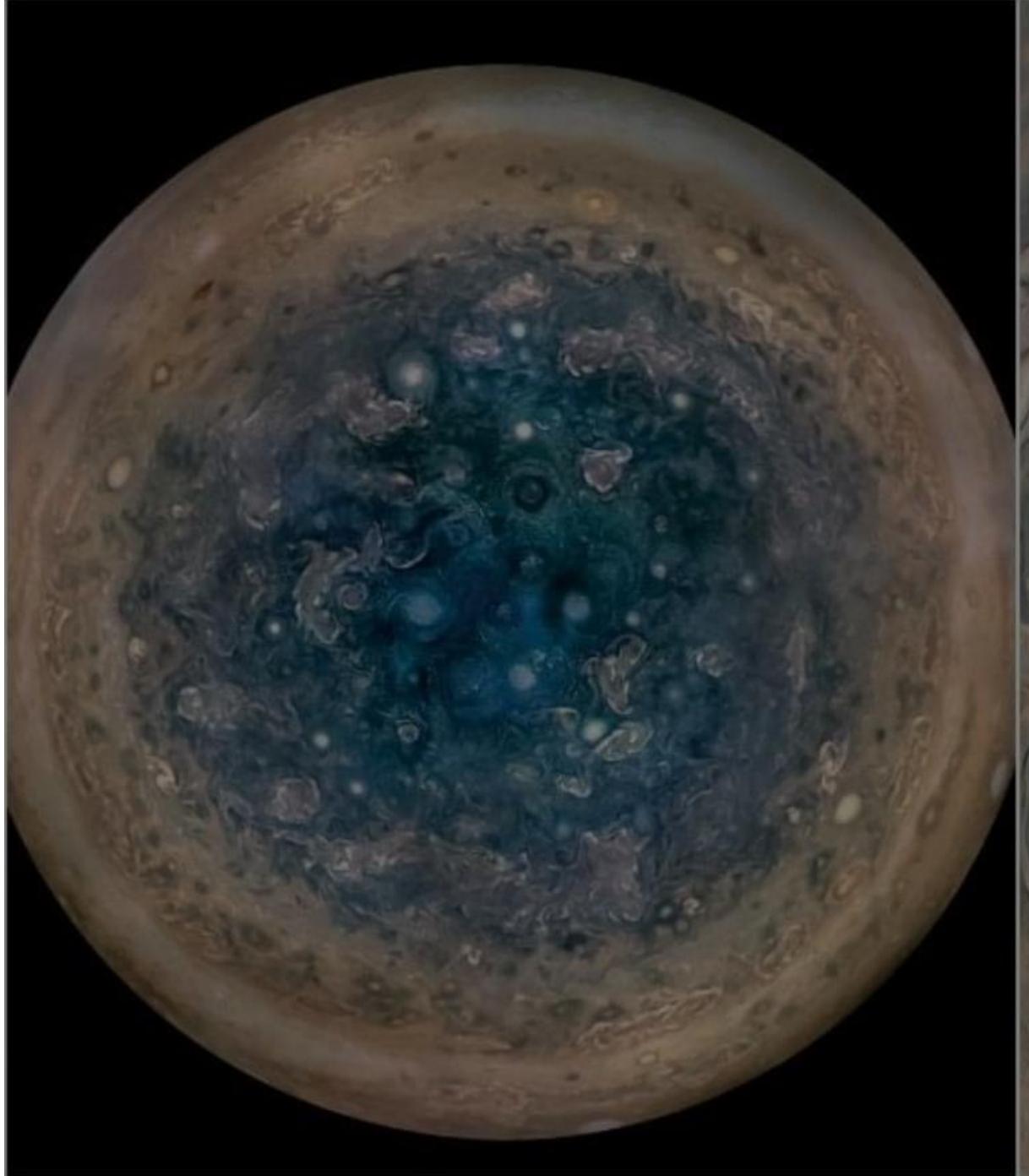


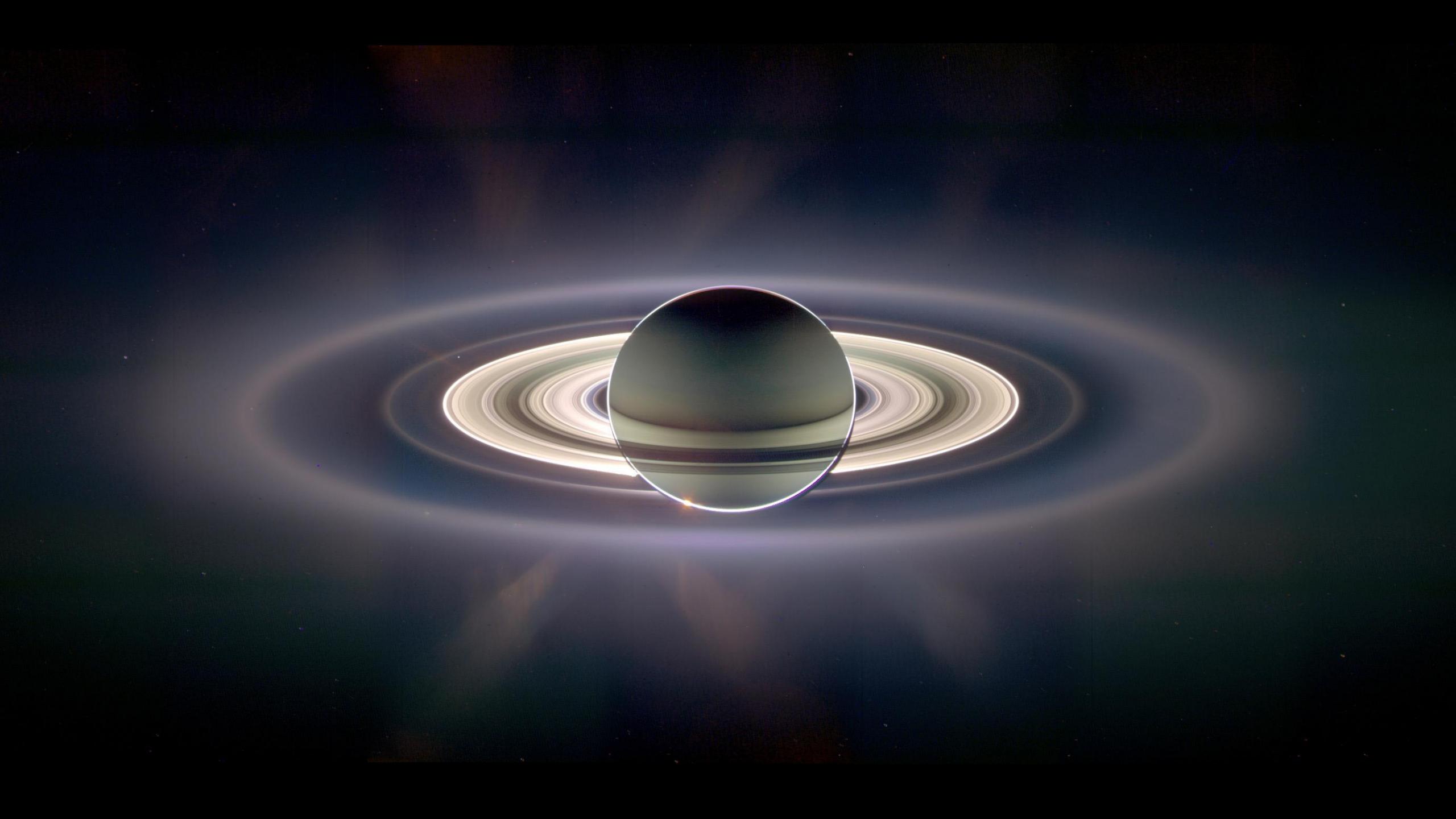


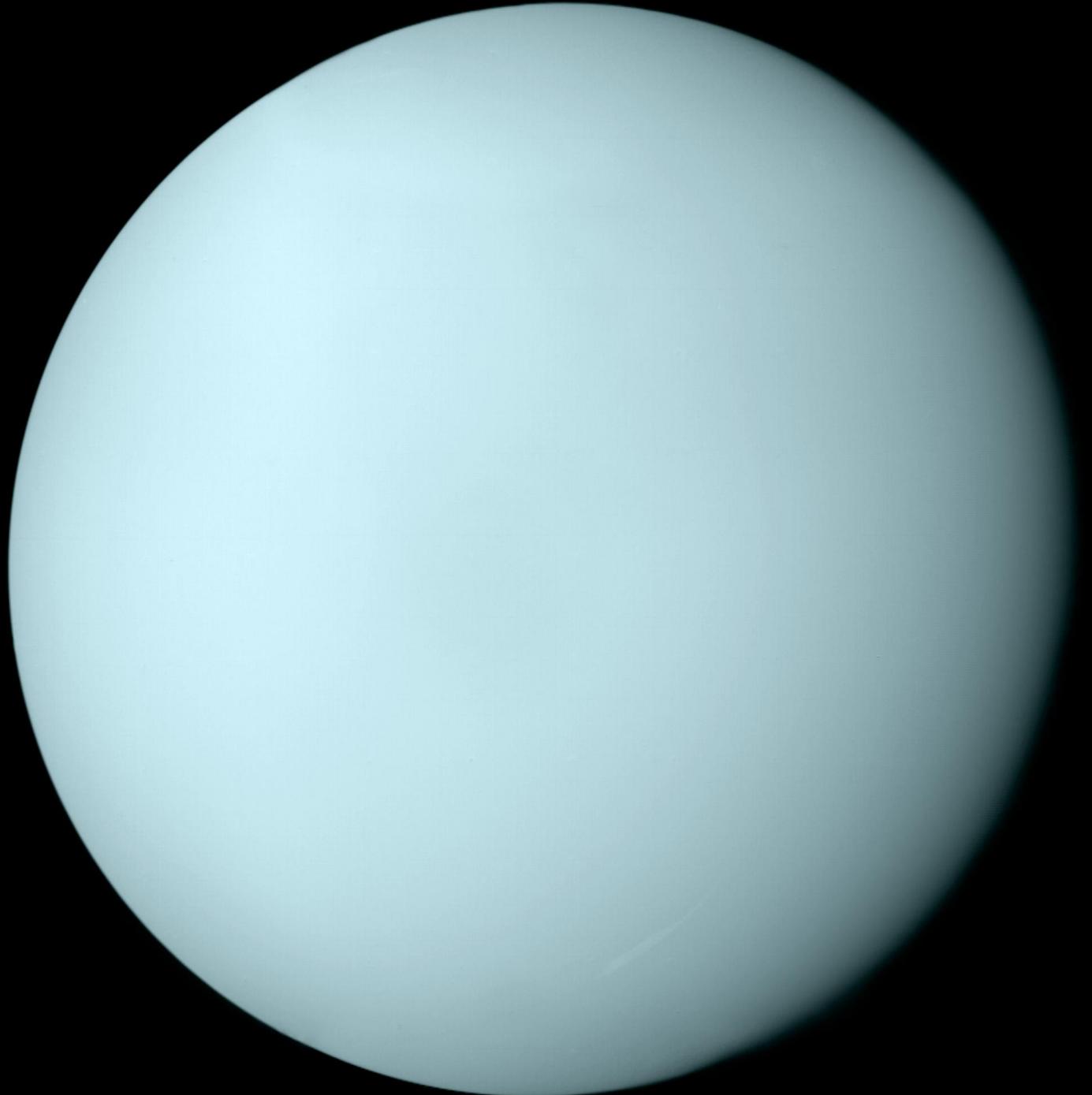


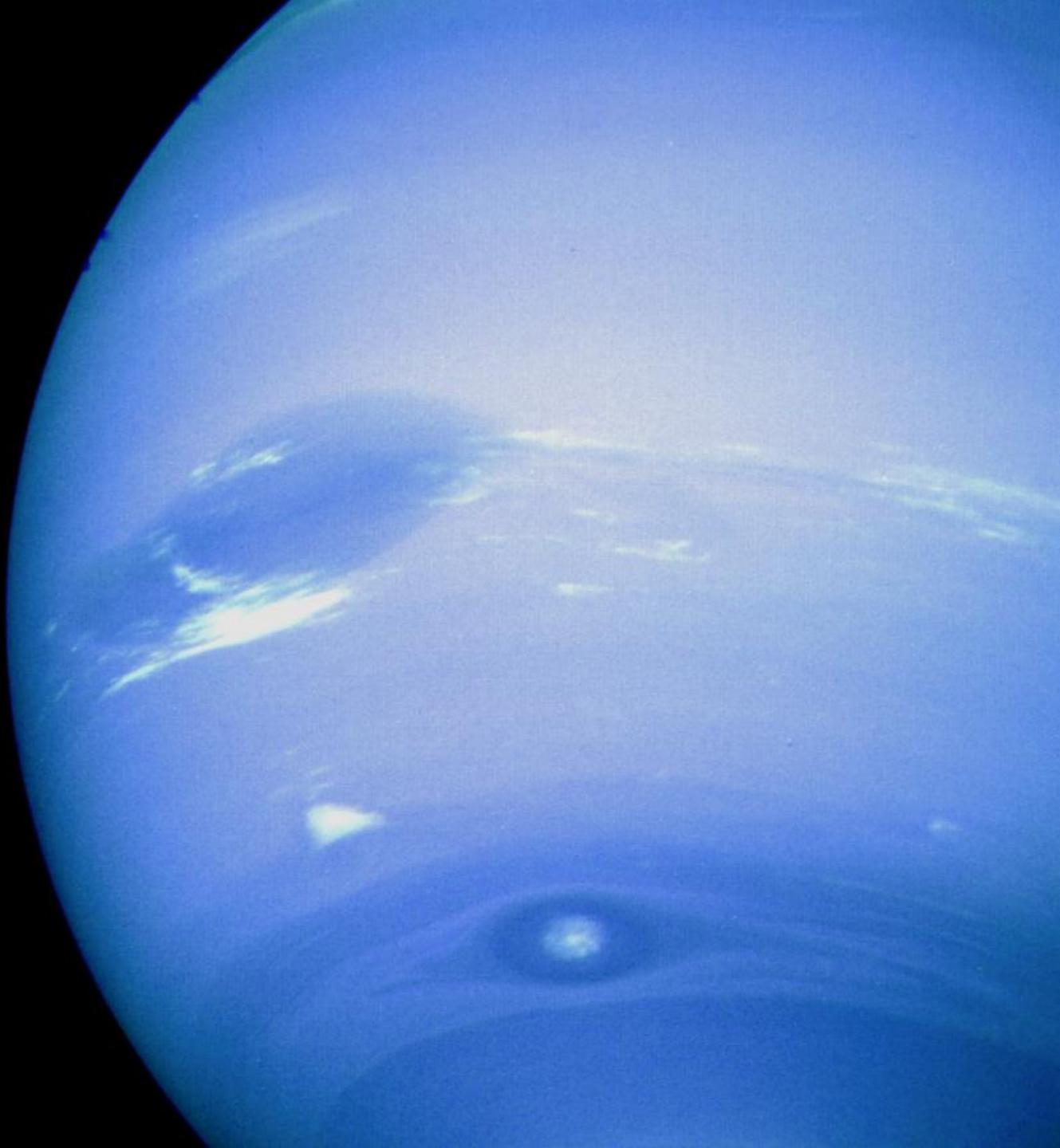




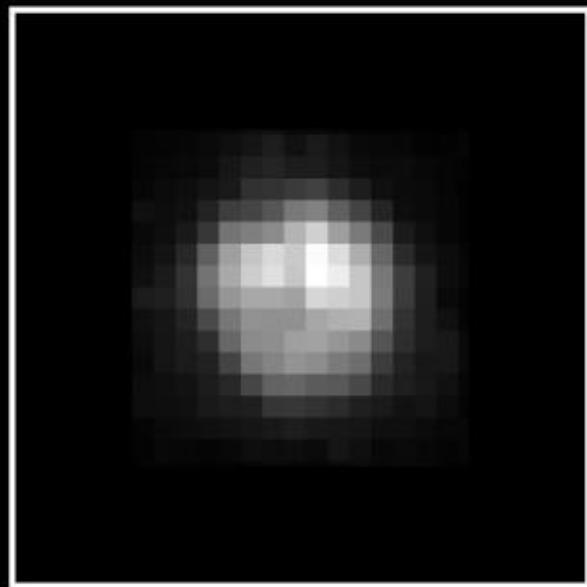






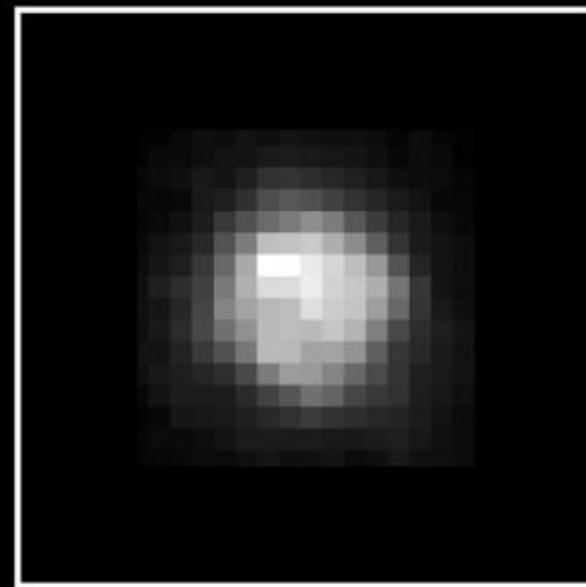




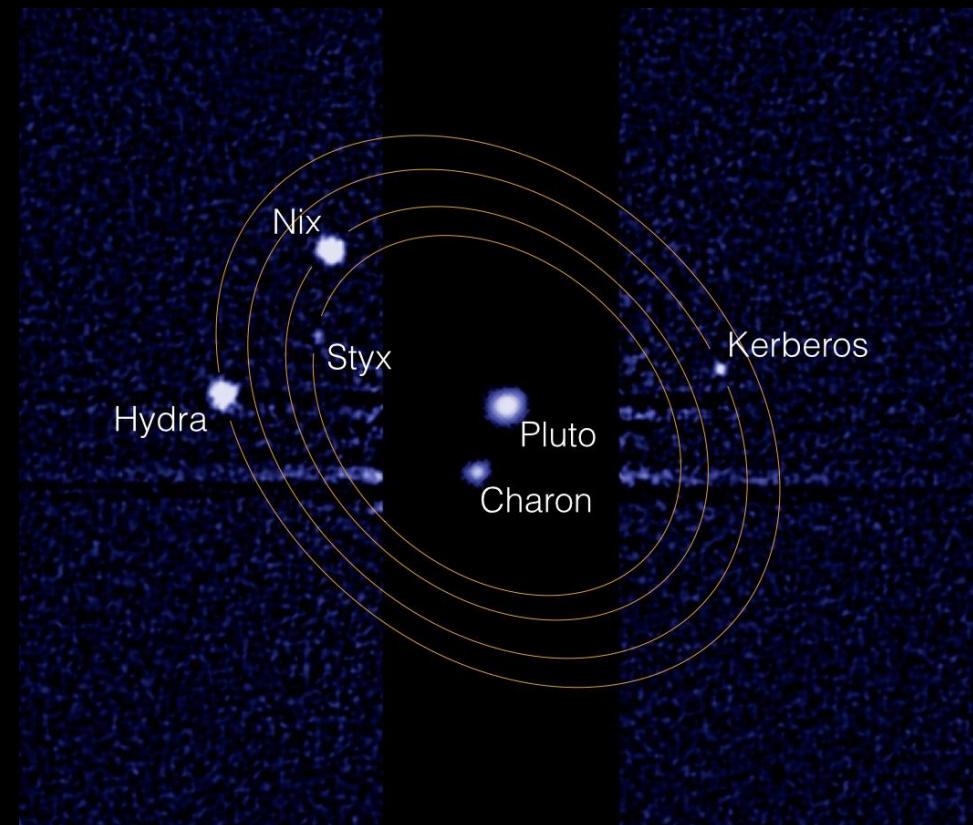


**Pluto**

PRC96-09a · ST Scl OPO · March 7, 1996 · A. Stern (SwRI), M. Buie (Lowell Obs.), NASA, ESA



HST · FOC



