

Survey of the Solar System

The Sun

Giant Planets

Terrestrial Planets

Minor Planets

Satellite/Ring
Systems



Terrestrial Planets

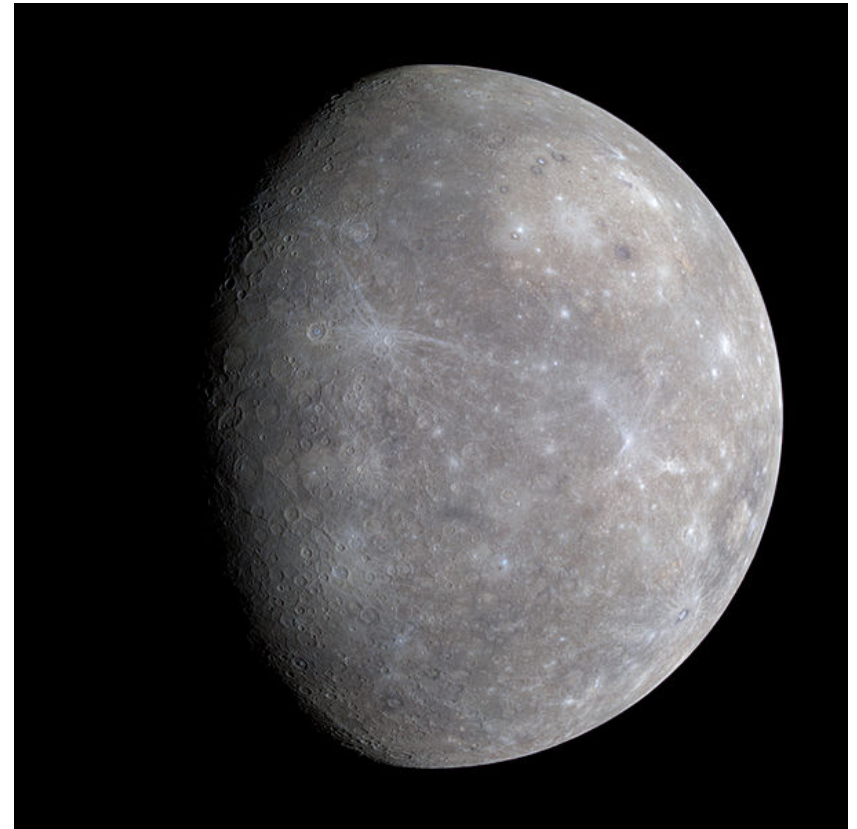
Mercury

Mass $\sim 3.3 \times 10^{23}$ kg

Radius ~ 2440 km

Orbit $\sim .39$ AU

Rotation ~ 58.6 days



False color image from the
Messenger mission

Terrestrial Planets

Mercury

Rocky surface → 4-5x higher density than giant planets, iron rich

Diffuse 'heavy' Atmosphere

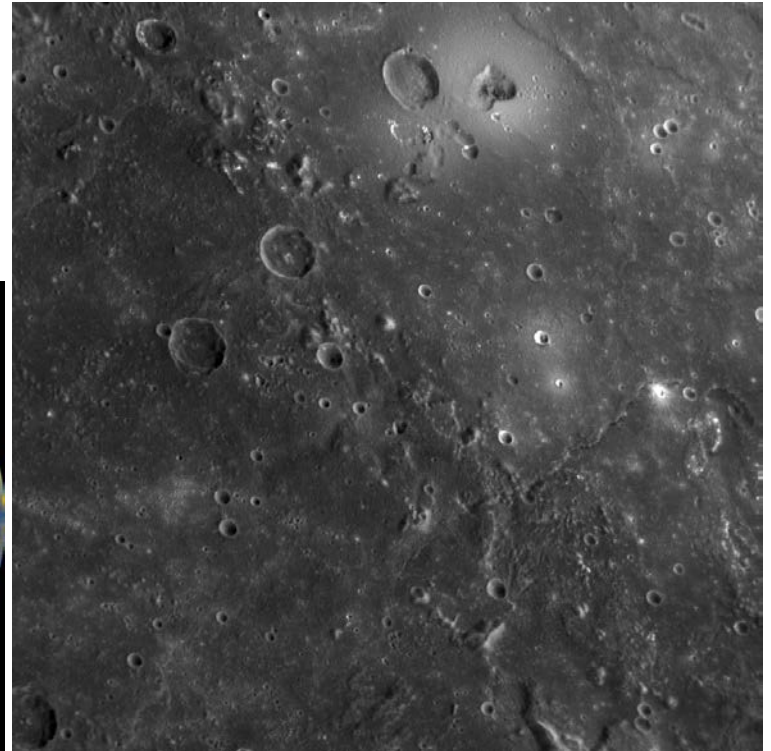
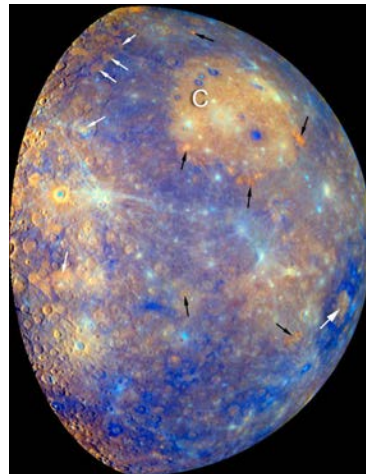
No satellites

Internal magnetic field

Slow rotation

No Rings

Aurora ??



Messenger image of volcanic vent

Terrestrial Planets

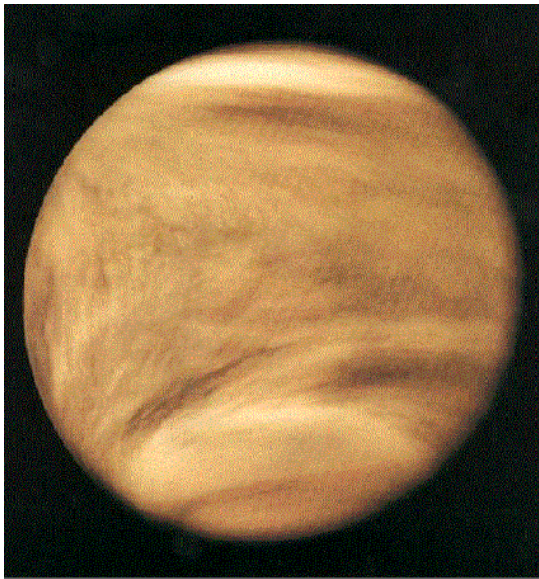
Venus

Mass $\sim 4.9 \times 10^{24}$ kg

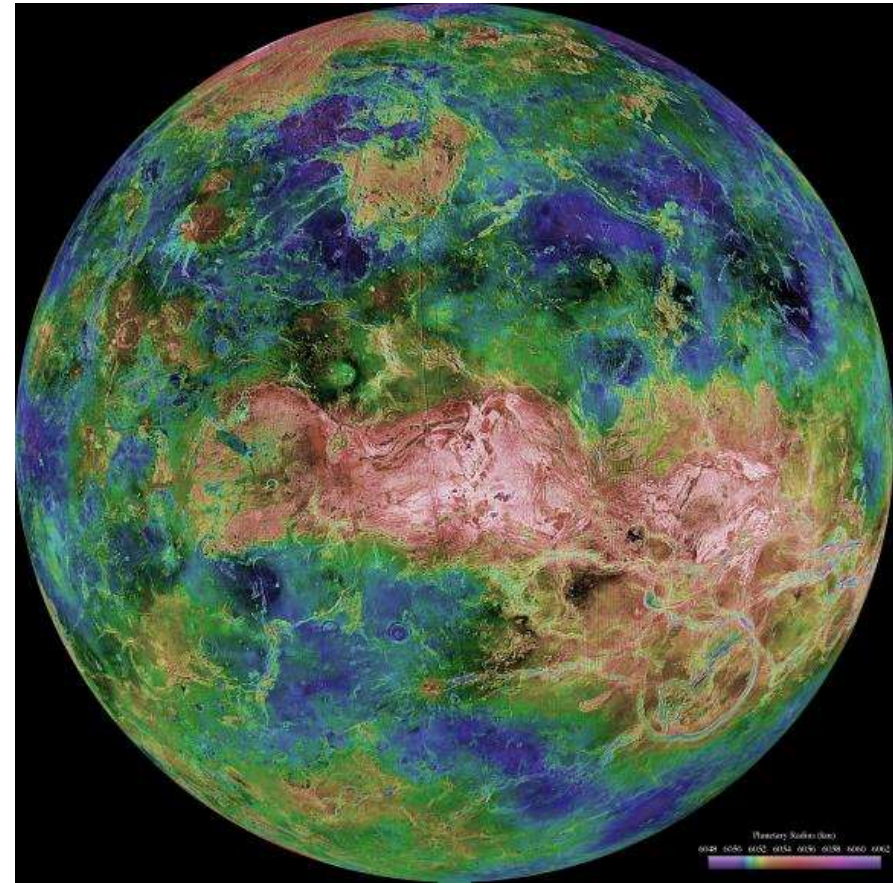
Radius ~ 6052 km

Orbit $\sim .72$ AU

Rotation ~ -243 days



From the Pioneer Venus Orbiter, 1979



False color image of Venus' surface structure from Magellan

Terrestrial Planets

Venus

Dense dynamic atmosphere, mostly CO₂ (~96%)

Strongest Greenhouse effect in the S.S. (733 K)

