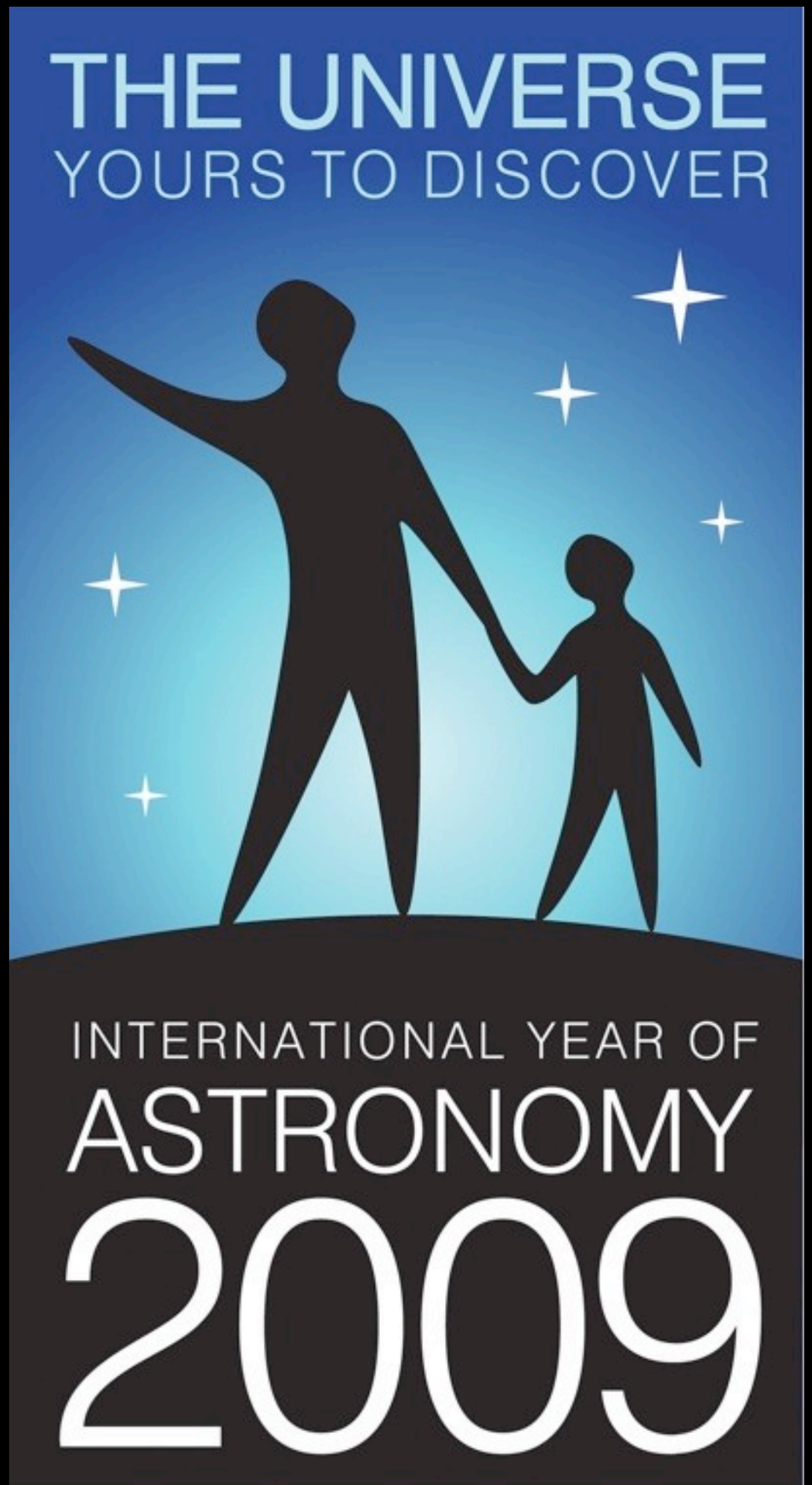
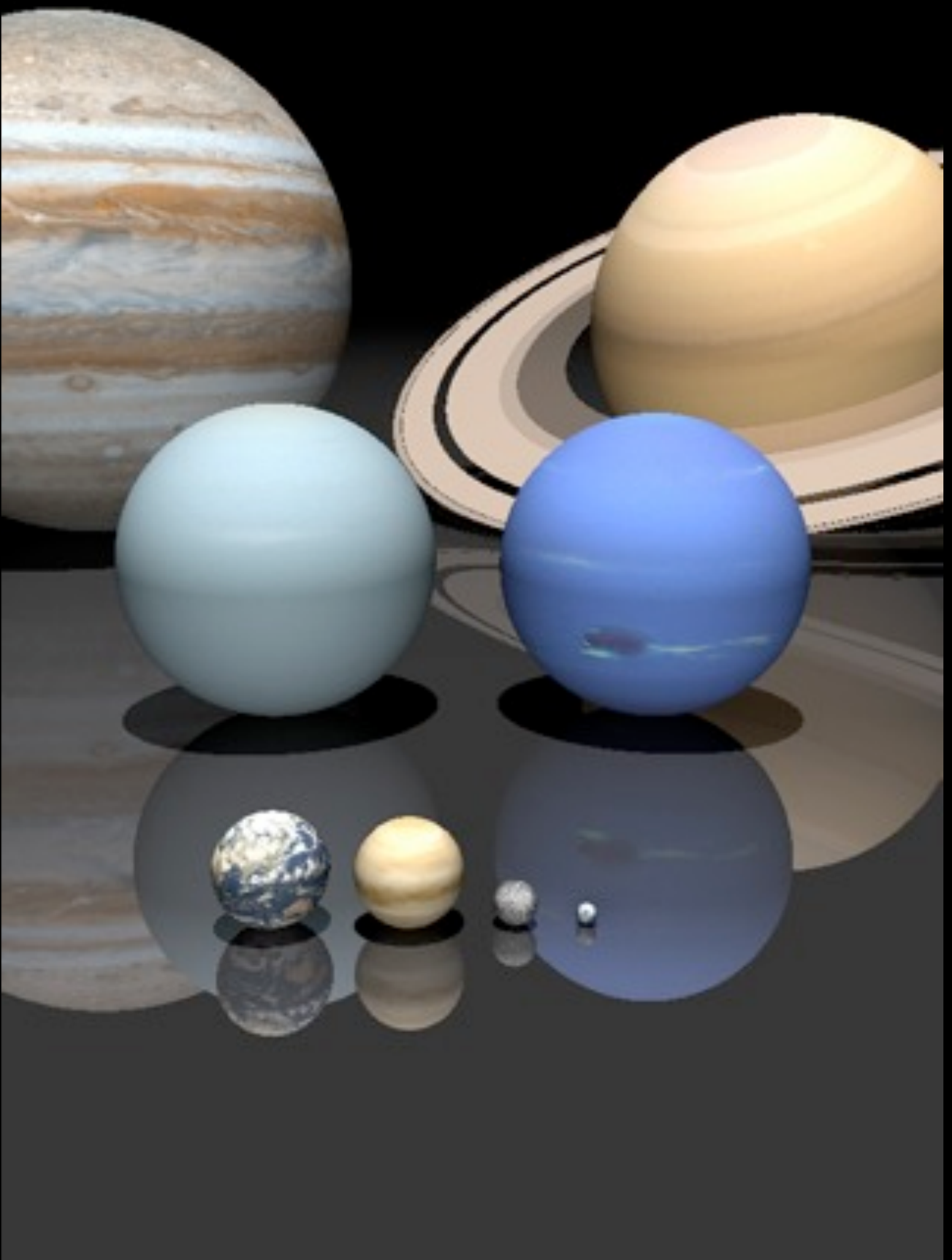


Celebrating 400 Years of Astronomical Telescopes

- 1609: Galileo first views the skies with a telescope.
- 1610: Galileo discovers four moons of Jupiter.
- 1610: Galileo notices the "tri-fold" appearance of Saturn.

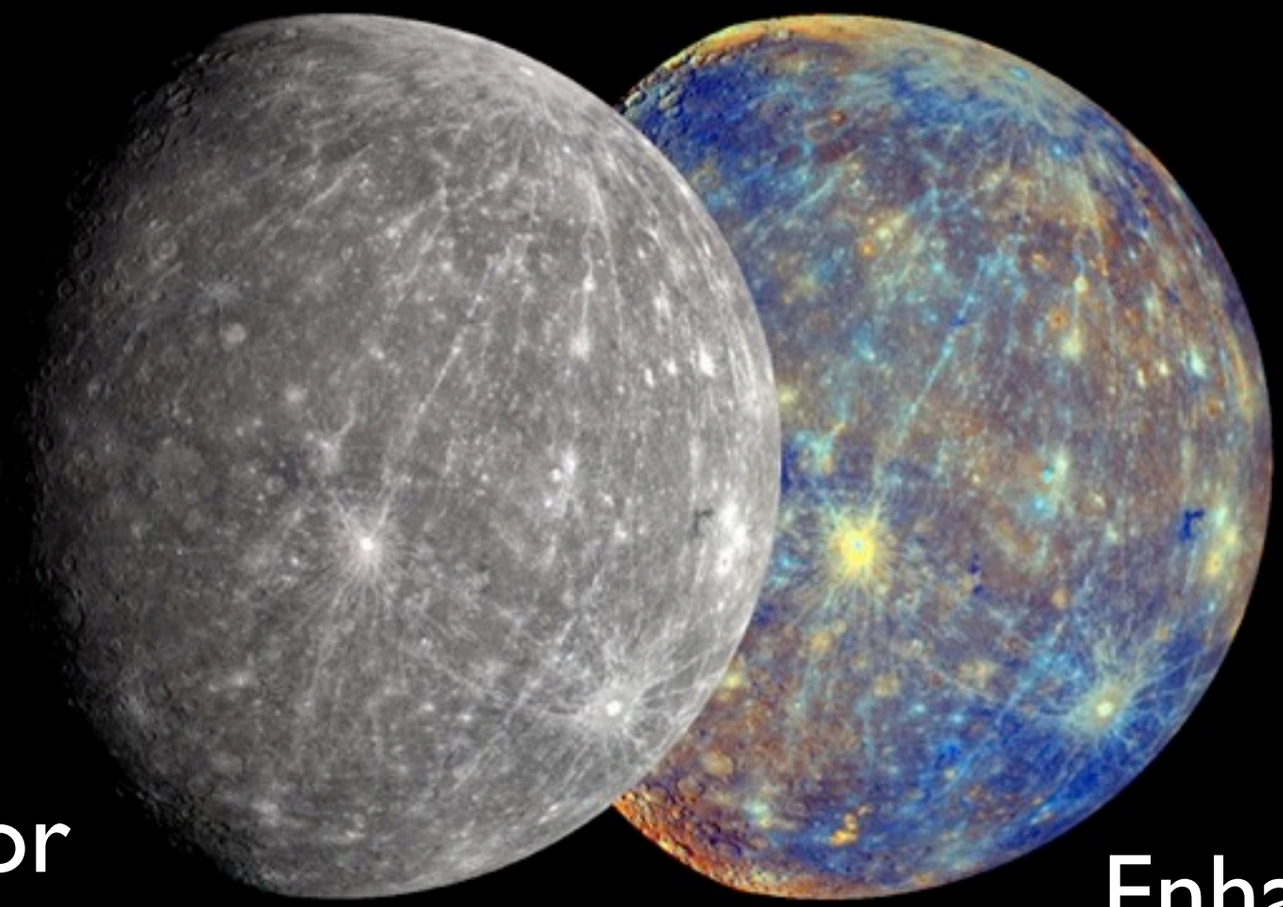


What's New Over the Sun

Mark R. Showalter
with Mitch Gordon
SETI Institute
mshowalter@seti.org

For the Night Sky Network
January 15, 2009

Mercury Messenger



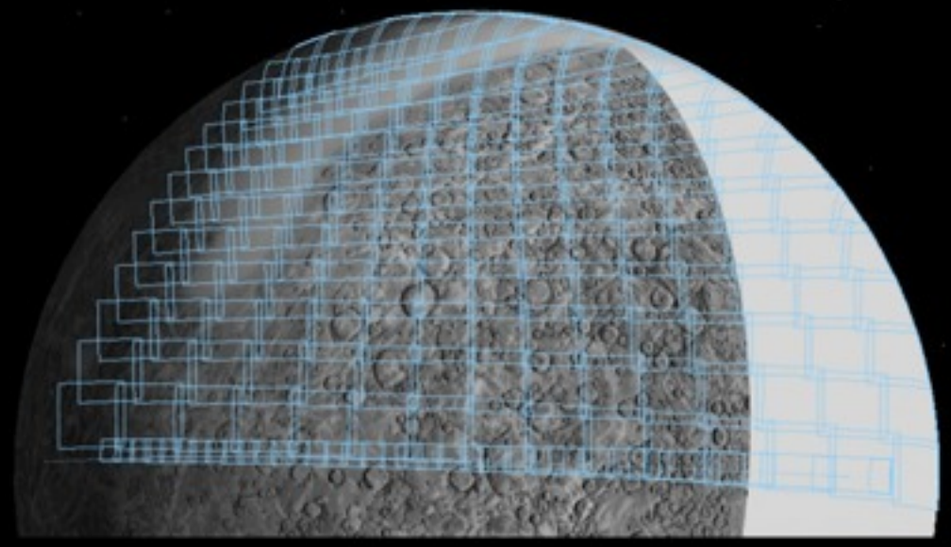
True color

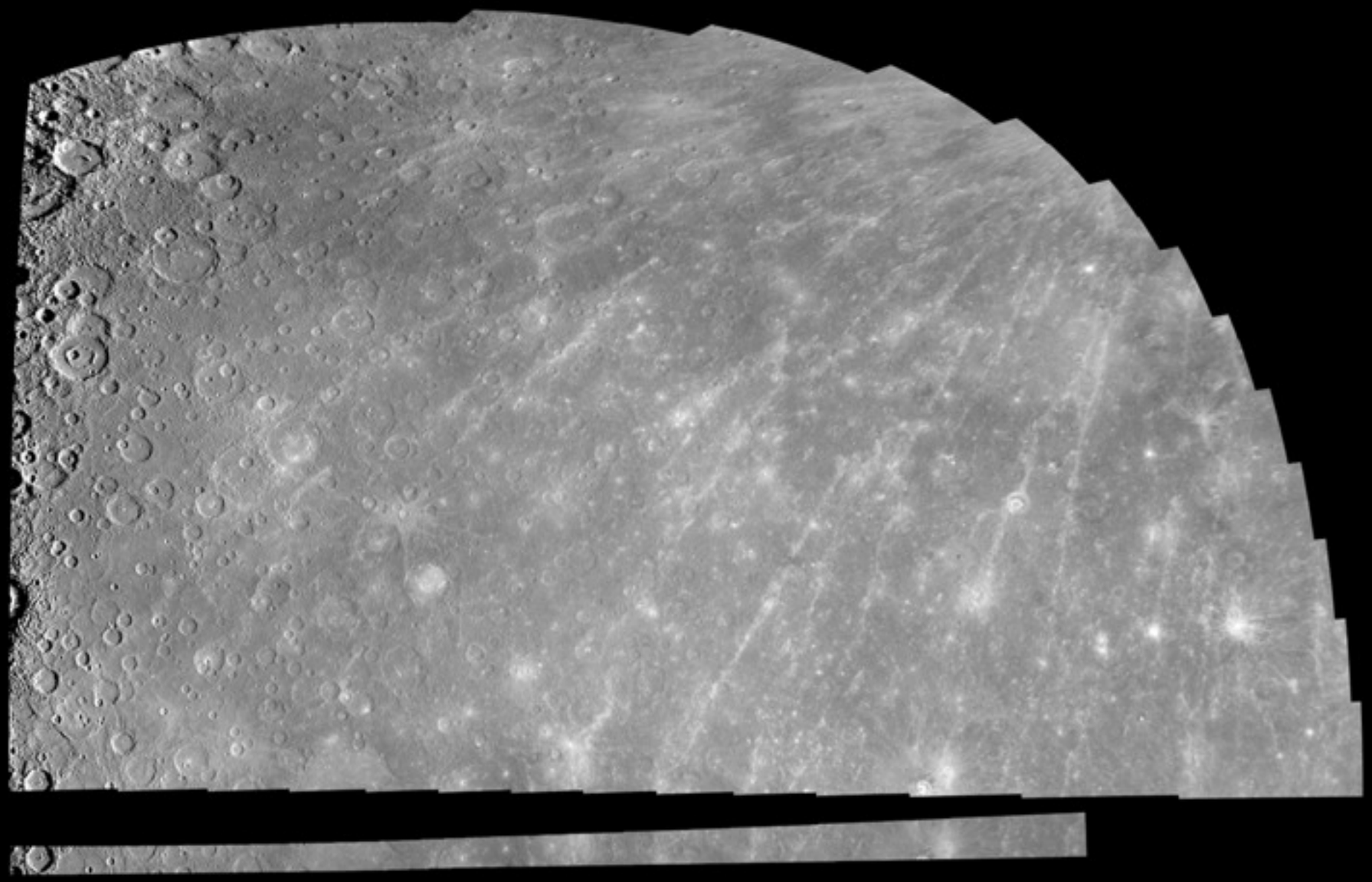
Enhanced

- October 2008: Mercury flyby #2
- September 2009: Mercury flyby #3
- March 2011: Orbit Insertion
  - One-year mapping mission
- See http://messenger.jhuapl.edu/