# Break

# Solar System Formation Theory

Any theory must be able to explain:

1. Patterns of motion among large bodies
  1. All planets orbit in the same plane (ecliptic)
  2. Most planets rotate in the same direction they orbit
2. Two major types of planets
3. Observations from outside of our Solar System

# 1. Planetary Motions

## 2. Two major types of planets

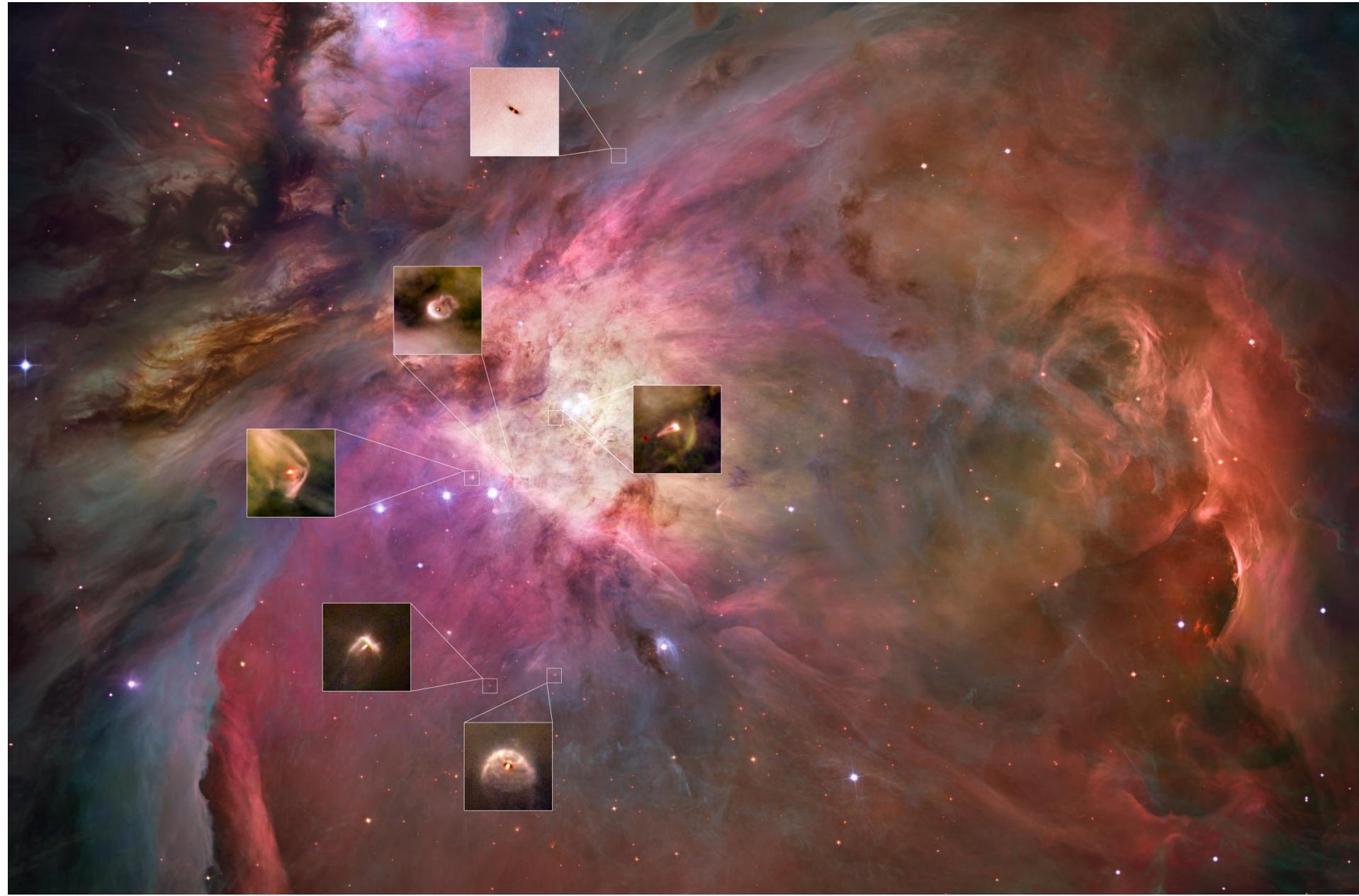
**Table 7.2 Comparison of Terrestrial and Jovian Planets**

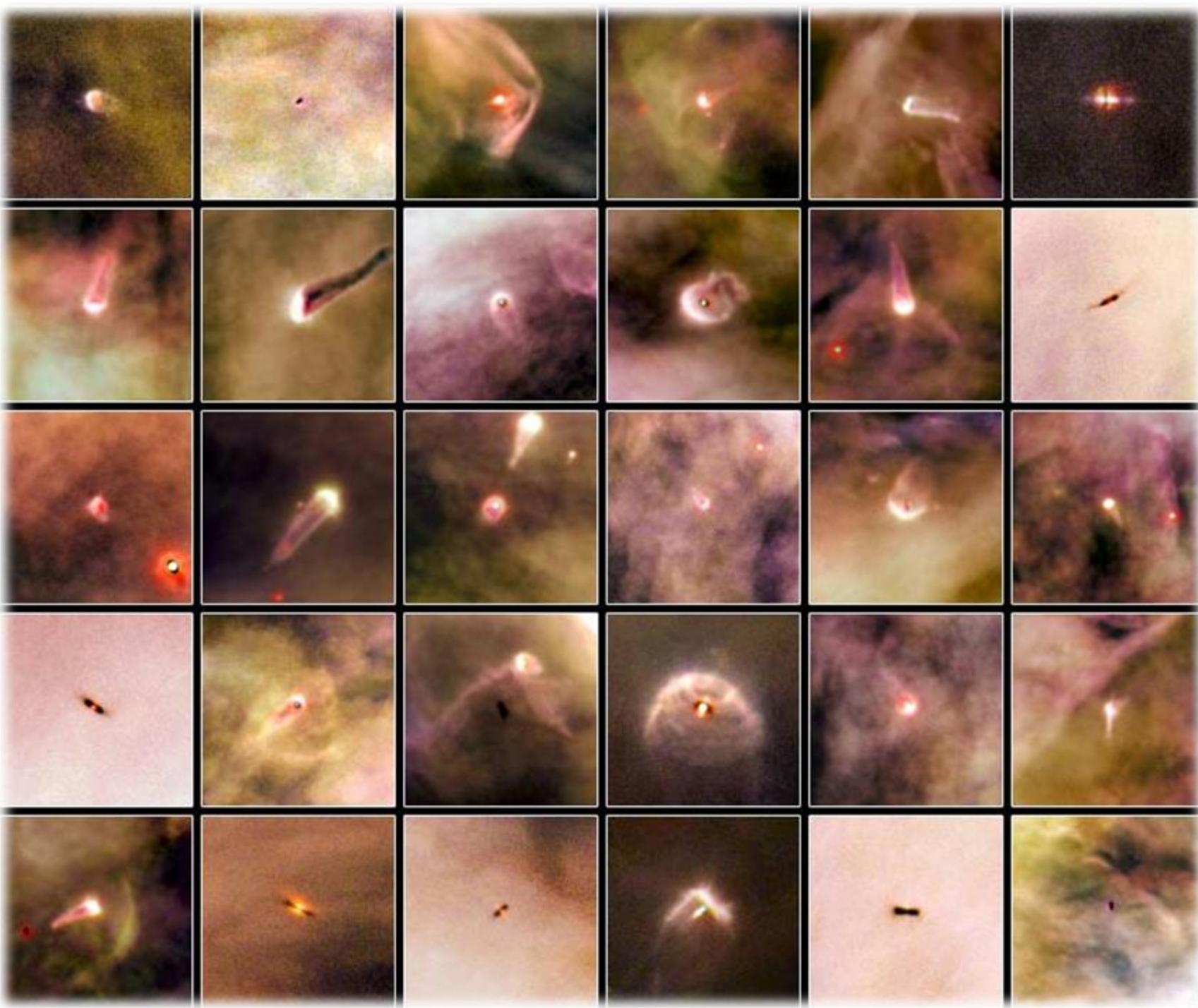
<i>Terrestrial Planets</i>	<i>Jovian Planets</i>
Smaller size and mass	Larger size and mass
Higher density	Lower density
Made mostly of rock and metal	Made mostly of hydrogen, helium, and hydrogen compounds
Solid surface	No solid surface
Few (if any) moons and no rings	Rings and many moons
Closer to the Sun (and closer together), with warmer surfaces	Farther from the Sun (and farther apart), with cool temperatures at cloud tops

