Saturn: A planet that rains diamonds

U of SC Aiken

DuPont Planetarium

Ruth Patrick Science Education Center

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Saturn's Place in Space

- How many planets?
  - Terrestrial Planets:
    - Earth, Mars, Mercury, Venus,
  - Gas Giant Planets:
    - Jupiter, Neptune, Saturn, Uranus,
  - Dwarf Planets:
    - Ceres, Eris, Haumea, Makemake, Pluto,

Saturn's Place in Space

Order from Sun

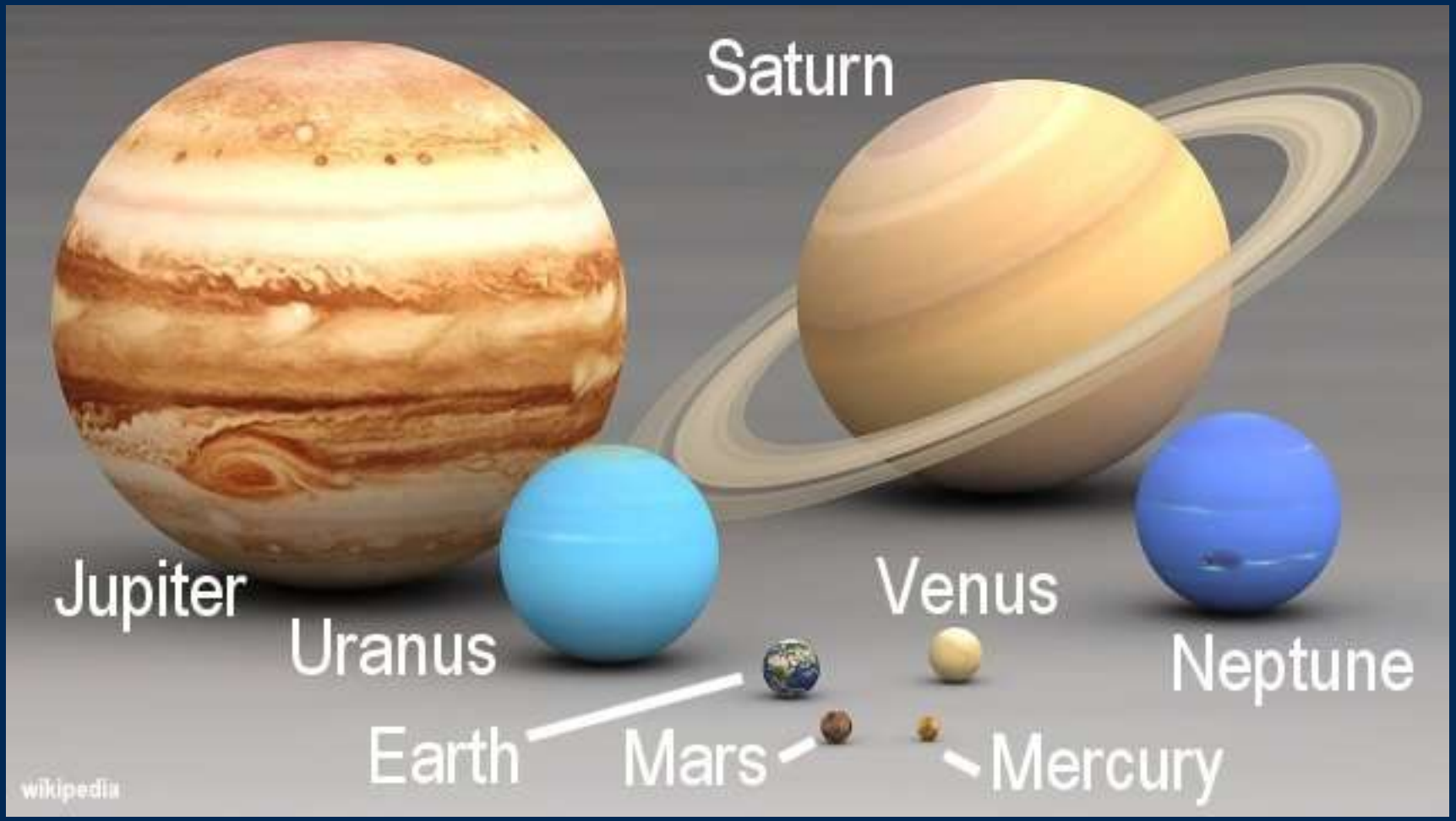
- Terrestrial and Gas Giant Planets:
  - Earth, Jupiter, Mars, Mercury, Neptune, Saturn, Uranus, Venus,
  - Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune,

Saturn's Place in Space

Order from Sun

- Terrestrial, Gas Giant and Dwarf Planets:
  - Ceres, Earth, Eris, Haumea, Jupiter, Makemake, Mars, Mercury, Neptune, Pluto, Saturn, Uranus, Venus,
  - Mercury, Venus, Earth, Mars, Ceres, Jupiter, Saturn, Uranus, Neptune, Pluto, Haumea, Makemake, Eris,