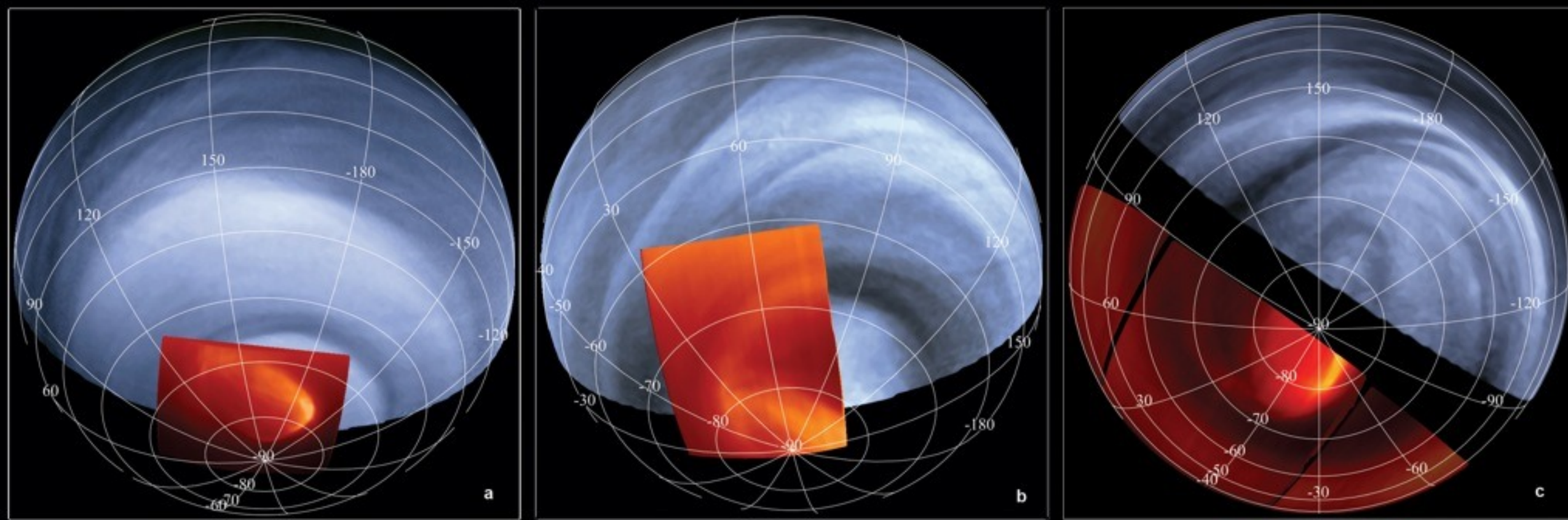
Mercury Flyby 2

Departure NAC Mosaics 1 and 2



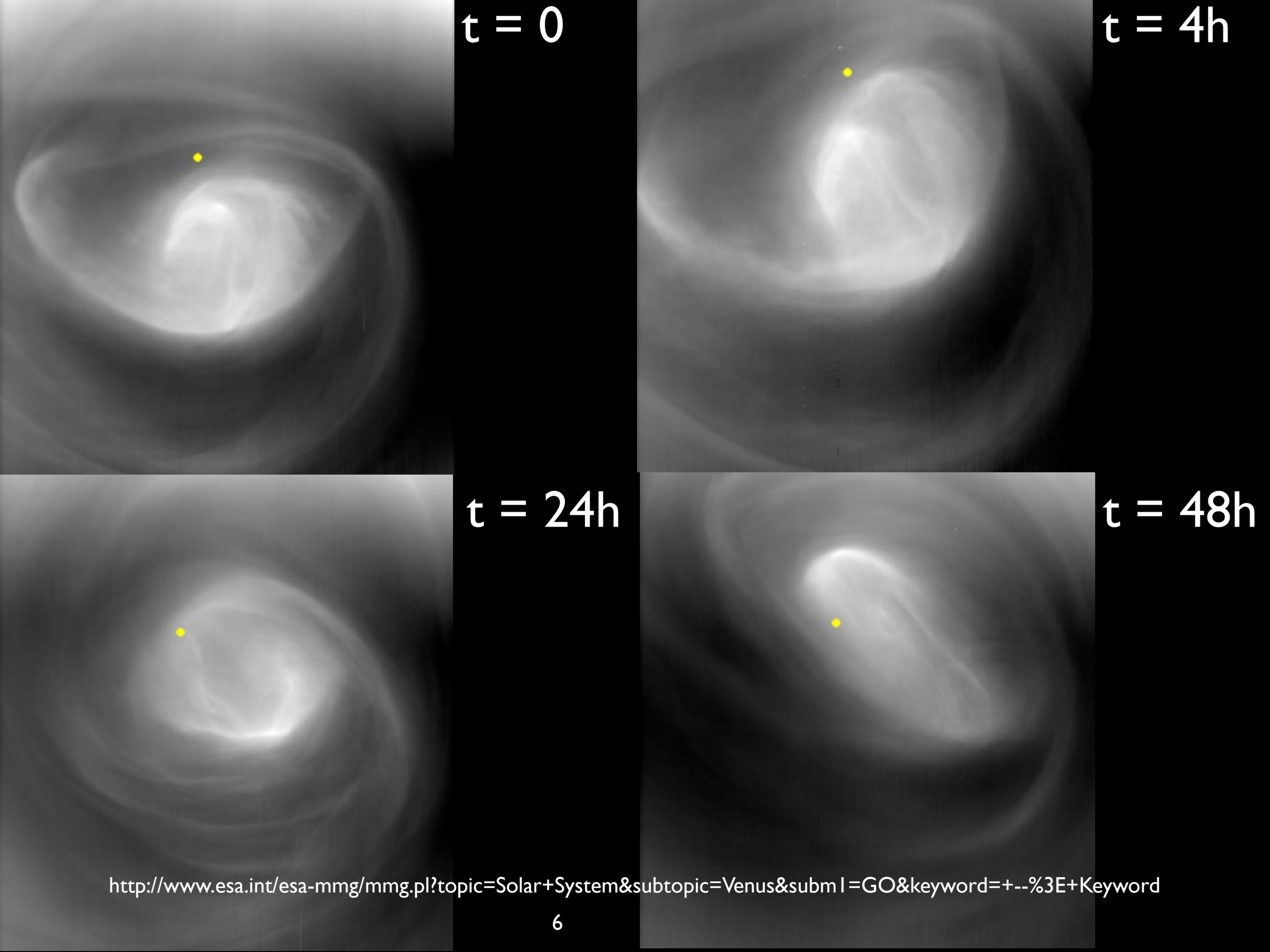


Venus Express

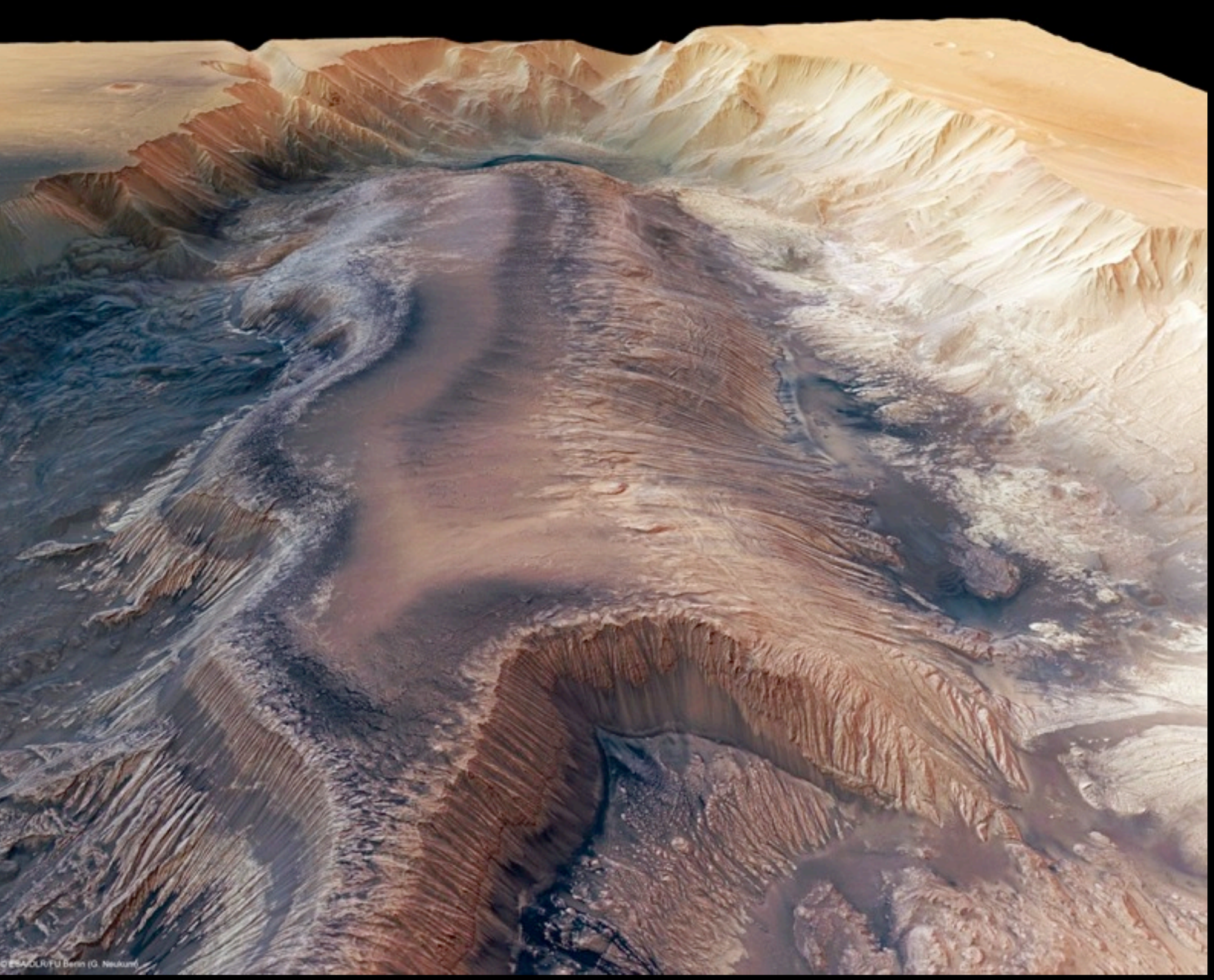


- Oval storm offset from the south pole
  - Red = thermal infrared (temperature)
  - Blue = ultraviolet (structure)

http://www.esa.int/esa-mmg/mmg.pl?b=b&type=I&mission=Venus%20Express&single=y&size=b&start=4



http://www.esa.int/esa-mmg/mmg.pl?topic=Solar+System&subtopic=Venus&submI=GO&keyword=+--%3E+Keyword



Perspective view of Herbes Chasma

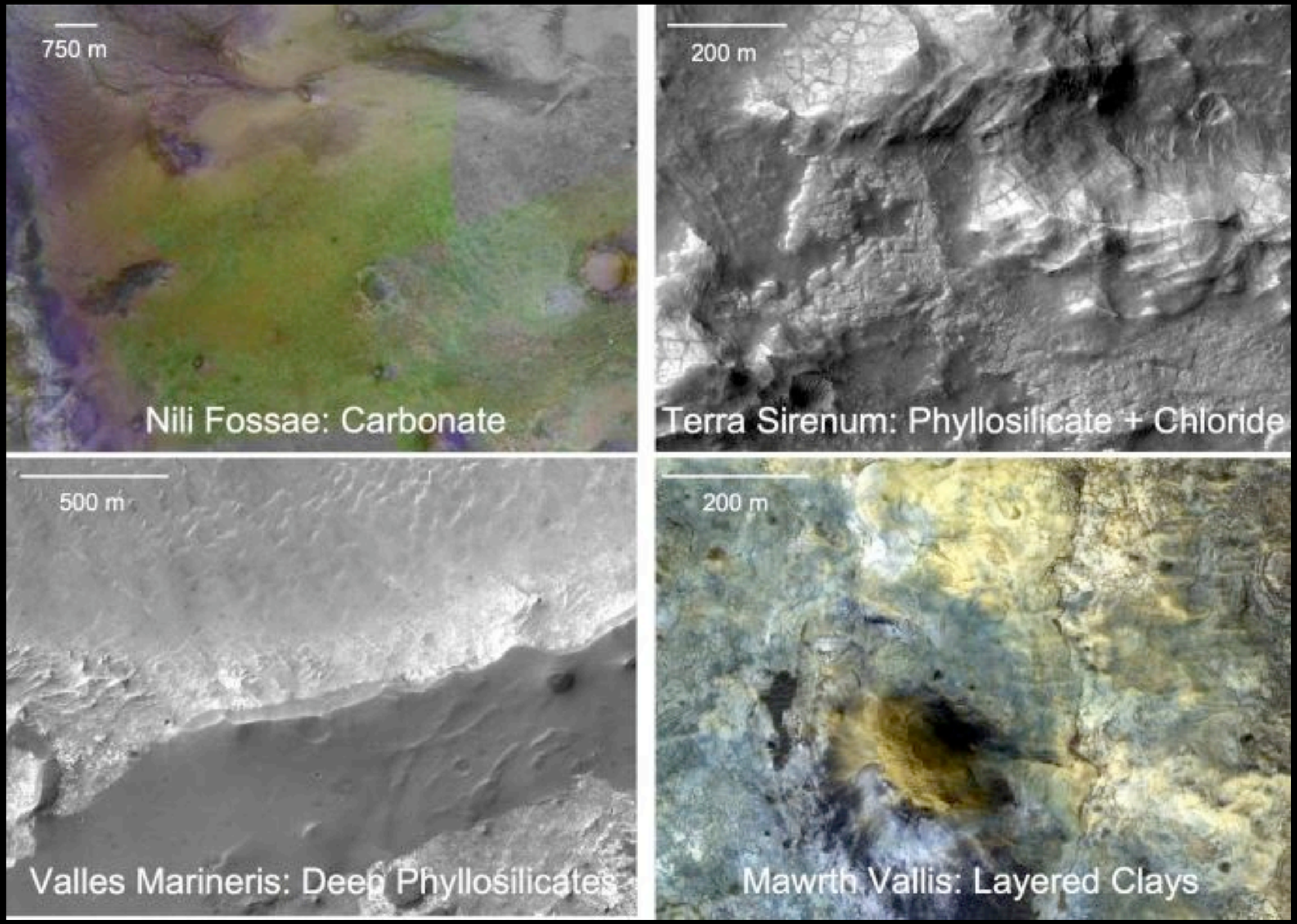
http://www.esa.int/esa-mmg/mmg.pl?b=b&type=I&collection=Space%20Science&single=y&start=7