# 3. Observations from outside of our Solar System









# Solar System Formation Theory

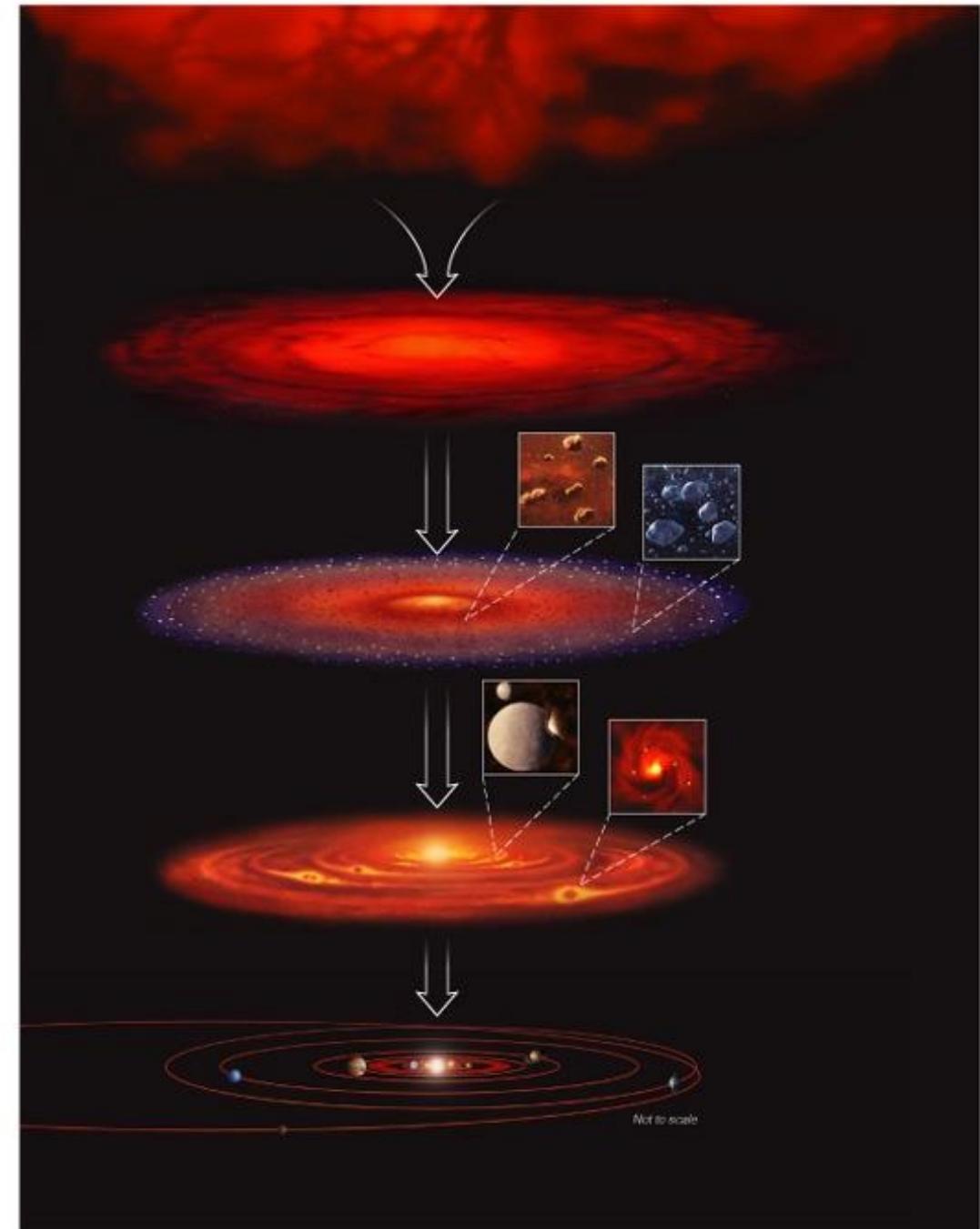
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# Nebular Theory

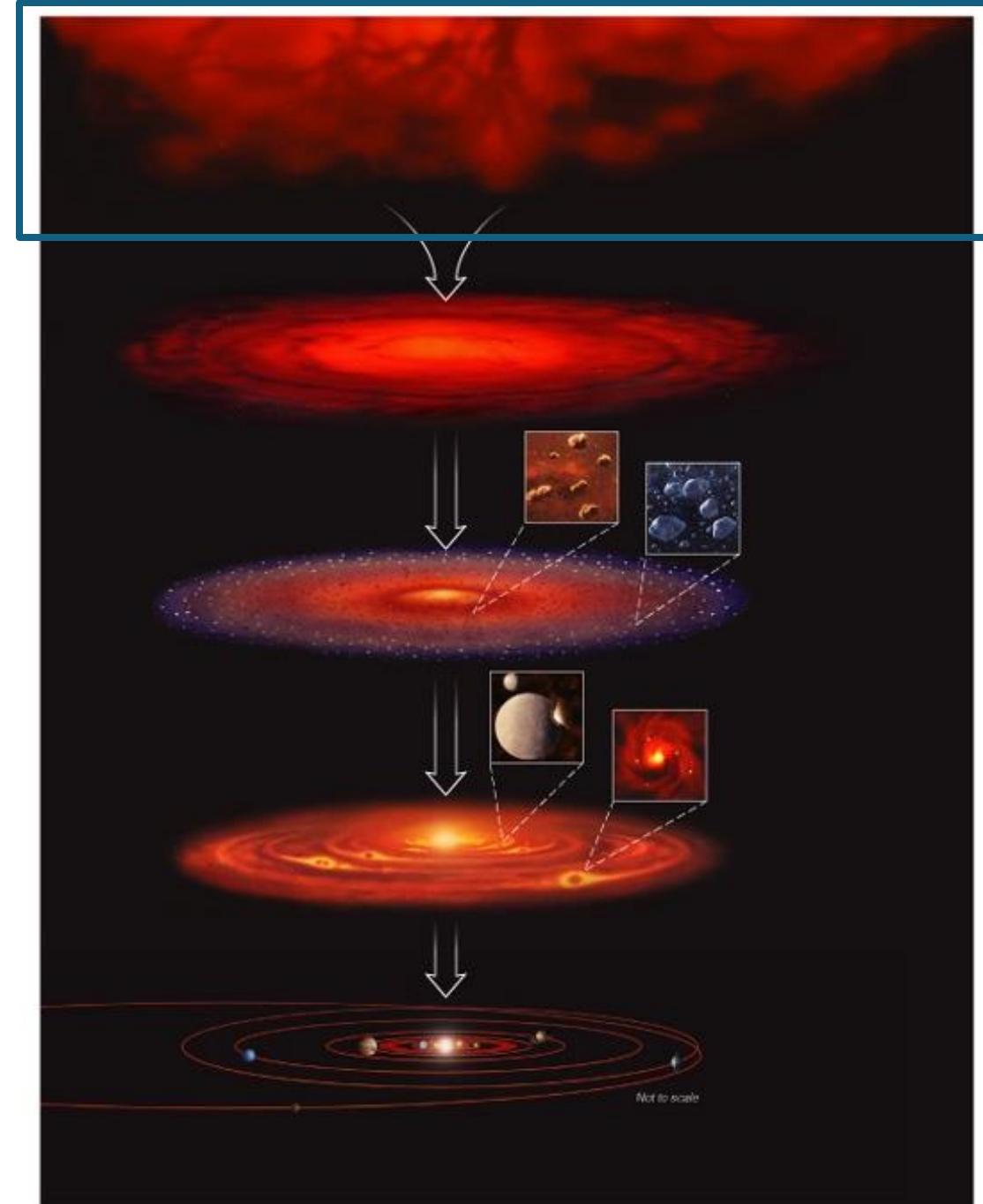
# Nebular Theory

1. The Solar Nebula was made of Hydrogen and Helium from the Big Bang, and other heavier elements from the explosions of massive stars.
2. Gravity: Nebula collapses: Heats, spins and flattens
3. Chemistry takes over: Materials condense and form solids depending on the distance from the Sun
4. Accretion: Those small solids bump into each other and build up planets
5. Clearing: The Sun clears out light gases from within the nebula