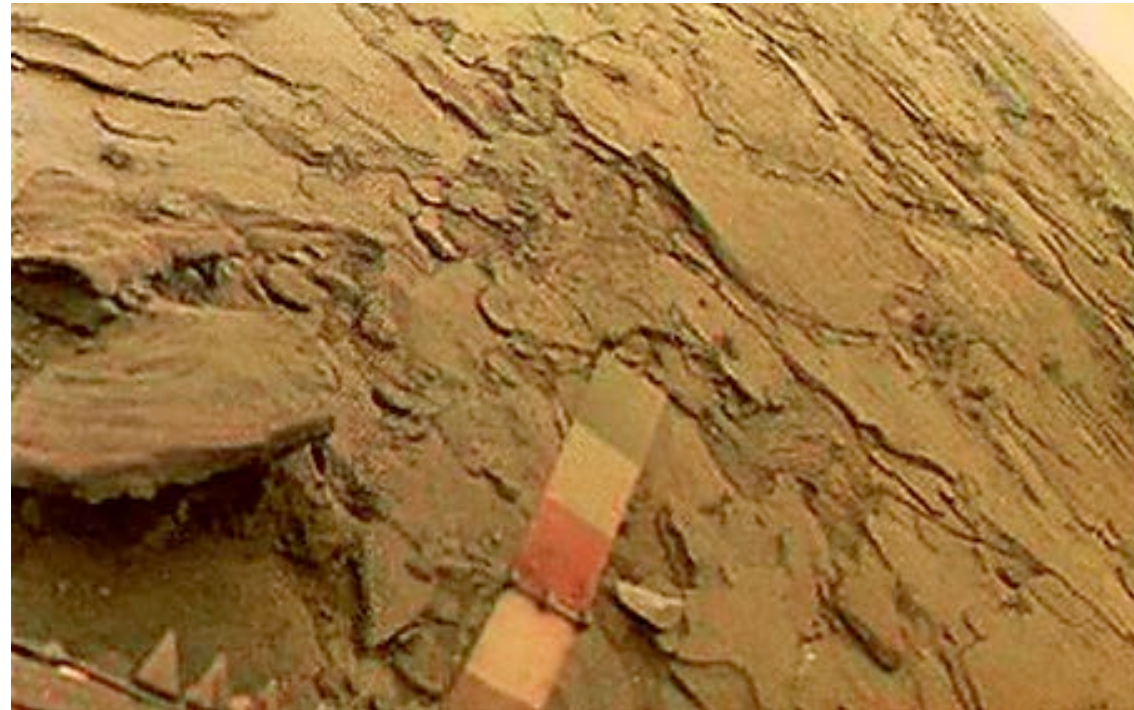
No satellites

No magnetic field

Retrograde rotation

No Rings

Aurora ??



Venera 14

Terrestrial Planets

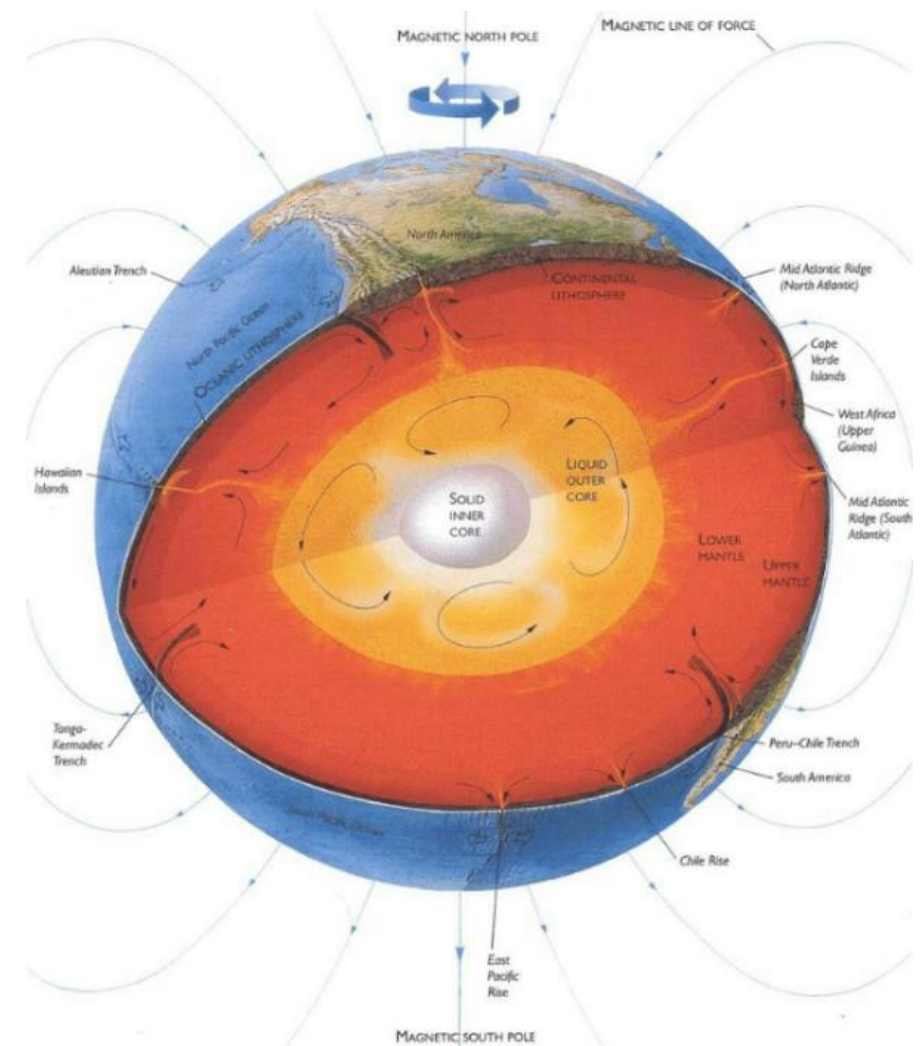
Earth

Mass $\sim 6.0 \times 10^{24}$ kg

Radius ~ 6371 km

Orbit ~ 1 AU

Rotation ~ 23.9 hr



Terrestrial Planets

Earth

Composed mostly of iron, oxygen & silicon by mass

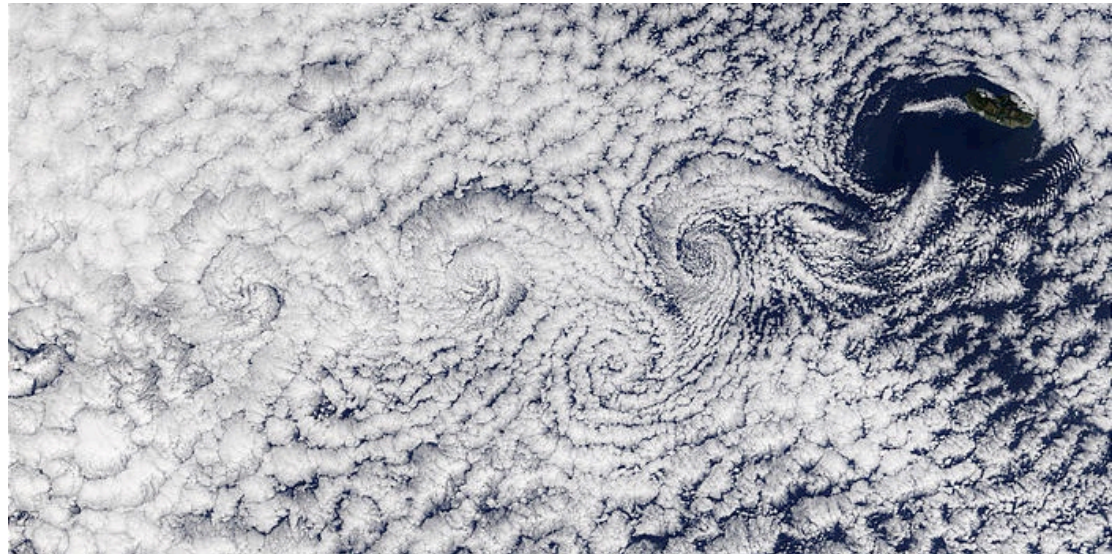
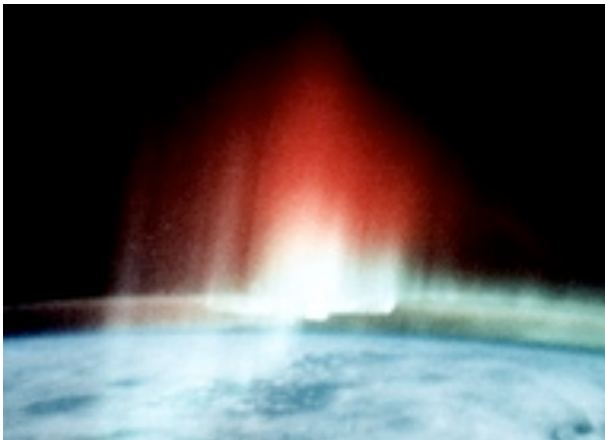
Atmosphere is N_2 & O_2 (78%, 21%), dynamic

Internal magnetic field

1 Satellite: Moon

No Rings

Aurora



Aurora observed from the space shuttle, and cloud vortices over Madeira Island from MODIS.