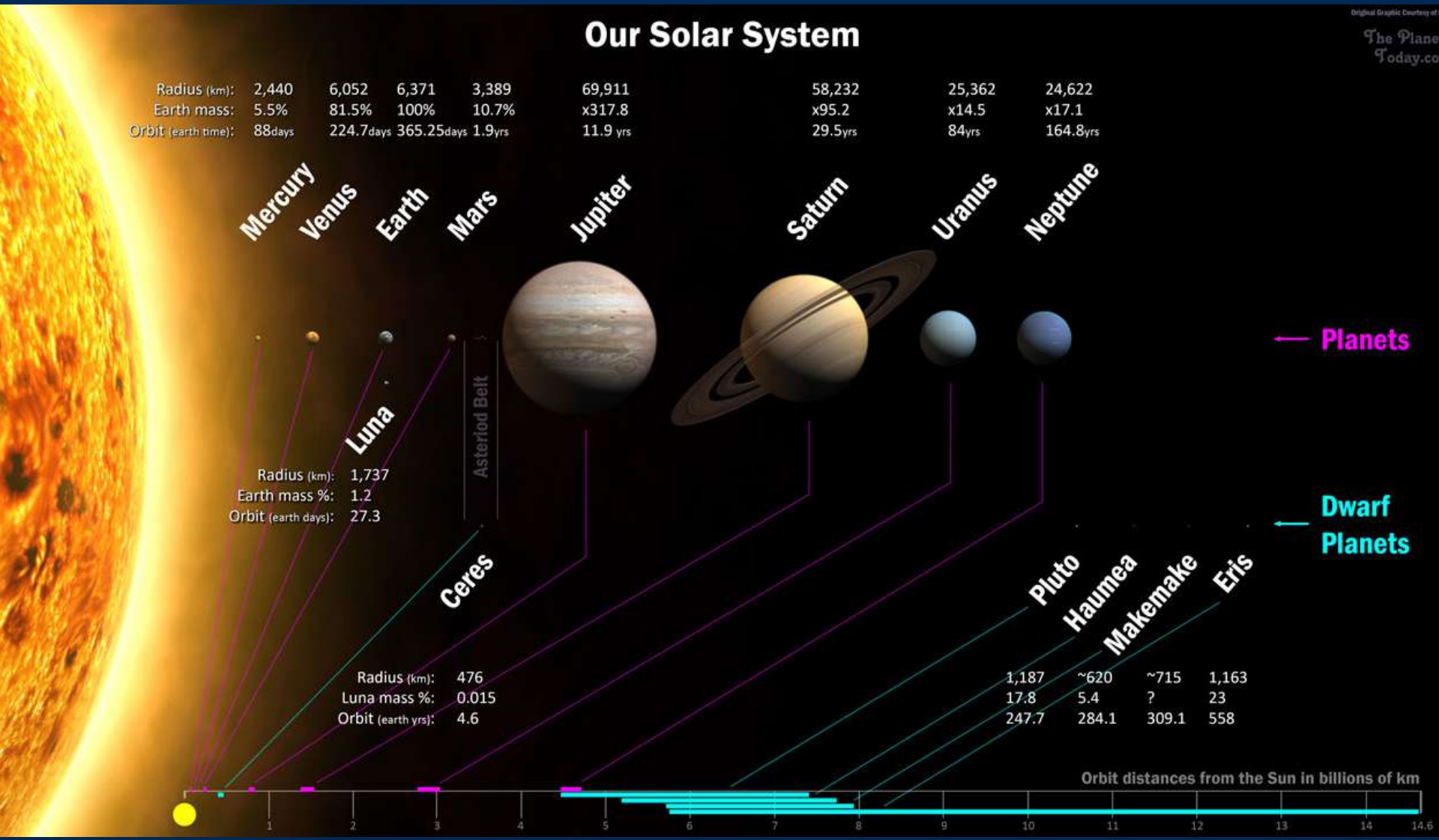
Saturn's Place in Space



Earth Size Comparisons

- 1,300,000 could fit inside of Sun
- 764 Earths could fit inside of Saturn
- 63 Earths could fit inside of Uranus