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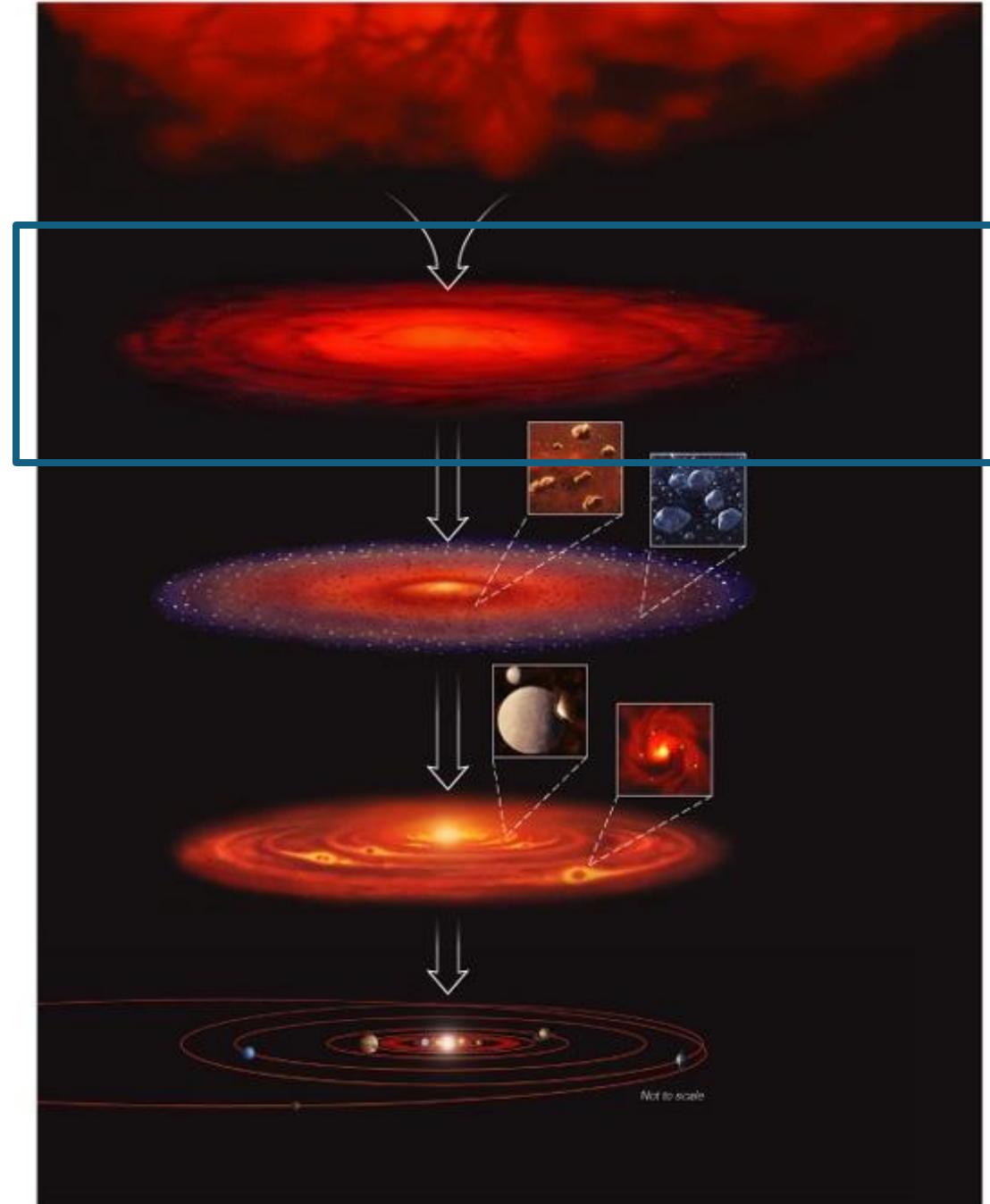
Matthew Bate