More info: http://www.venus.wisc.edu/

Mars Mission Info

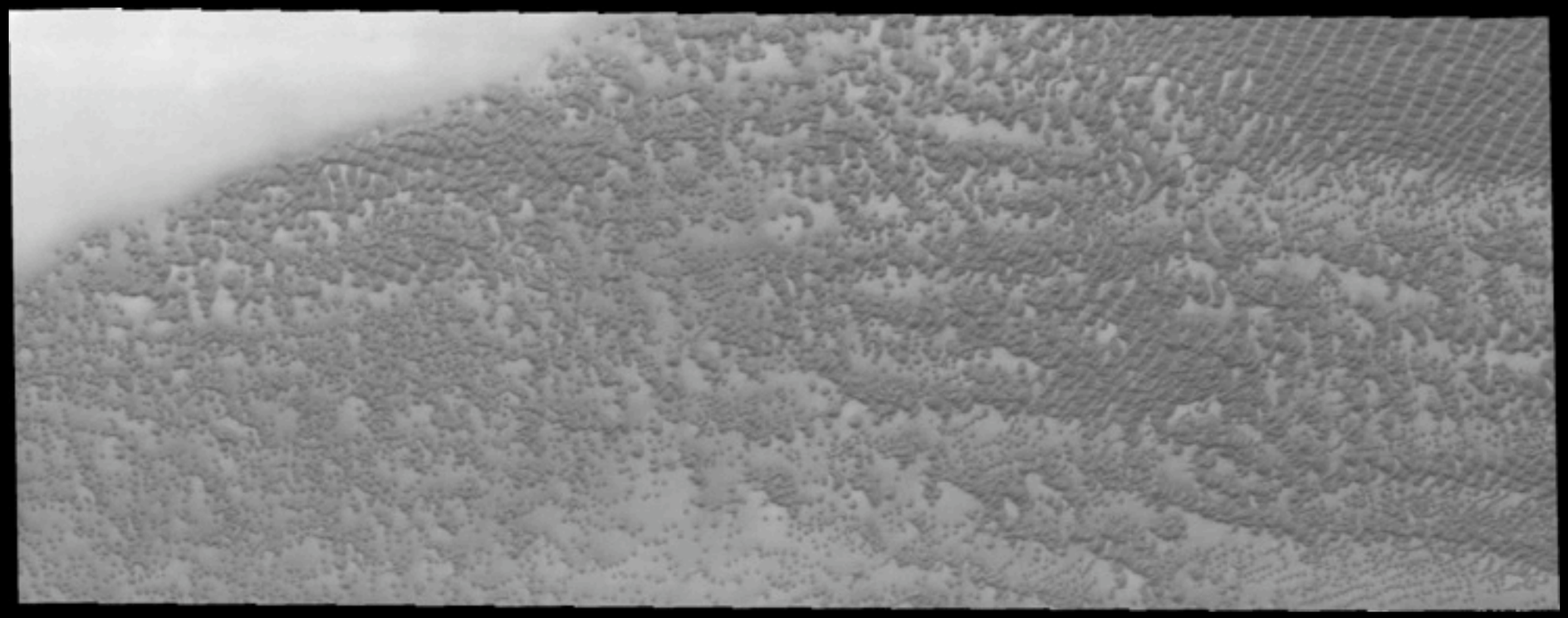
- http://marsprogram.jpl.nasa.gov/
- http://photojournal.jpl.nasa.gov/target/Mars
- Mars Reconnaissance Orbiter
  - Climate & geology
  - http://marsprogram.jpl.nasa.gov/mro/
- Mars Odyssey: Subsurface water
  - http://mars.jpl.nasa.gov/odyssey/
- Mars Exploration Rovers
  - Climate, geology, water activity
  - http://marsrovers.jpl.nasa.gov
- Phoenix: Arctic lander, soil analysis
  - http://phoenix.lpl.arizona.edu/

MRO: Four types of geological deposits (PIA11732)

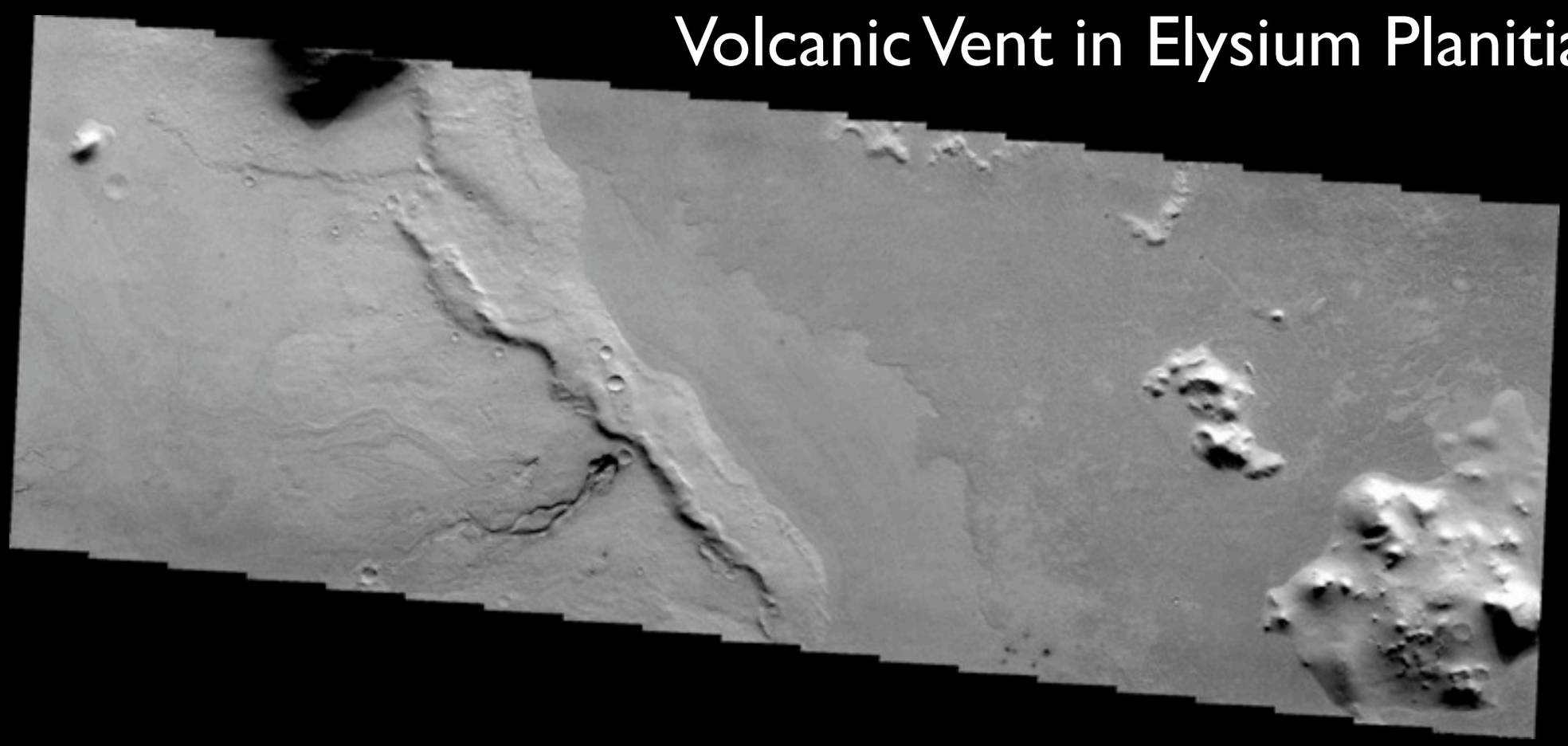


Mars Odyssey

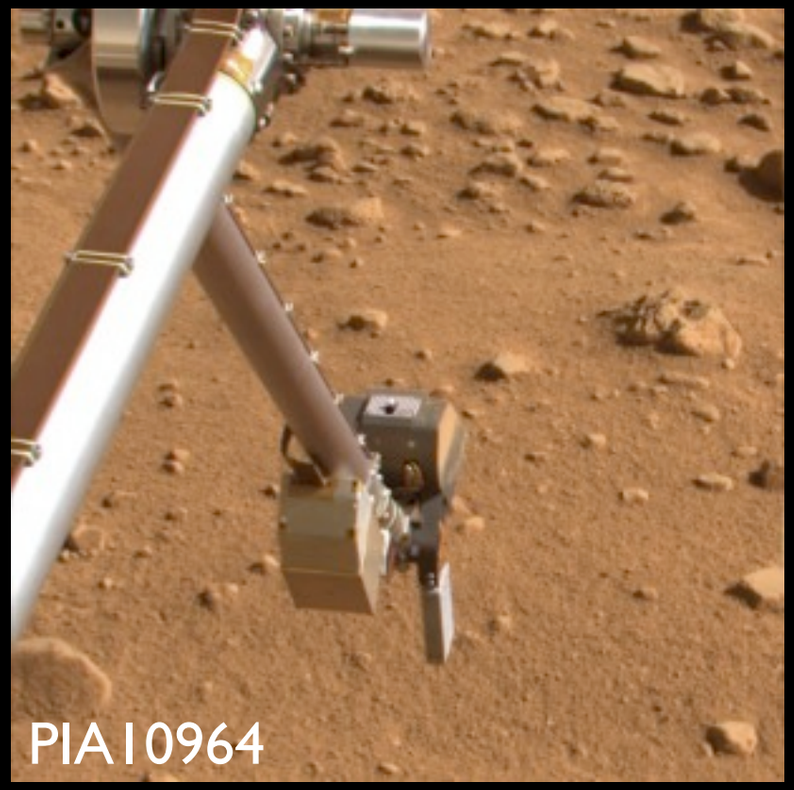
Polar Dunes (PIA11292)



Volcanic Vent in Elysium Planitia (PIA11290)

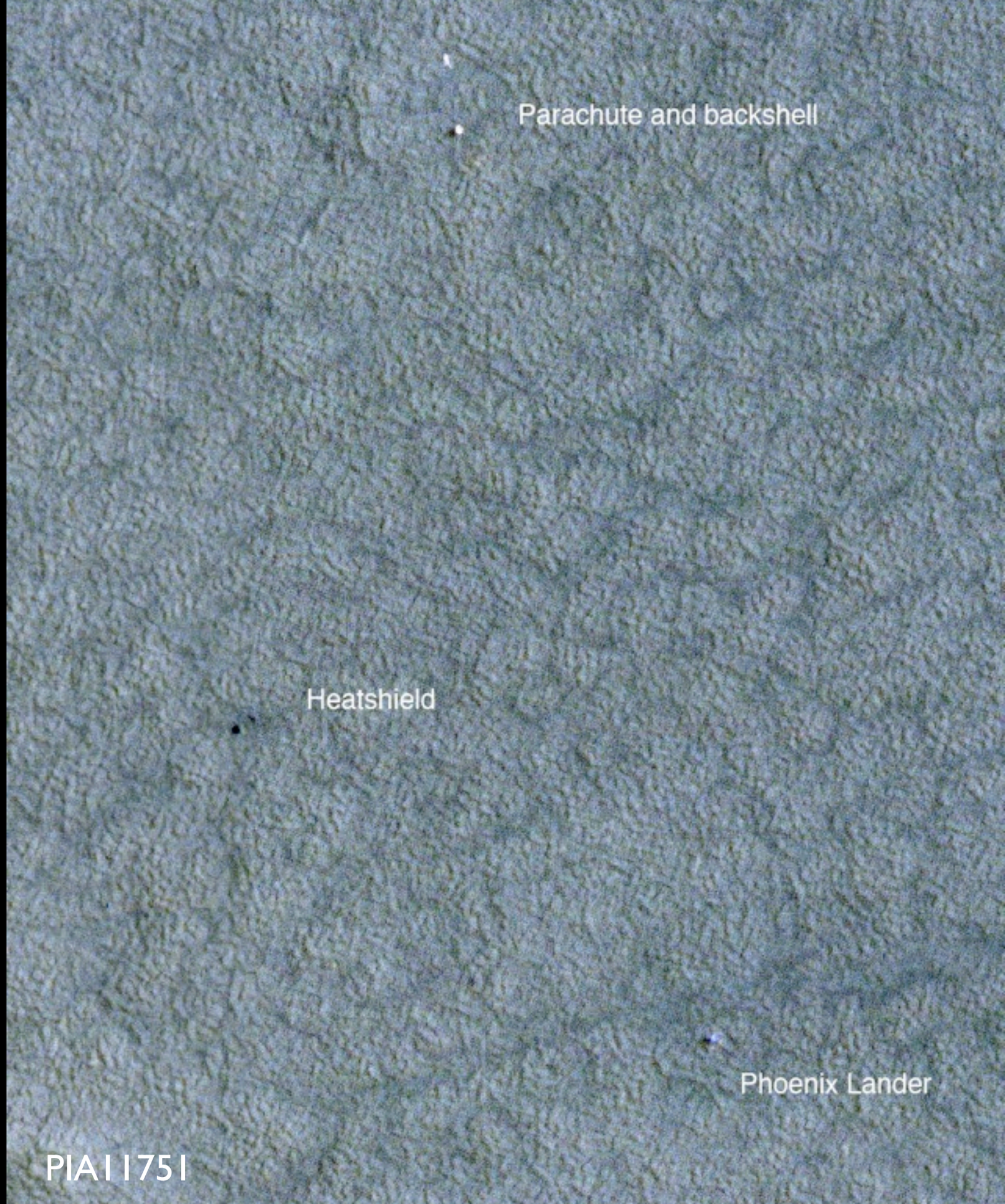


Phoenix



PIA10964

PIA11189

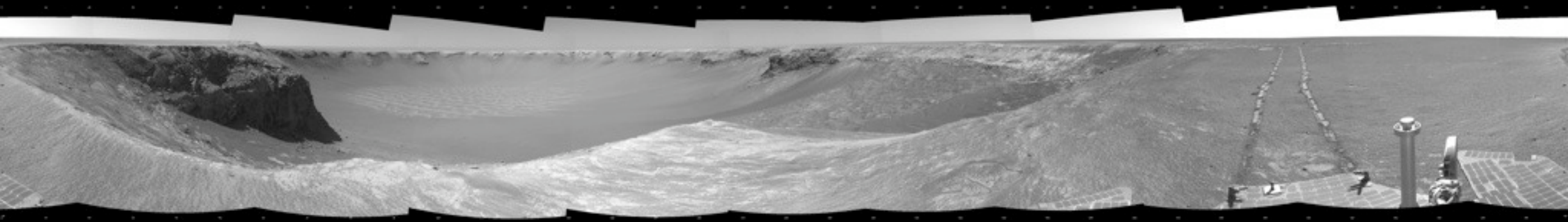


PIA11751

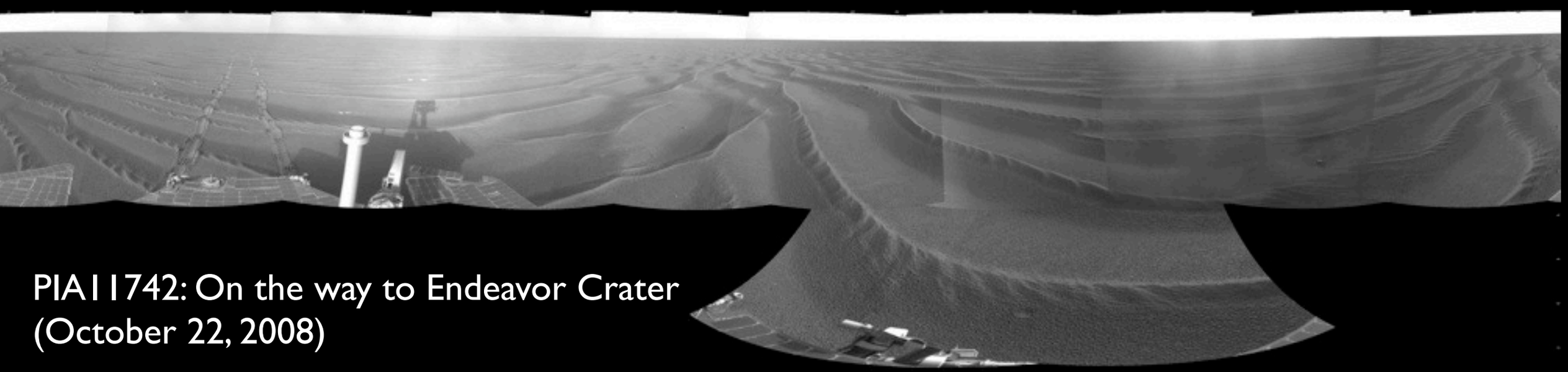
Opportunity Rover
As seen from MRO

PIA08816

PIA09260: Dust Devil Movie



PIA01894: "Duck Bay", Victoria Crater



PIA11742: On the way to Endeavor Crater
(October 22, 2008)

PIA08529: Possible meteorite

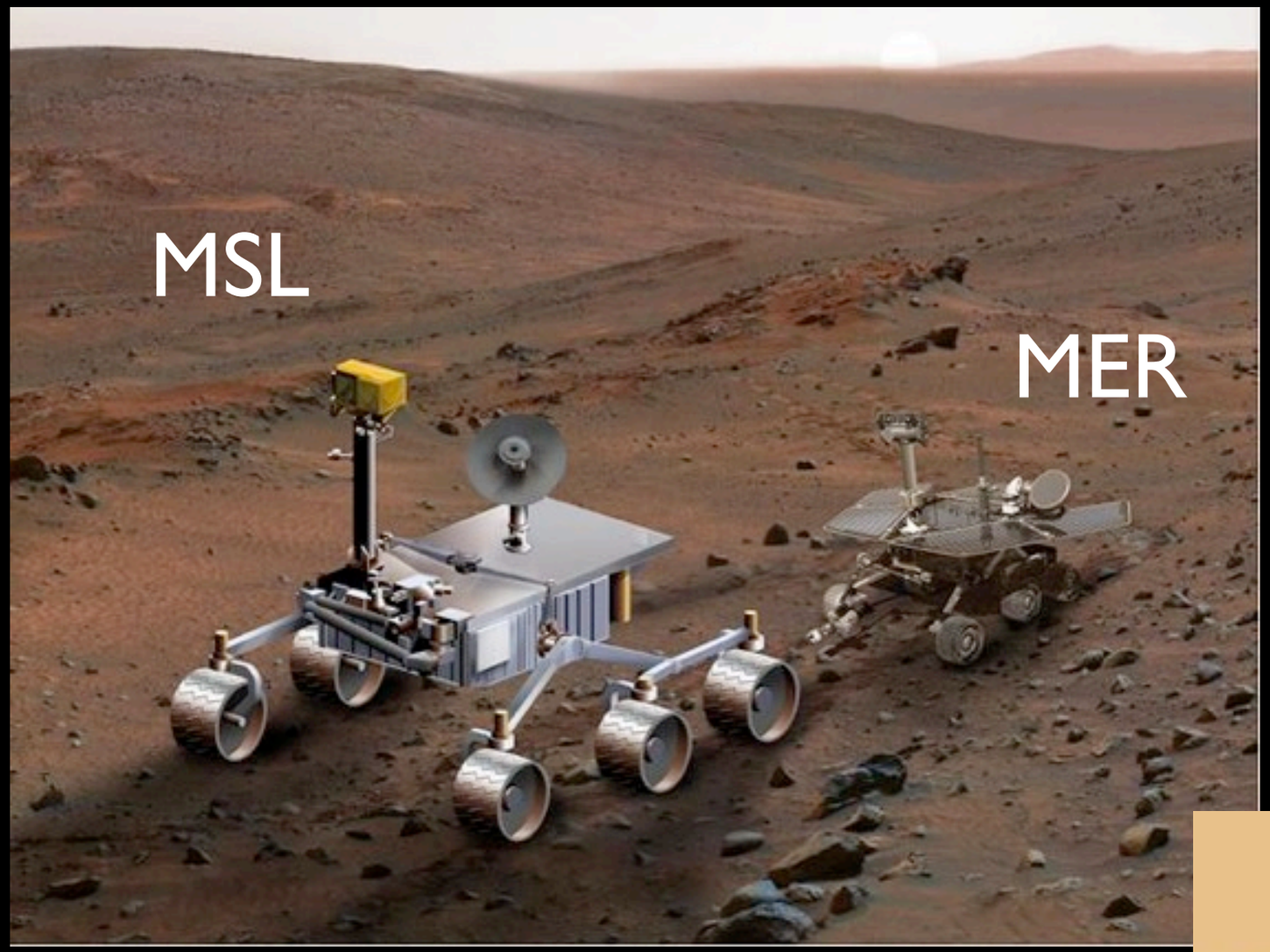
PIA1175: Panorama from Opportunity prior to Solar conjunction November–December 2008. (Enhanced color.)