Saturn's Place in Space

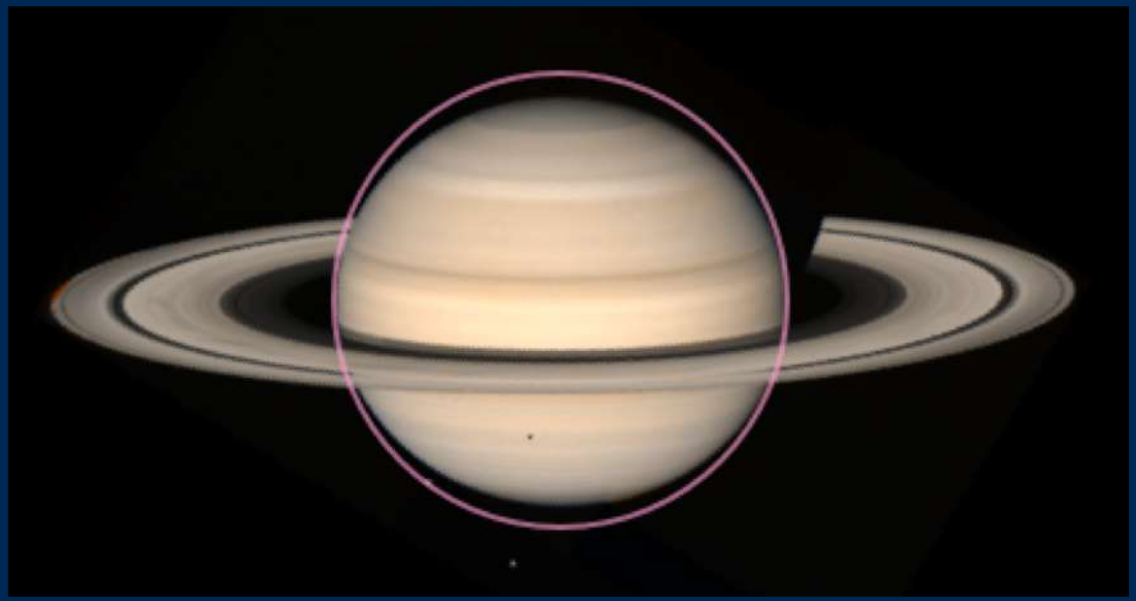


Density

- Saturn is the least dense planet
- Saturn = 0.687 grams/cubic centimeter
- Water = 1 g/cm3
- Earth is 5.52 g/cm3

Shape

- Most oblate planet
- equatorial diameter = 120,536 km / 74,897 mi
- polar diameter = 108,728 km / 67,560 mi



Orbit and Rotation

- Rotation = 10 hours and 34 minutes
  - shortest day of any planet
- Orbit = 29.4 Earth years
  - Assyrians nicknamed it Lubadsagush – oldest of old

Name of Saturn

- Roman god Saturnus
  - Roman god of farming
  - Father of the god Jupiter
- Greeks god Cronus.
- Saturday named after Saturn

Raining Diamonds on Saturn

- Lightning storms
- Split carbon atoms
- Form soot

- High pressure
- Heat
- Rapid cooling

- Diamonds form

Spacecraft Visits

NASA'S Pioneer 11
1979

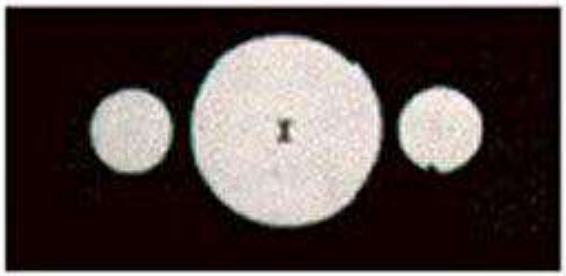
NASA'S Voyager 1 - 1980
NASA'S Voyager 2 - 1981

International
Cassini
2004-2017

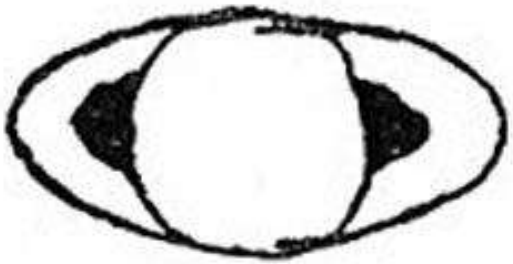
https://WWW.energy.gov/articles/nuclear-heart-cassini

Galileo and Saturn

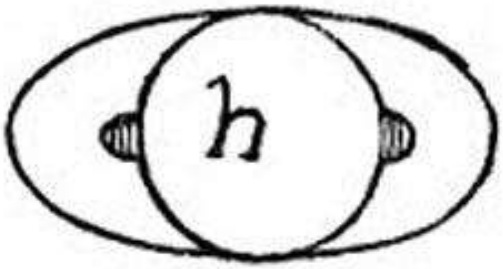
- First to use telescope to view the heavens
- Ears
- Disappeared in 1612



