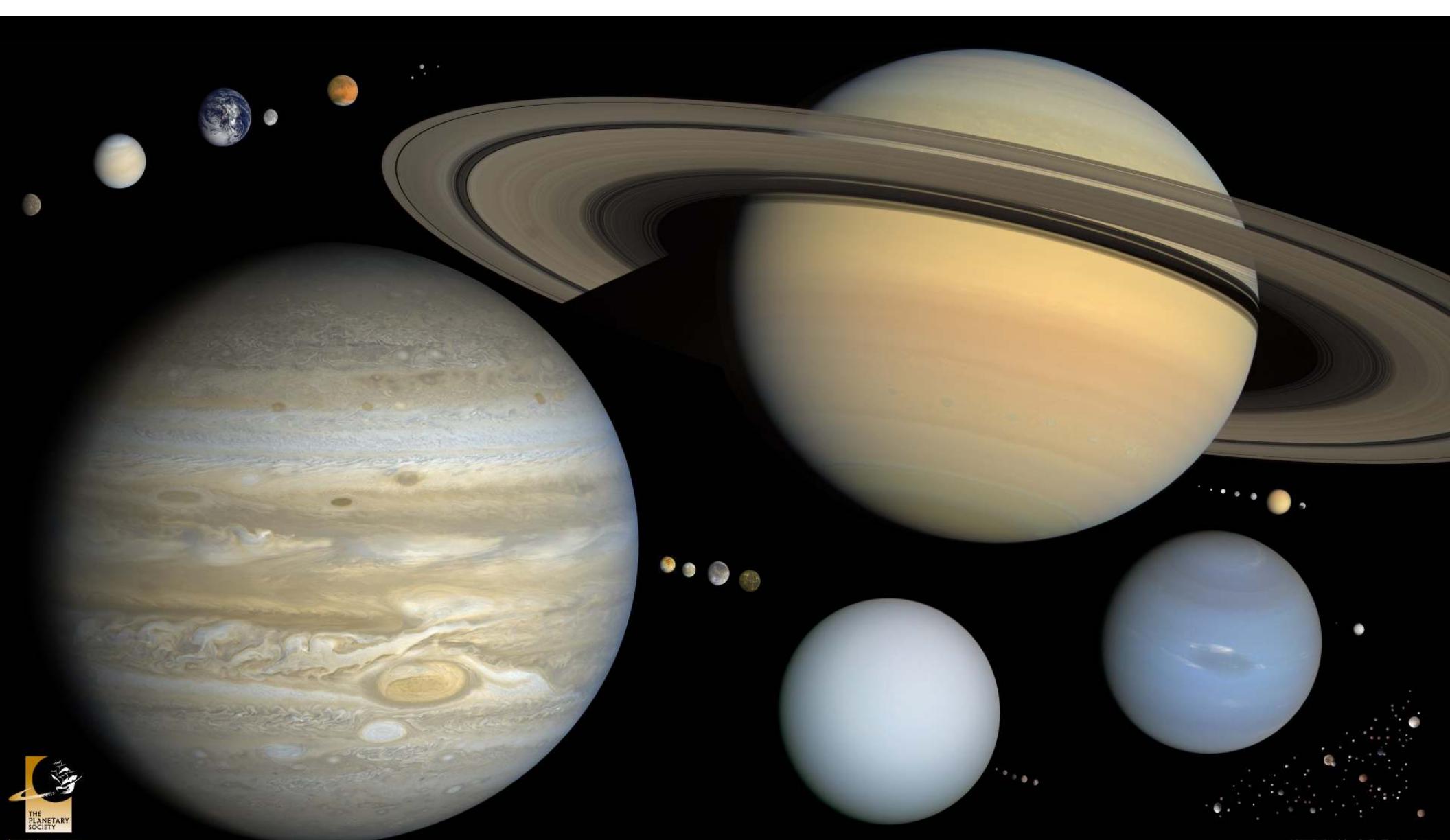


# Planets!

Astro 101: Astrophysics and the University of Victoria



<http://planetary.org>

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Images from NASA/JPL & JHUAPL missions, processed by Björn Jónasson; Mattias Malmer; Ted Stryk; Gordan Ugarković; INGS NASA, ESA, and A. Feld (S1Sci)

# worlds to explore

# Planetary Surfaces

Venus



Earth



Moon



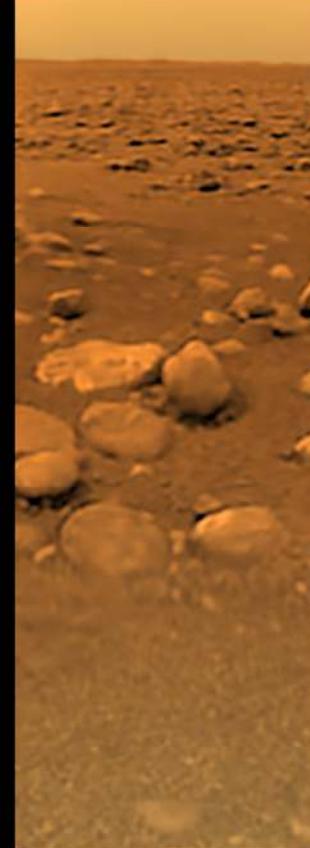
Mars



Asteroid Itokawa



Titan



## Image Credits:

Venus [Venera 14]; IKI / Don Mitchell / Ted Stryk / Mike Malaska  
Earth / Mike Malaska

Moon [Apollo 17]; NASA

Mars [Mars Exploration Rover Spirit]; NASA / JPL / Cornell / Mike Malaska

Asteroid Itokawa [Hayabusa]; ISAS / JAXA / Gordan Ugarkovic

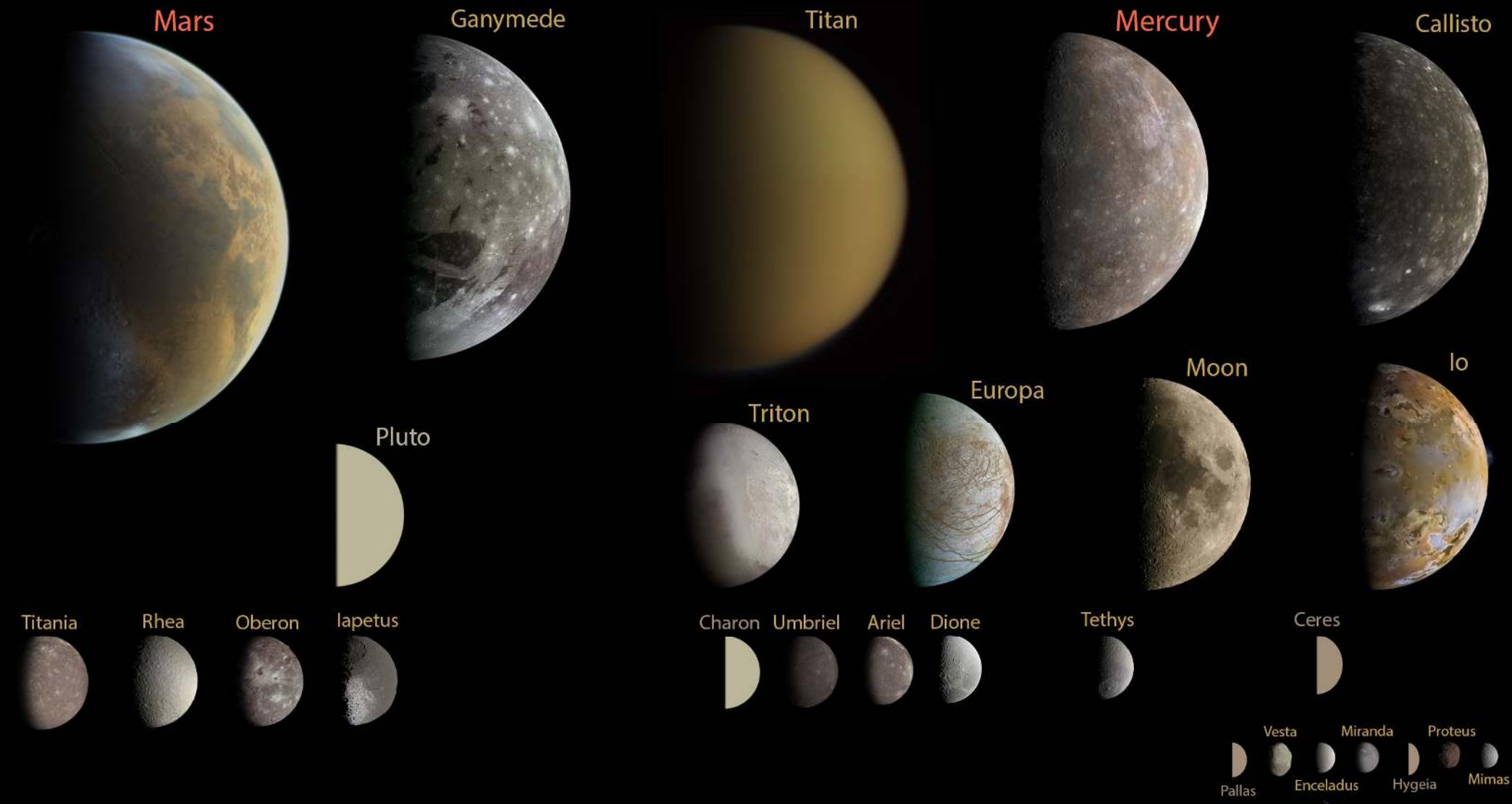
Titan [Cassini-Huygen]; ESA / NASA / JPL / University of Arizona