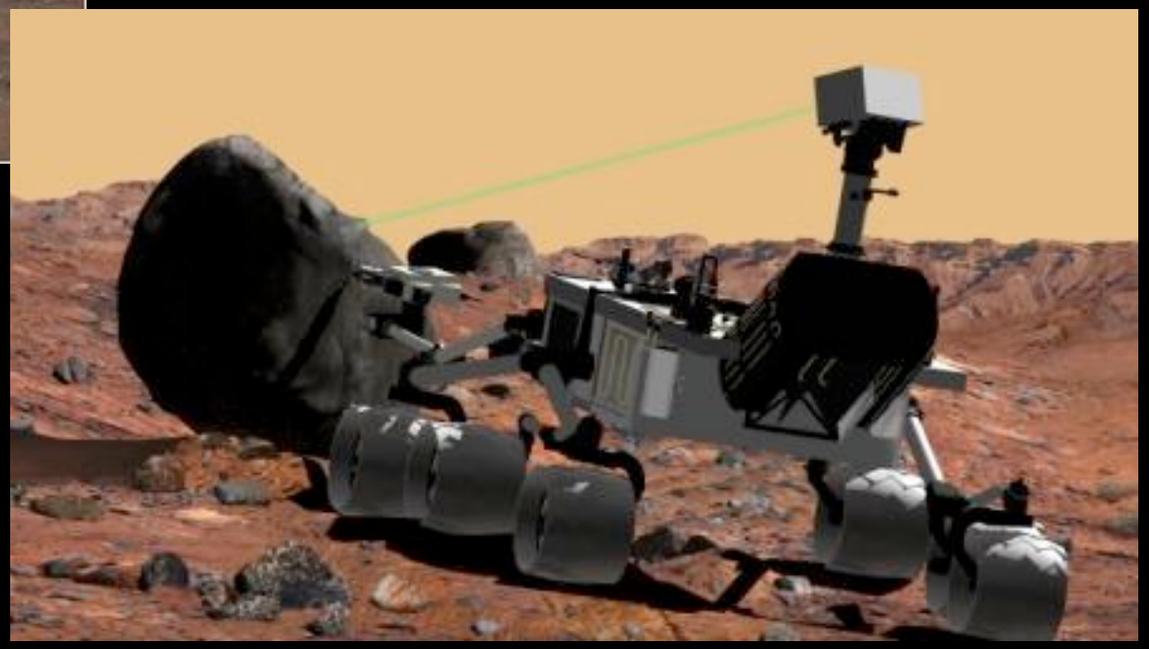
MER Status Report

- Entering the 6th year of their 90-day mission.
- Spirit: "Serious but stable"
- Opportunity: "Post-solar conjunction hangover"

Coming Next: Mars Science Laboratory

http://marsprogram.jpl.nasa.gov/msl/





PIA10368:
Phobos from MRO

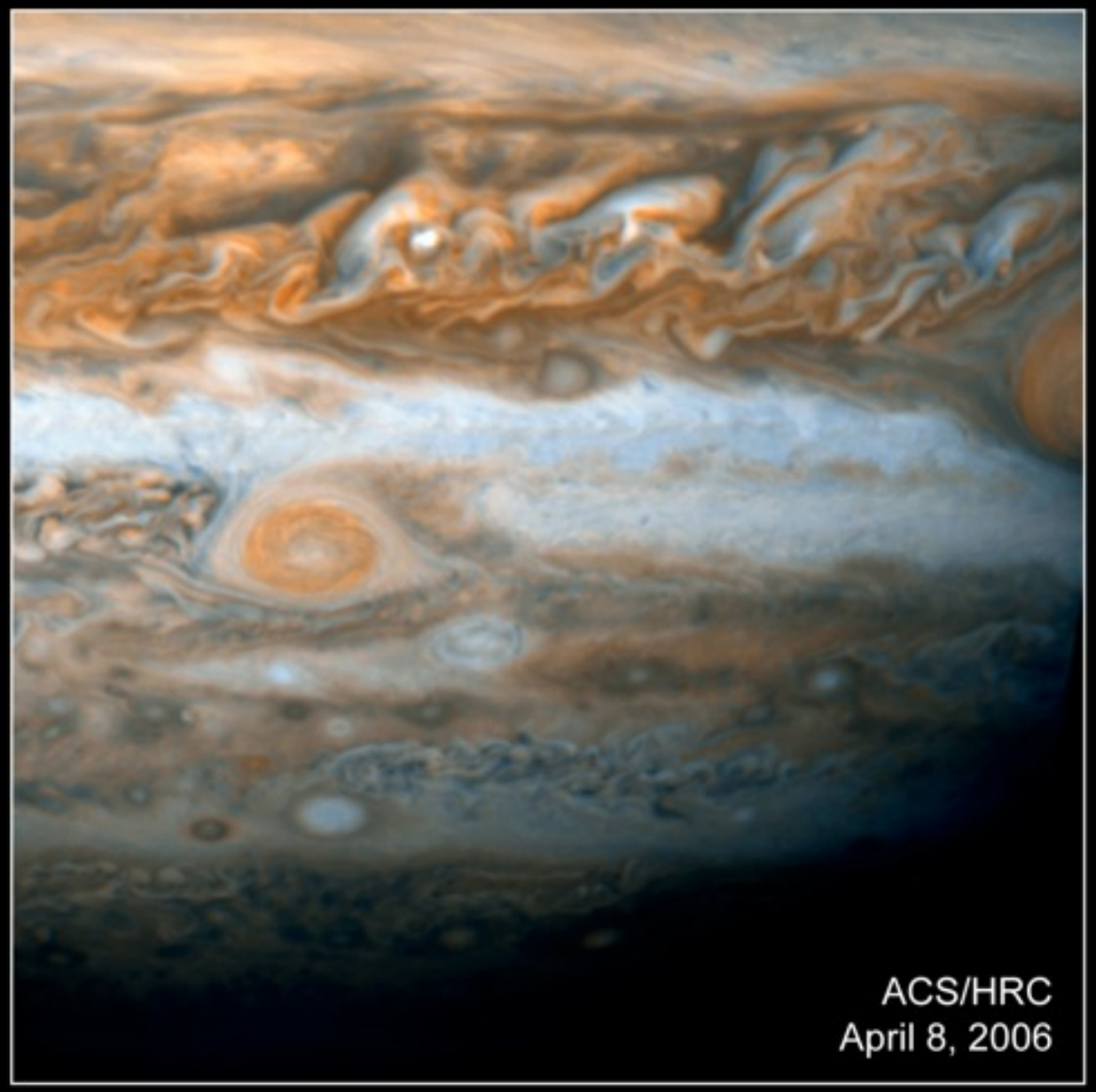
Mars *still* has no detectable rings!