Galileo first sketch
1610



Better telescope
1616



Published etch
1623

Axial inclination

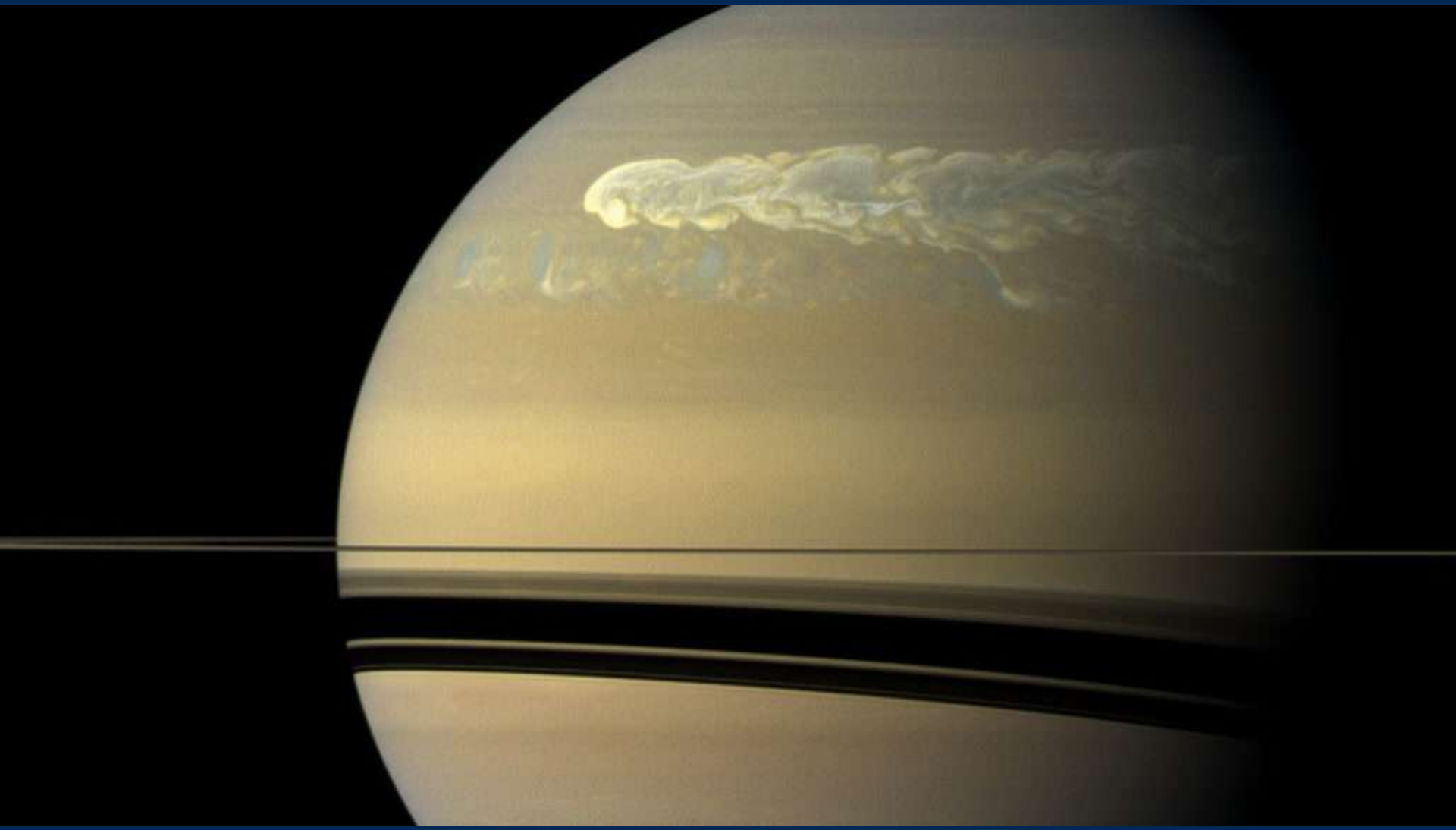
- 26.7° Tilt
- Ring plane on edge at 13-15 year intervals
- Ring plane views 2/11/1996, 9/4/2009,3/23/2025, 10/15/2038