Composition by Mike Malaska

# Worlds <10k km visited by spacecraft, 2014



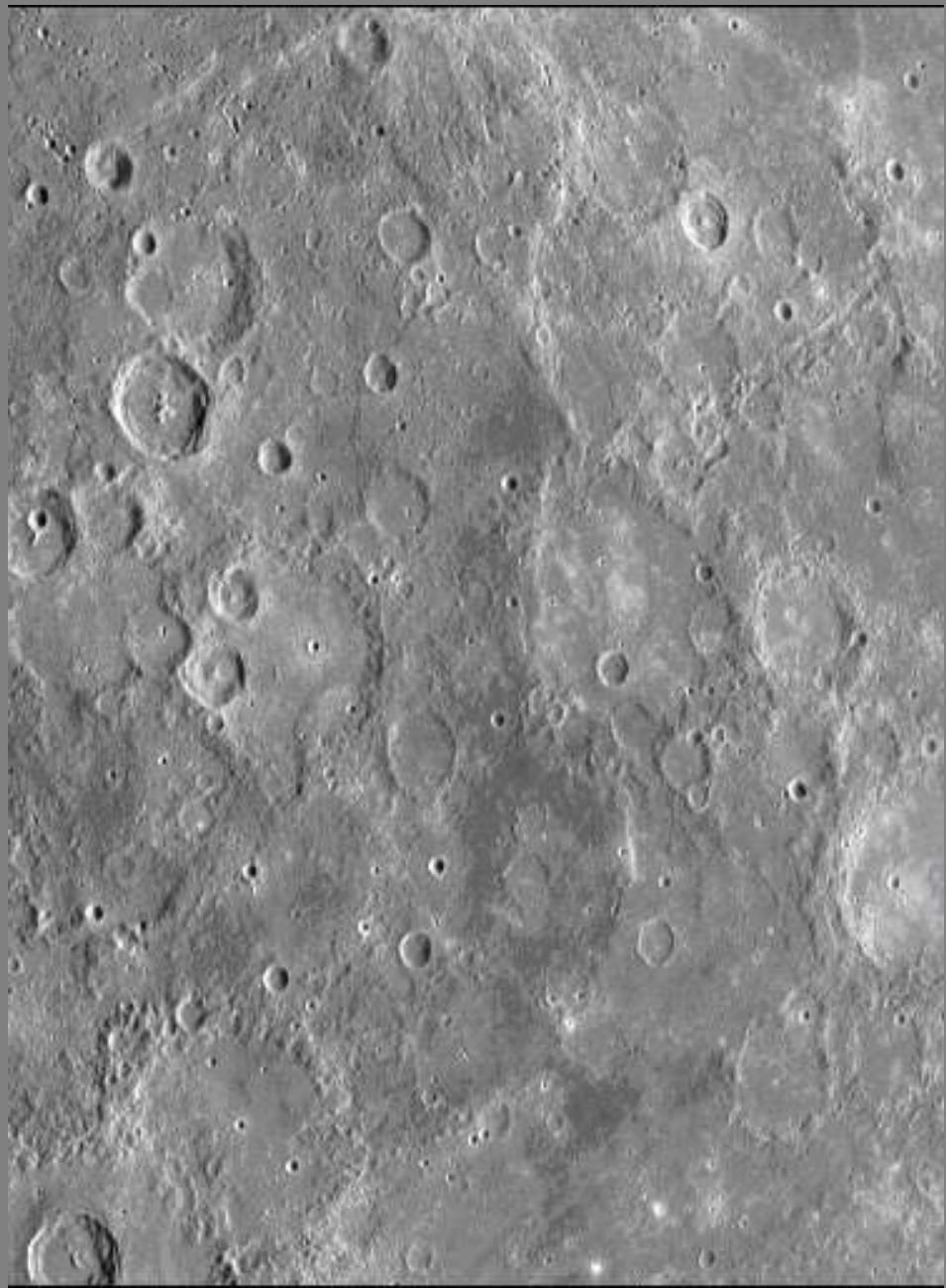
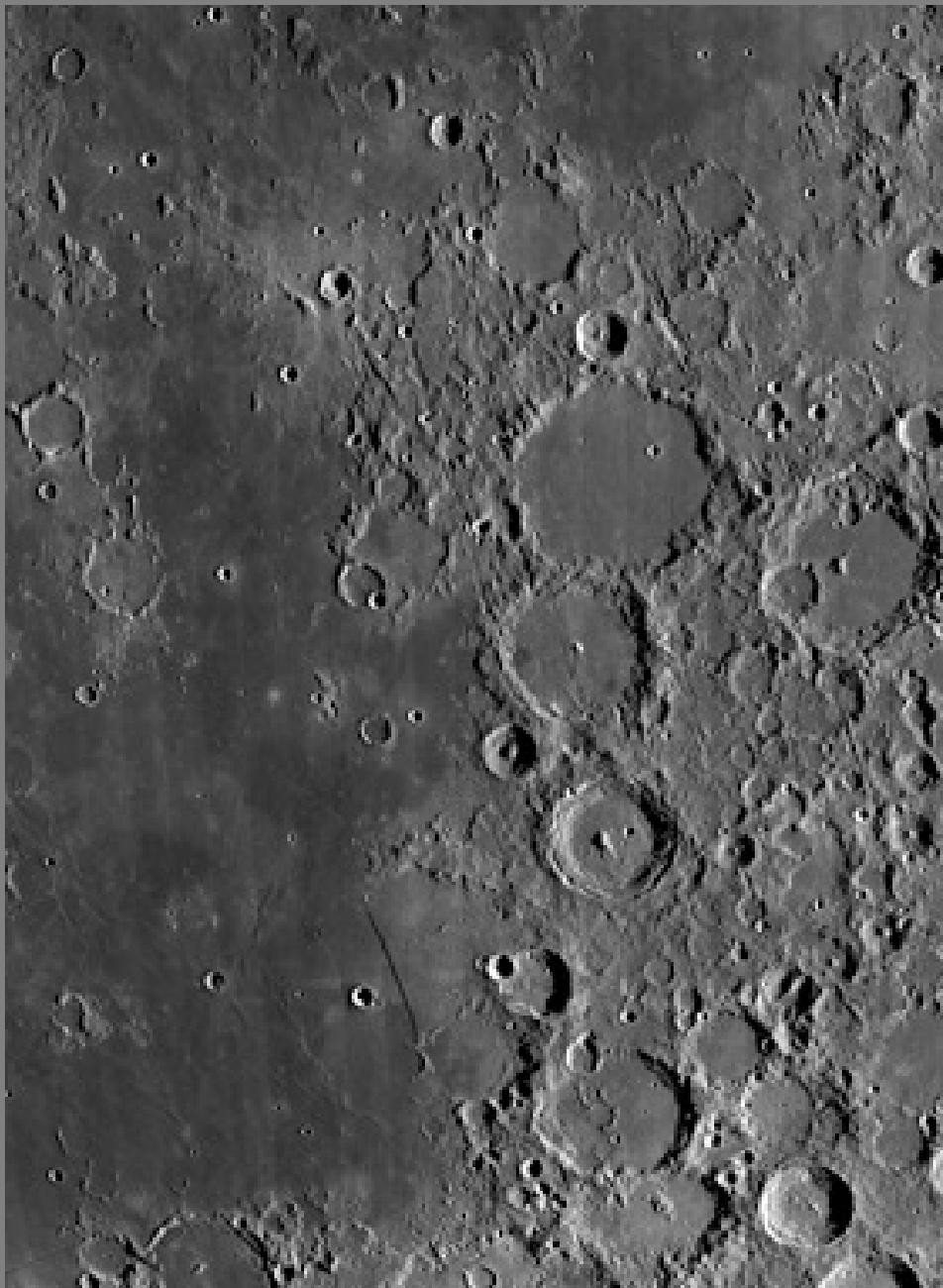
# Worlds <10k km visited by spacecraft, 2015