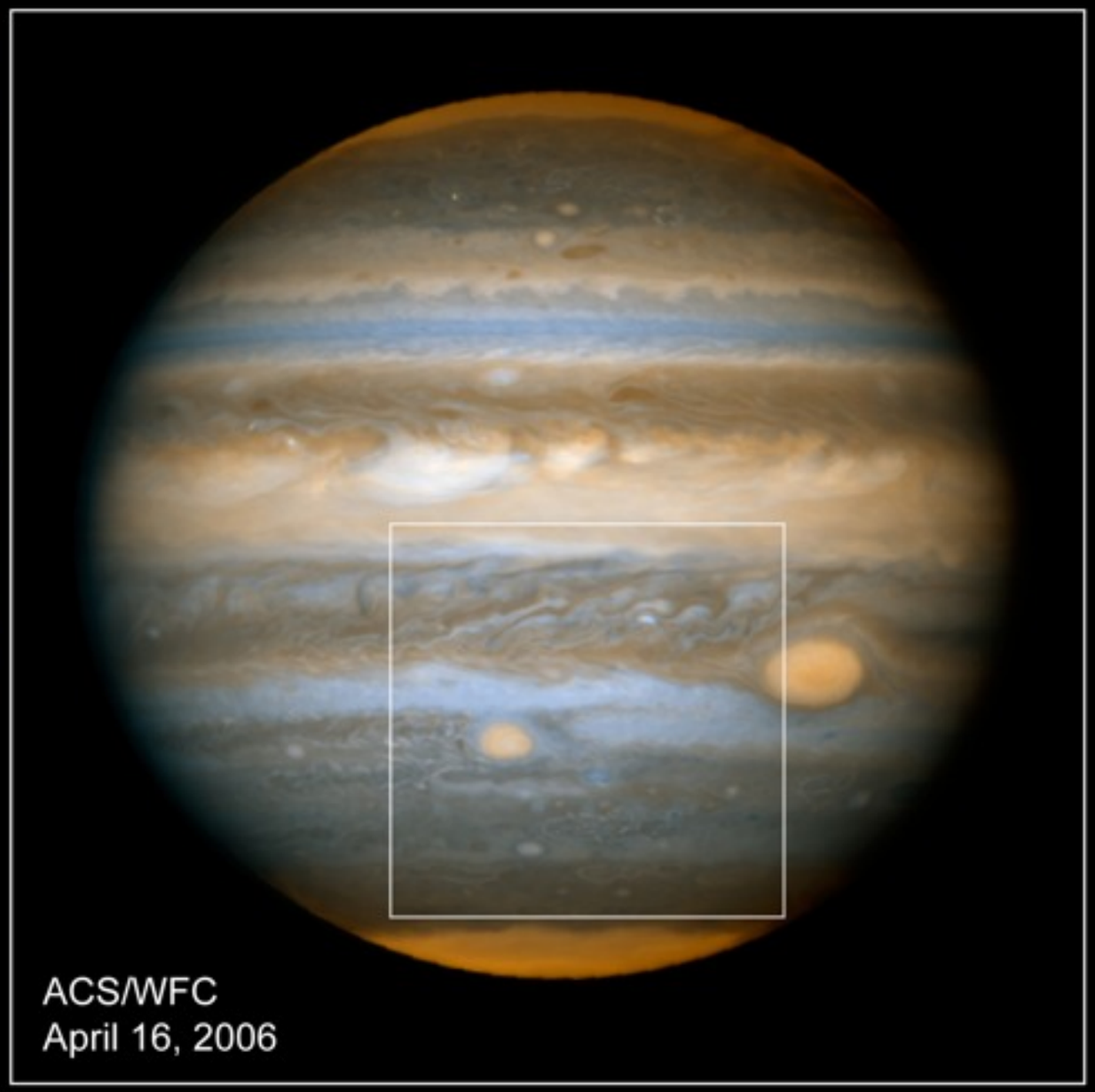
Recent Climate Change on Jupiter

February 13, 1995: Three white ovals approaching

1998–2000: Ovals merge

http://hubblesite.org/newscenter/archive/releases/1995/18/image/a



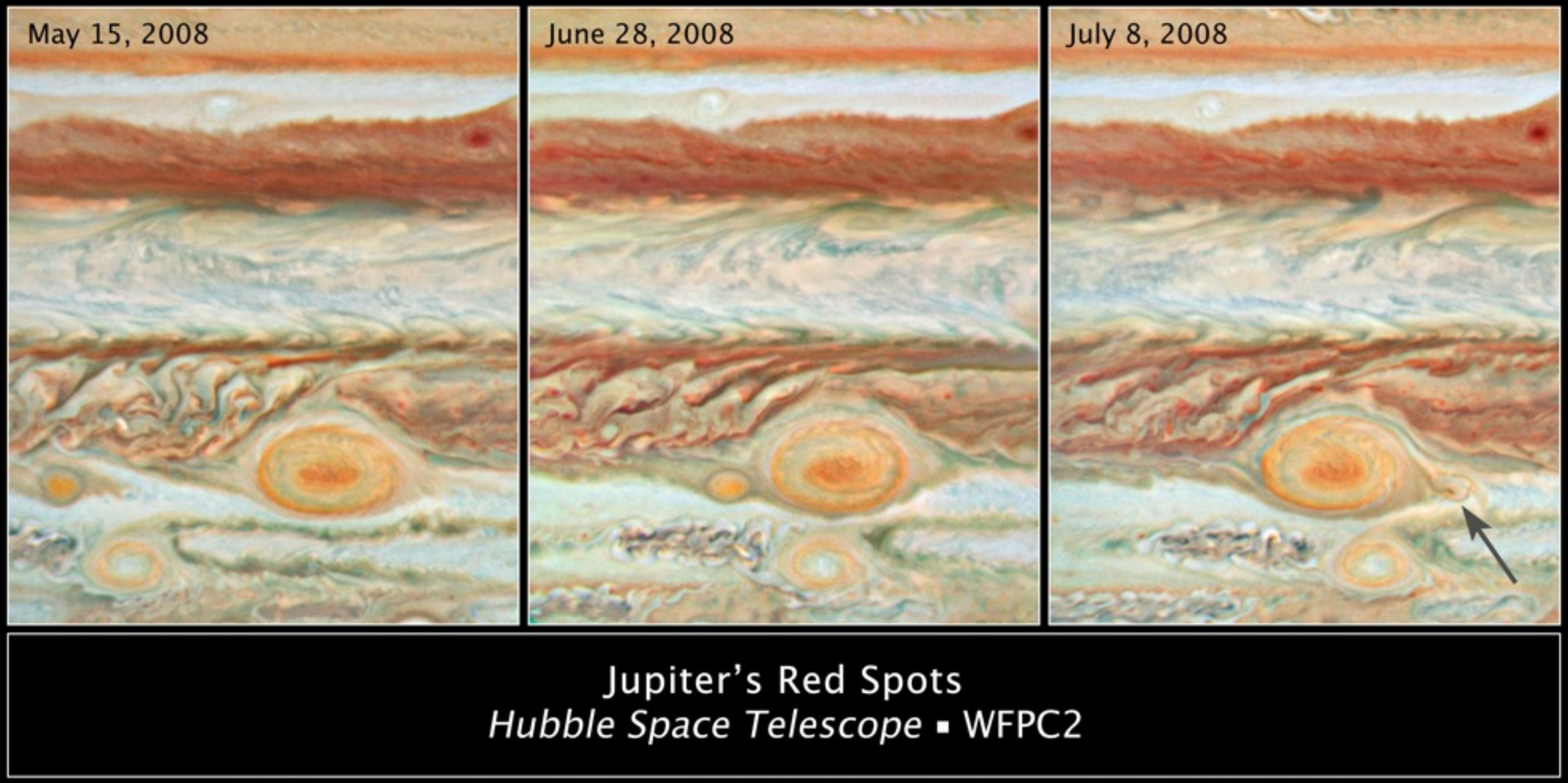


Jupiter's Red Spots

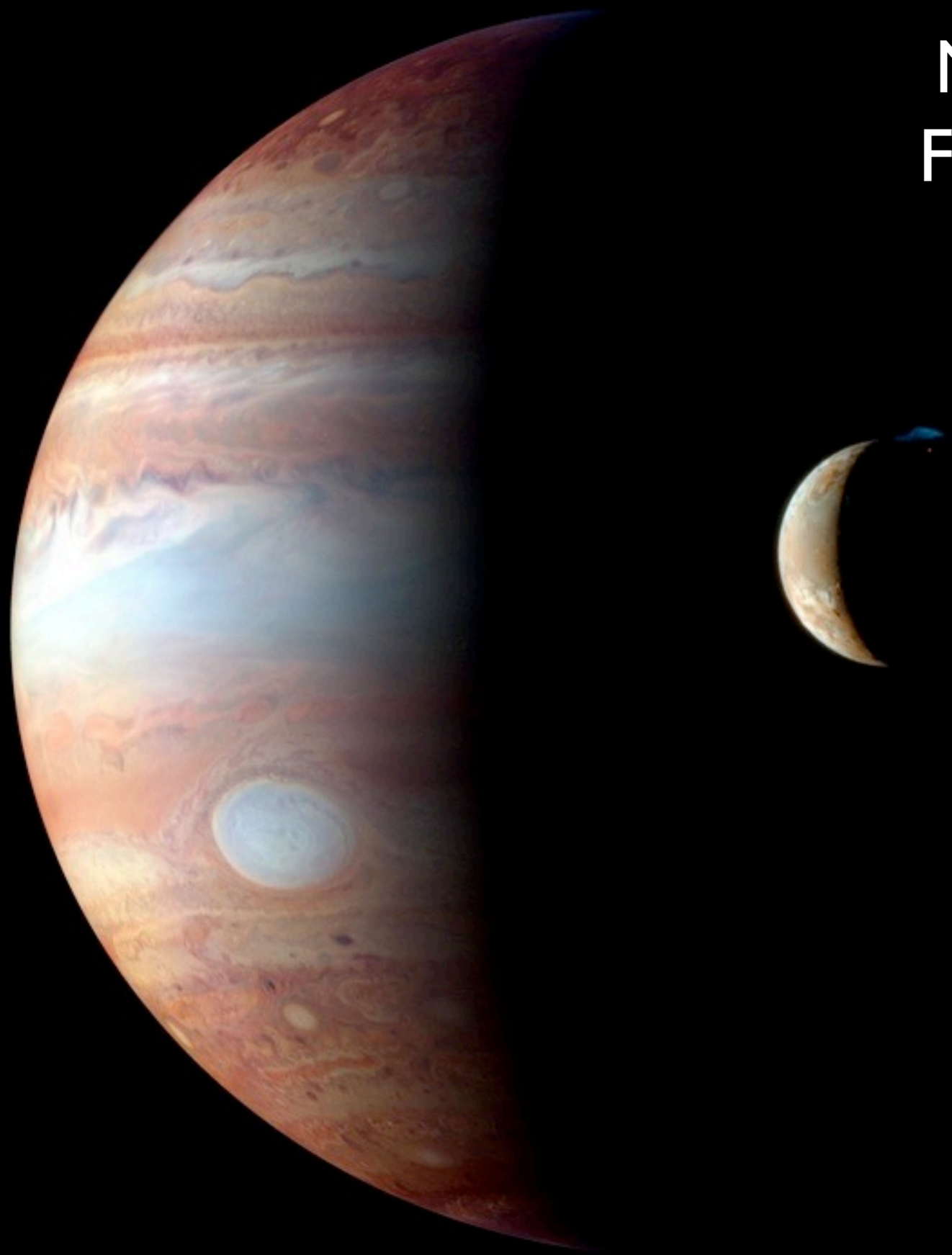
Hubble Space Telescope • Advanced Camera for Surveys

NASA, ESA, A. Simon-Miller (NASA/GSFC), I. de Pater and M. Wong (University of California, Berkeley) STScI-PRC06-19

Oval Turns Red



2008: A smaller spot merges into the Great Red Spot

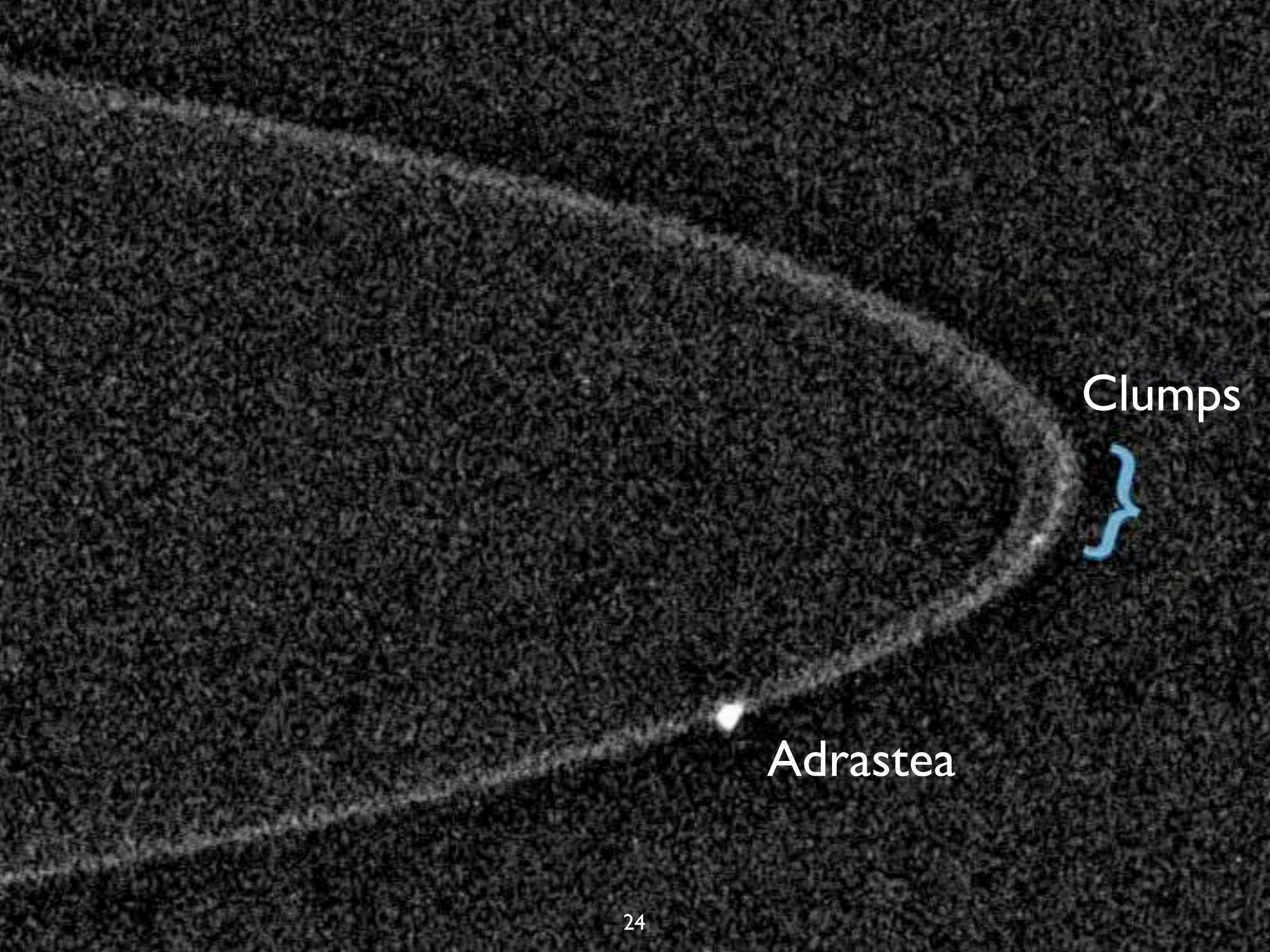


New Horizons Flyby February-March 2007

PIA10102: Montage

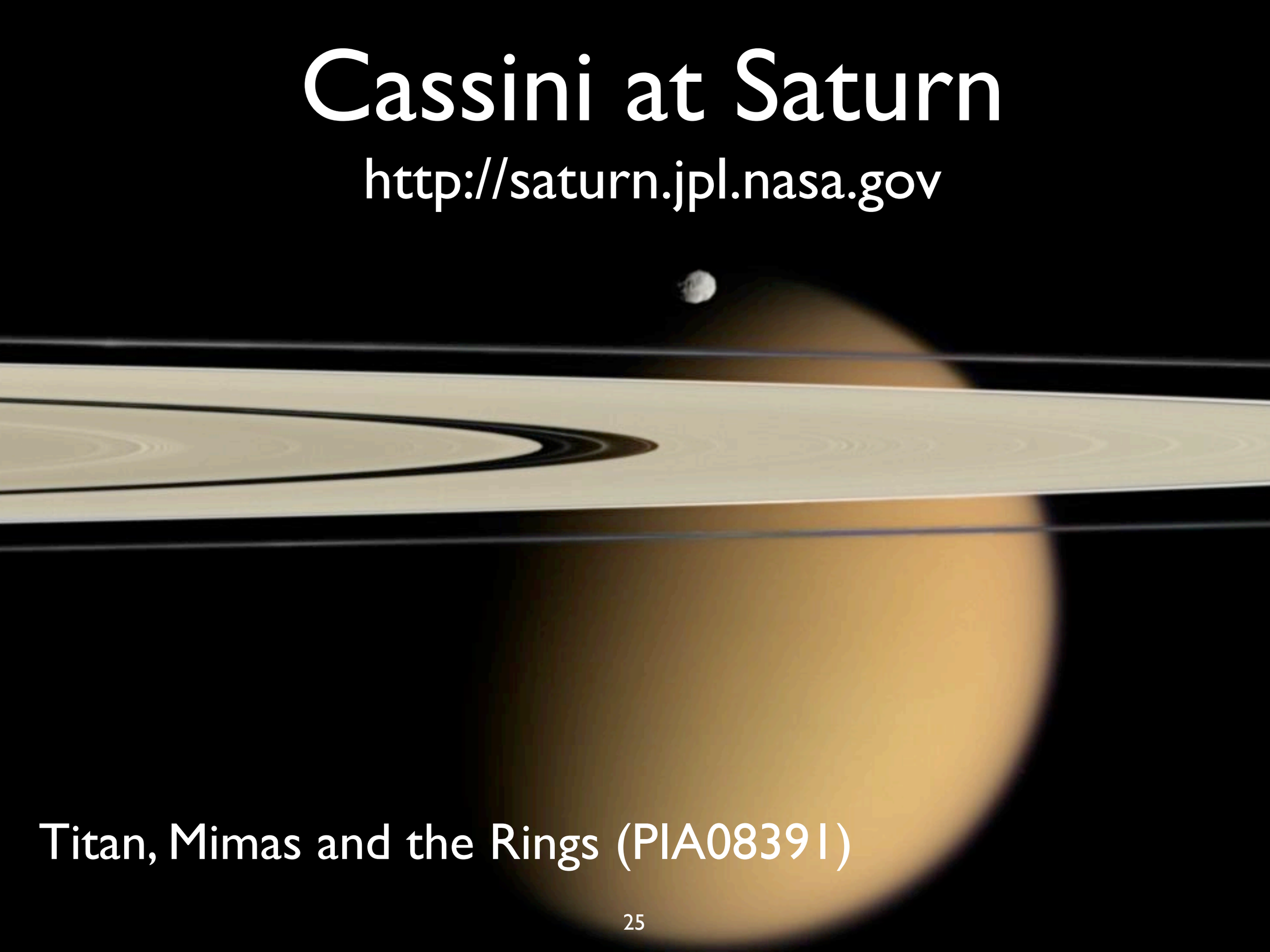
PIA09358: Io Volcanism

Plume movie: http://photojournal.jpl.nasa.gov/catalog/PIA09665


Clumps
Adrastea

Cassini at Saturn

http://saturn.jpl.nasa.gov

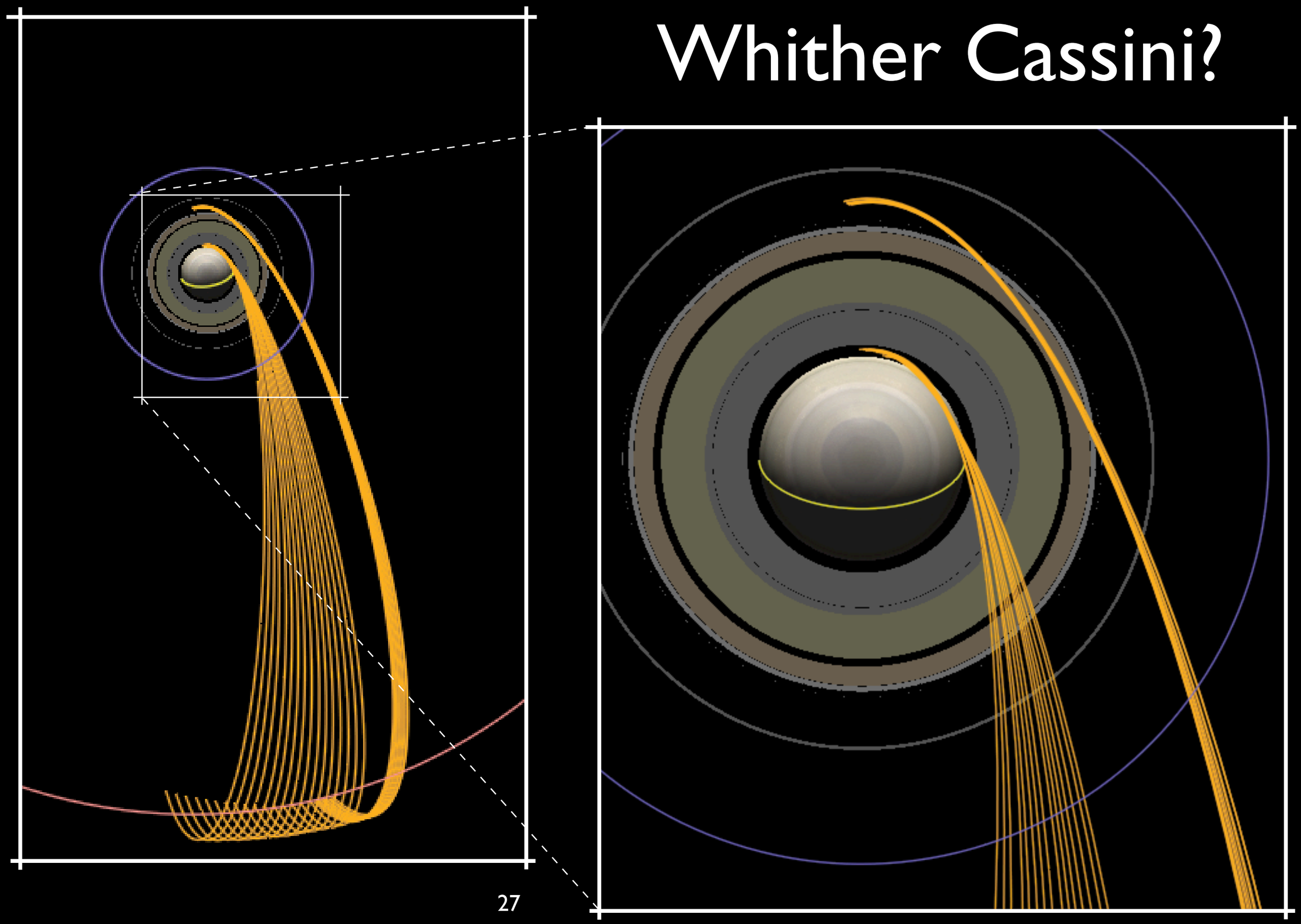


Titan, Mimas and the Rings (PIA08391)