UNIVERSITY OF  
**EXETER**

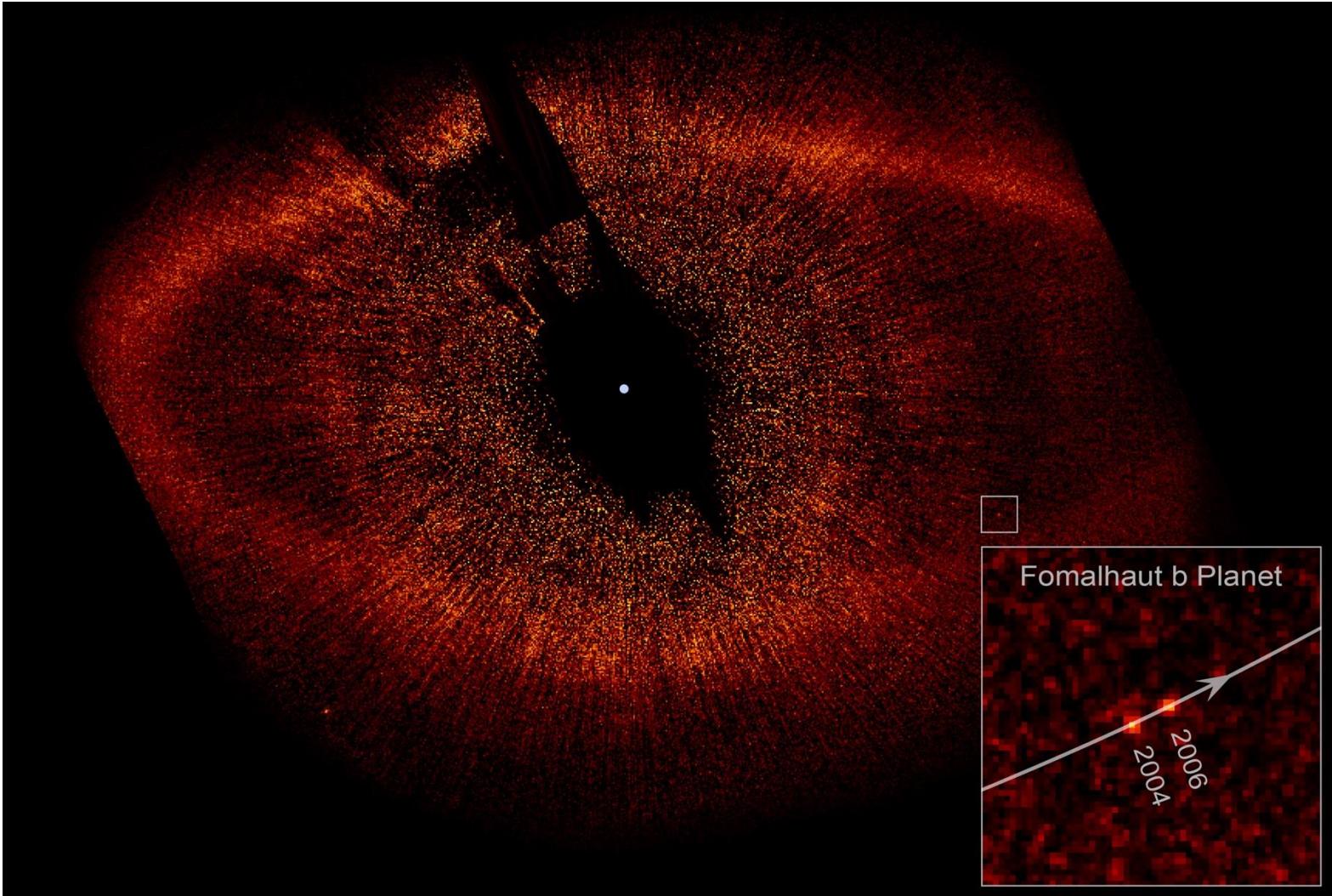


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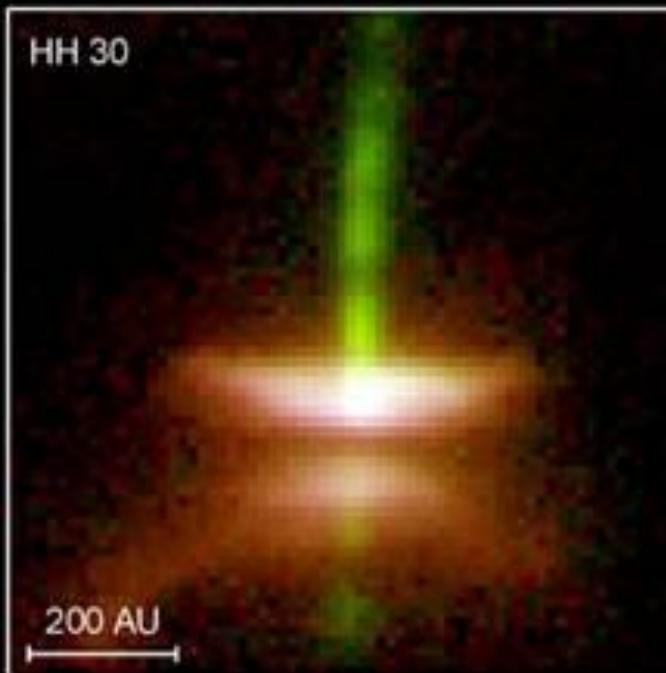
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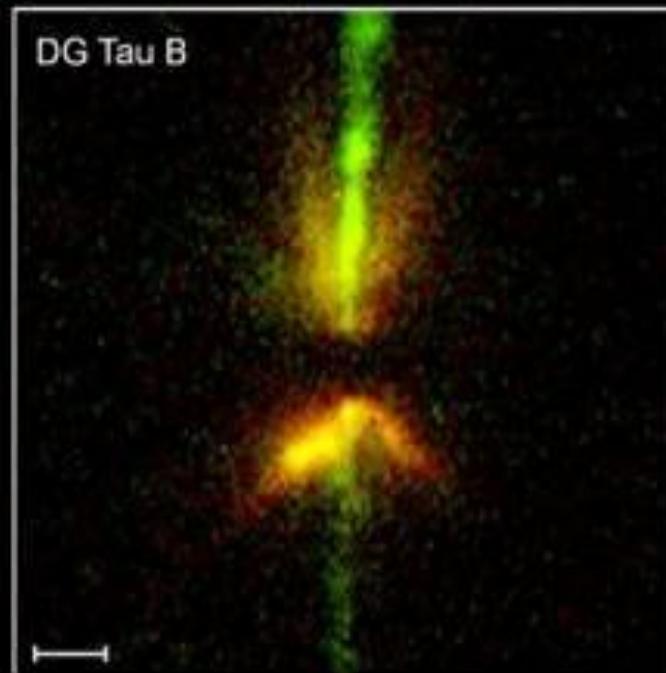
# Fomalhaut