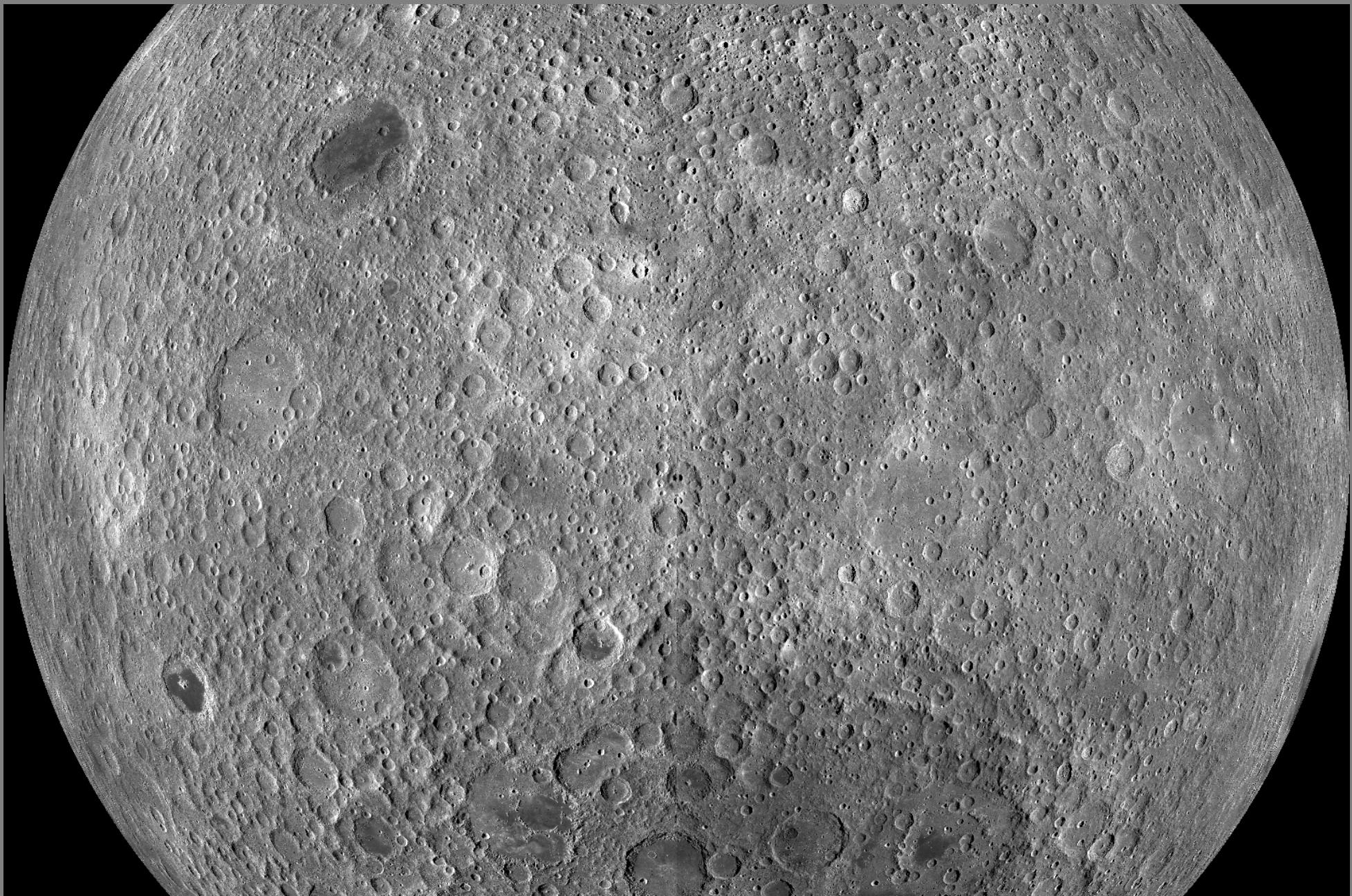


The impact crater Kuiper

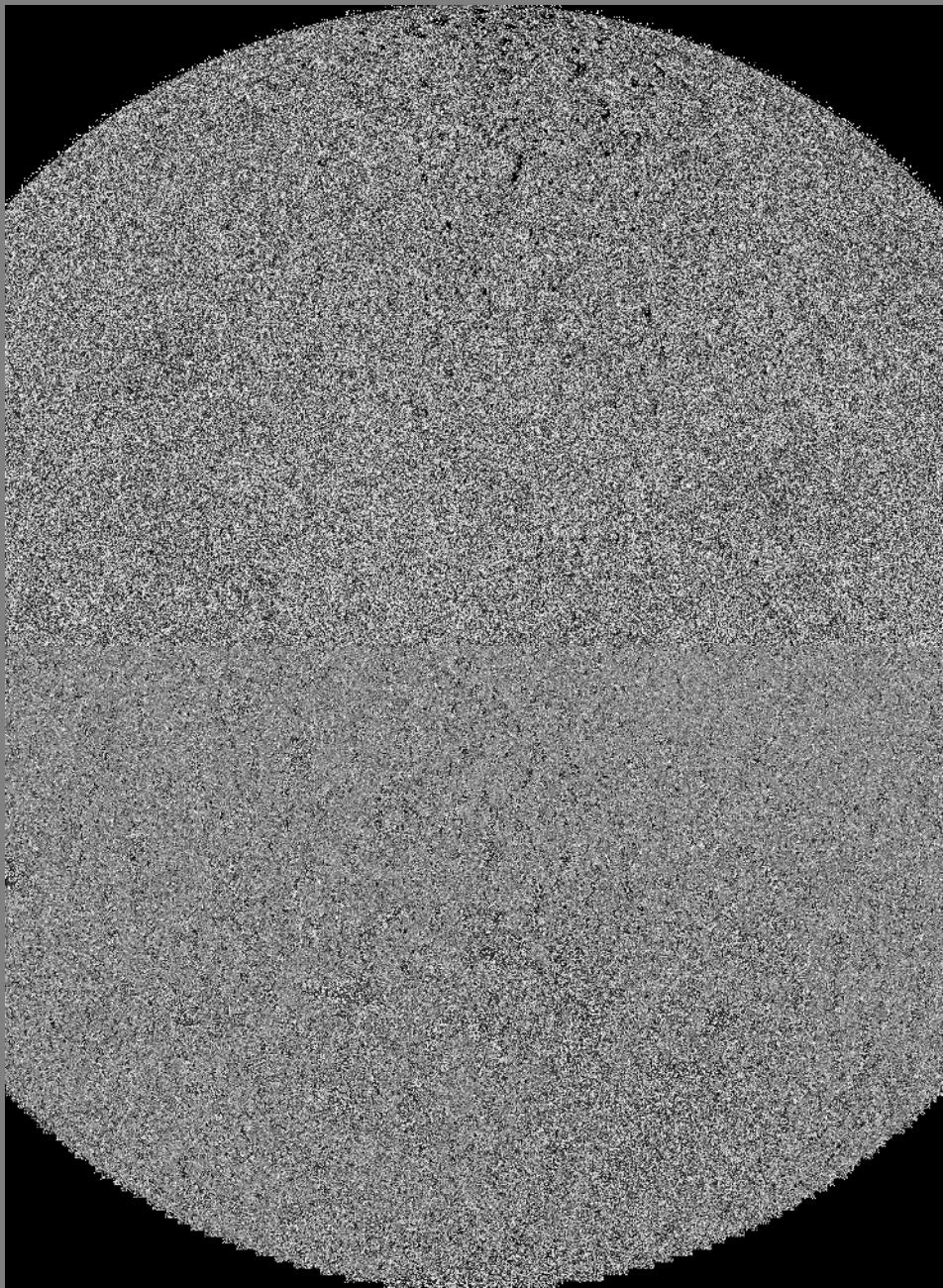
fresh surface features



Mercury, a lunar twin? Understanding one object helps us understand the other one better. Constraining physics of 'one-off' things is not possible.



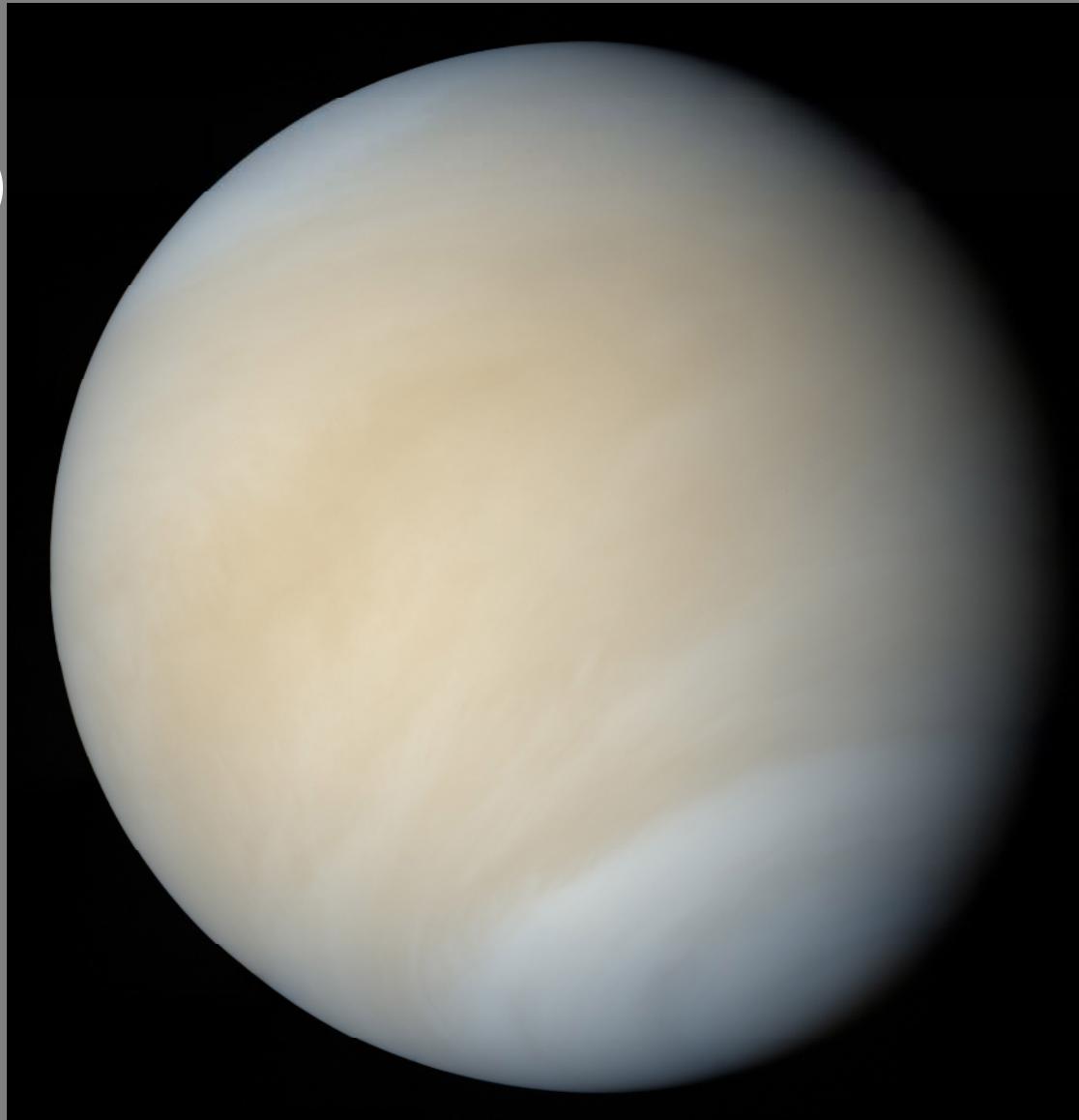
The far side of the moon... an unfamiliar view of a very familiar friend



An enormous lack of symmetry that is often misunderstood

# Venus

- Venus Express (ESA)
- Akatsuki (JAXA)  
(maybe 2015)
  - IR mapping,  
atmospheric study