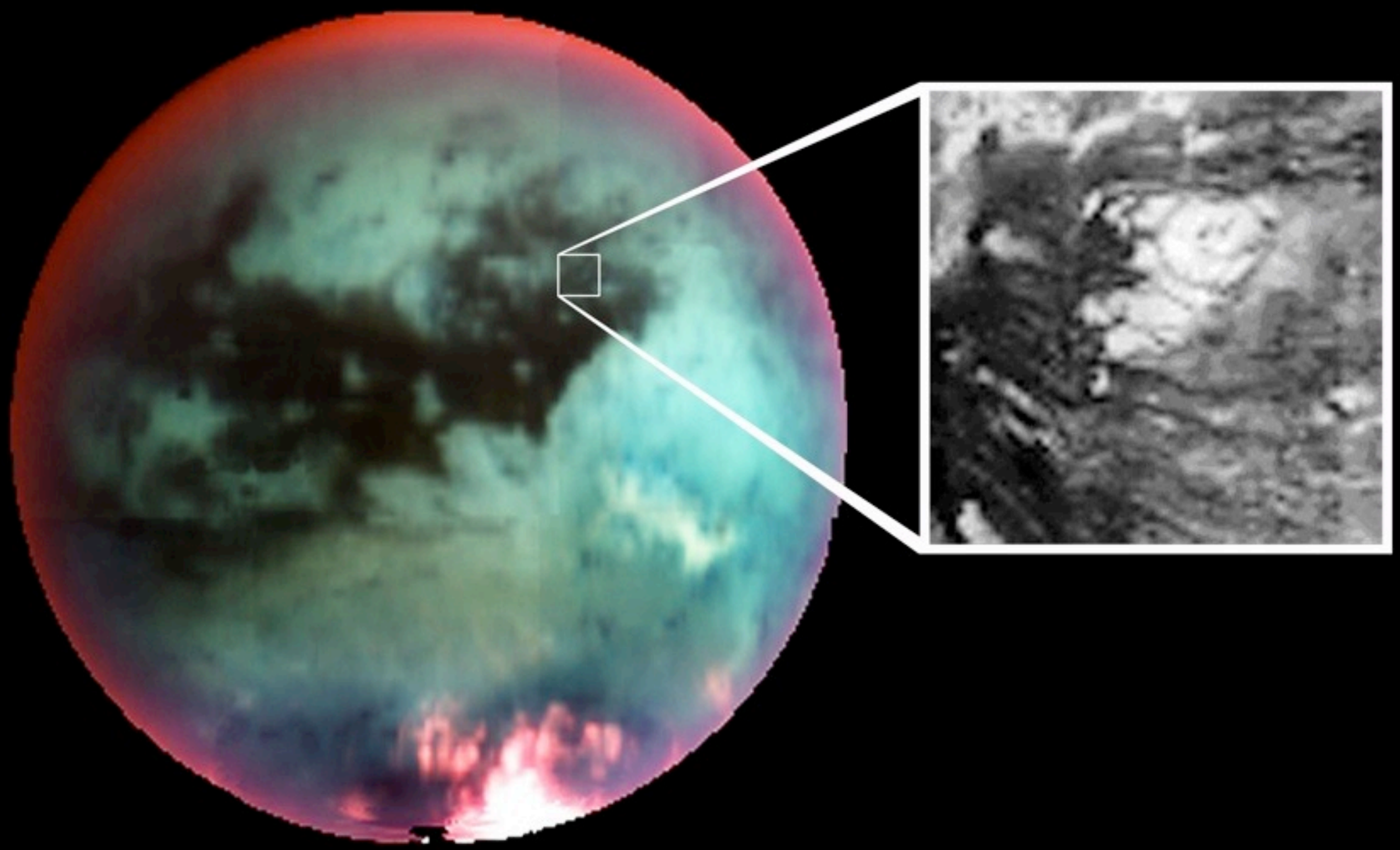
Cassini Status

- Spacecraft remains healthy.
- Four-year nominal mission was in completed June 2008.
- The two-year "equinox mission" is under way.
  - Note: Saturn's 2009 equinox will not be observable from Earth.
- A multi-year "XXM" has been proposed.
  - Spacecraft activities will necessarily become simpler.
  - Goal is to remain active till solstice.

Whither Cassini?



An Icy Volcano on Titan?



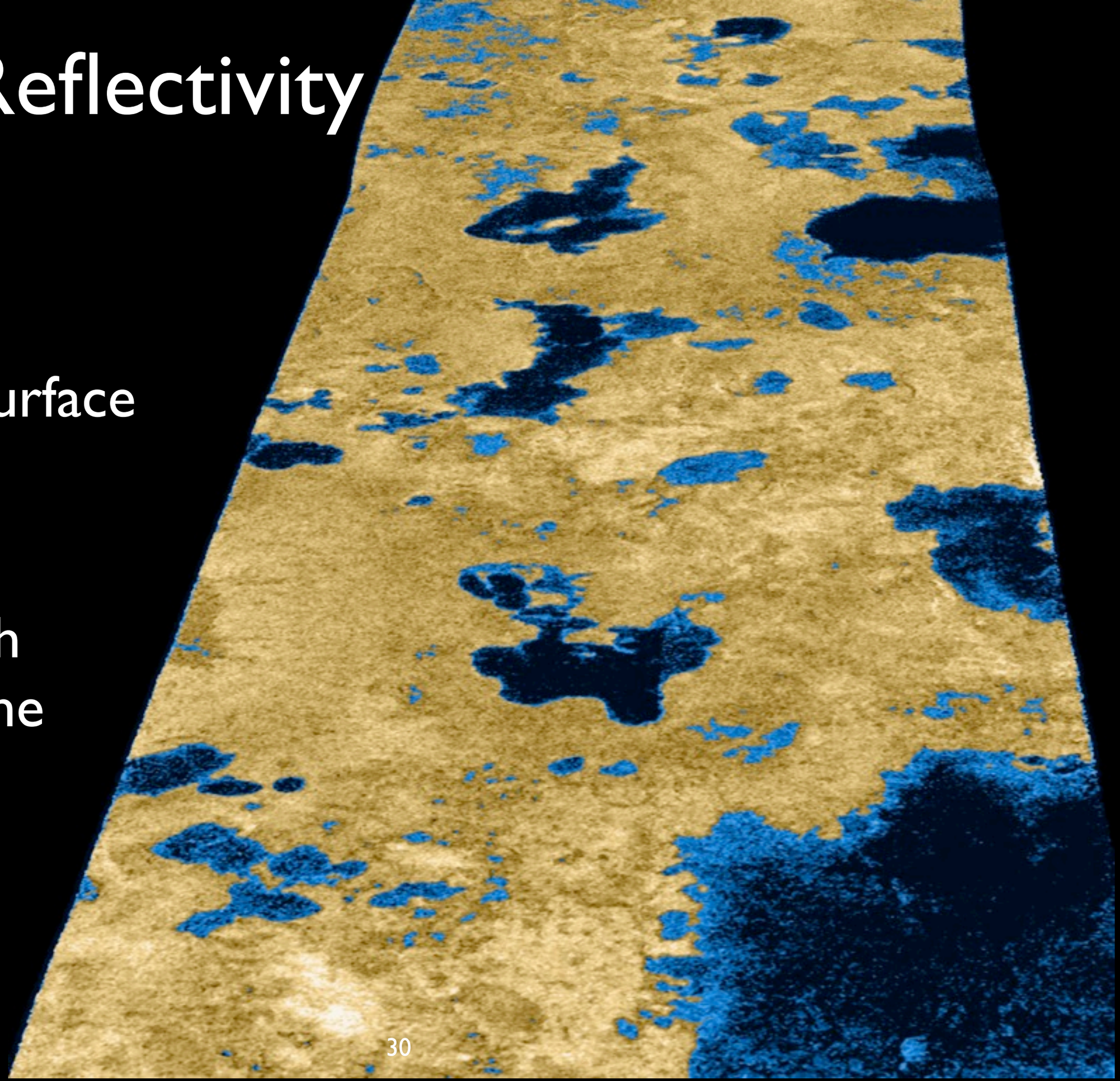
Movie: http://photojournal.jpl.nasa.gov/catalog/PIA11700

“Channels” imaged by the Huygens descent camera

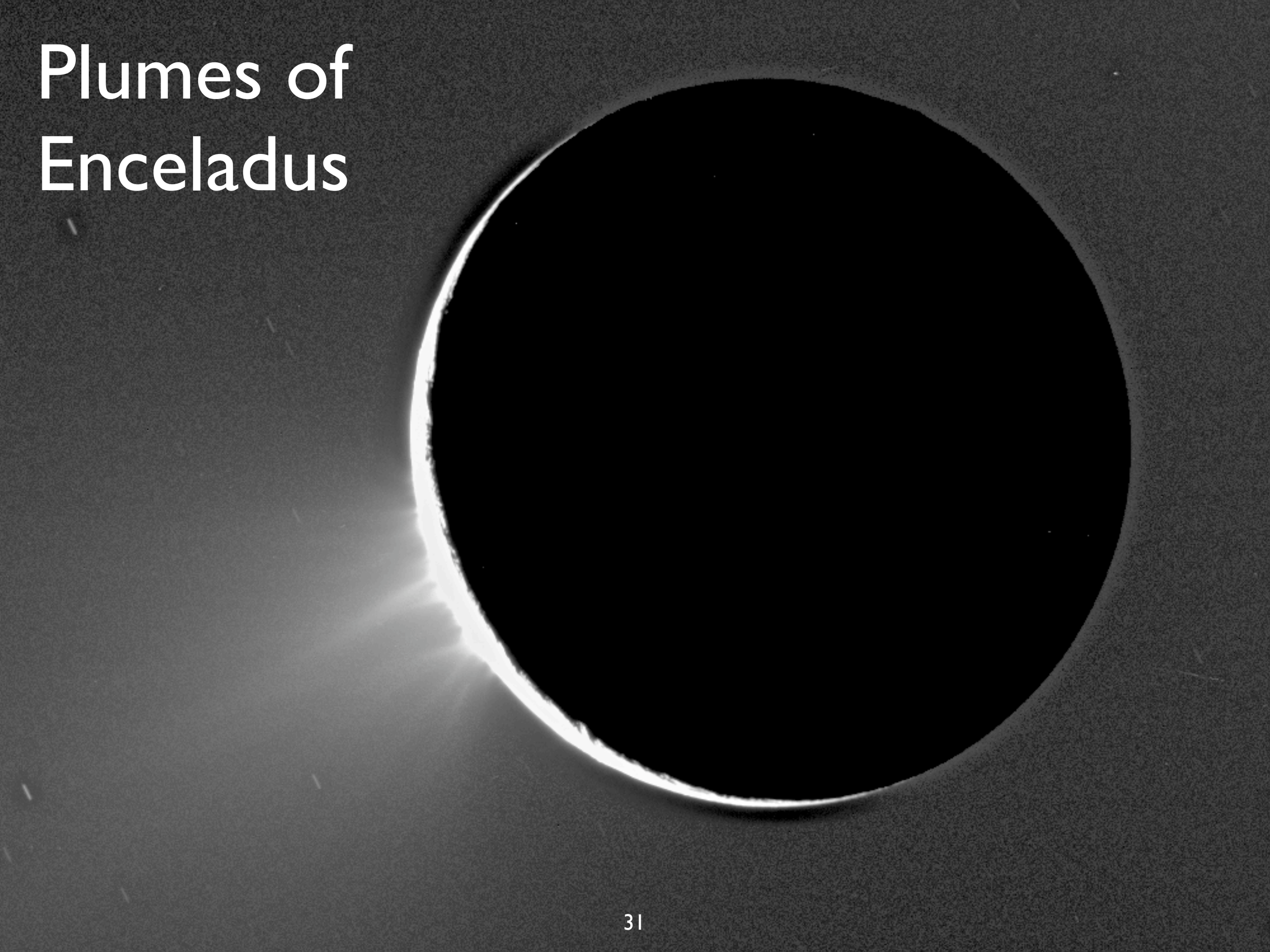
Radar Reflectivity

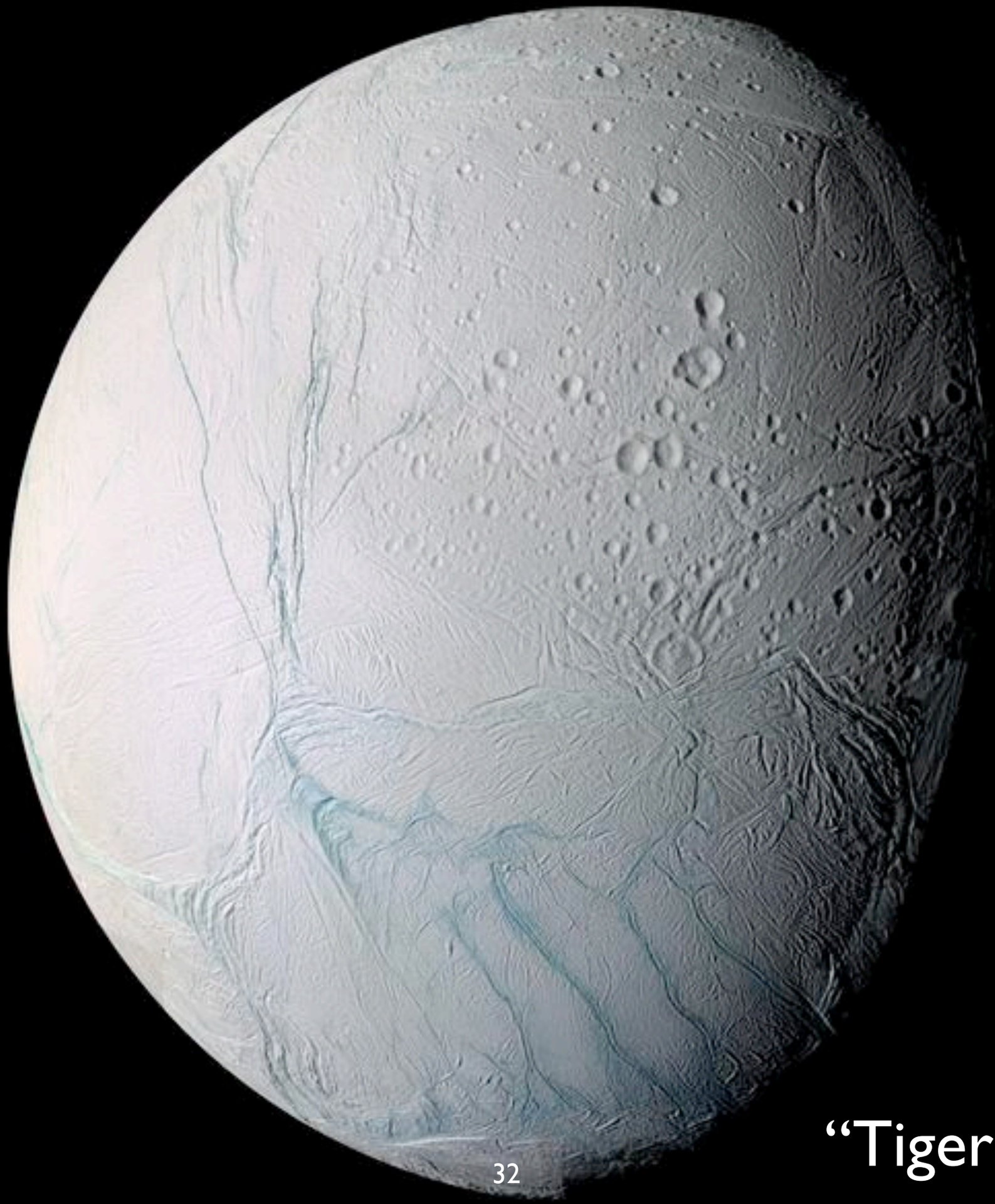
- Yellow
  = bright
  = rough
  = solid surface

- Blue
  = dark
  = smooth
  = methane lakes!