Terrestrial Planets

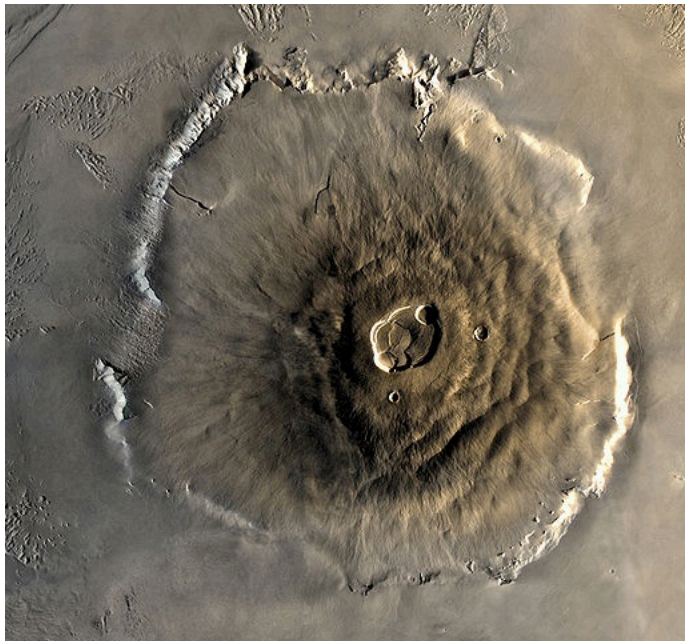
Mars

Mass $\sim 6.4 \times 10^{23}$ kg

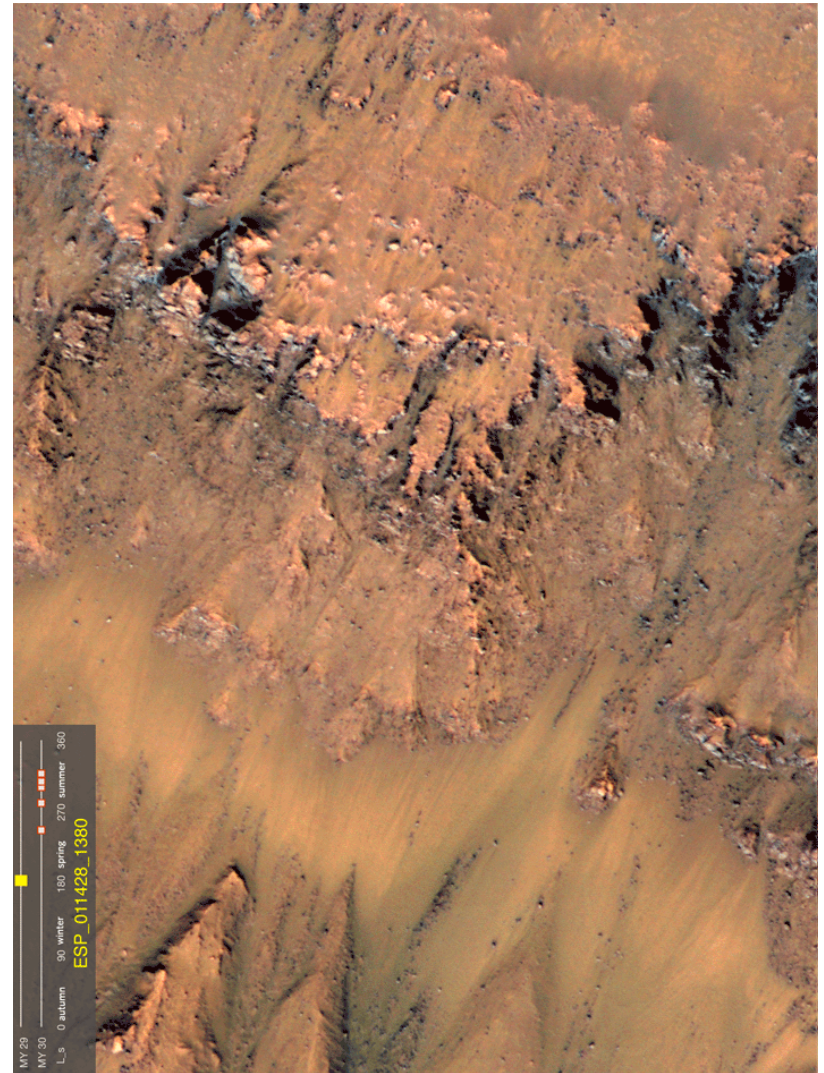
Radius ~ 3390 km

Orbit ~ 1.5 AU

Rotation ~ 24.6 hrs



Viking mosaic of
Olympus Mons



Slope flows on crater wall

Terrestrial Planets

Mars

Dynamic surface, extreme geologic features

Thin atmosphere (~7 mbar)