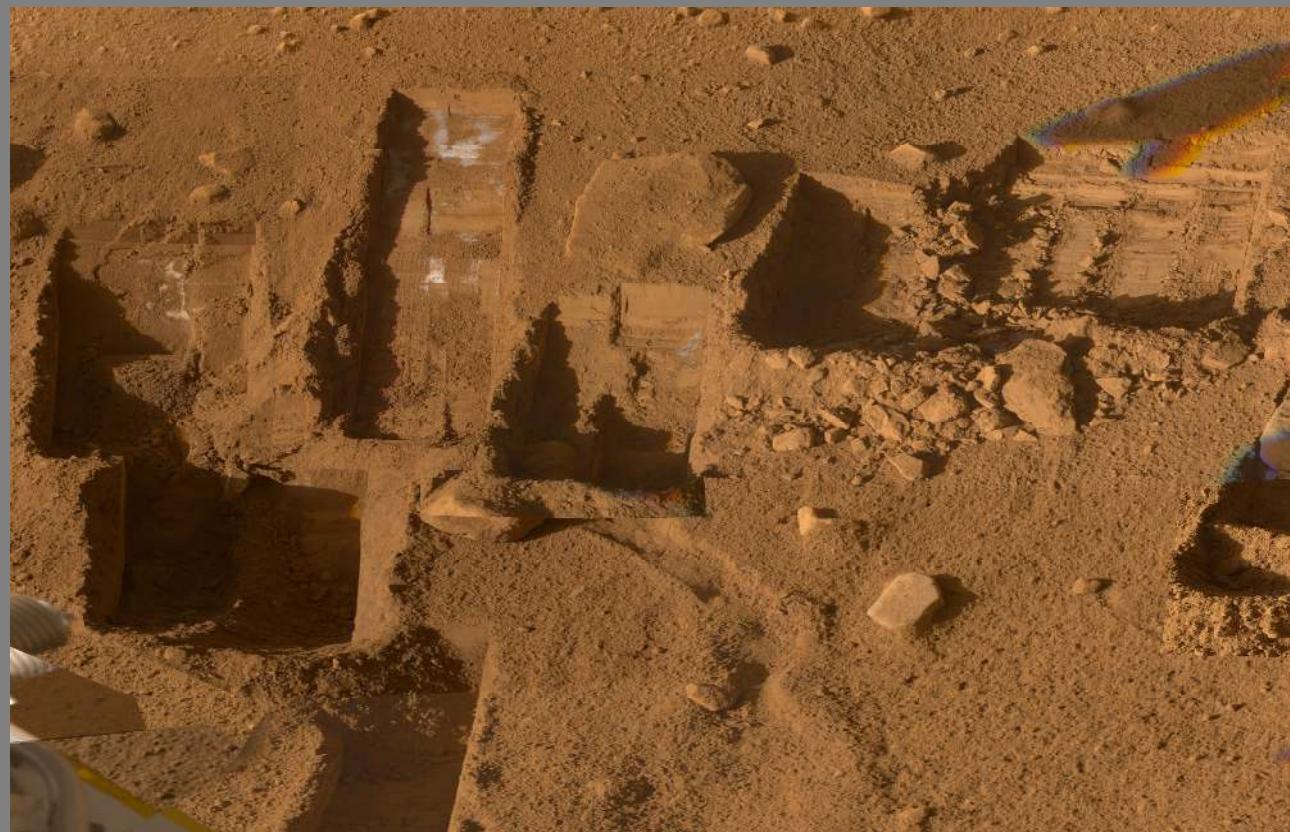
# Polygonal patterned ground



# Mars Phoenix Lander

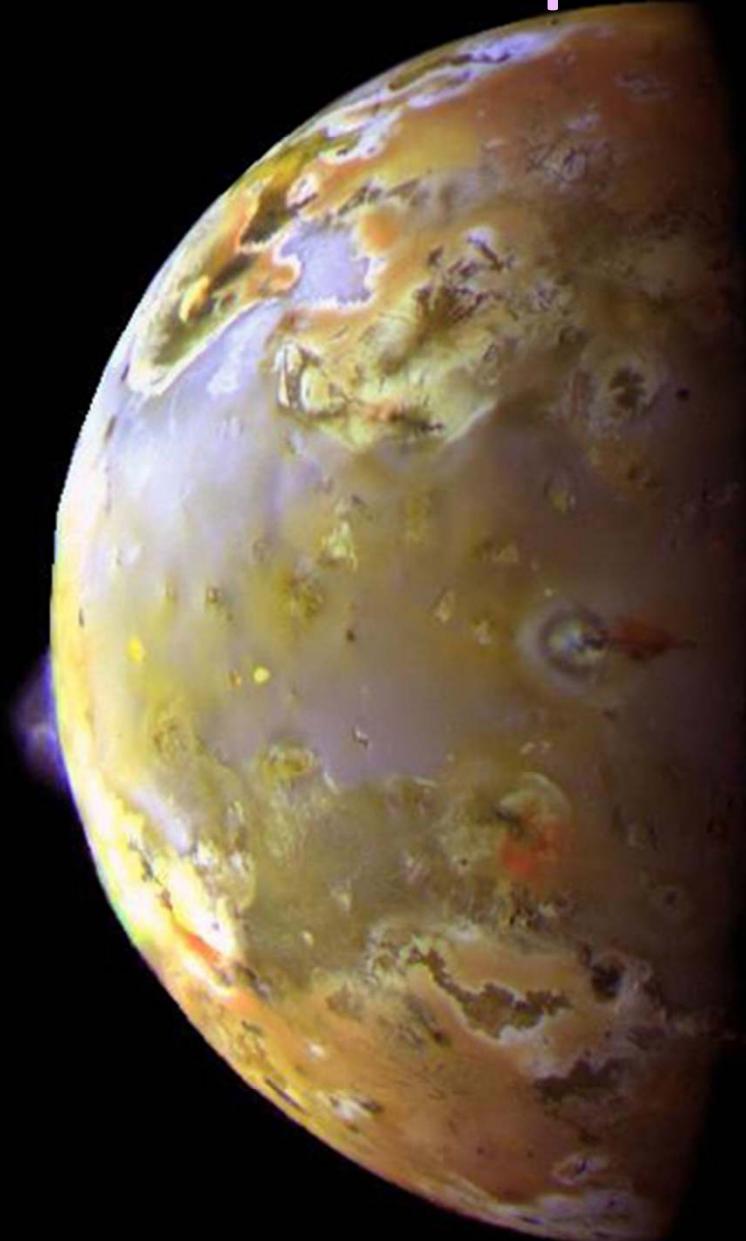


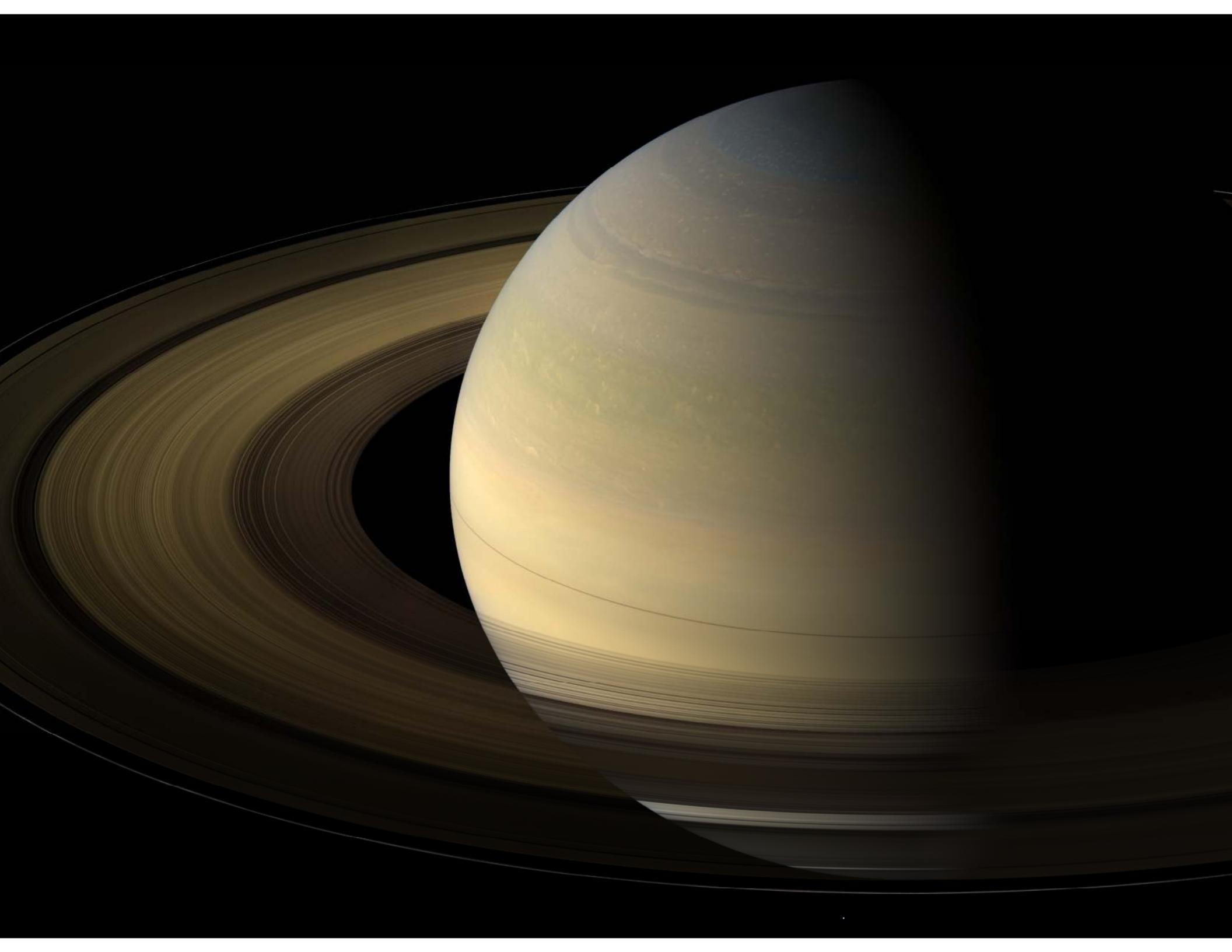
Victoria Valley

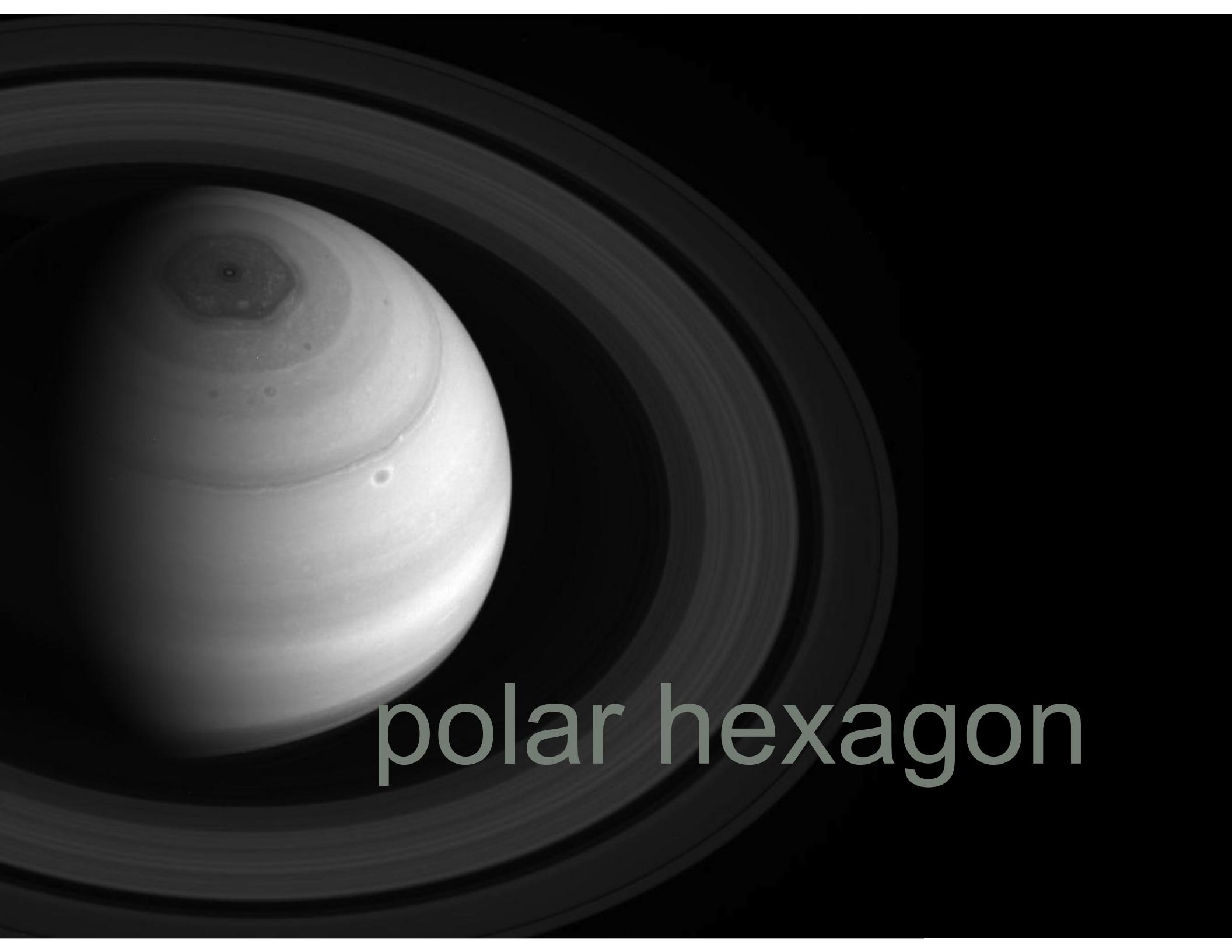


Ice is just below the surface of red dirt.