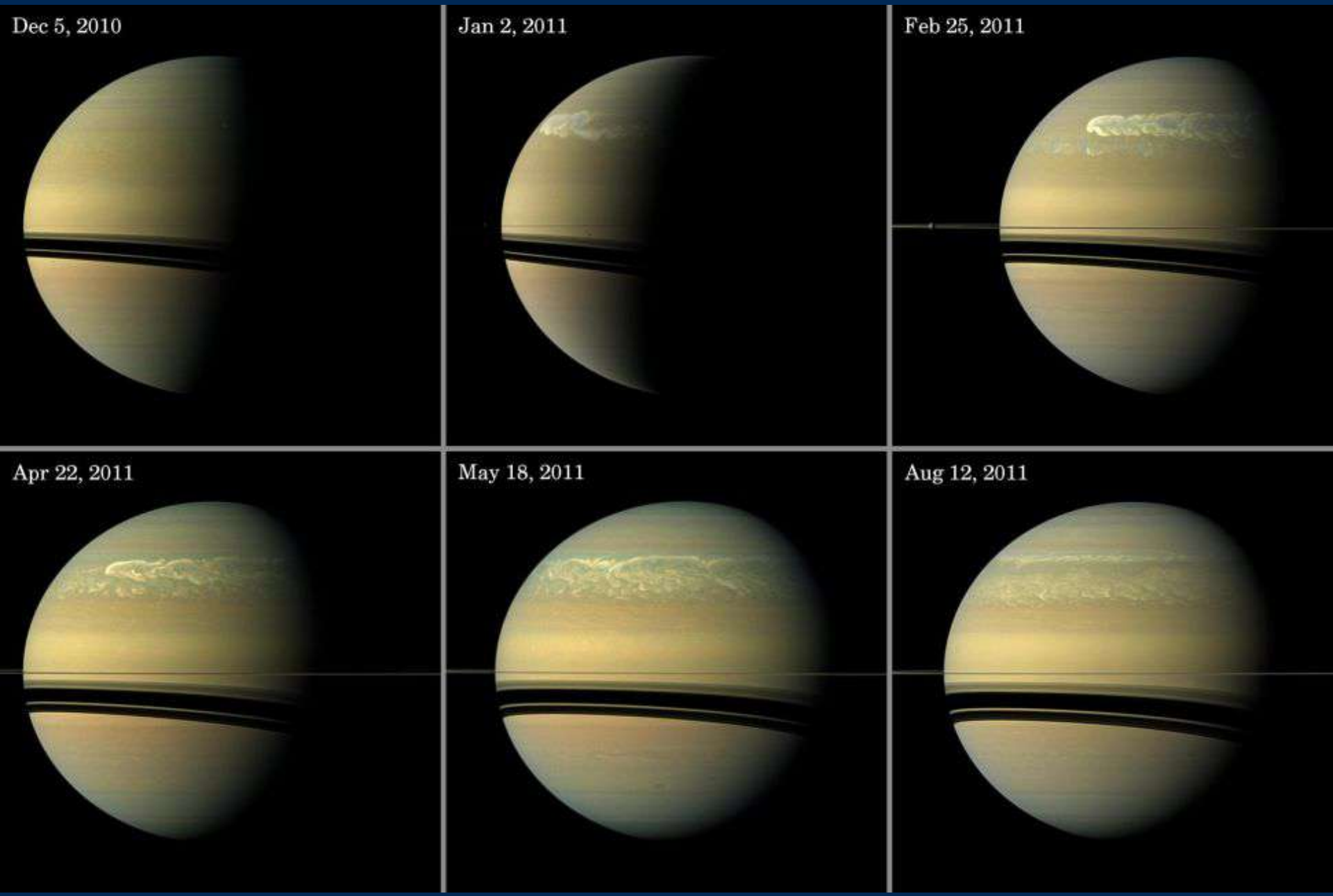
Atmosphere

- Hydrogen (96%) and helium (3%)
- Wind speeds: 1,800 km/hr (1,100 mi/hr)
- Storms
  - Small storms
  - Great White Spots
  - Titanic storms
  - Vortex
- Storms on Saturn – Great White Spots 2010
- Single image

Storms on Saturn – Great White Spots

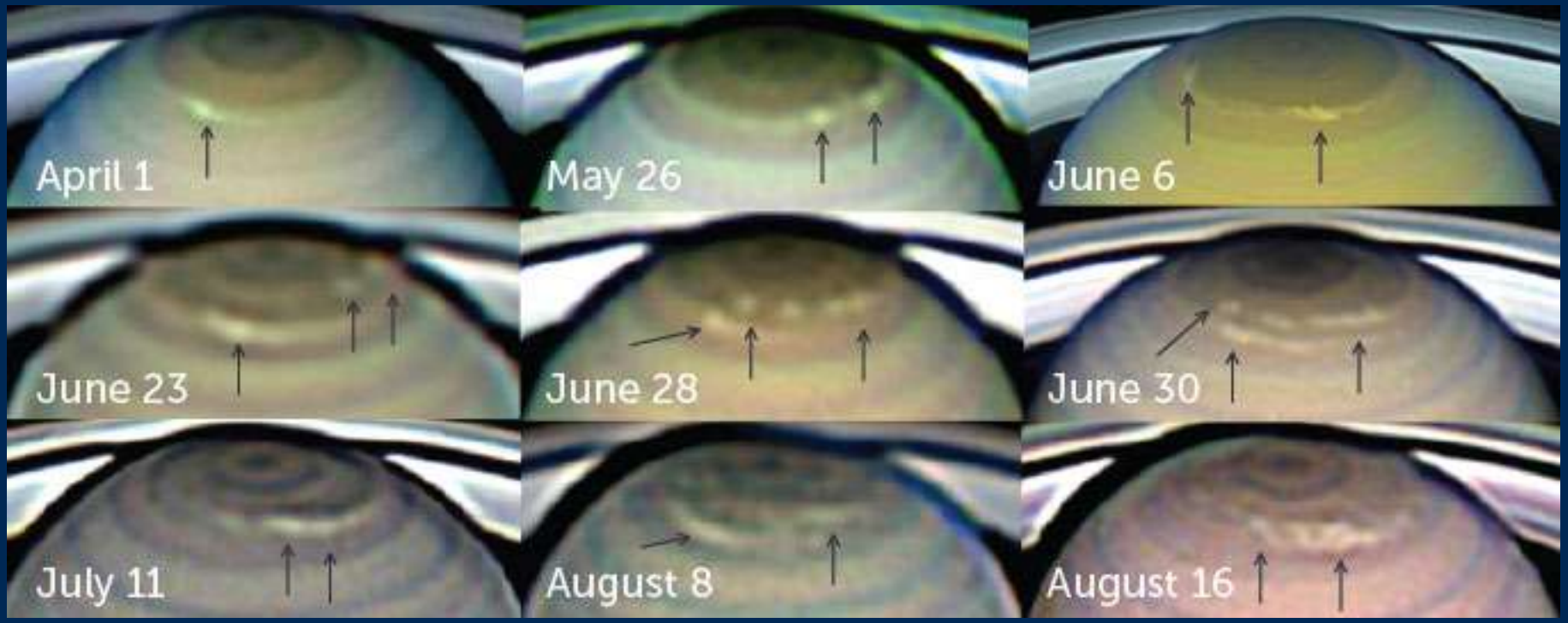
- Recur every 20-30 years
- ”Titanic” storms 6 times since 1876
- Smaller storms more regularly
- Lightning flashes
  - Small storms – few per minute
  - Great white spots – few per second