Active weather/seasons

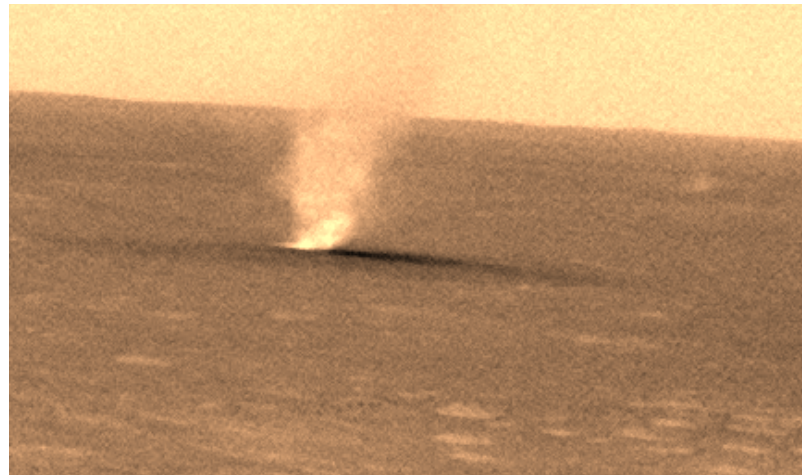
2 satellites

Remnant magnetic field

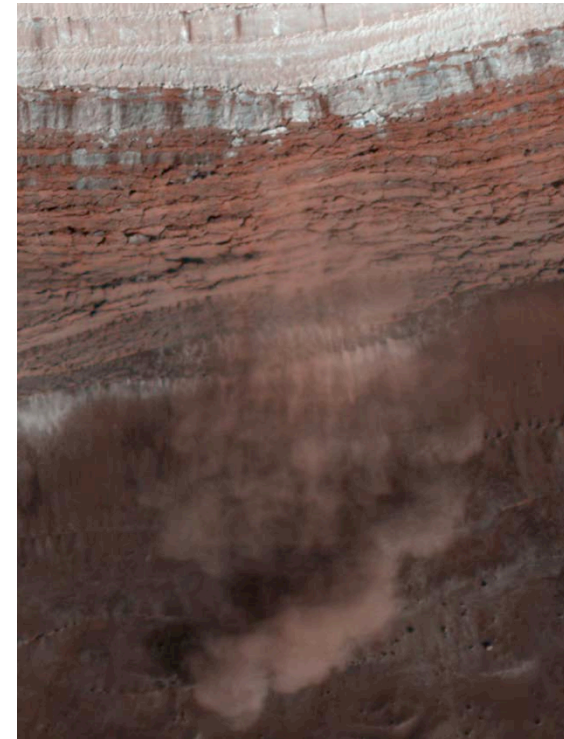
No rings

Aurora

History of
water



Dust devil viewed by Spirit

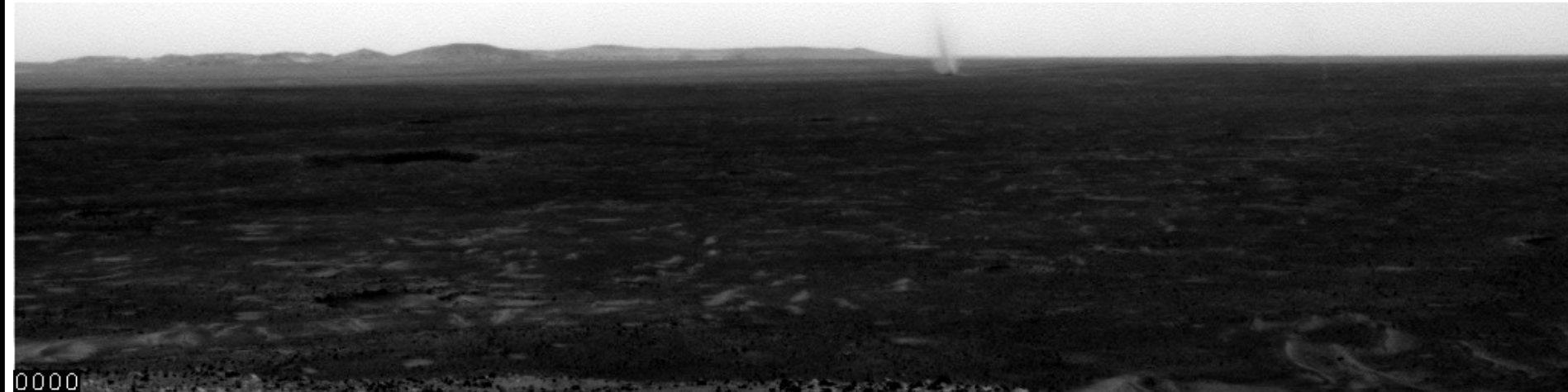


MRO: polar avalanche
seen from orbit

Terrestrial Planets

Mars

Spirit dust devil movie



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Survey of the Solar System

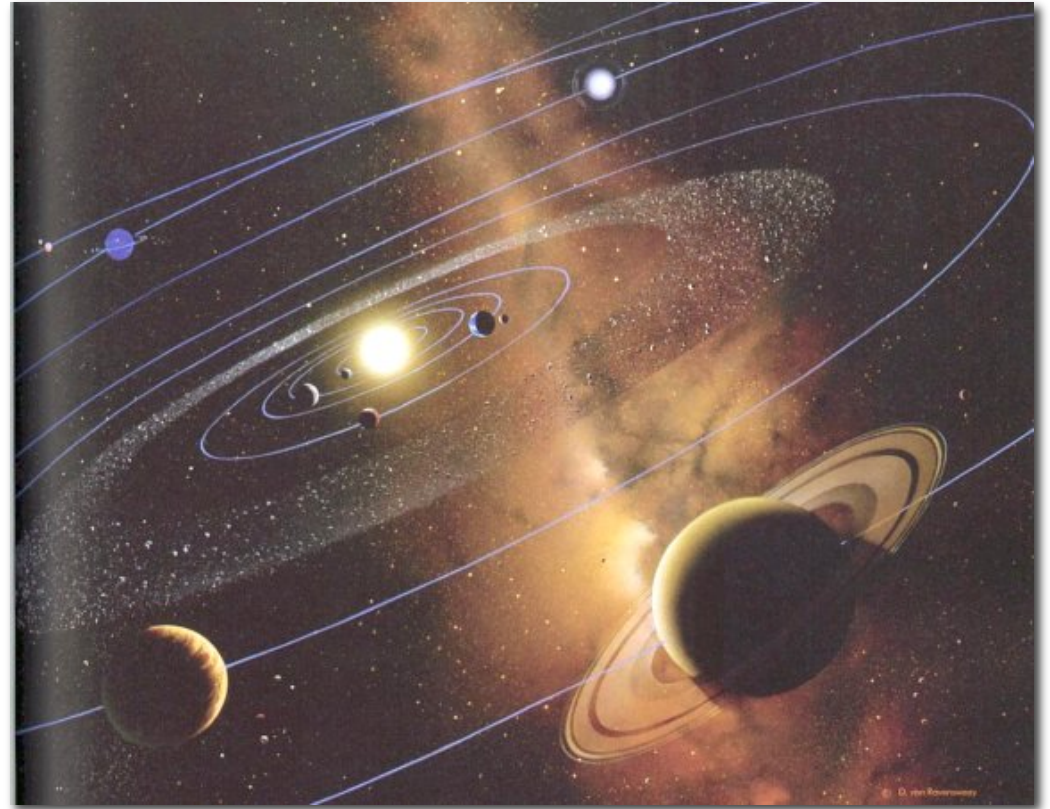
The Sun

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Terrestrial Planets

Minor Planets

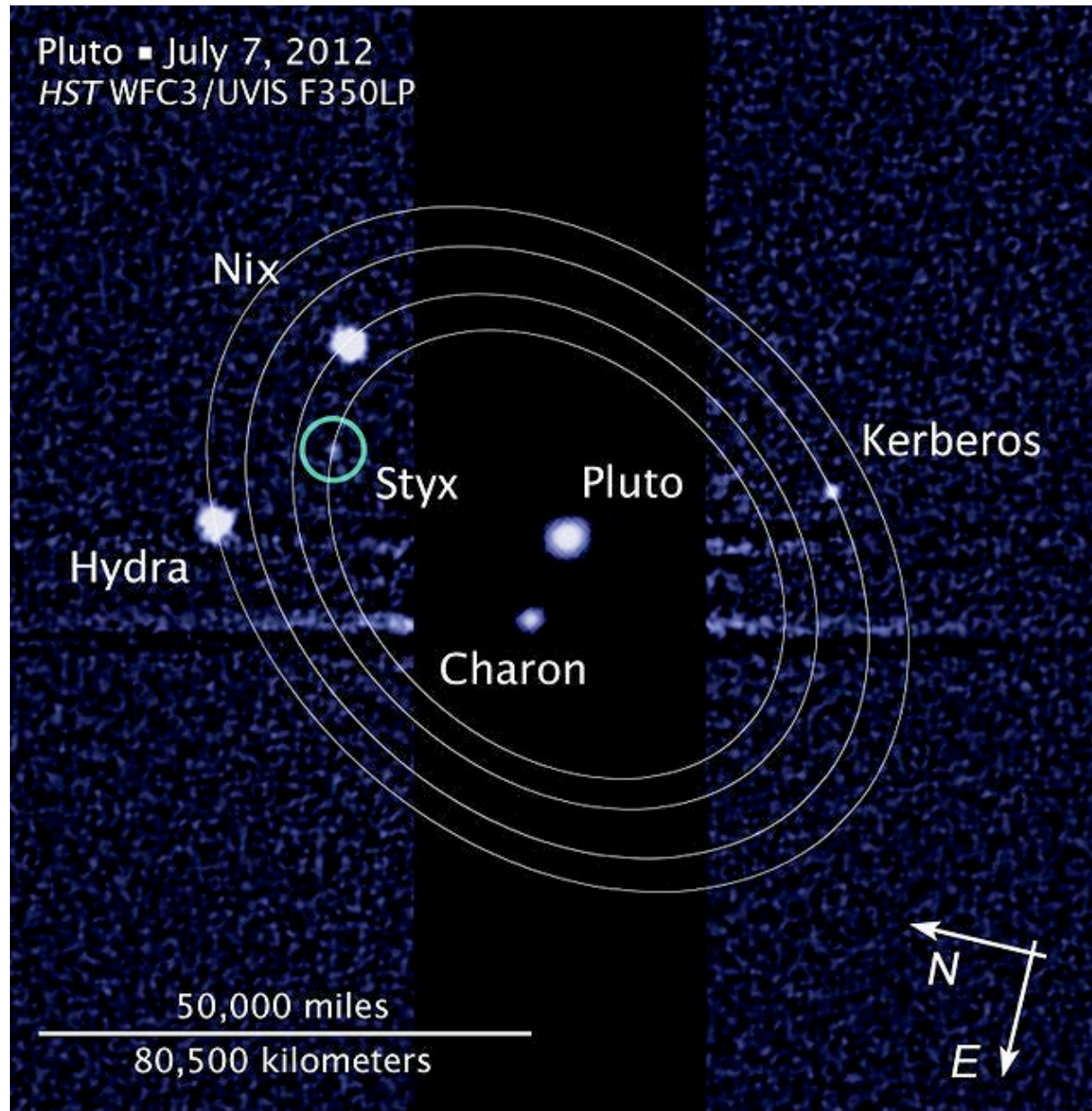
Satellite/Ring
Systems



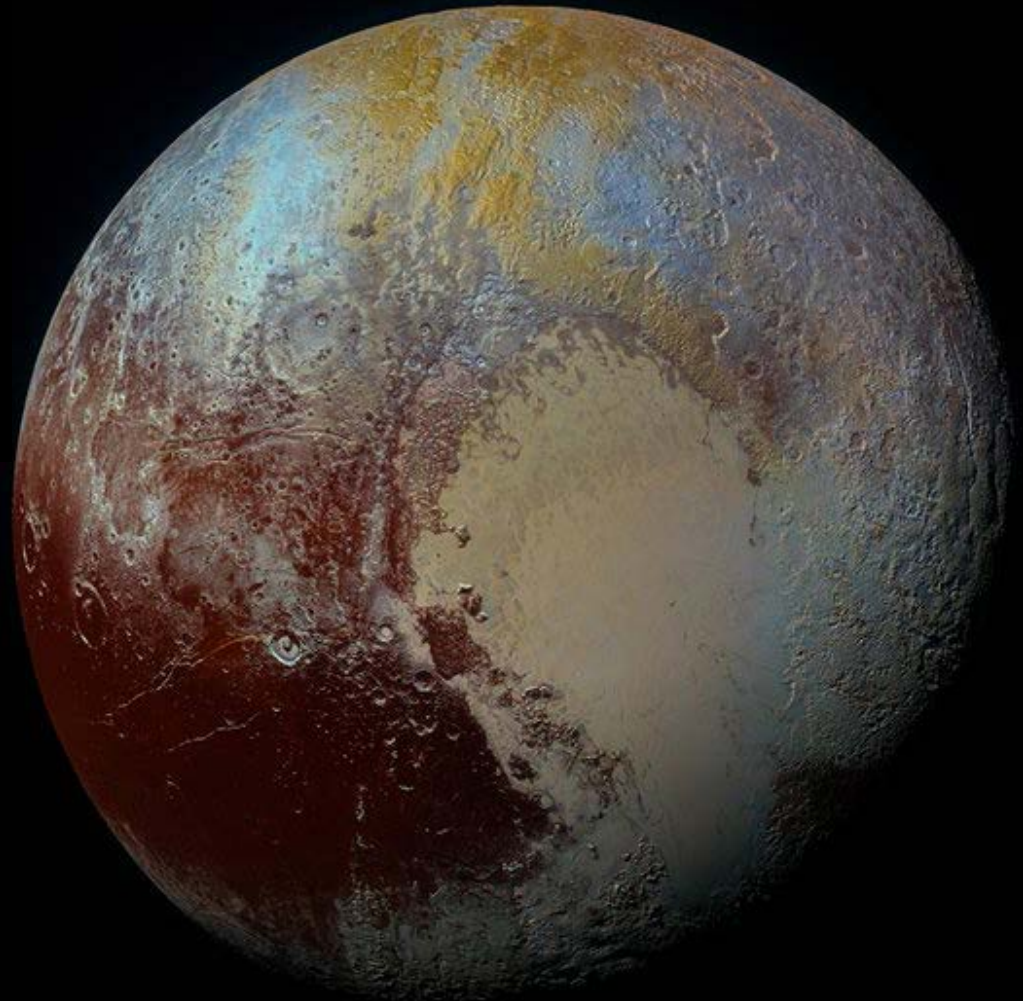
Pluto – 2 years ago



Pluto system – 2 years ago



Pluto system – today

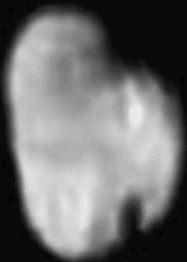


Nix

Hydra

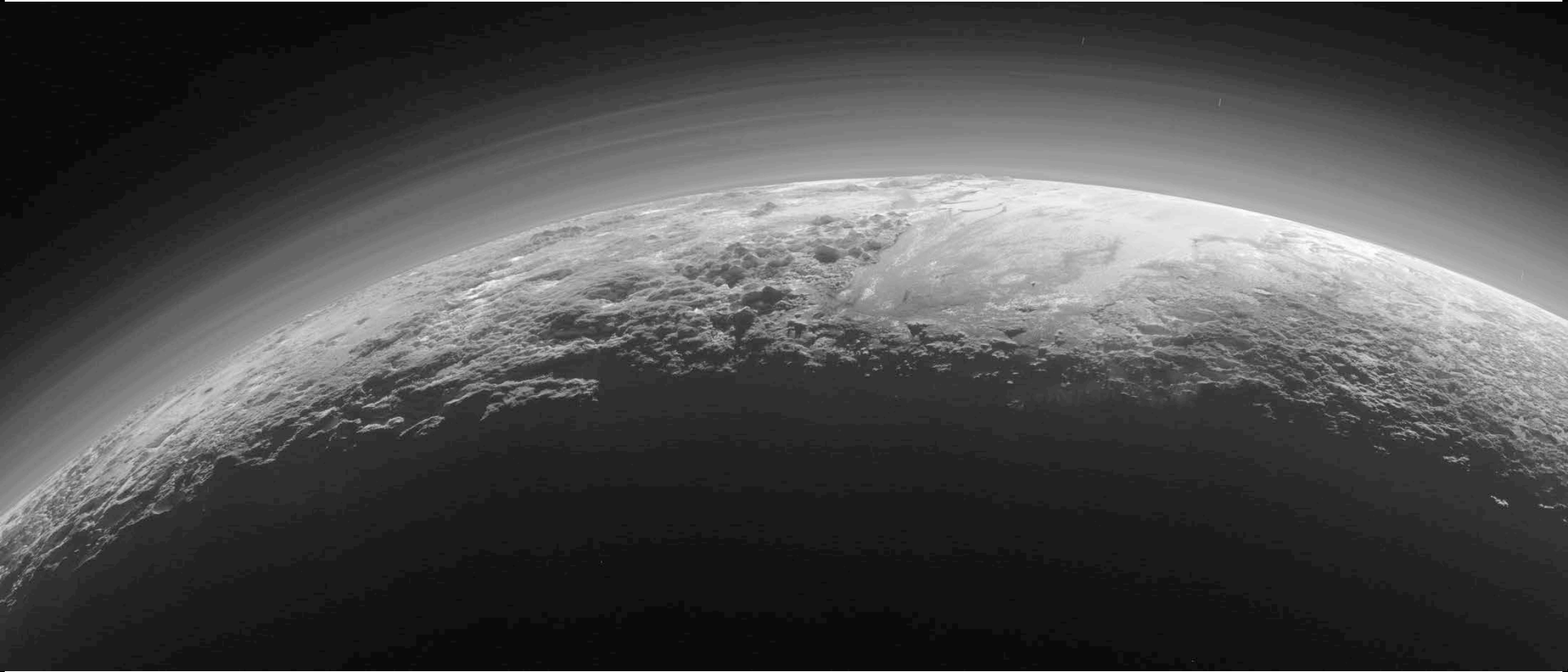


enhanced color



black and white

O.M.G.

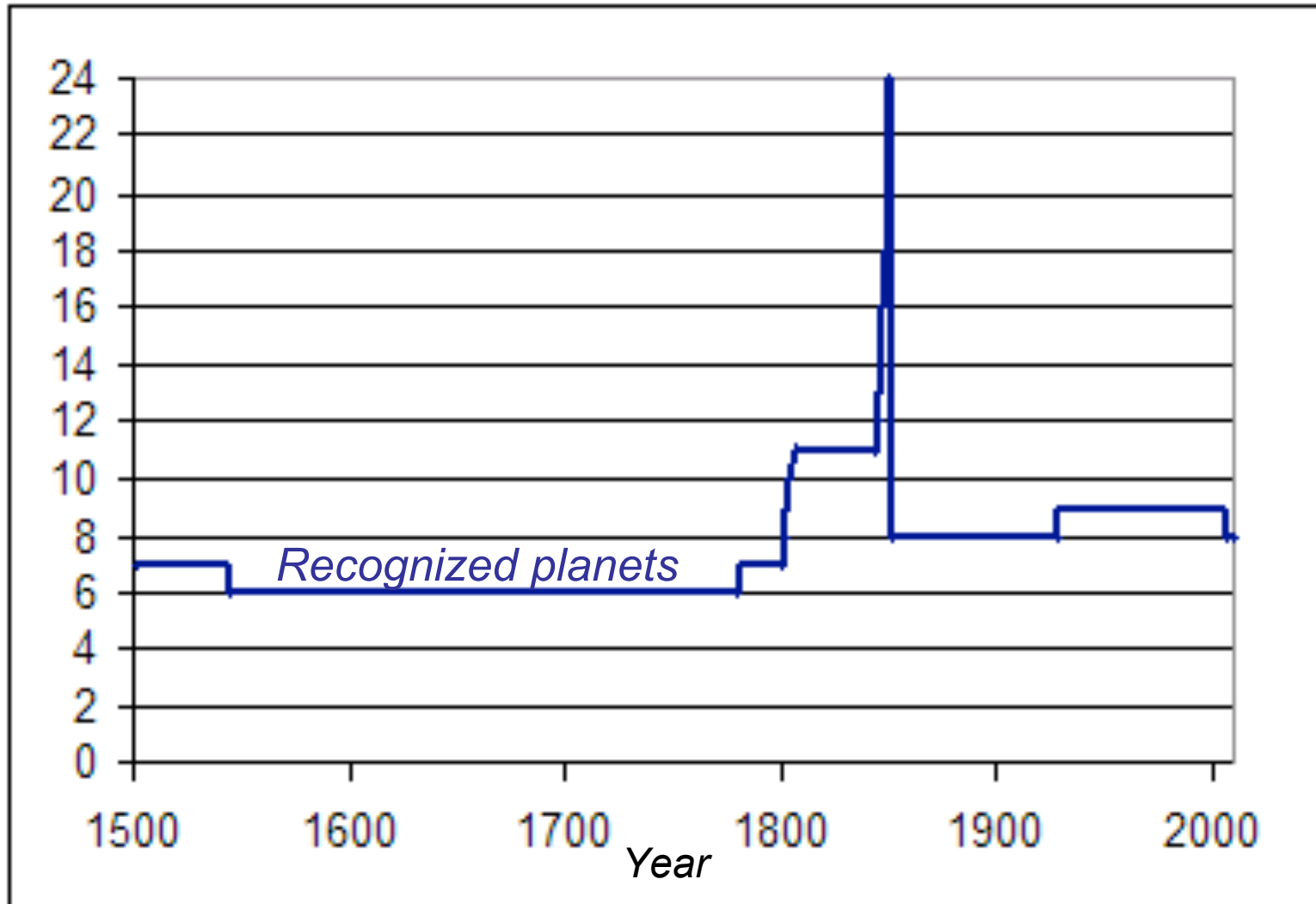