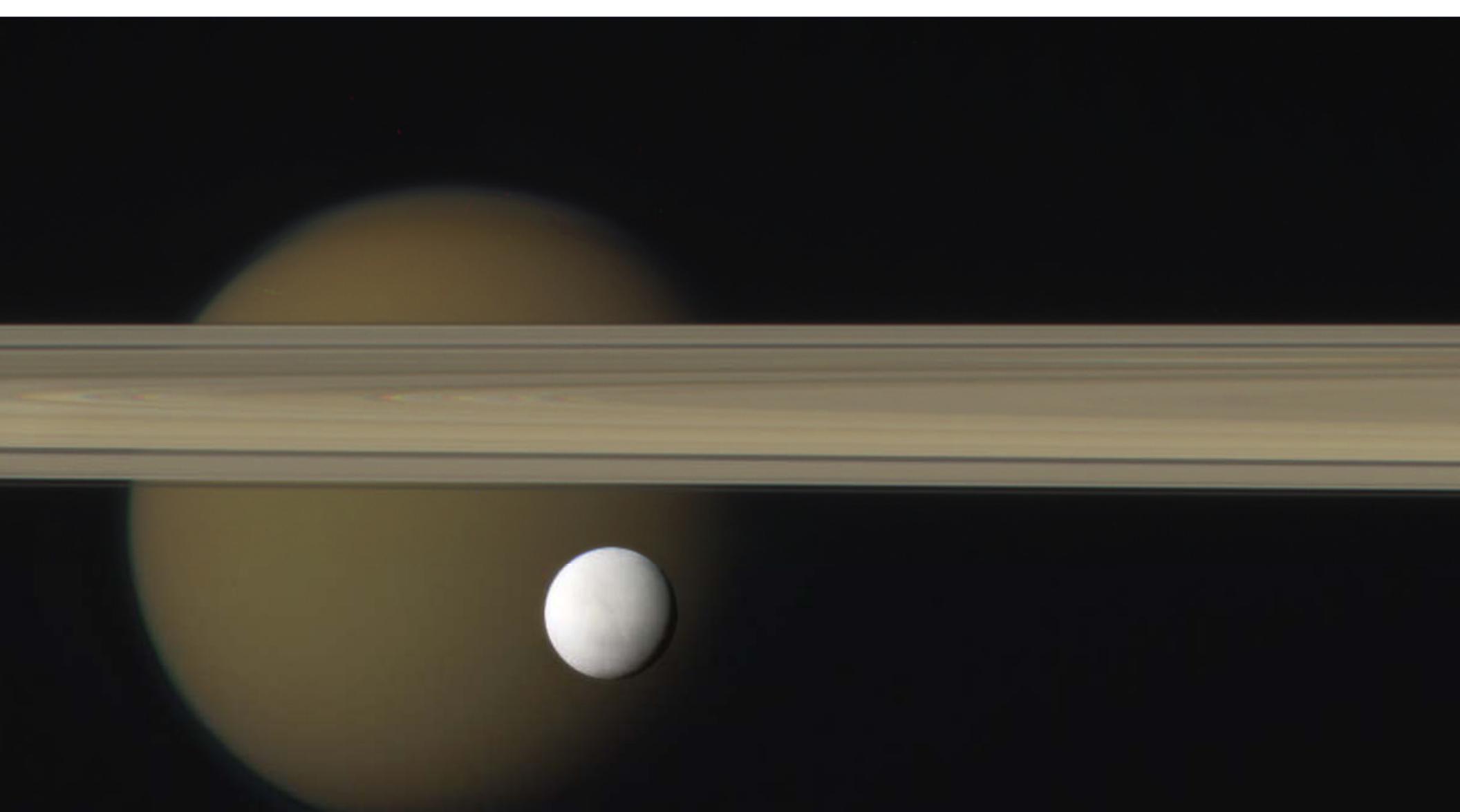
# Io, moon of Jupiter





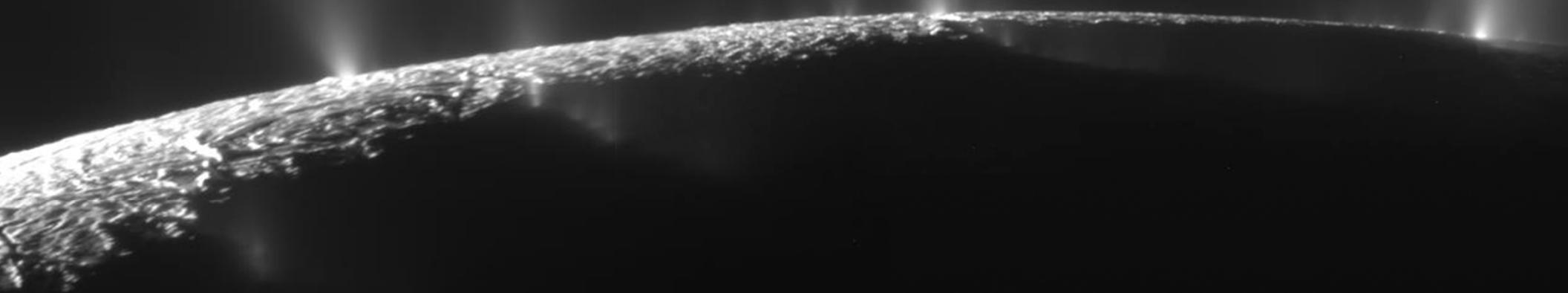


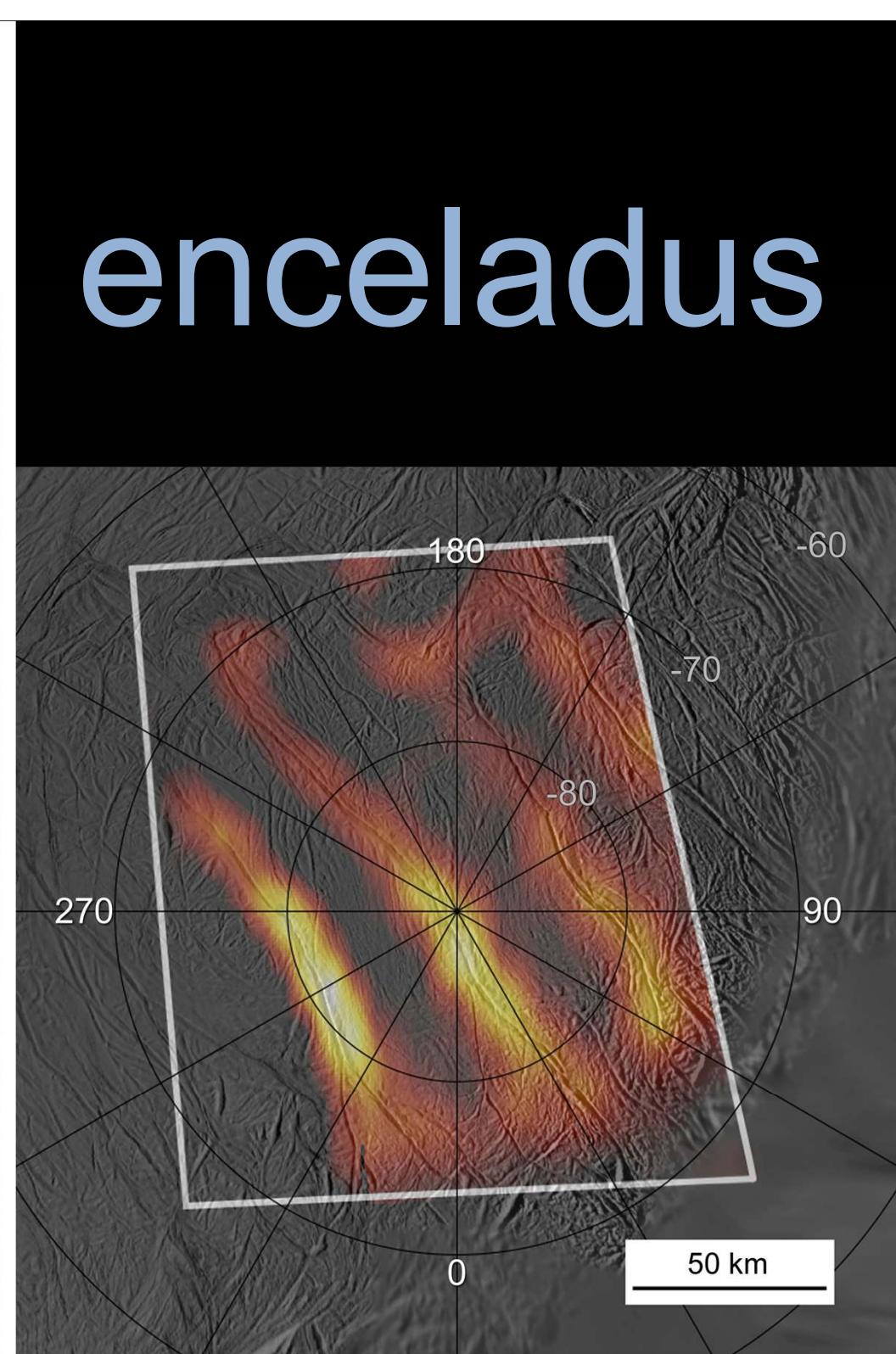
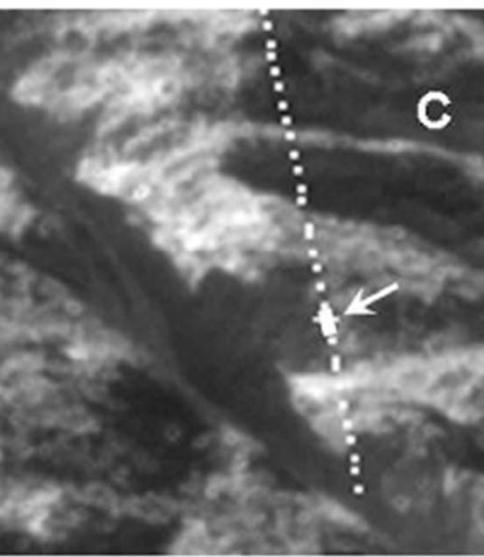
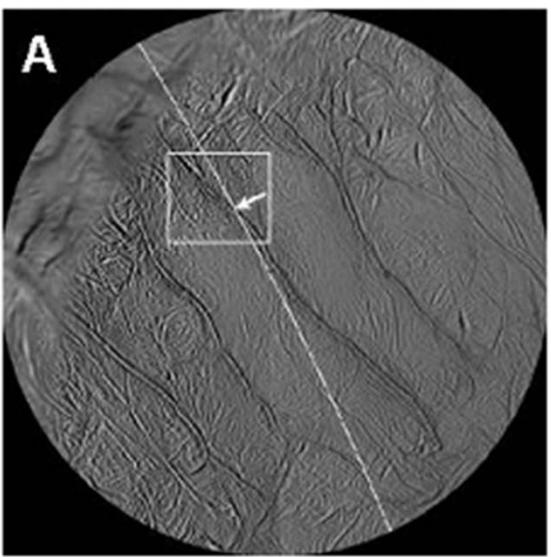
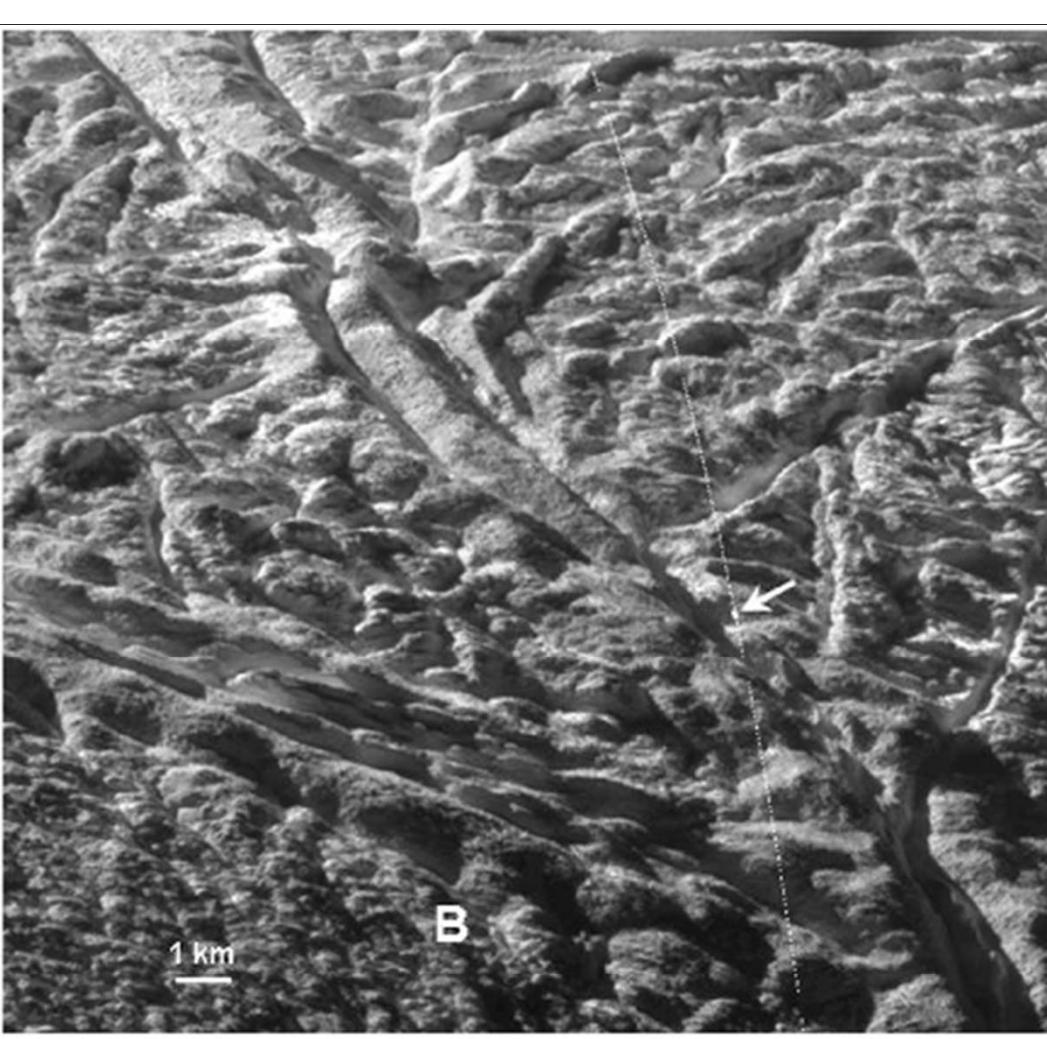
polar hexagon