Dec 5, 2010
Jan 2, 2011
Feb 25, 2011
Apr 22, 2011
May 18, 2011
Aug 12, 2011

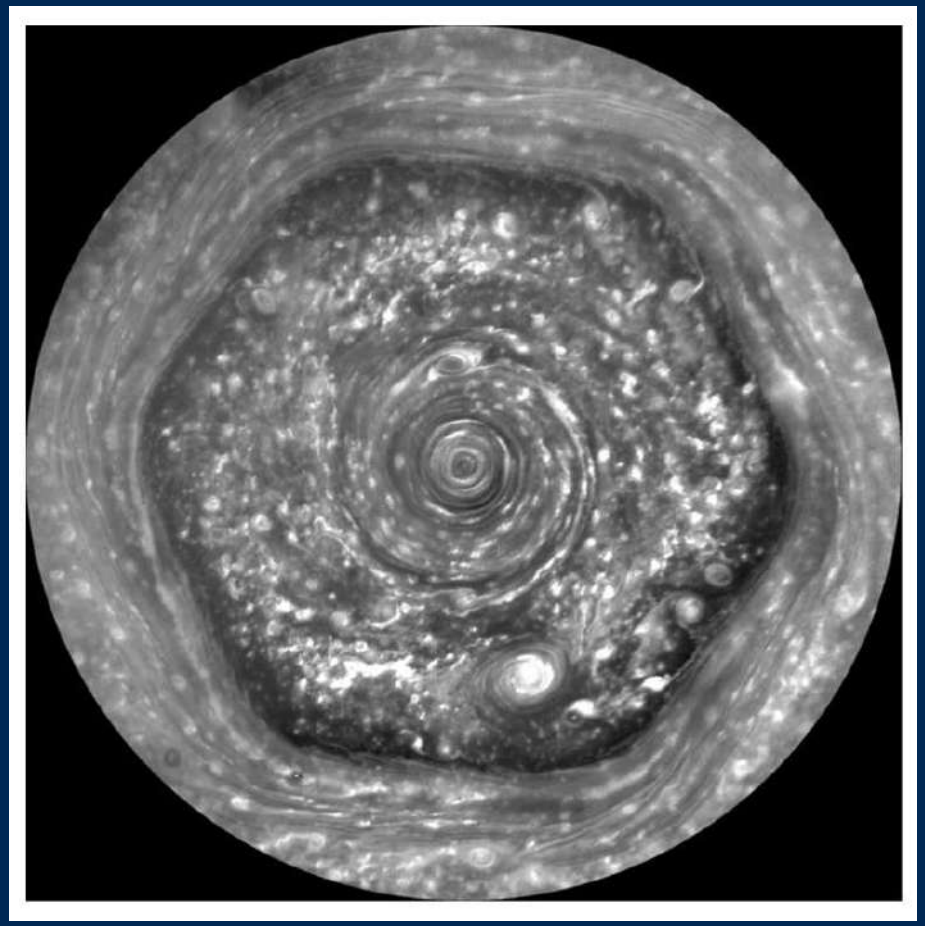
Storms on Saturn – New type

- 2018 – near north pole
- No lightning

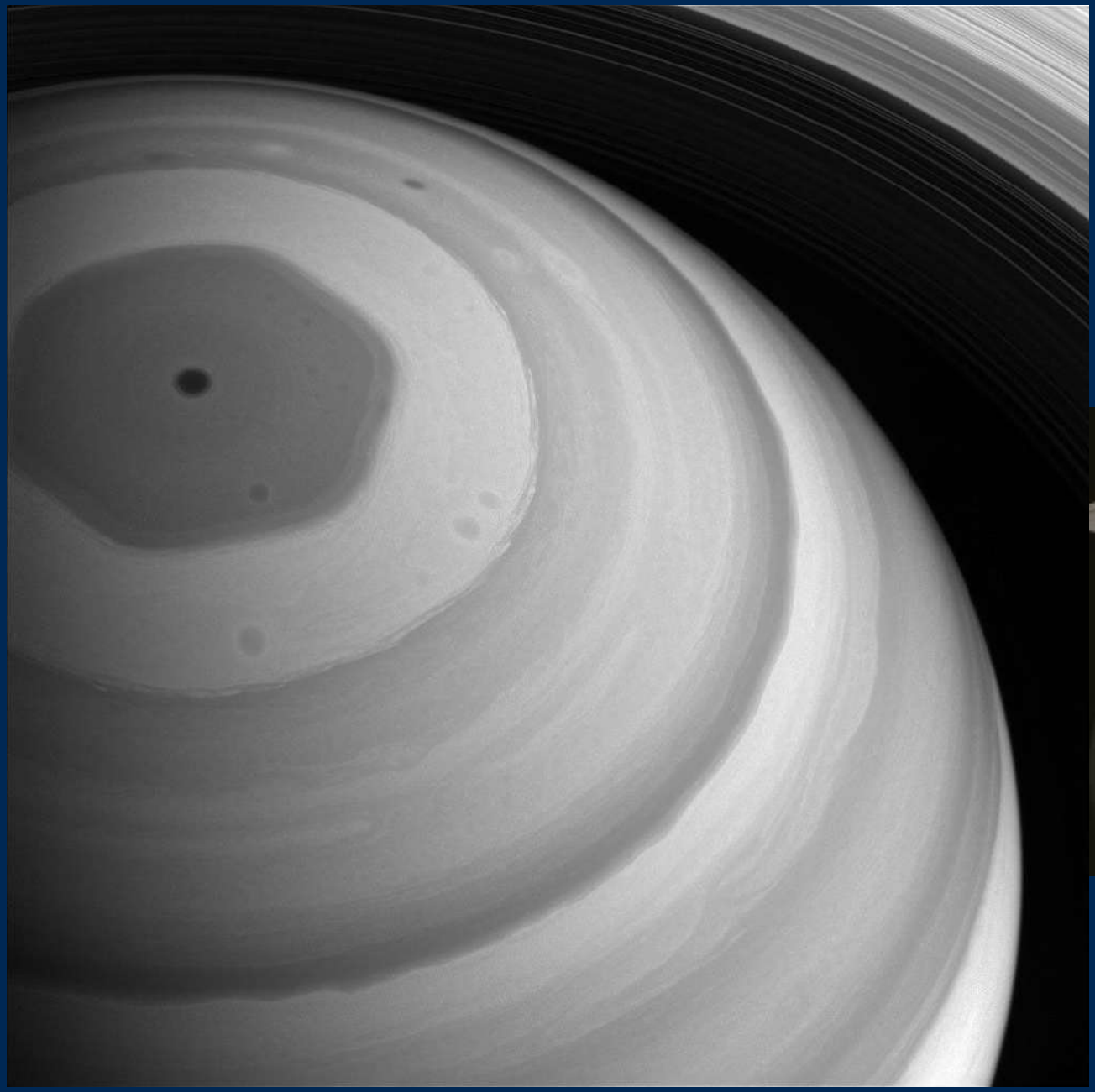


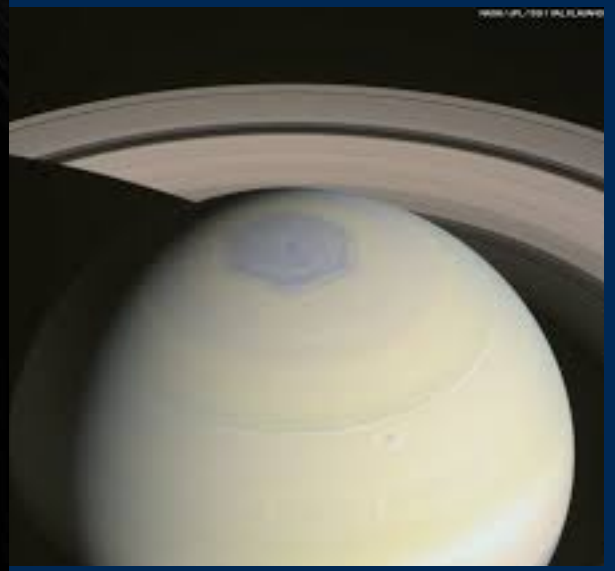
Storms on Saturn – Vortex

- Discovered by probes



Taken by Voyager





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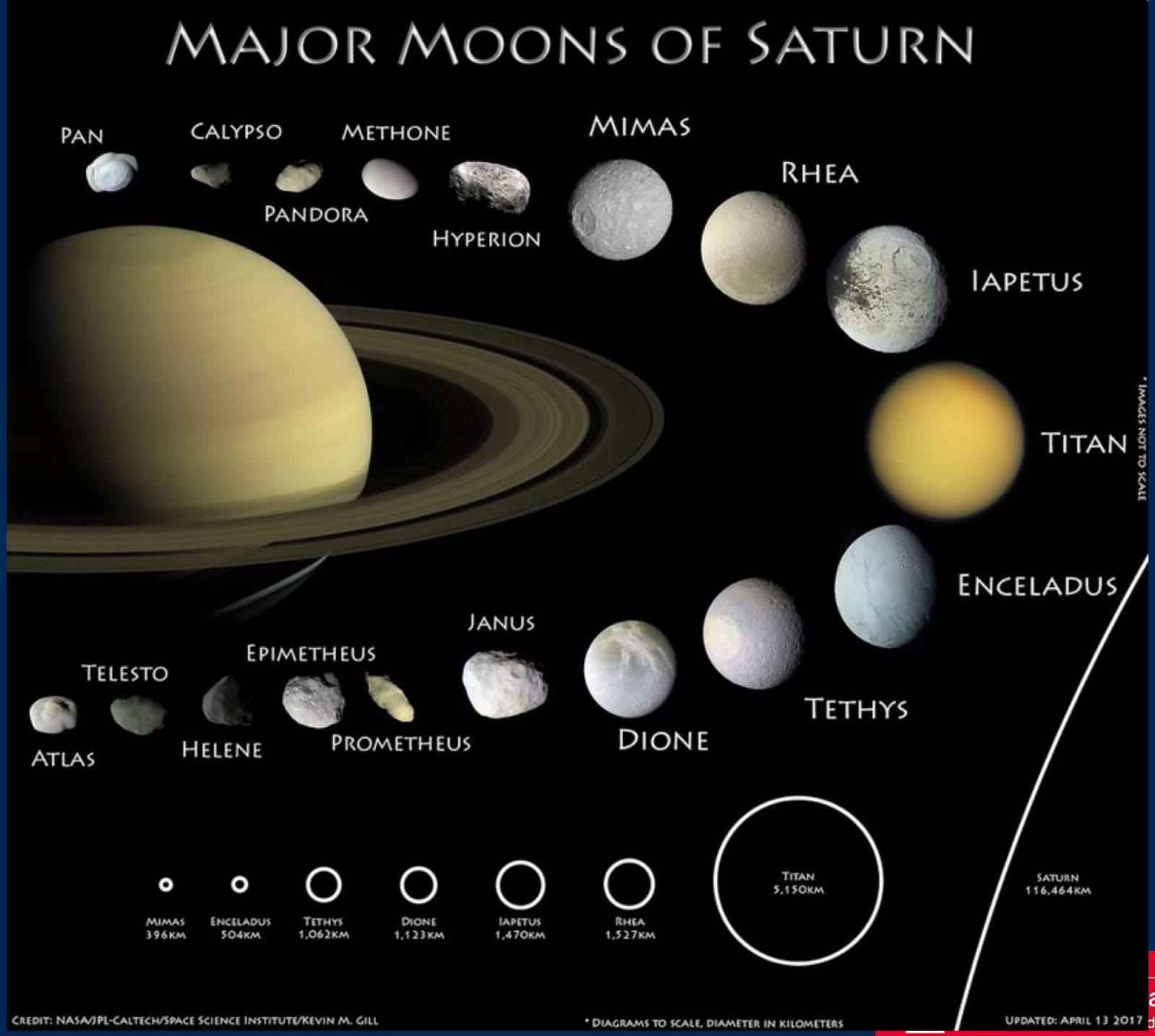