Plumes of Enceladus

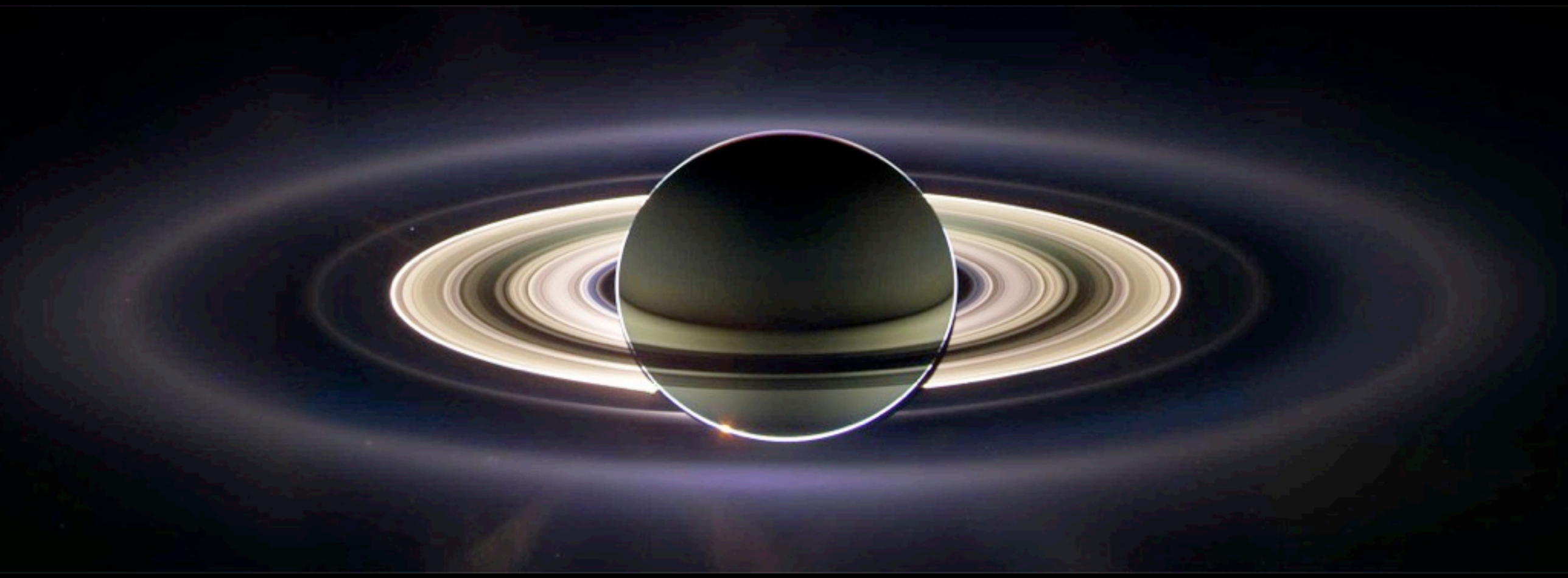




"Tiger Stripes"

Tiger Stripe closeup

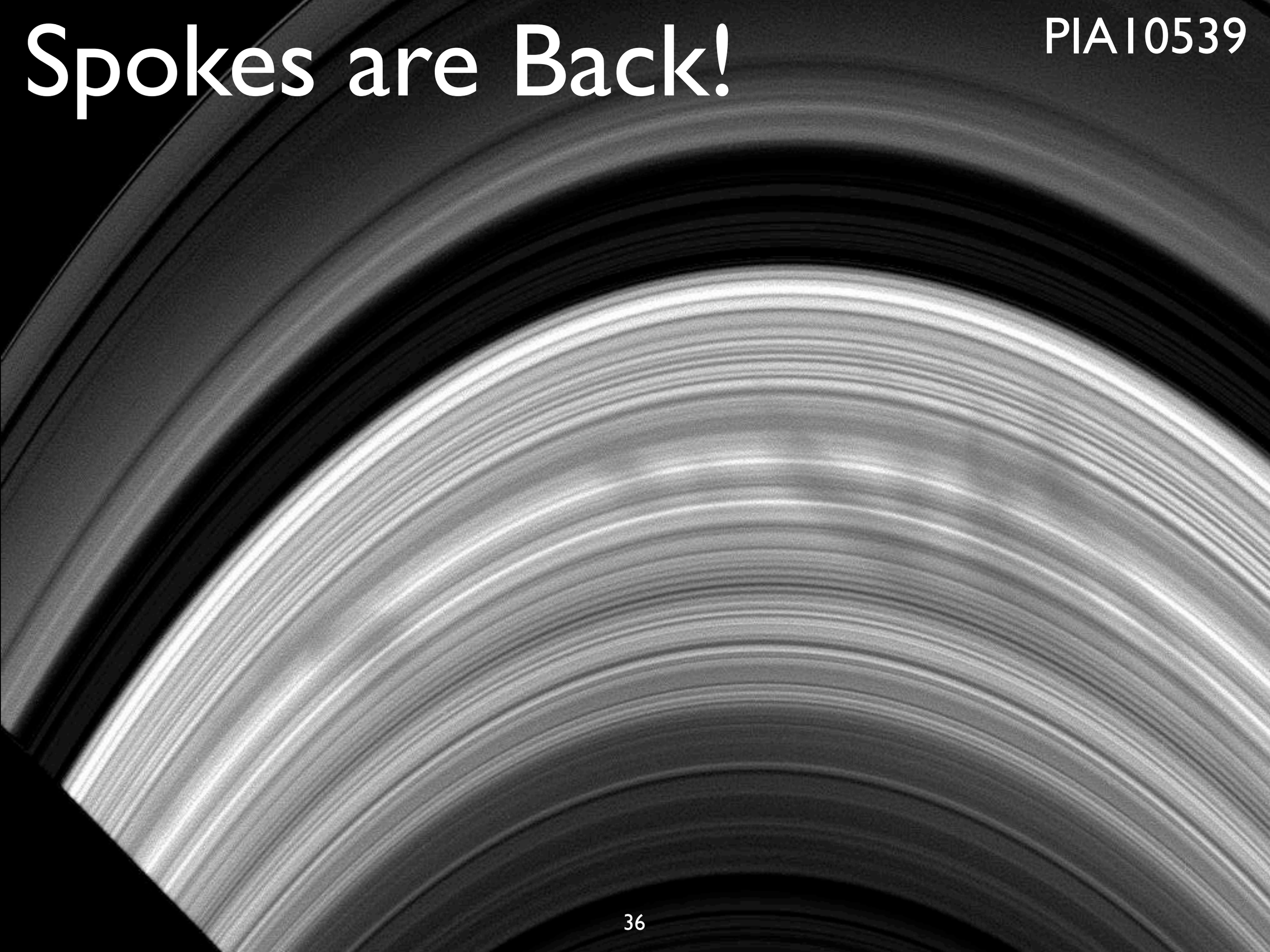
The Rings as Seen from Saturn's Shadow



Faint, dusty arcs accompany most small moons

Spokes are Back!

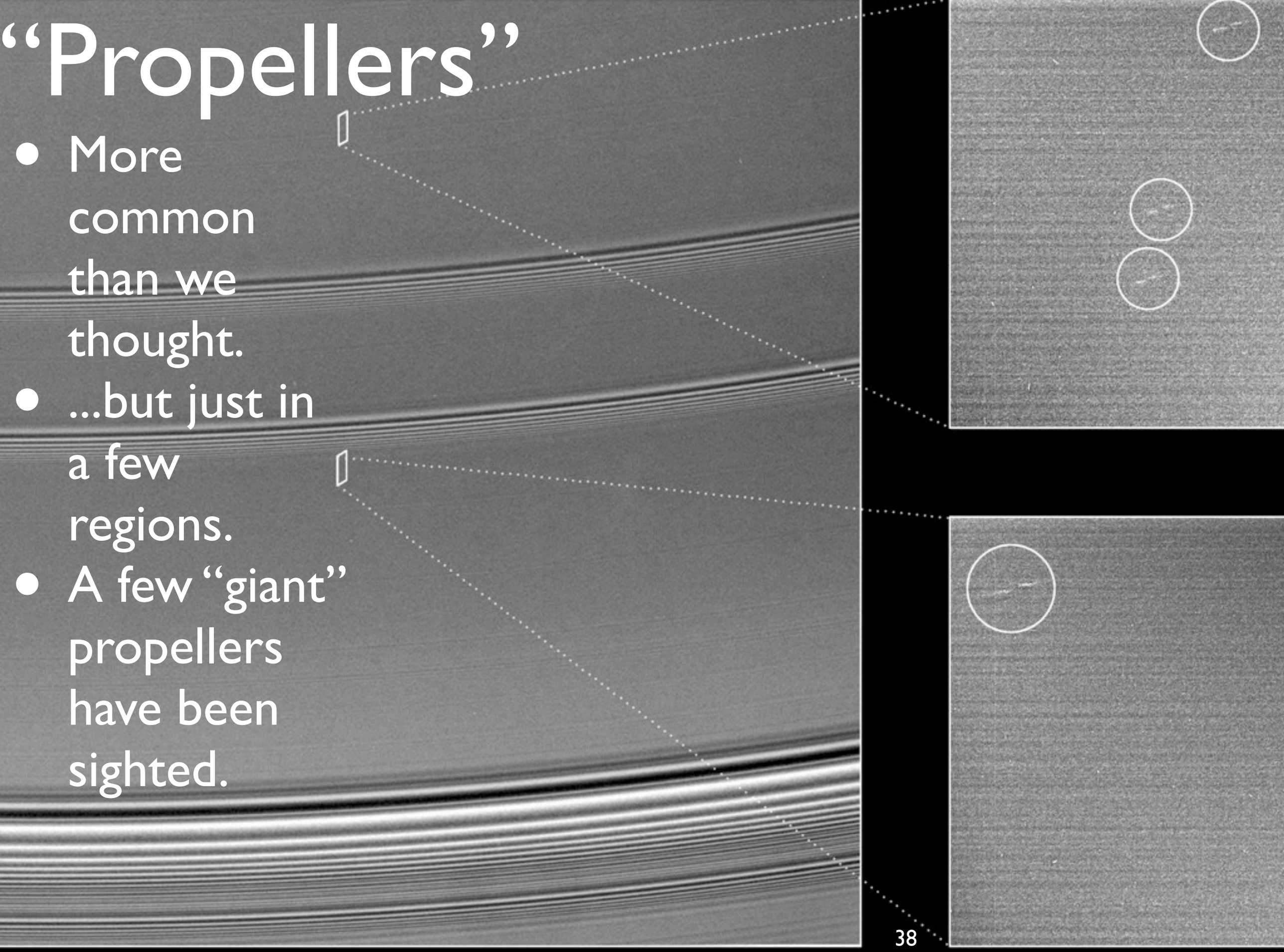
PIA10539



- A ring has appeared since Voyager?
- The ring appears to be “heliotropic.”

“Propellers”

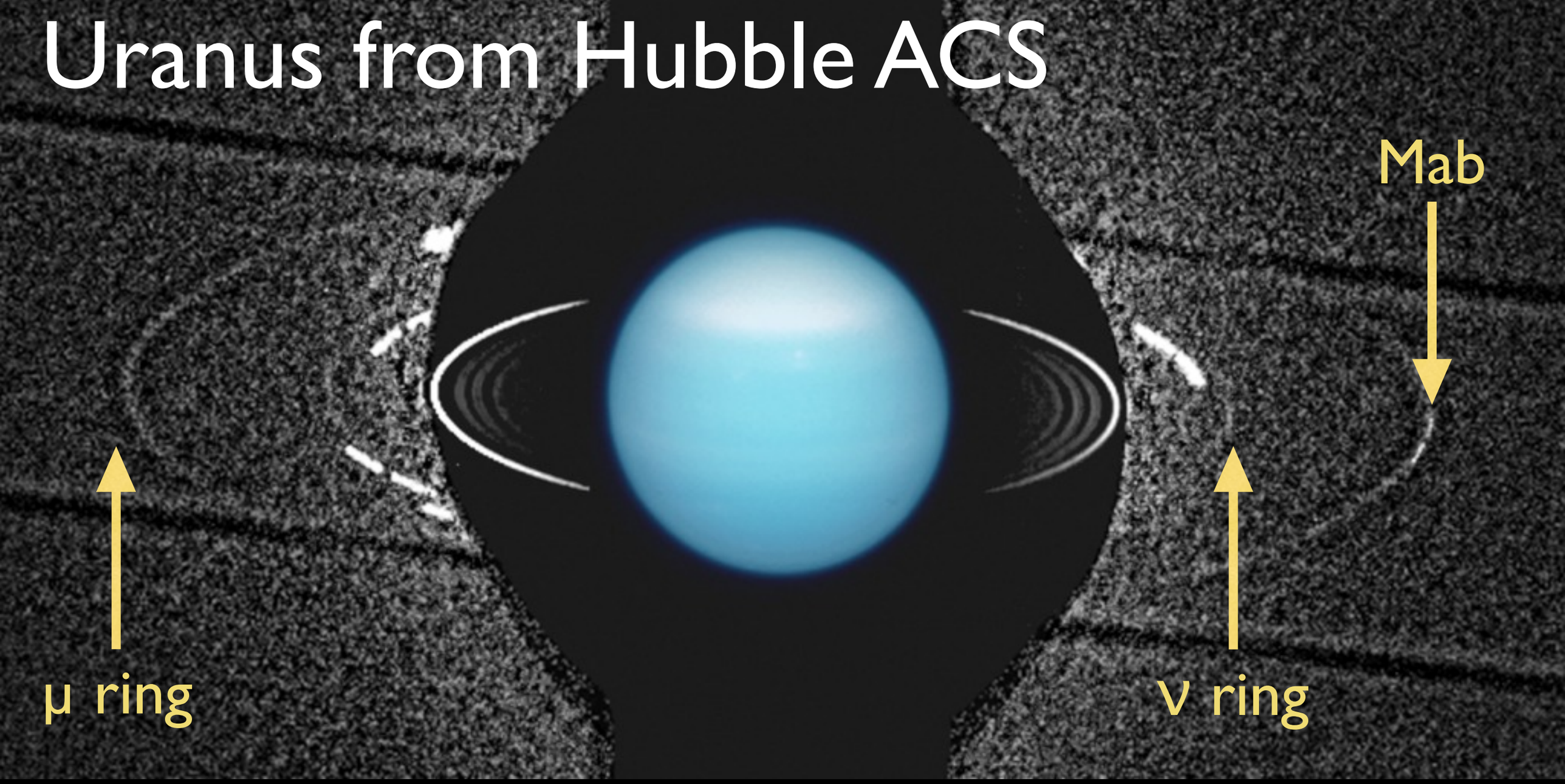
- More common than we thought.
- ...but just in a few regions.
- A few “giant” propellers have been sighted.



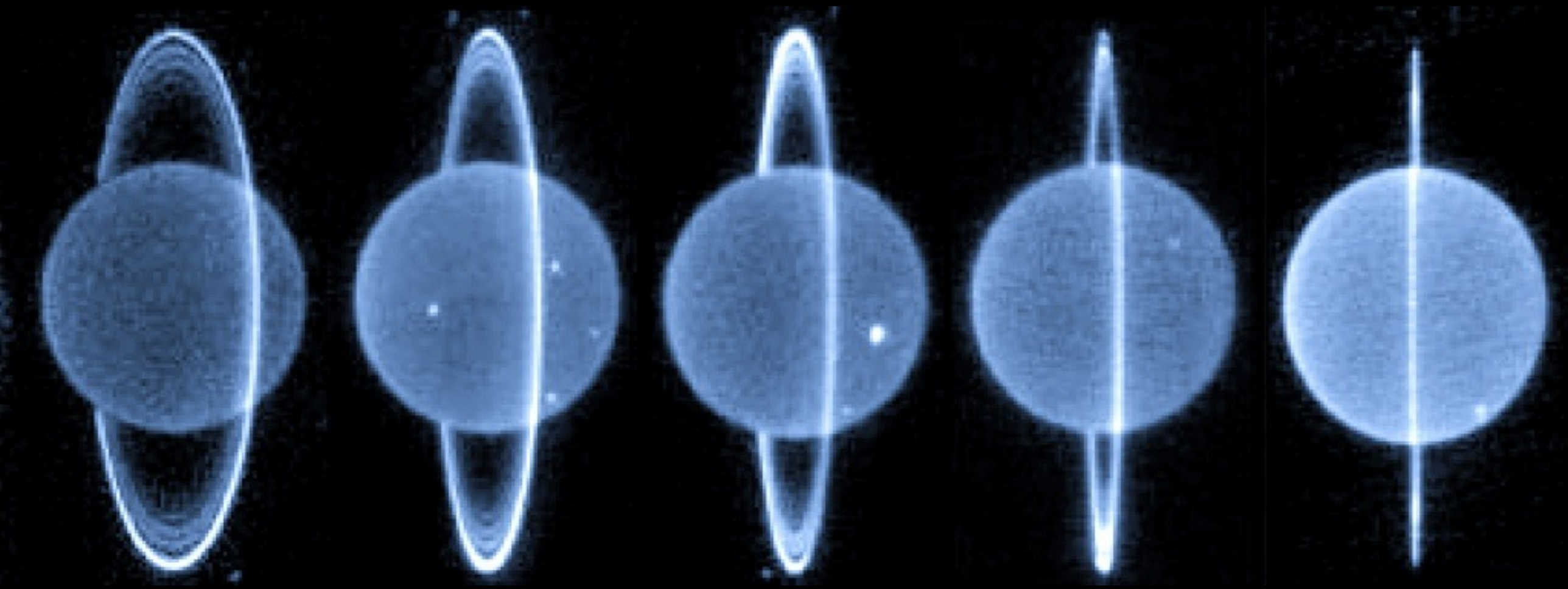
Europa or Titan?

NASA will announce the destination of its next "flagship" mission by February 4.