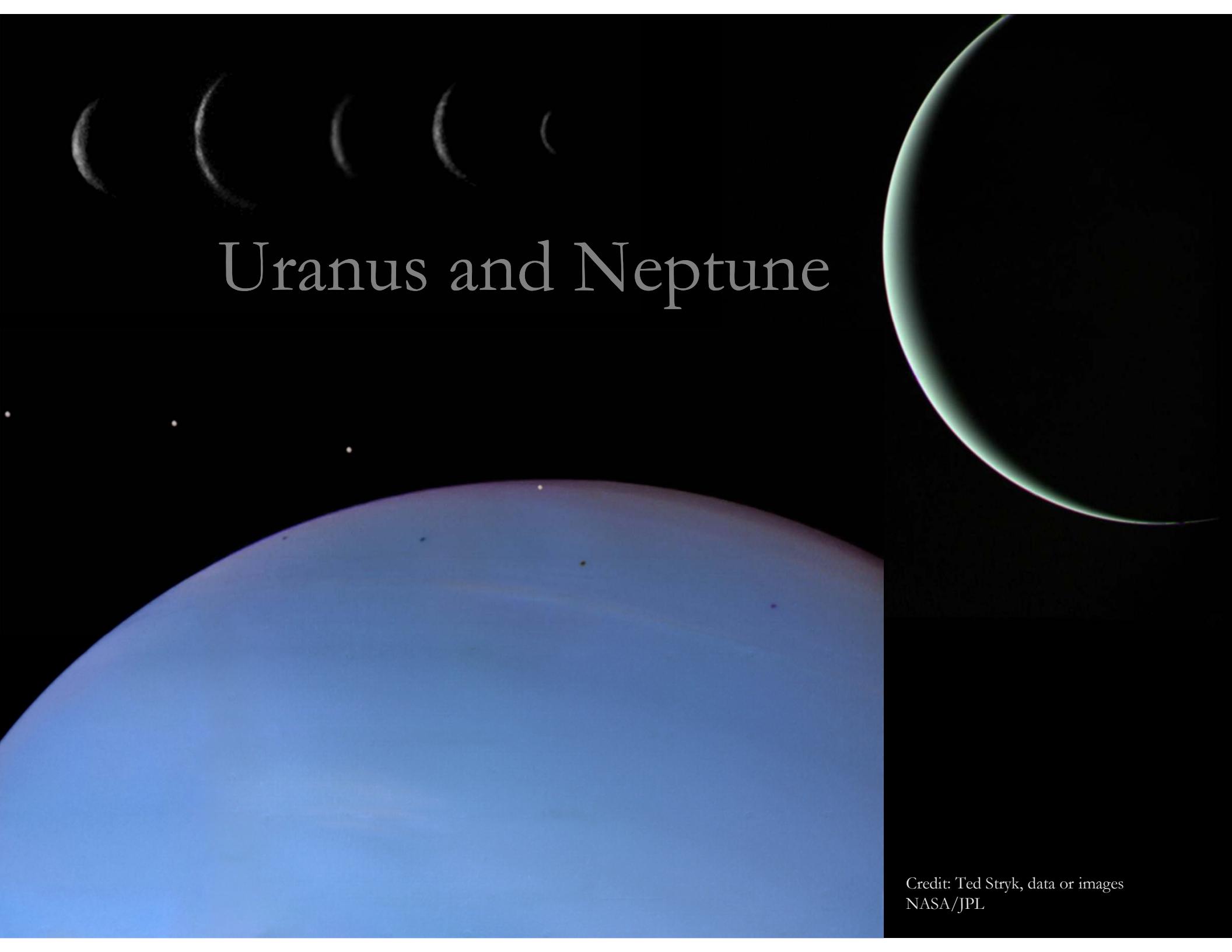
at saturn:  
titan, enceladus

# enceladus





enceladus



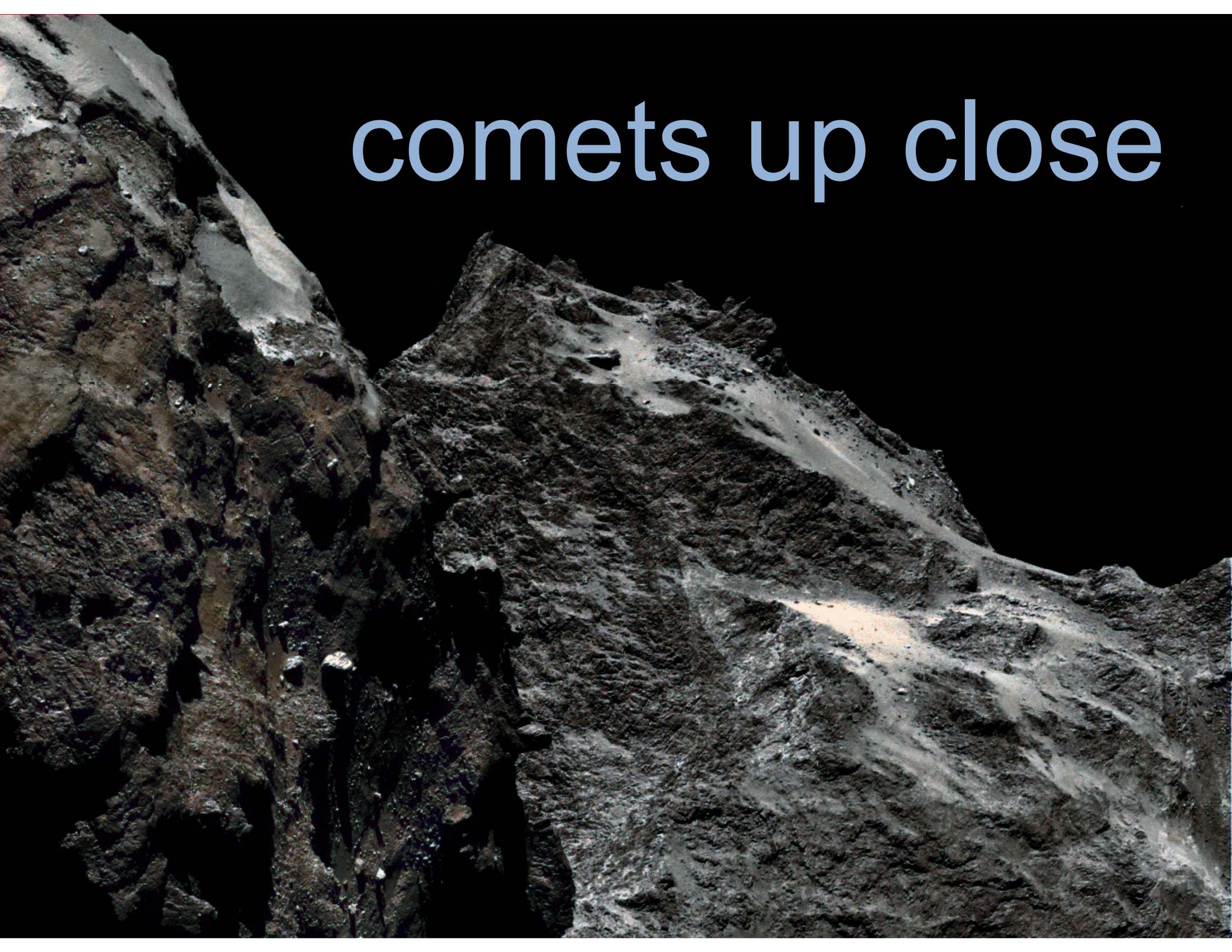
# Uranus and Neptune

Credit: Ted Stryk, data or images  
NASA/JPL



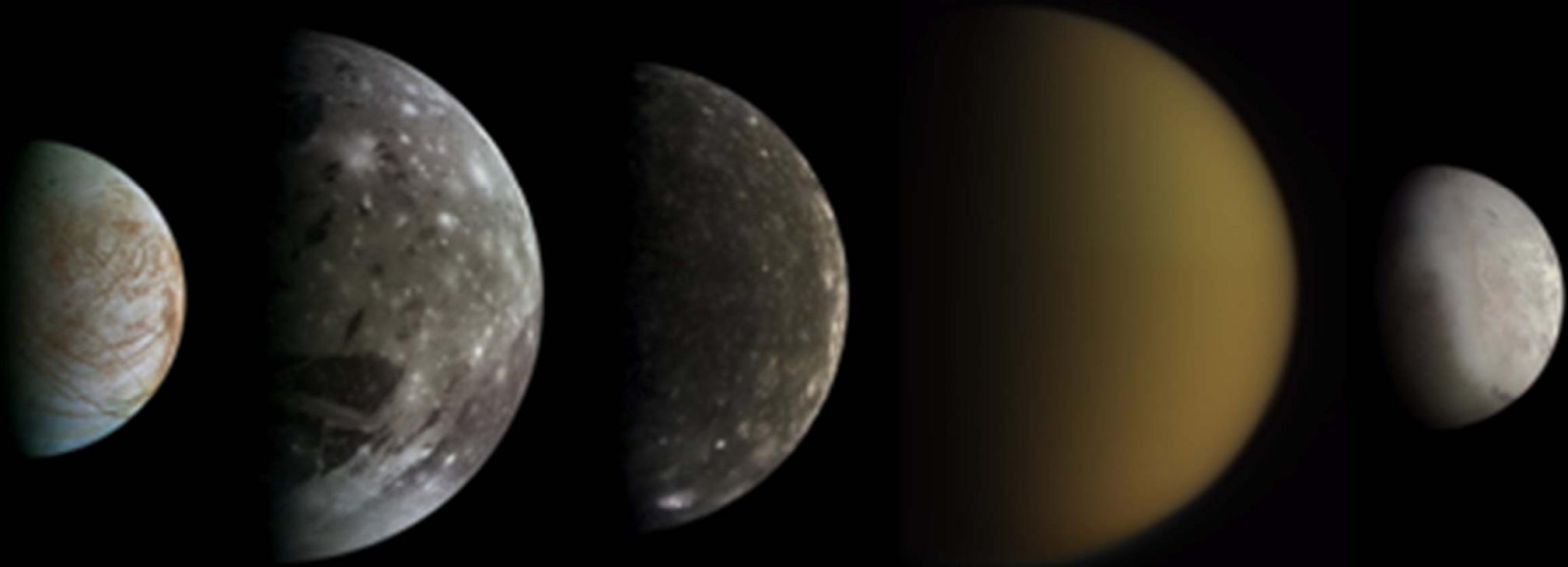
Planet formation

A standard model

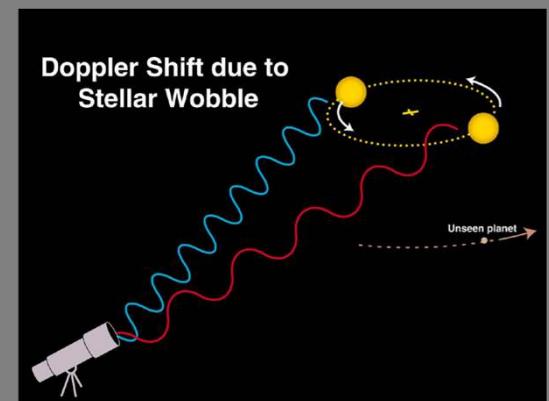