Rings

- All gas giants have rings
- 282,000 km (175,000 mi) wide
- 1 km (0.6 mi) thick
- Over 500 separate rings
- Origin: comets, asteroids or shattered moons
- Rock, ice, dust

Moons

- 82 official moons – Jupiter = 79
- 150 moonlets
- Billions of rocks - minimoons


MAJOR MOONS OF SATURN
PAN
CALYPSO
METHONE
MIMAS
RHEA
PANDORA
HYPERION
IAPETUS
TITAN
* IMAGES NOT TO SCALE
ENCELADUS
JANUS
EPIMETHEUS
TELESTO
TETHYS
ATLAS
HELENE
PROMETHEUS
DIONE
TITAN 5,150KM
SATURN 116,464KM
MIMAS 396KM
ENCELADUS 504KM
TETHYS 1,062KM
DIONE 1,123KM
IAPETUS 1,470KM
RHEA 1,527KM
CREDIT: NASA/JPL-CALTECH/SPACE SCIENCE INSTITUTE/KEVIN M. GILL
* DIAGRAMS TO SCALE, DIAMETER IN KILOMETERS
UPDATED: APRIL 13 2017


Dione
Enceladus
Iapetus
Mimas
Phoebe
Rhea
Tethys
Titan
Solar System Wiki