HH 30



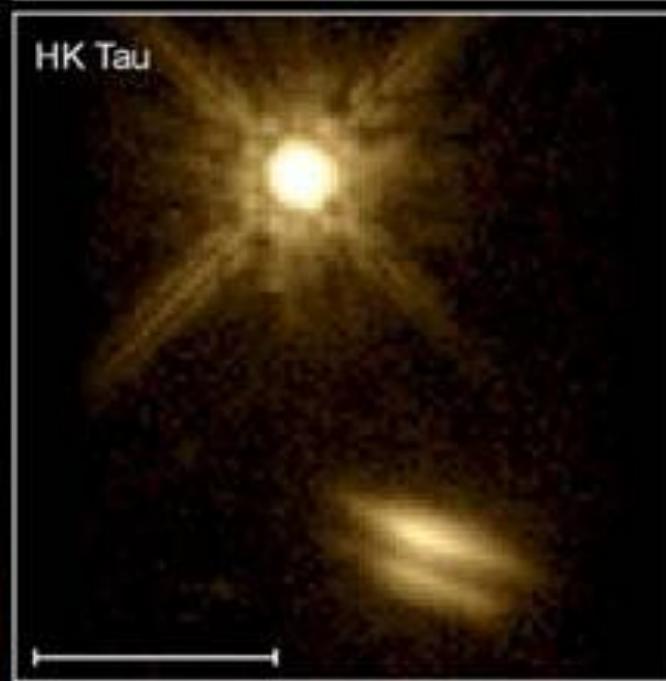
DG Tau B



Haro 6-5B

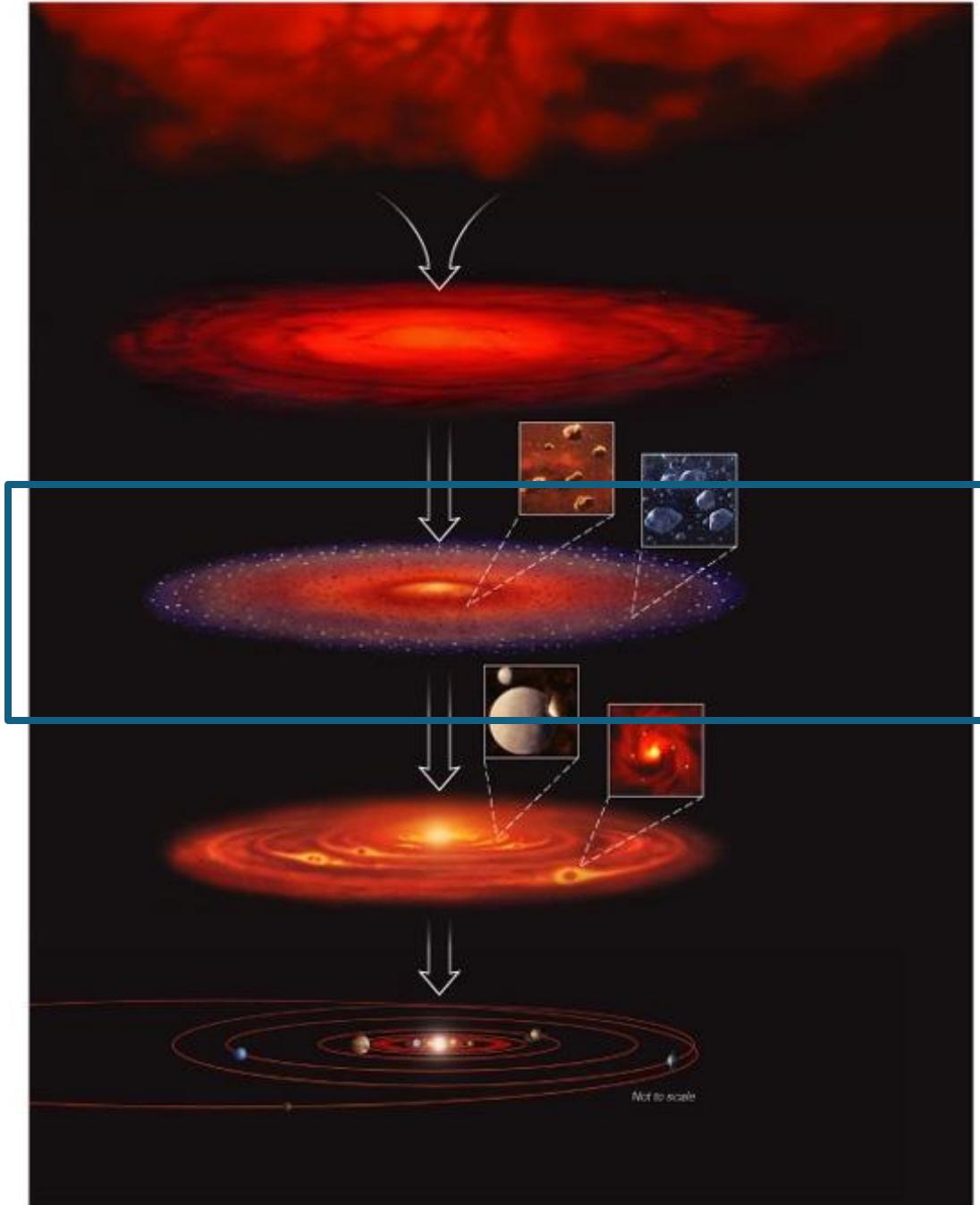


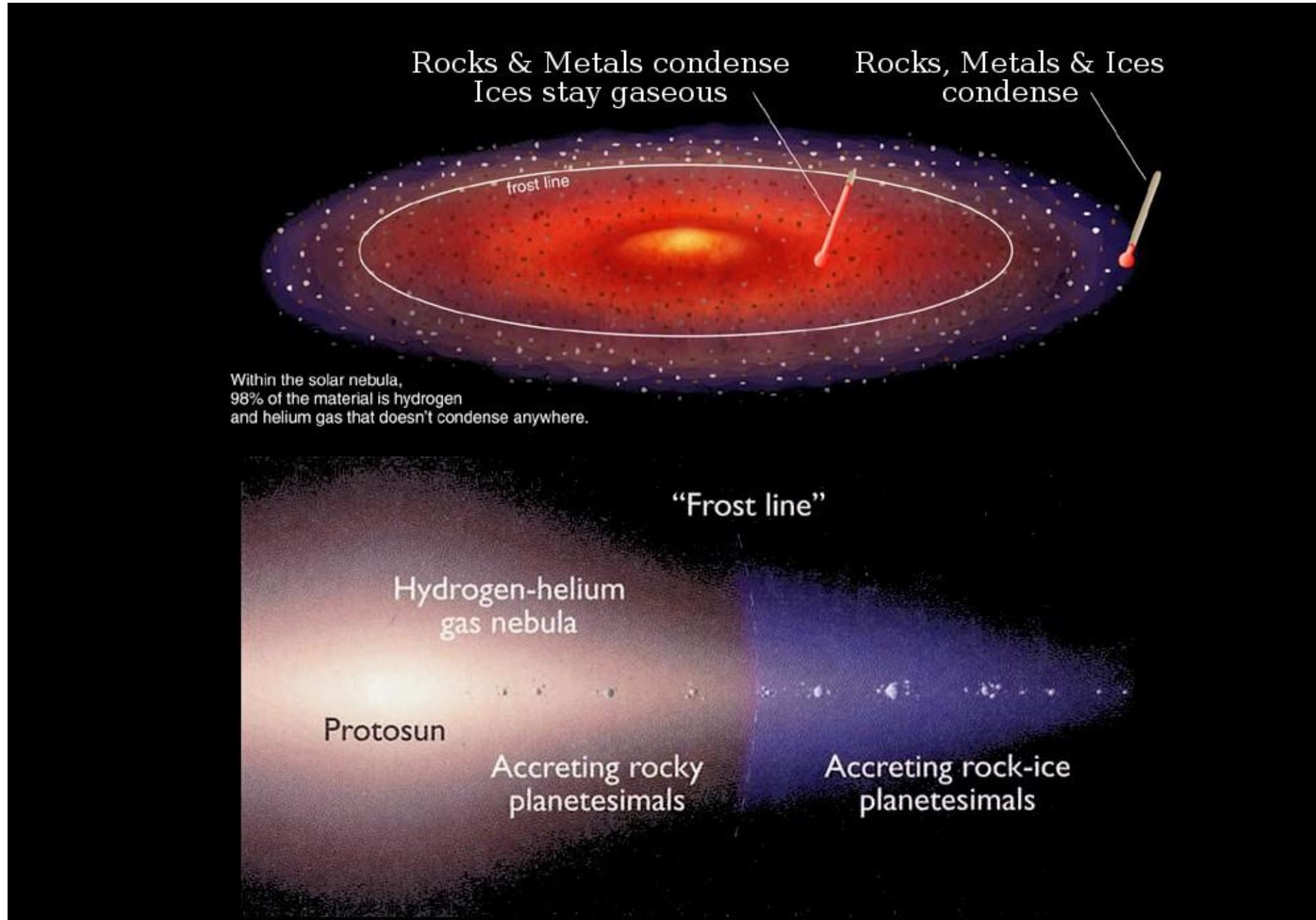
HK Tau



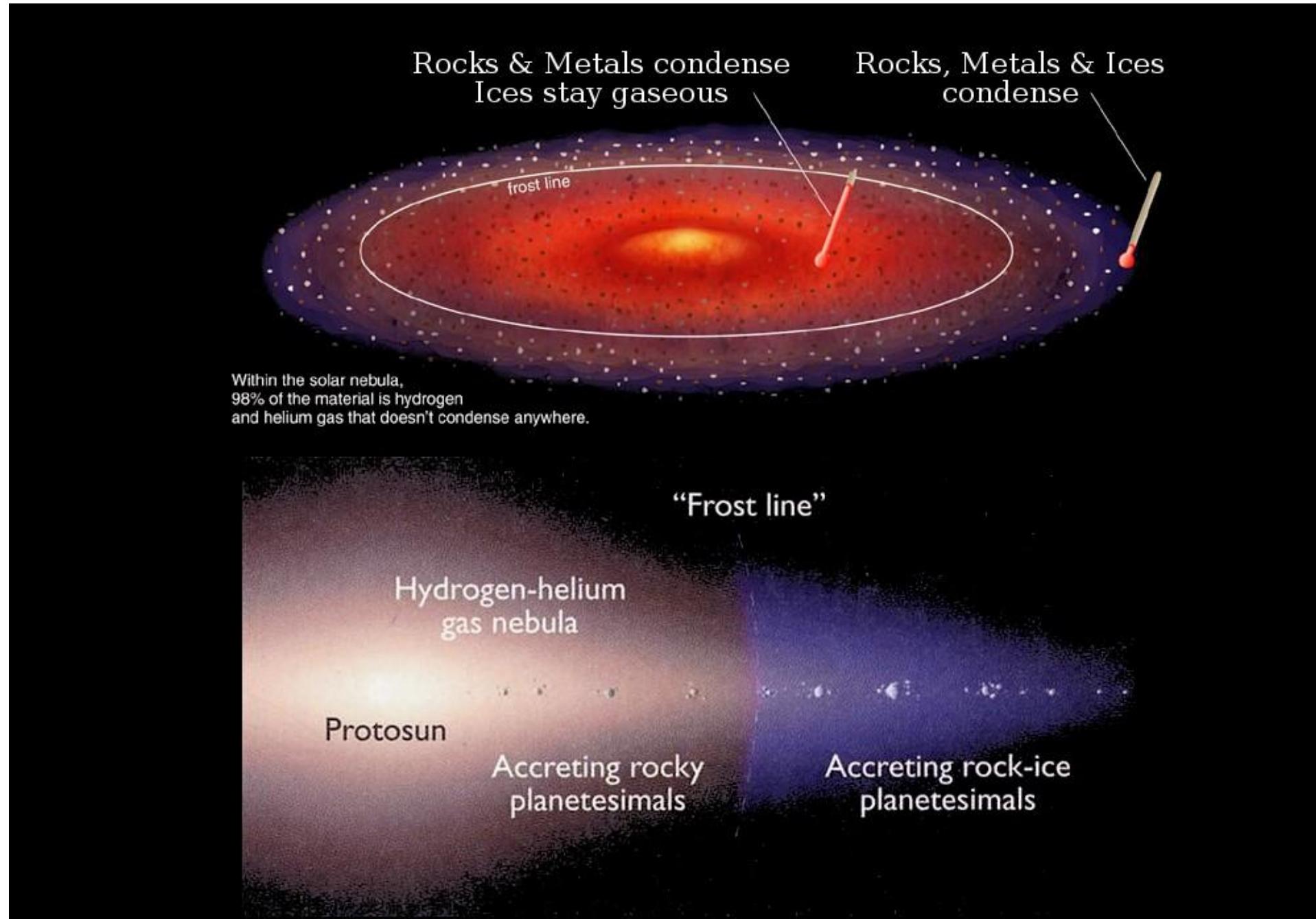
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3. Chemistry takes over: Materials condense and form solids depending on the distance from the Sun