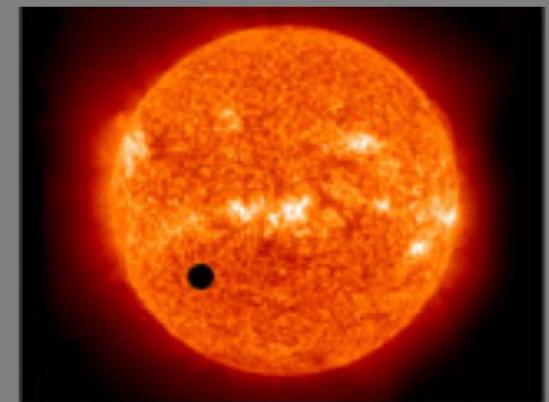
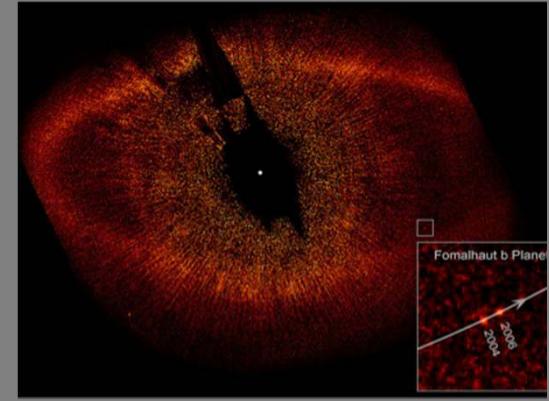
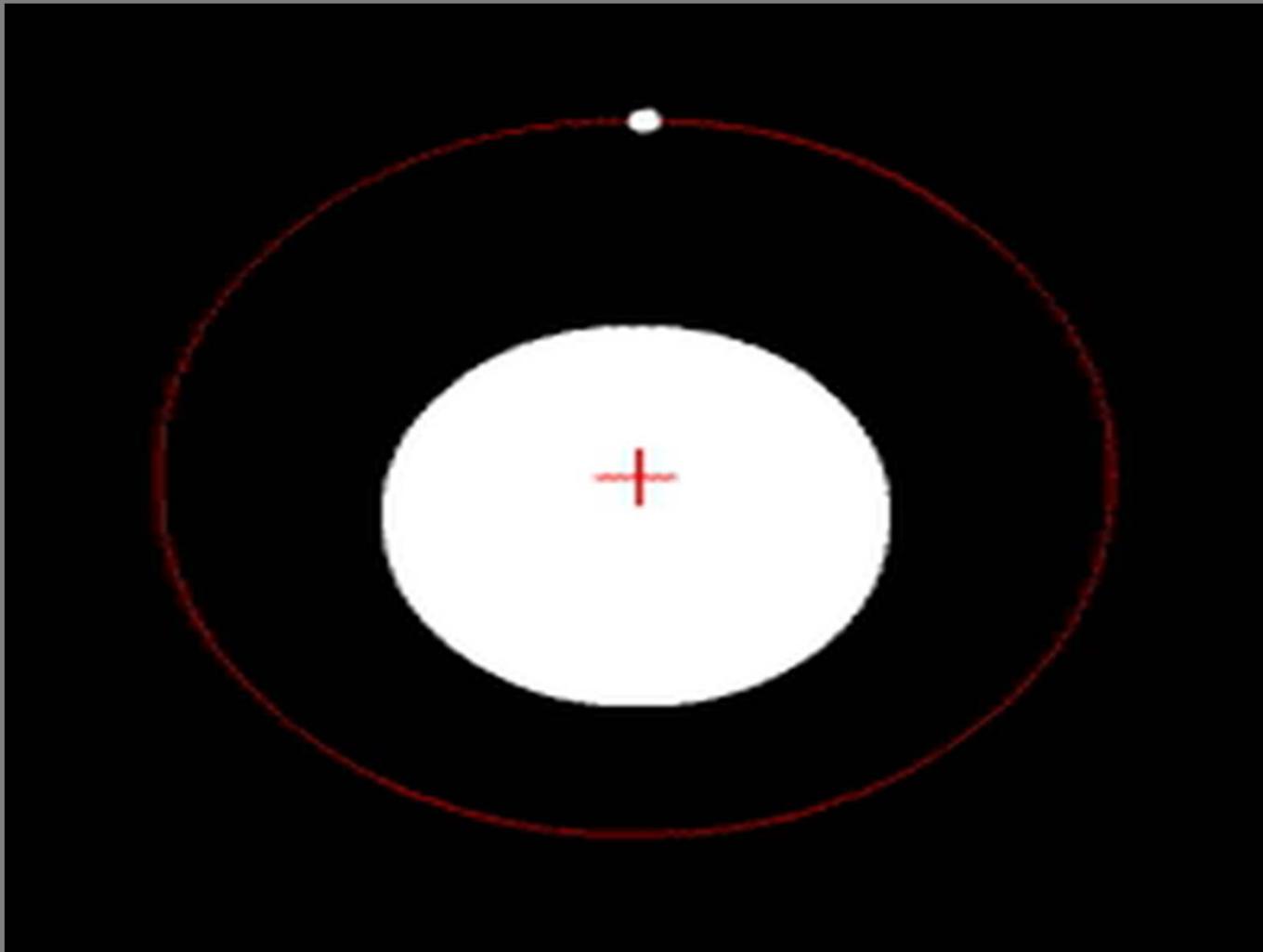


comets up close

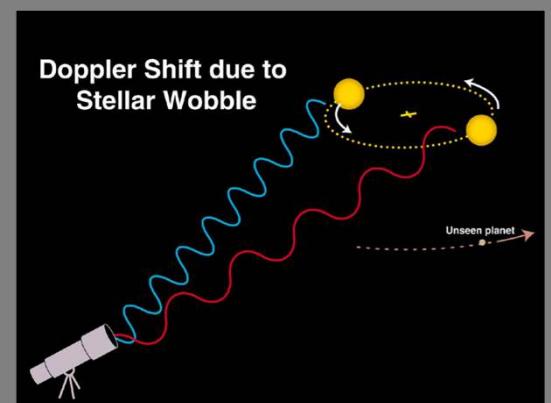
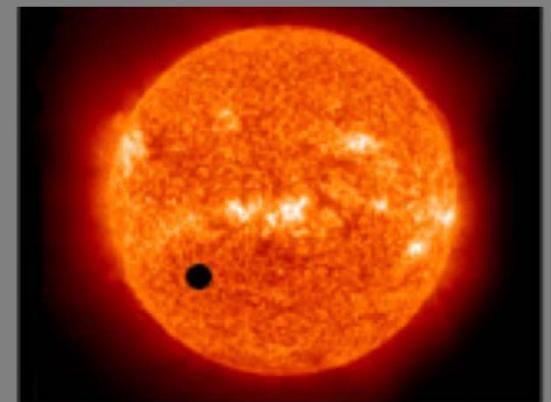
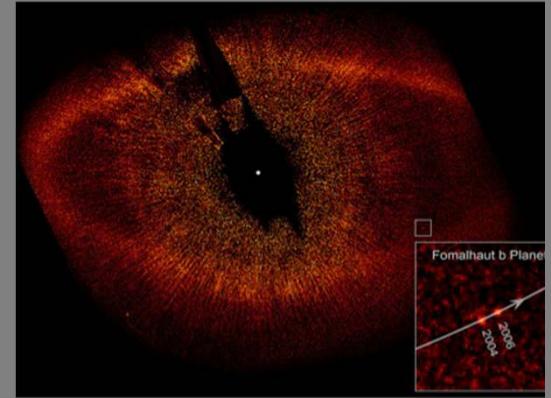
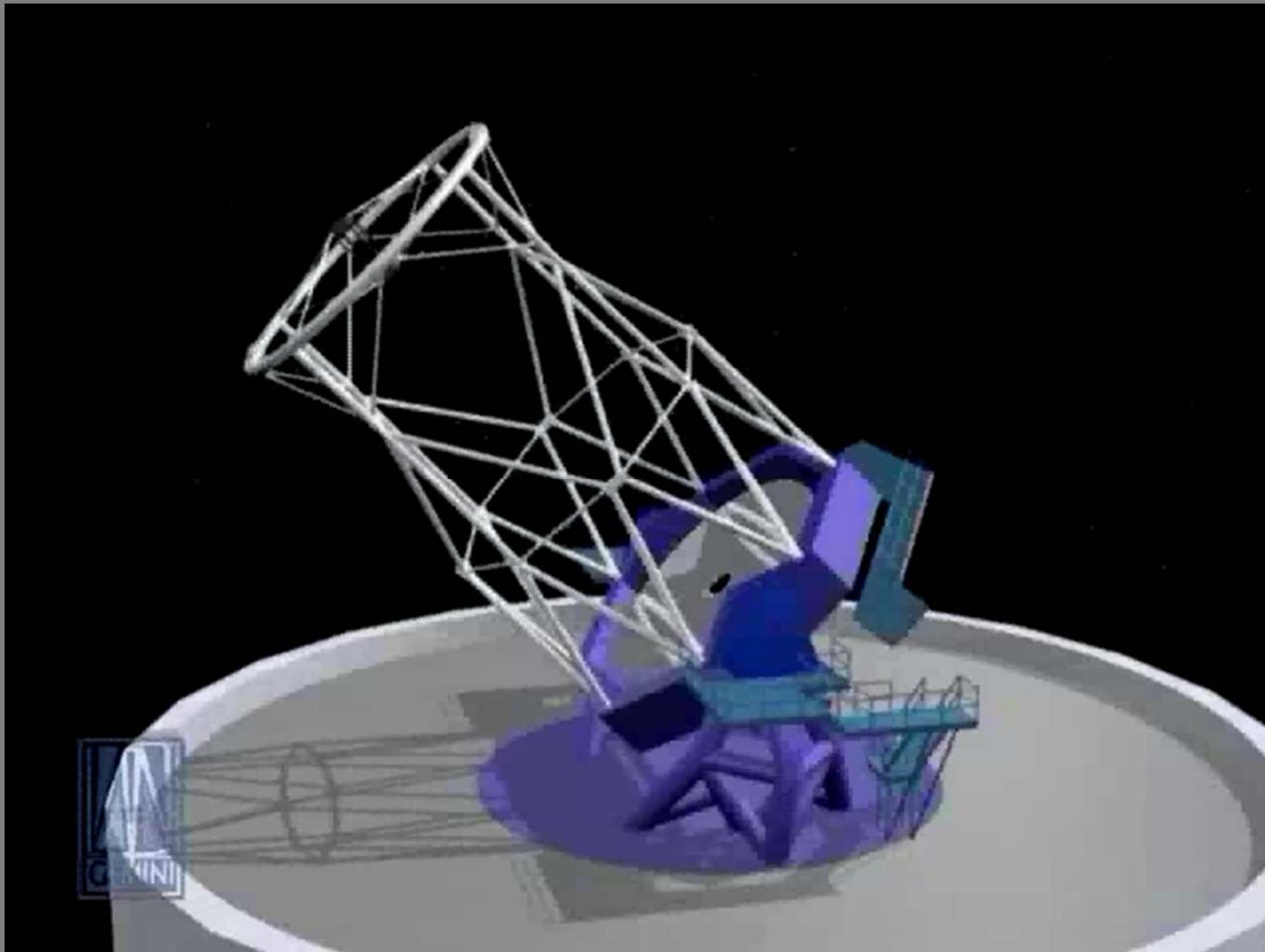