What Happened to Pluto?

A planet as defined in 2006 by the IAU
(International Astronomical Union):

1. Orbits the sun
2. Is large enough to have become round due to the force of its own gravity
3. Is not a satellite
4. Must dominate the neighborhood around its orbit (cleared its orbital path)

What Happened to Pluto?



Definition of a dwarf planet

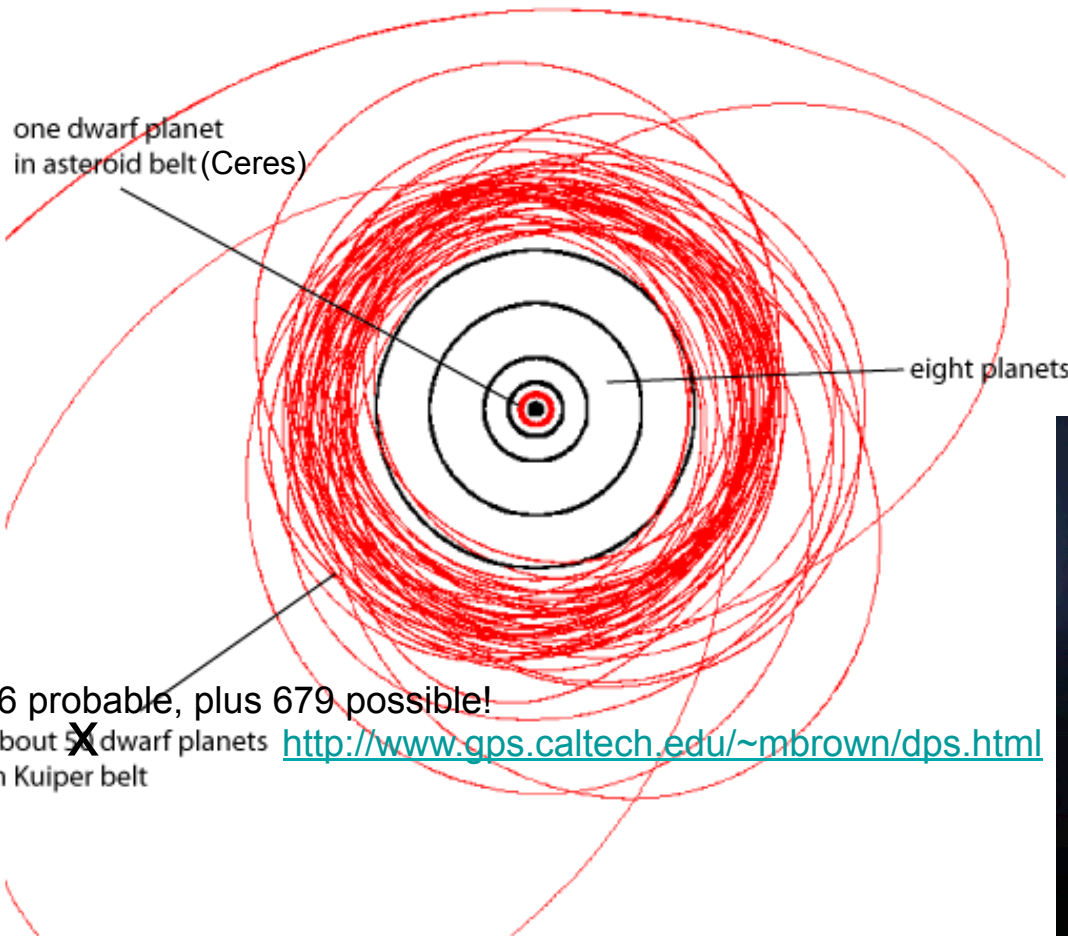
1. Orbits the sun
2. Is large enough to have become round due to the force of its own gravity
3. Is not a satellite
- ~~4. Must dominate the neighborhood around its orbit (cleared its orbital path)~~

Currently there are 5 recognized by the IAU:
Ceres, Pluto, Eris, Makemake, and Haumea

Though due to difficulties in confirming KBO roundness there are probably >100 known objects

Minor / Dwarf Planets

The new solar system



Earth For Scale:

Eris [$D \sim 2330$ km]

Ceres [$D \sim 945$ km]