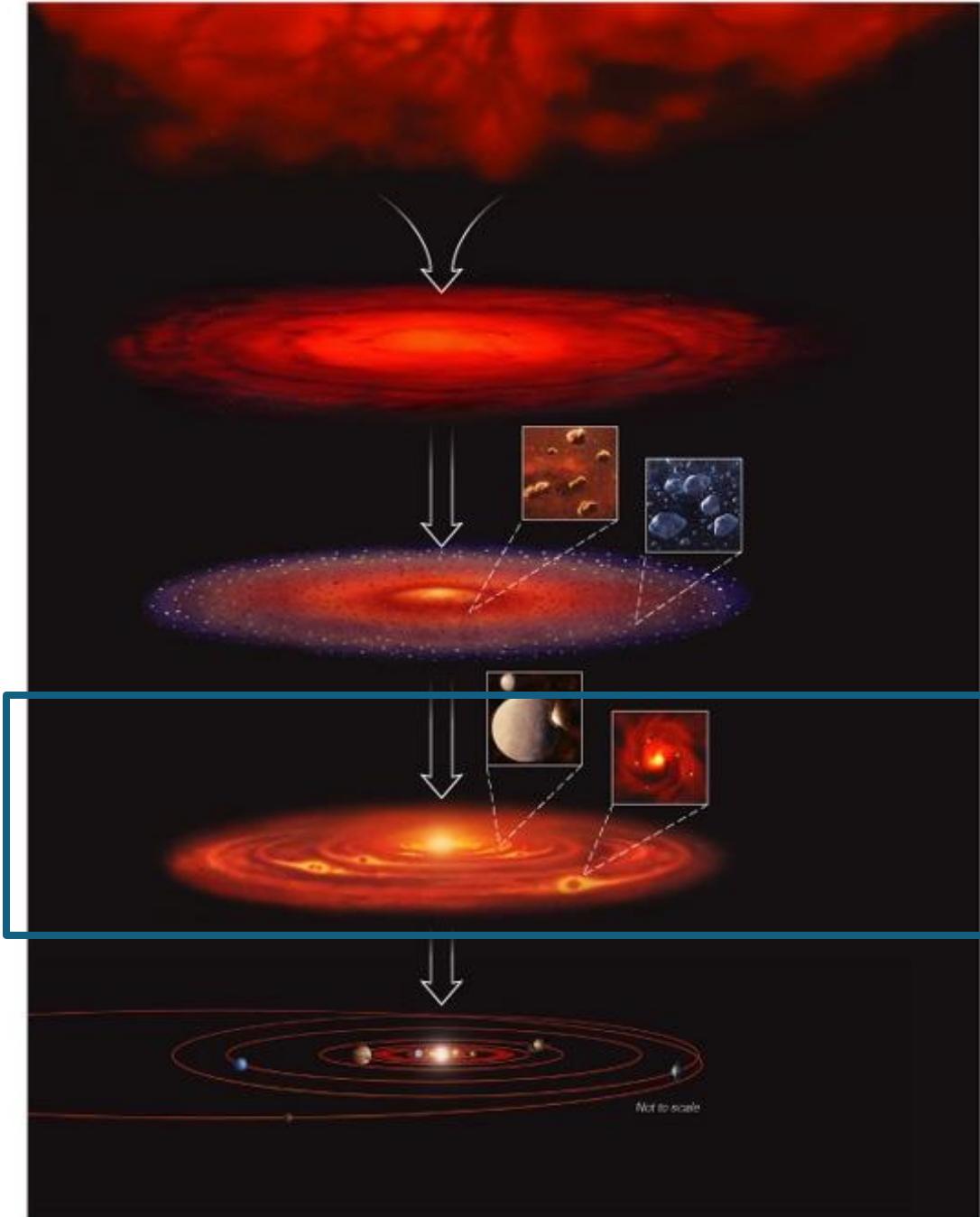






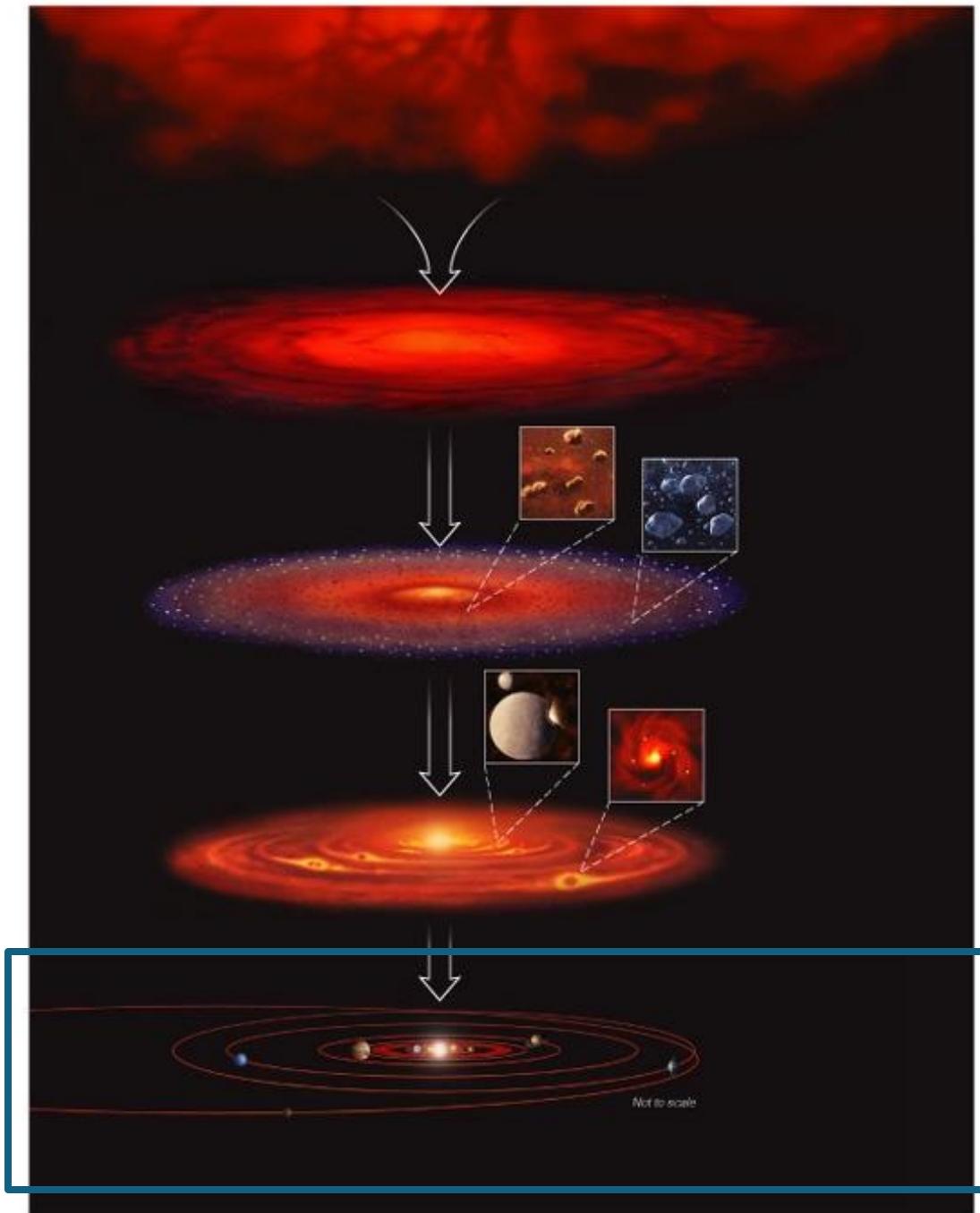
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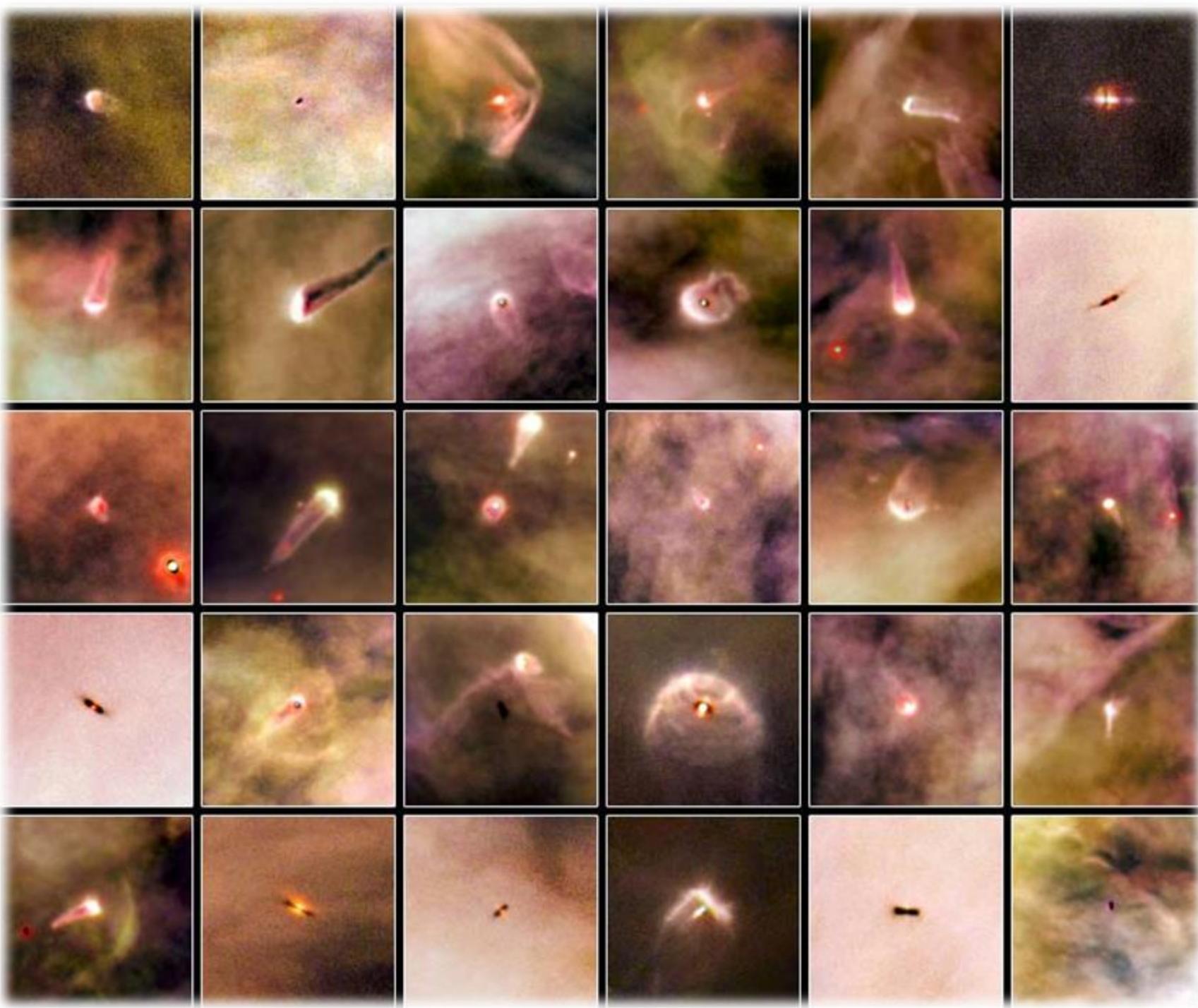
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# Nebular Theory

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# Problems...

- How does Earth still have water?
- Why is Venus rotating “backwards” with a 244 day period?
- Why is Uranus’ tilt nearly aligned with it’s orbit, not with the Suns?