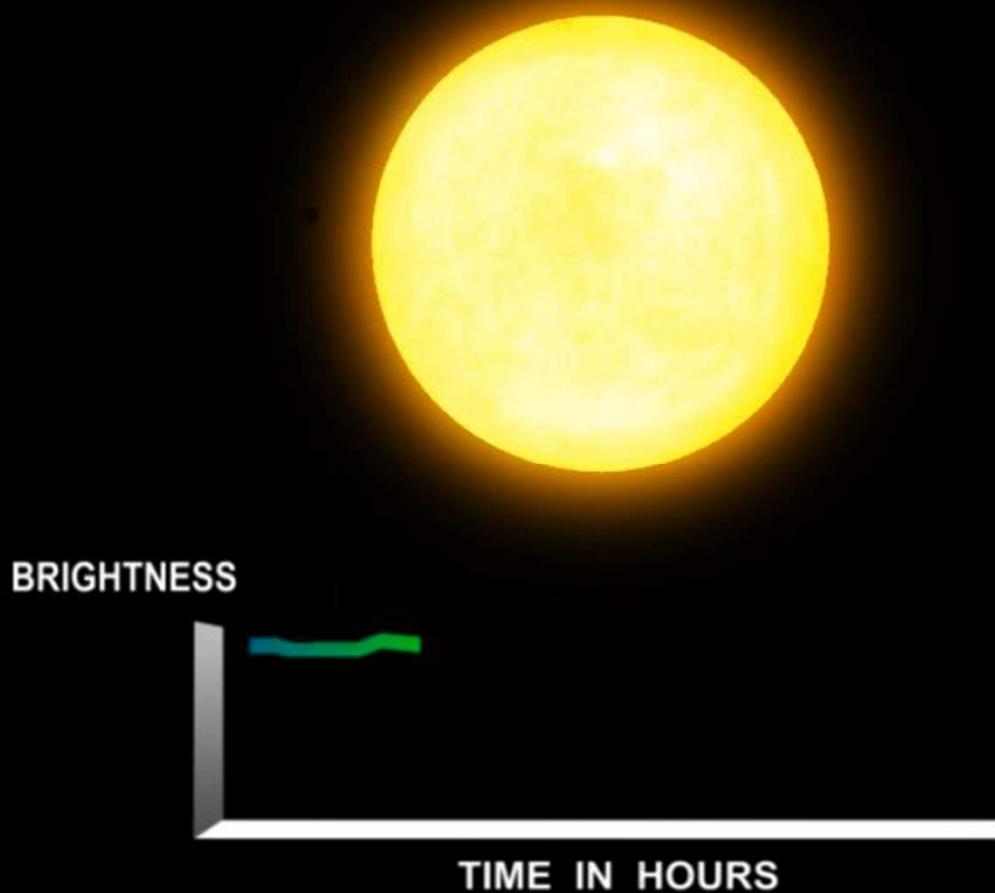
What worlds are there  
**elsewhere?**



Many ways to find planets, but they are all tricky. The most common: radial velocity, transits and direct imaging.

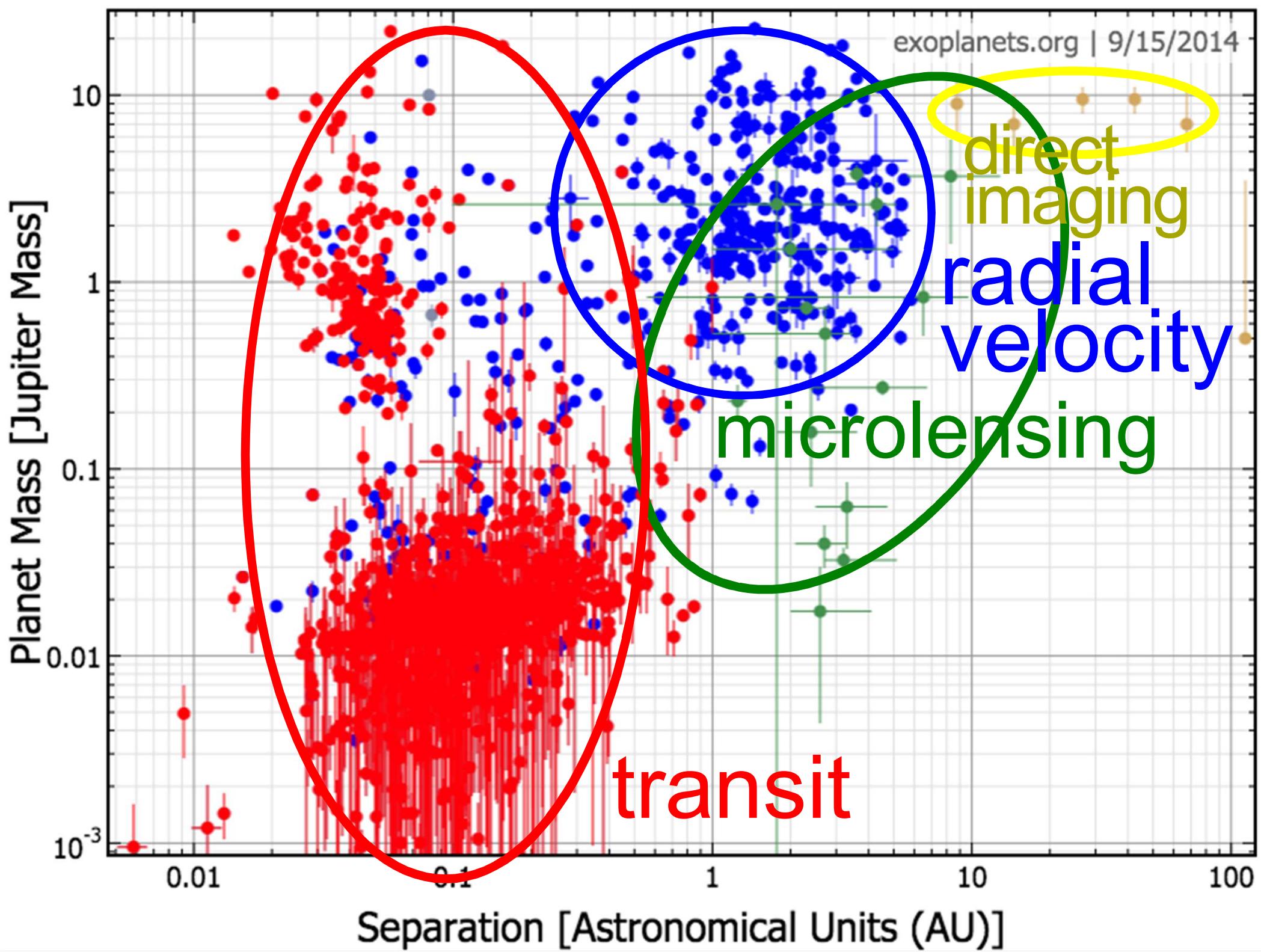


Direct imaging requires stabilizing the atmosphere so that light from the star and the planet can be separated. AO is a specialty of UVic and HIA

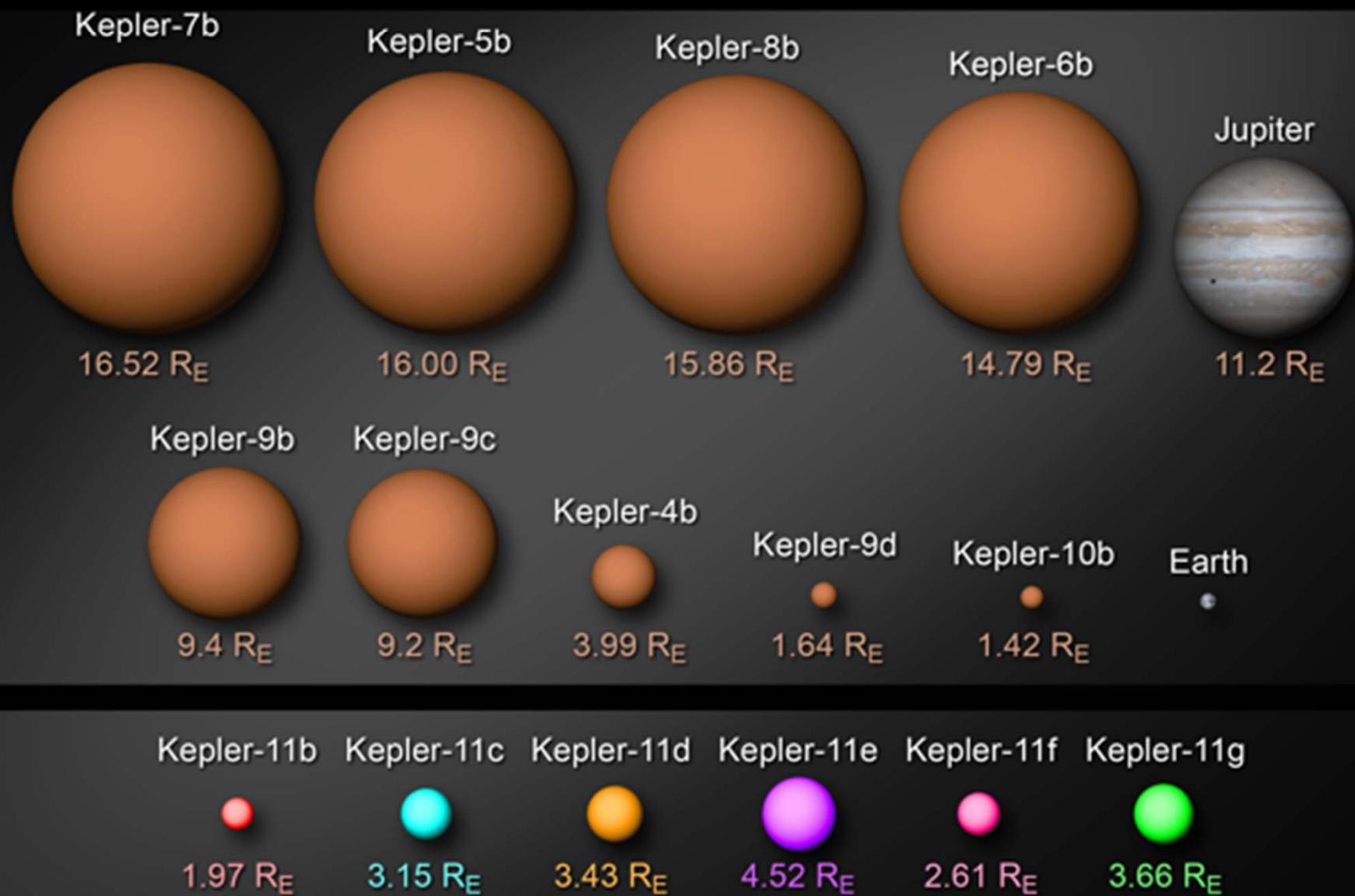


Planets occulting stars

Need to see multiple passes



# Planet Sizes



# Kepler discoveries

Yours to explore...



ASTR 255.

“Introduction to Planetary Science.”