Pluto (& Charon)



Image credit: M. Brown

Image credit: NASA

Asteroids

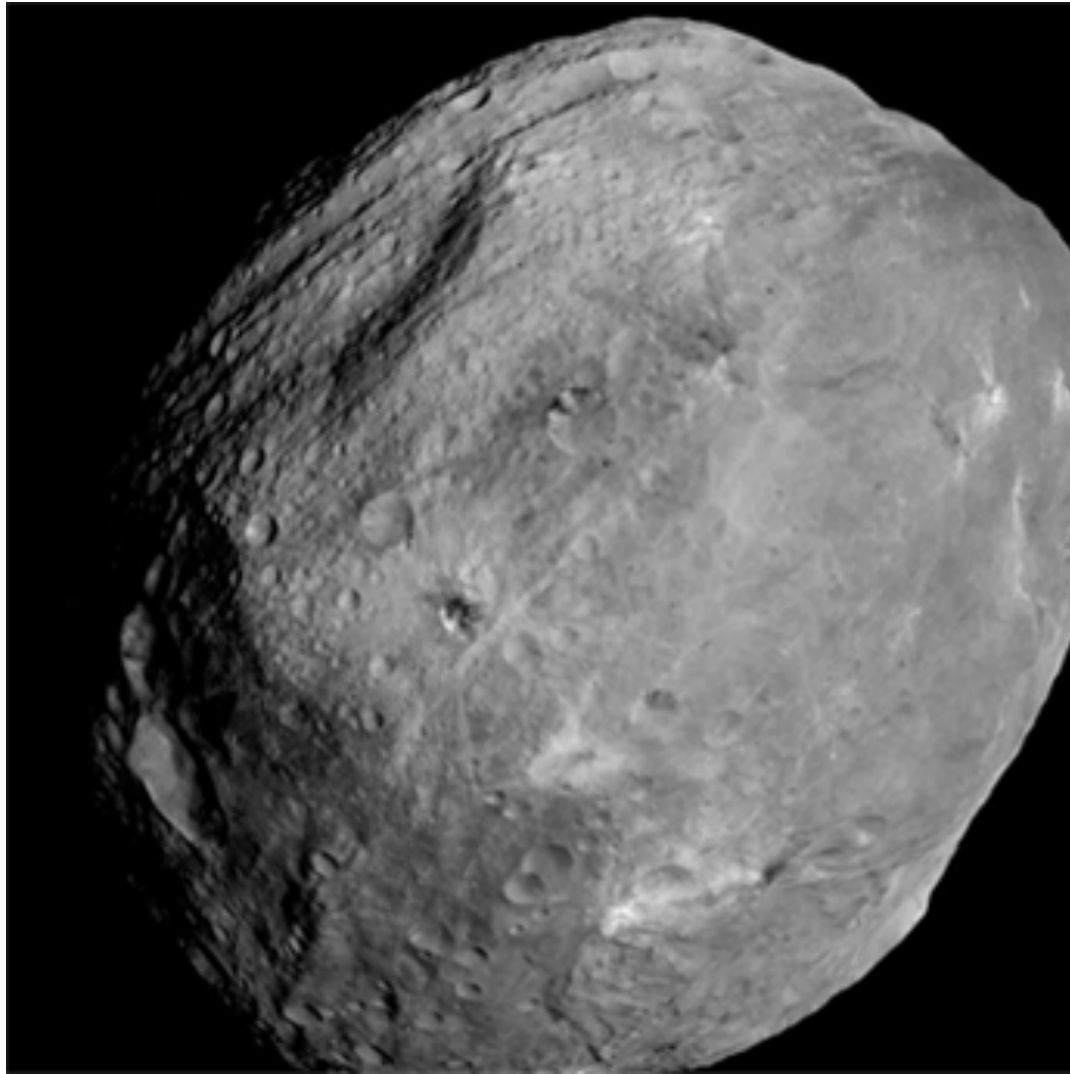
Minor planets with unconfirmed roundness and generally < 500 km in radius.

Most reside in the asteroid belt (2.1–3.3 AU) between Mars' and Jupiter's orbits.

Other populations include centaurs, Trojans, Kuiper belt objects (e.g., Pluto).

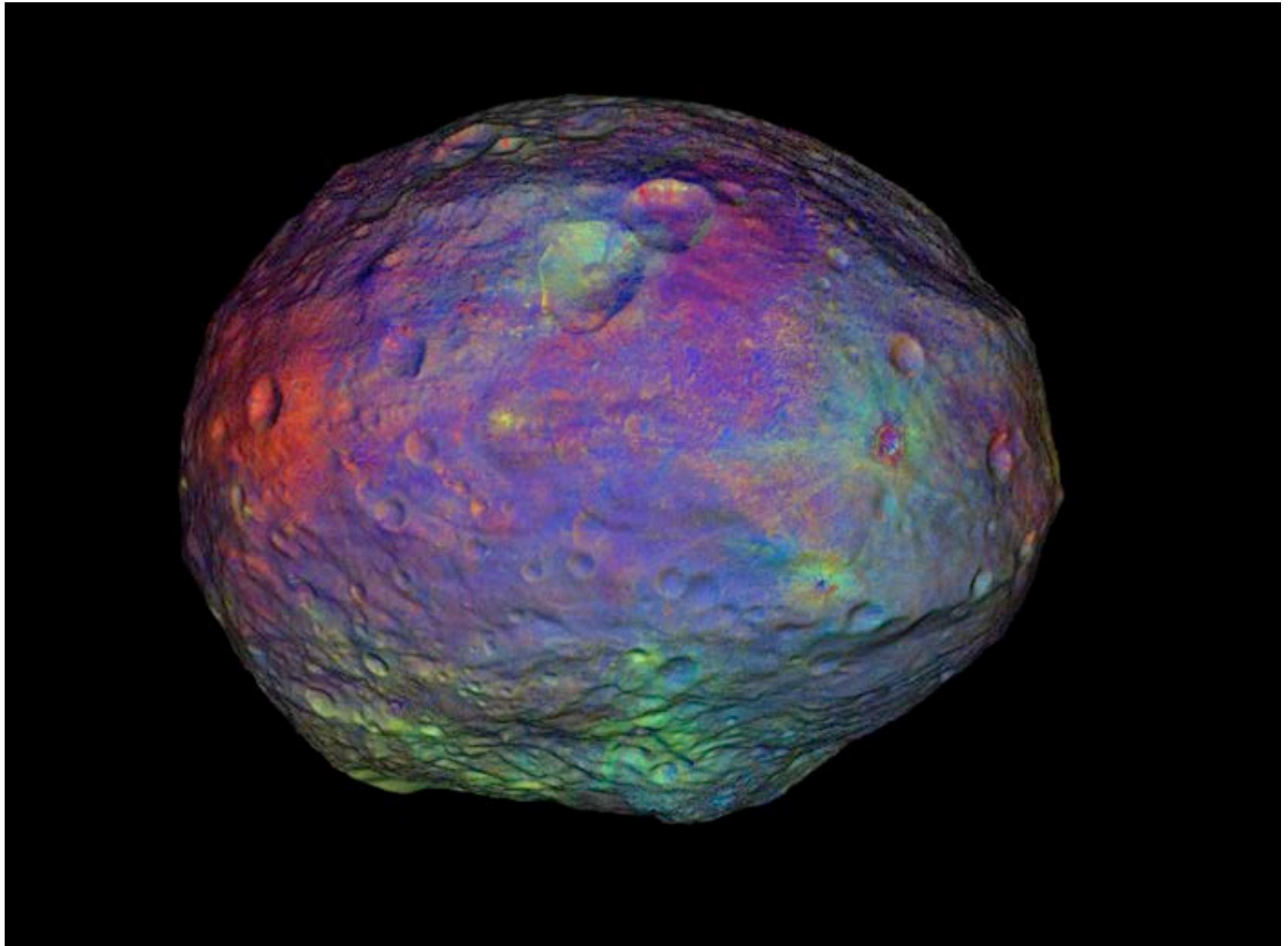
They actually can, and several do, have confirmed satellites.

Vesta

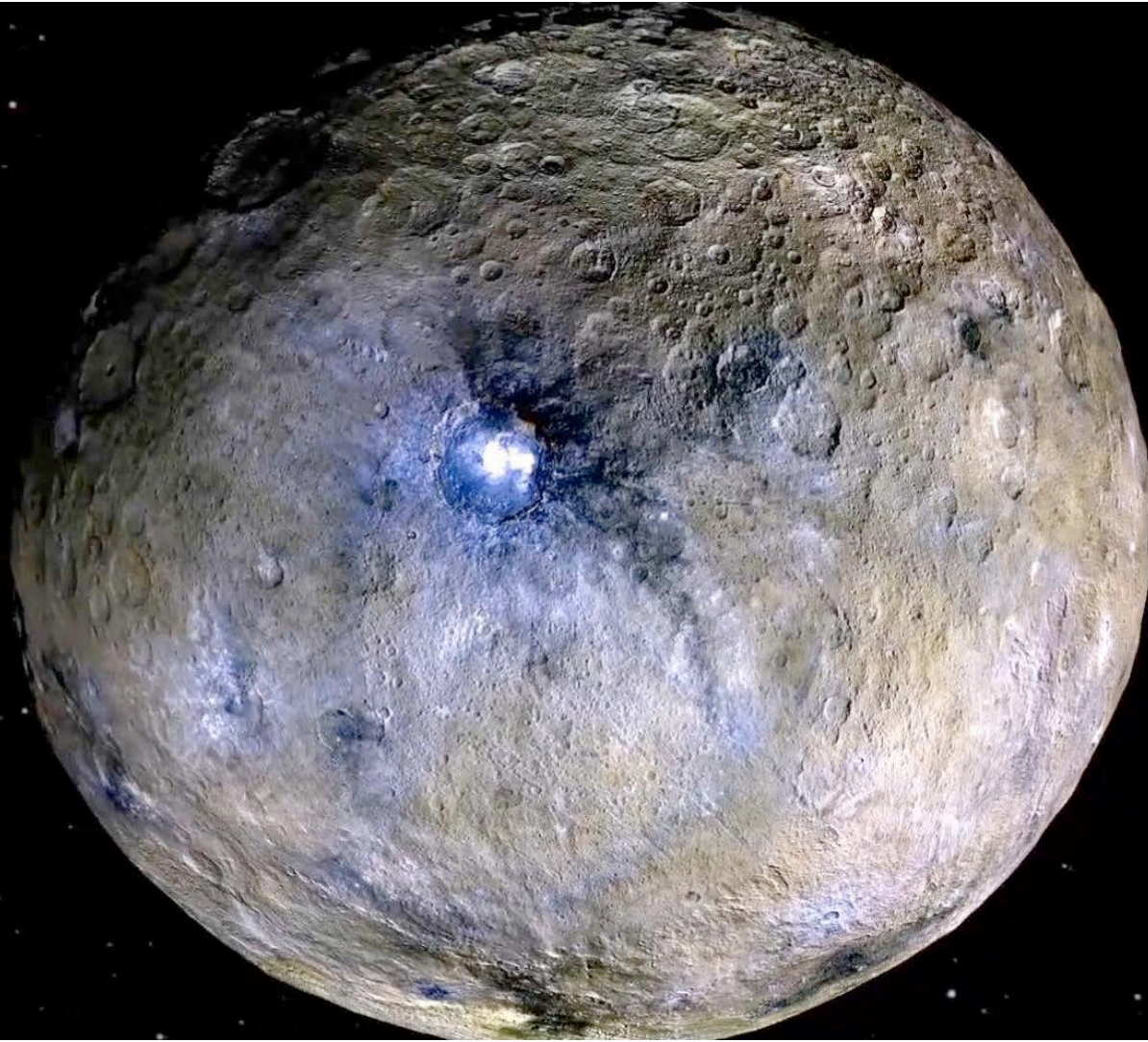


July 24, 2011

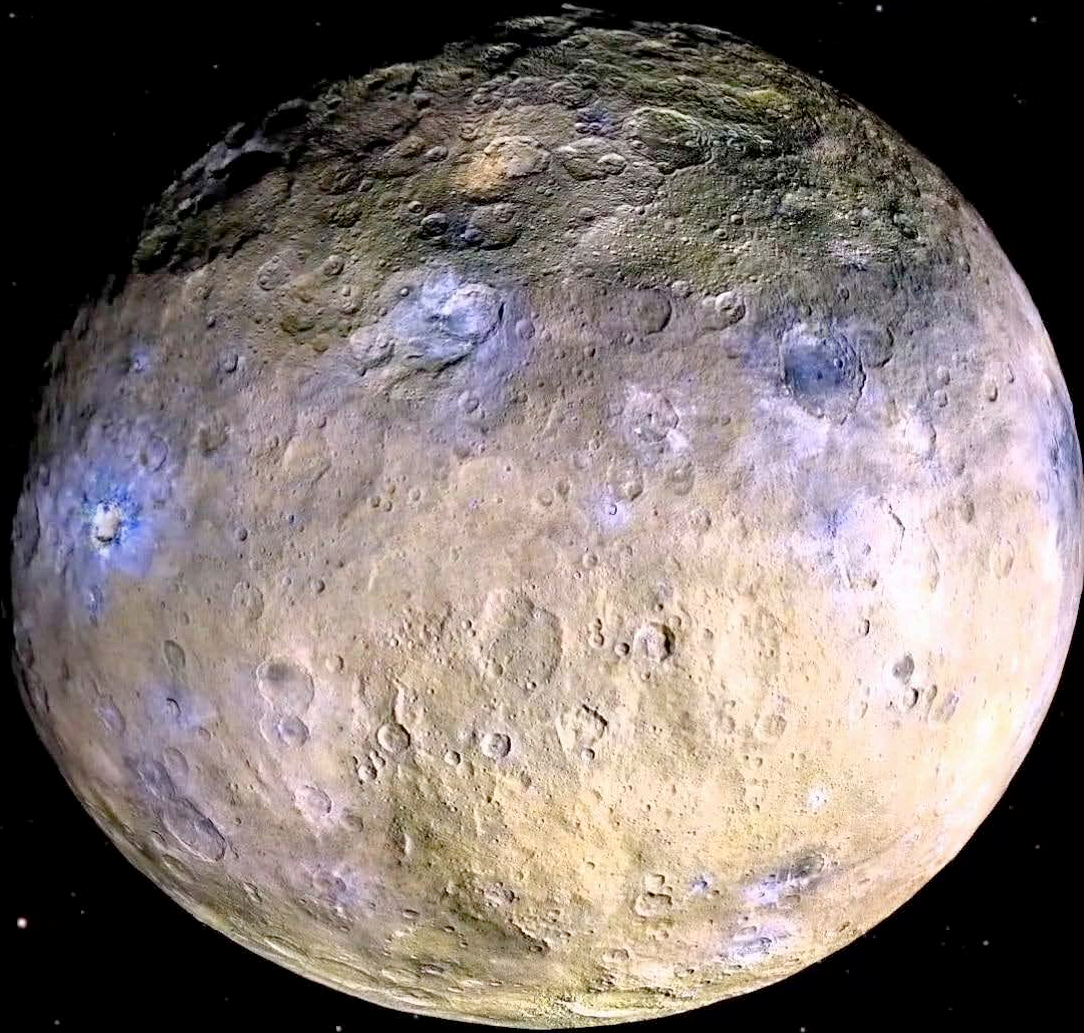
Vesta (enhanced color)



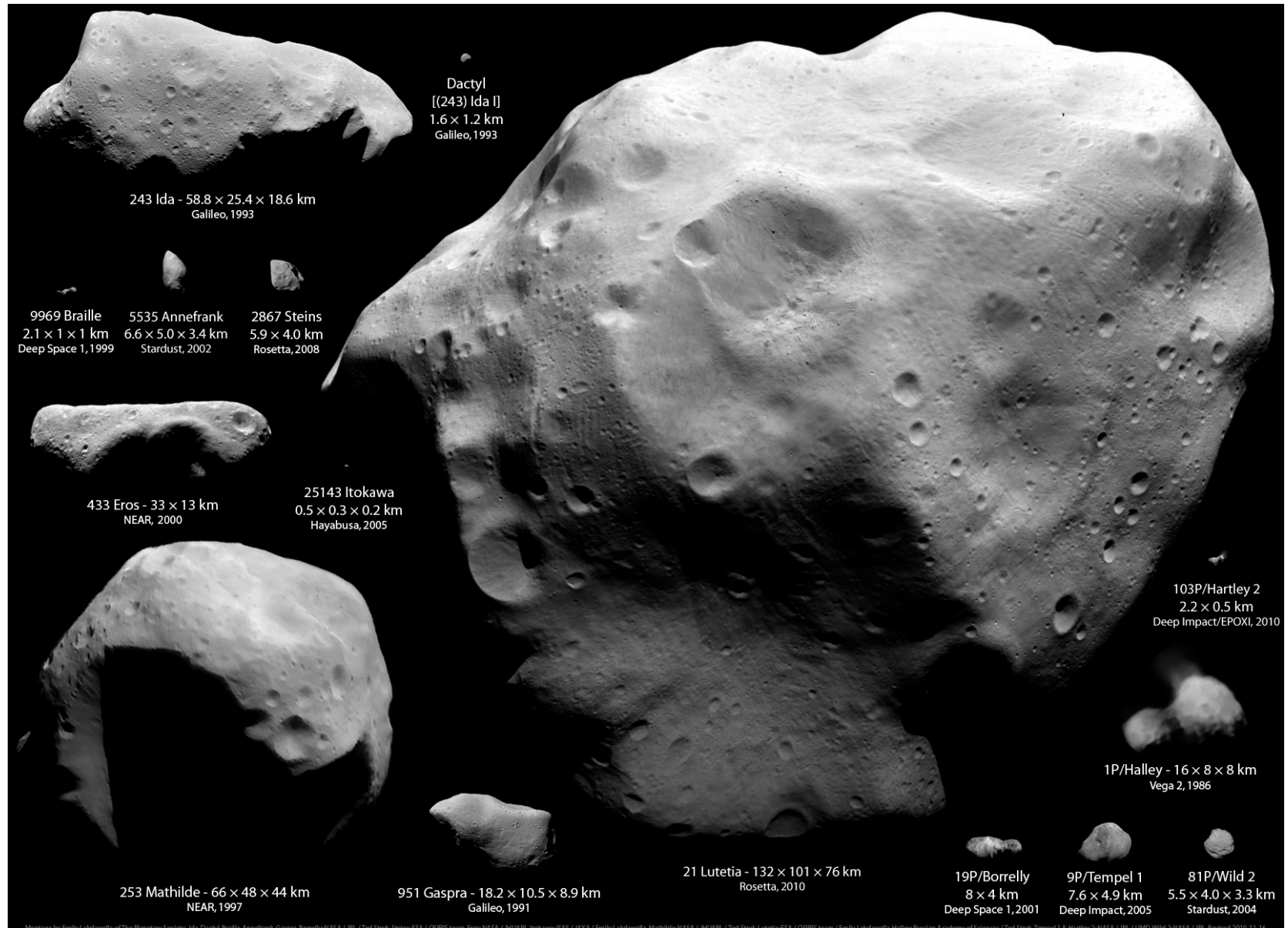
Ceres!



Ceres!



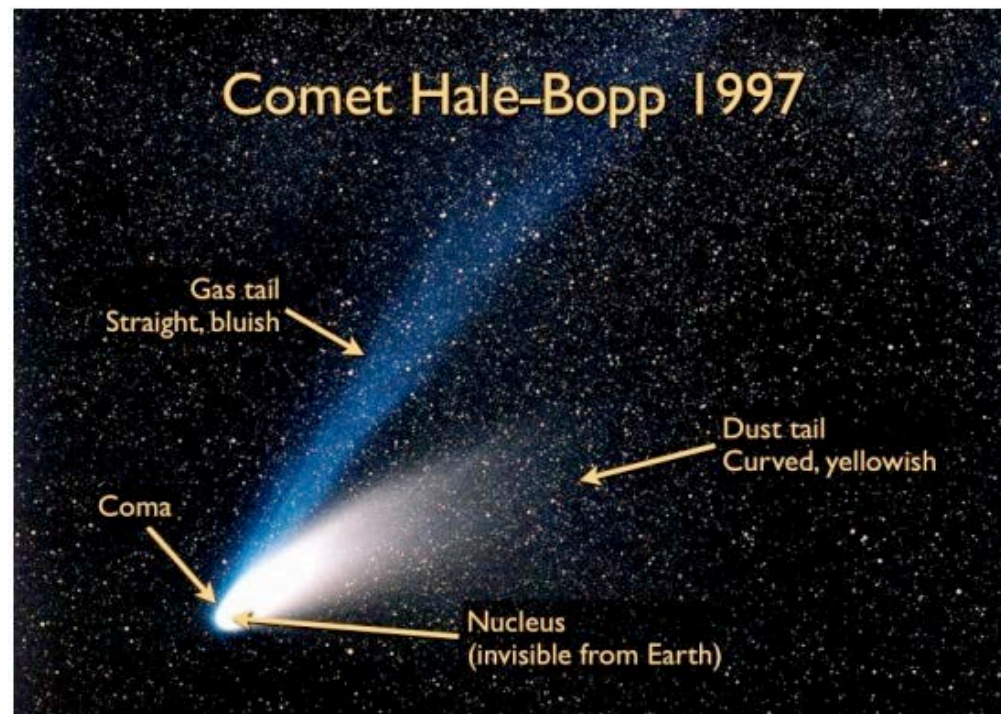
Other Asteroids and Comets Visited



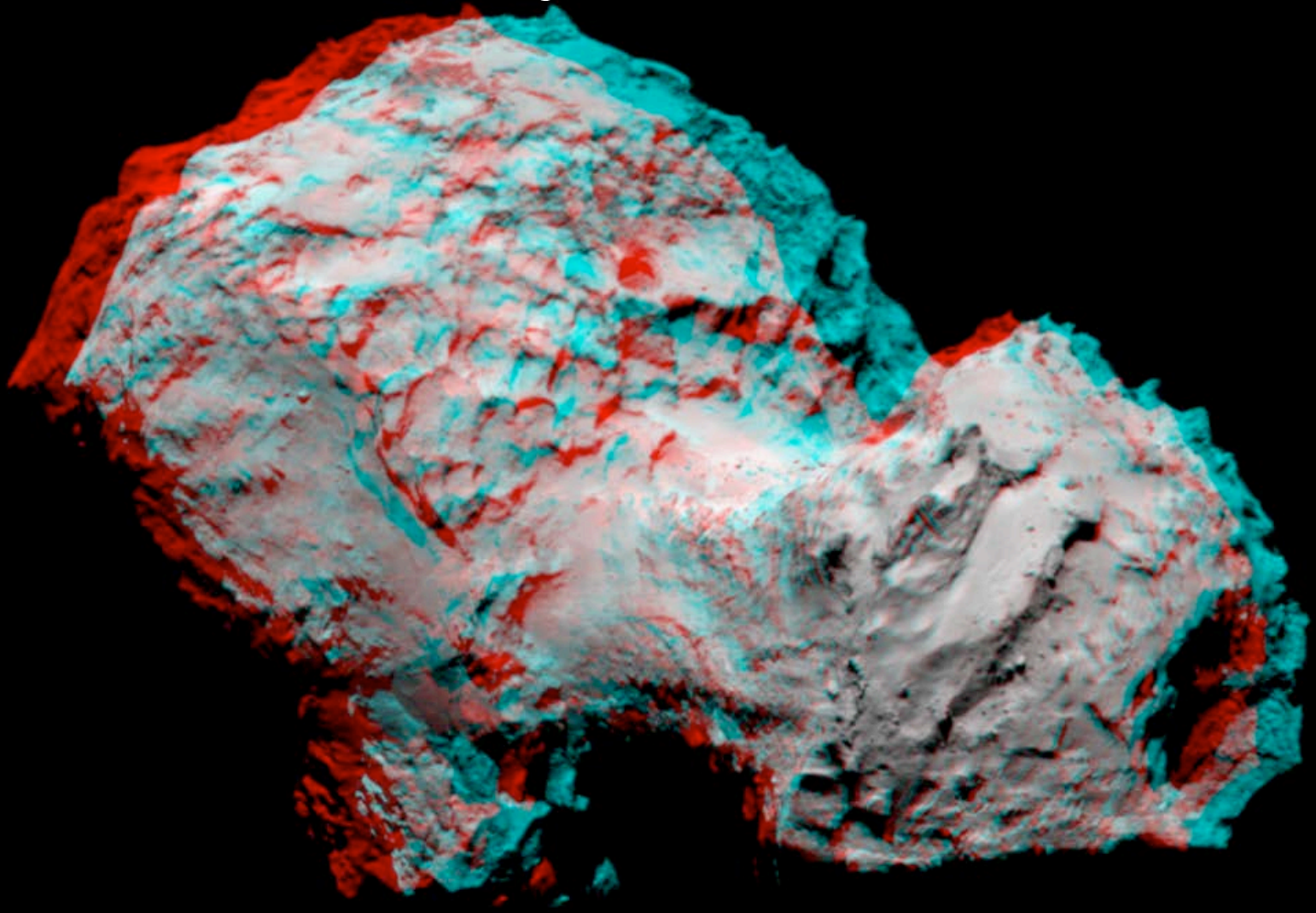
Comets

Ice-rich objects that lose mass in the form of water vapor and ice/dust grains when exposed to sufficient solar heating.

Mostly reside in the Oort Cloud ($1-5 \times 10^4$ AU) and Kuiper Belt region

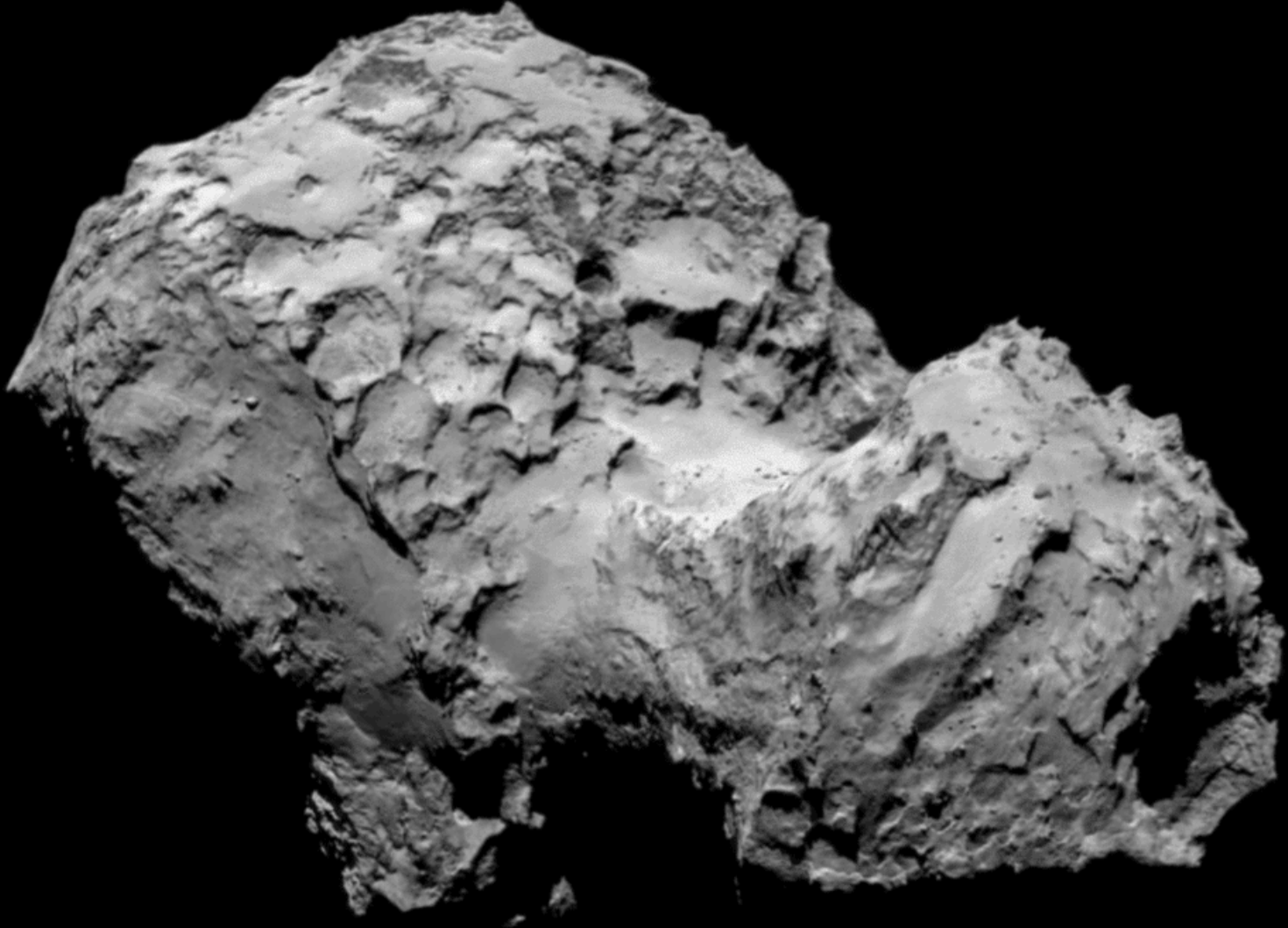


Comets: Churyumov-Gerasimenko



August 3, 2014

Comets: Churyumov-Gerasimenko



August 3, 2014

Comets: Churyumov-Gerasimenko