Uranus from Hubble ACS



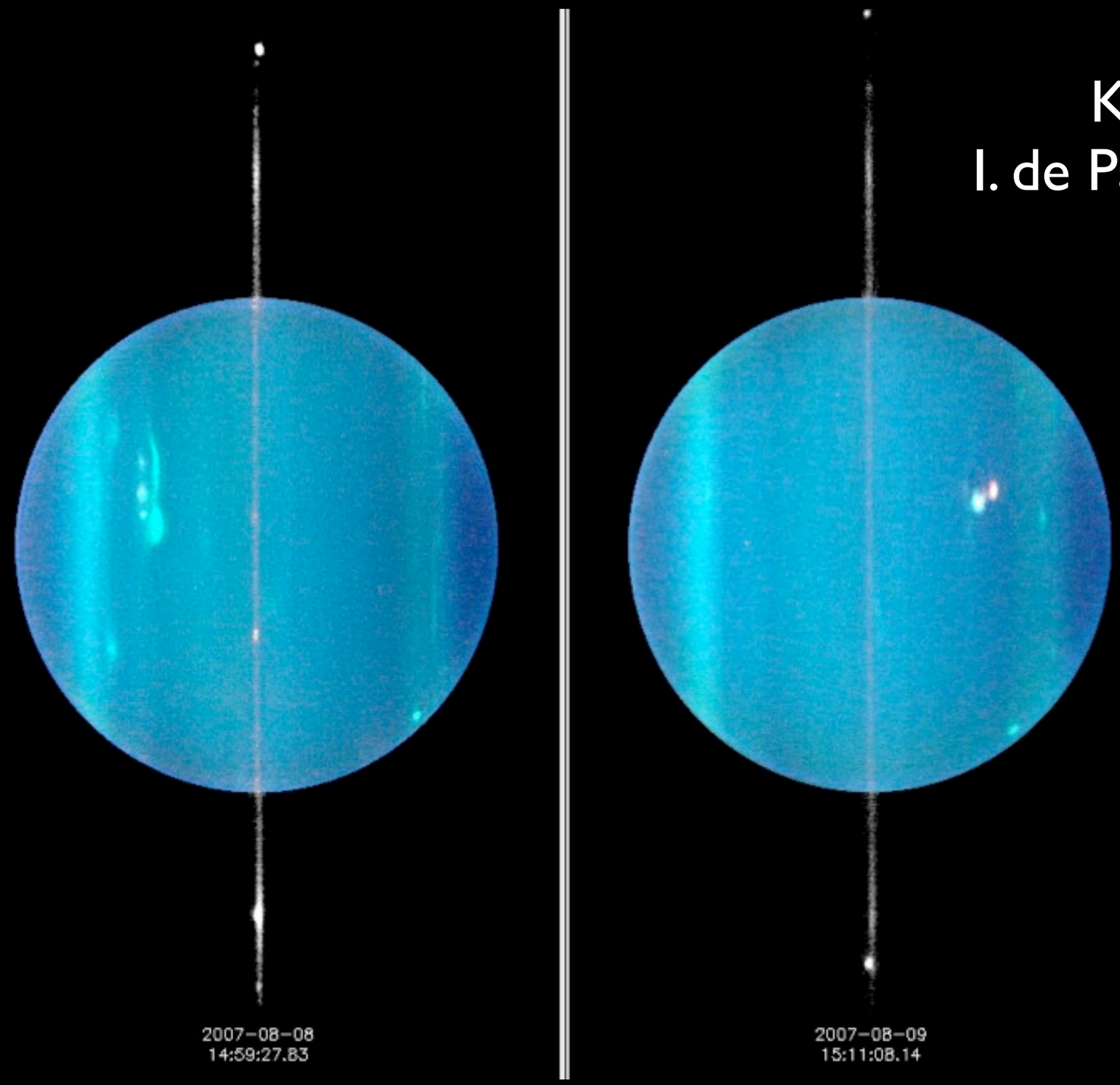
- Mab and Cupid discovered 2003.
- Perdita recovered 2003.
- Two rings discovered 2005.
- Satellite system appears to be chaotic.

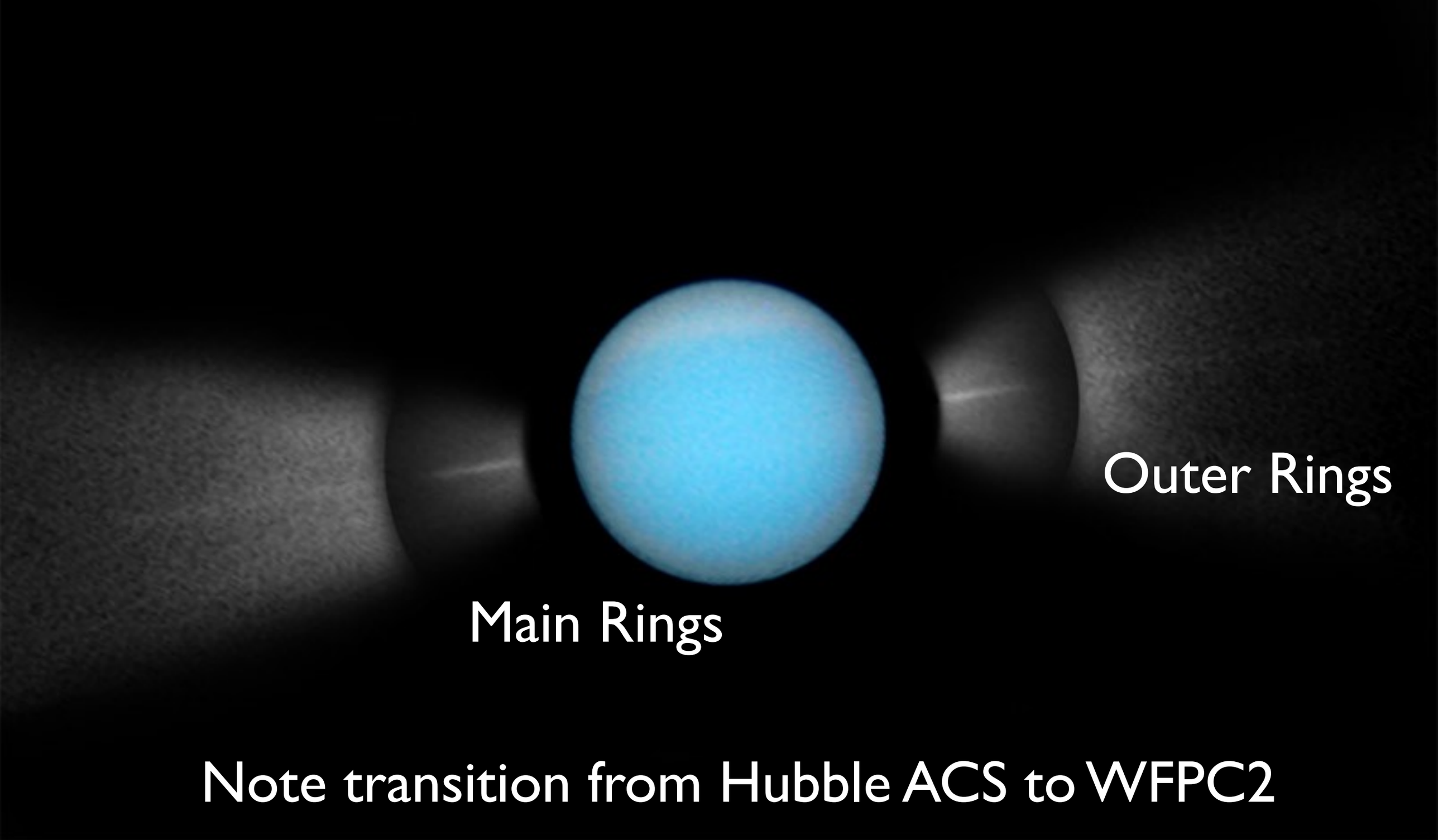


2003 2004 2005 2006 2007

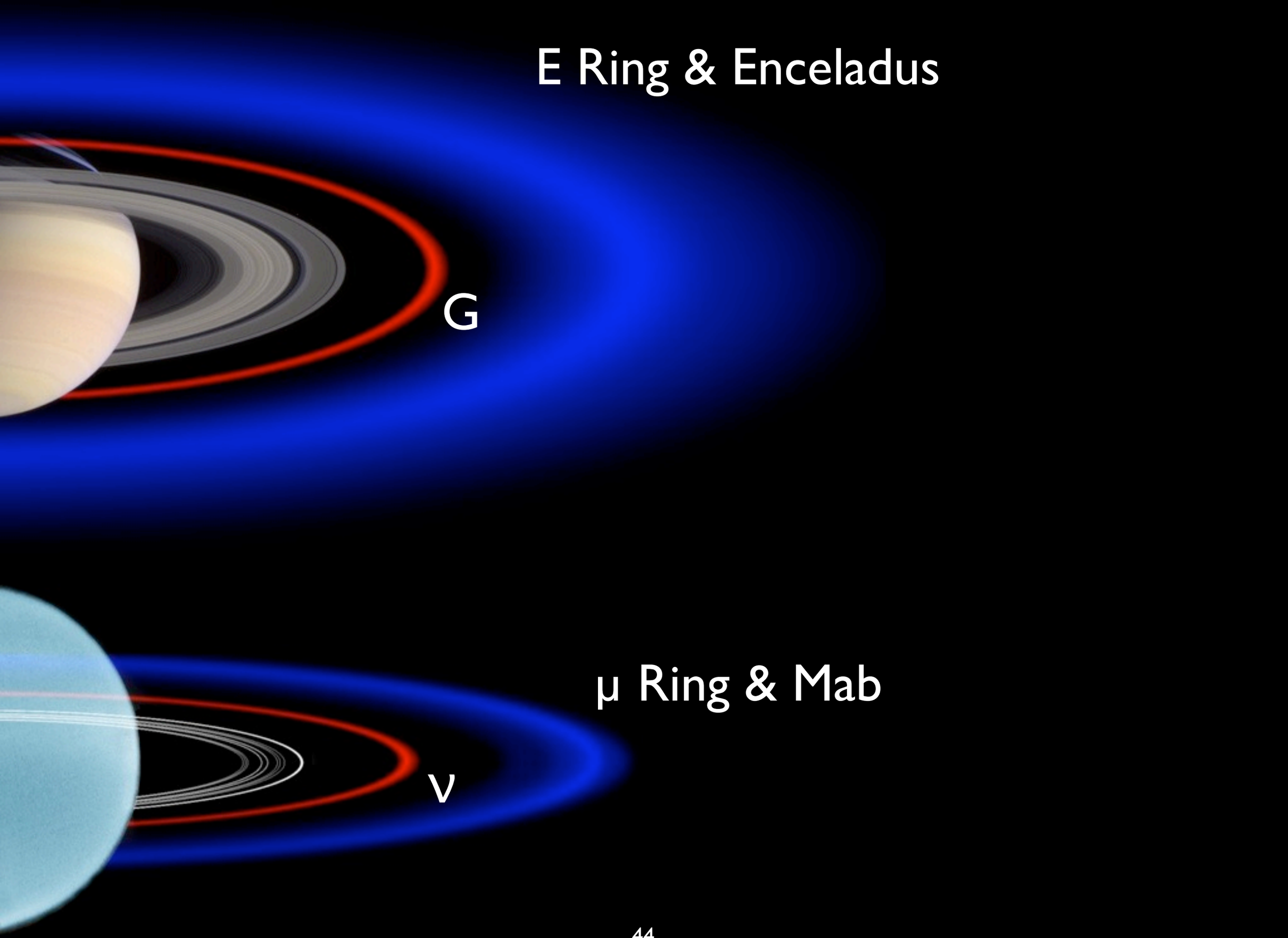
Uranian equinox 2007
Keck Telescope infrared images
I. de Pater, U. C. Berkeley

Keck Telescope
I. de Pater, U. C. Berkeley

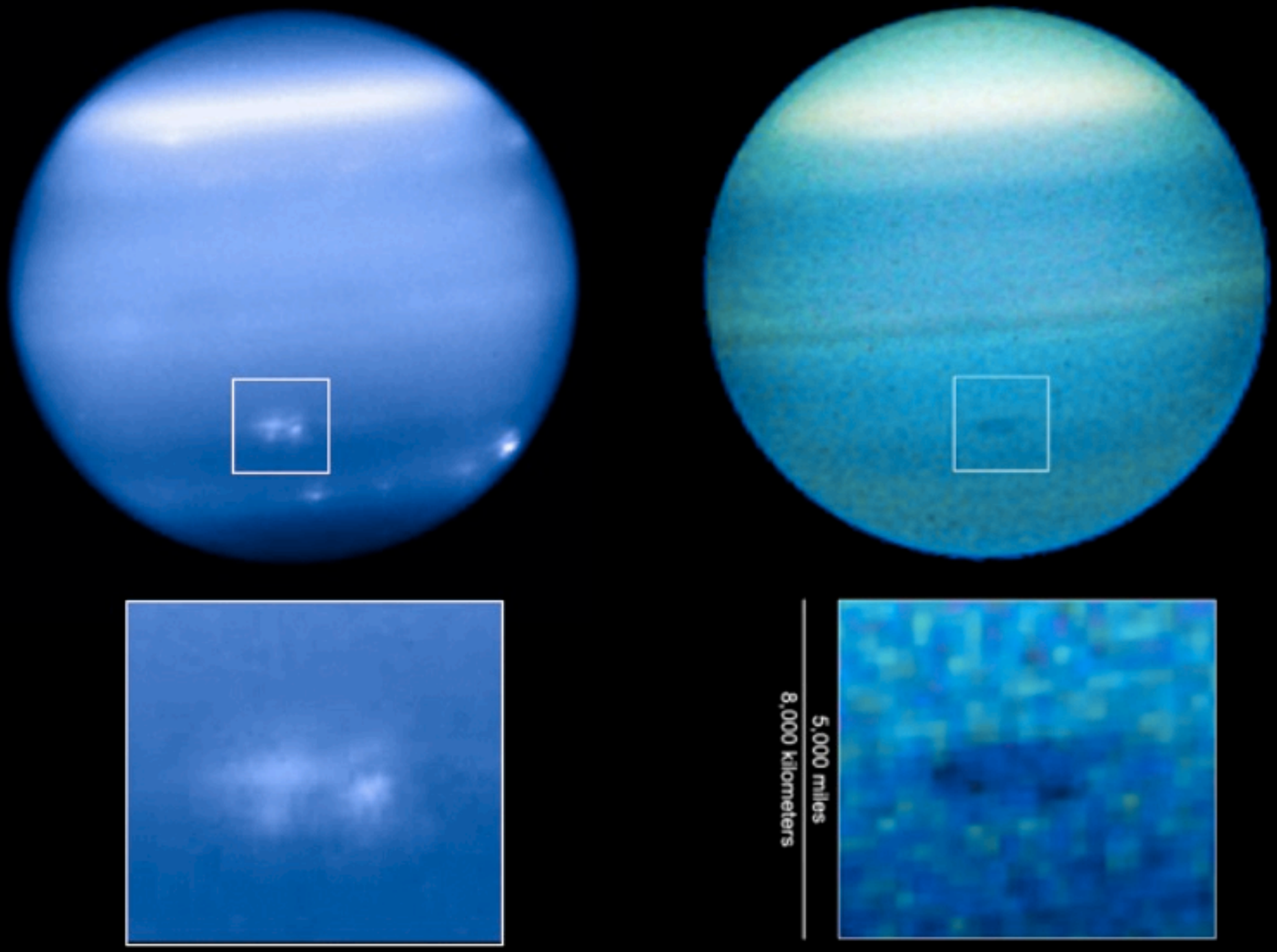




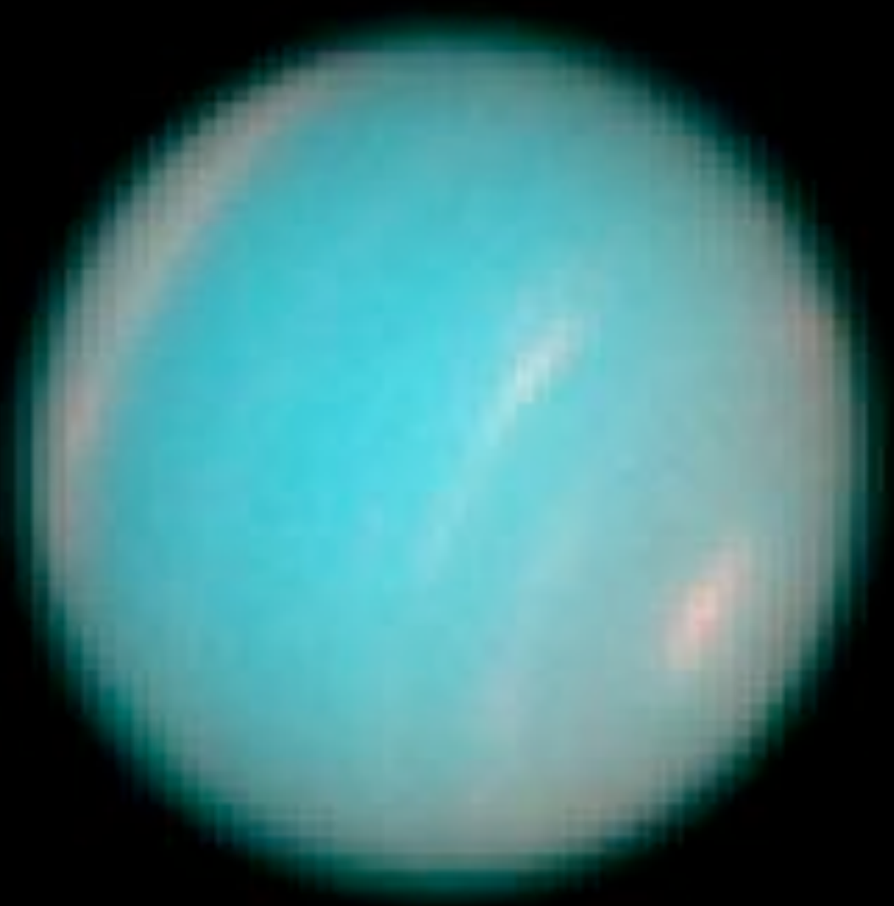
Note transition from Hubble ACS to WFPC2

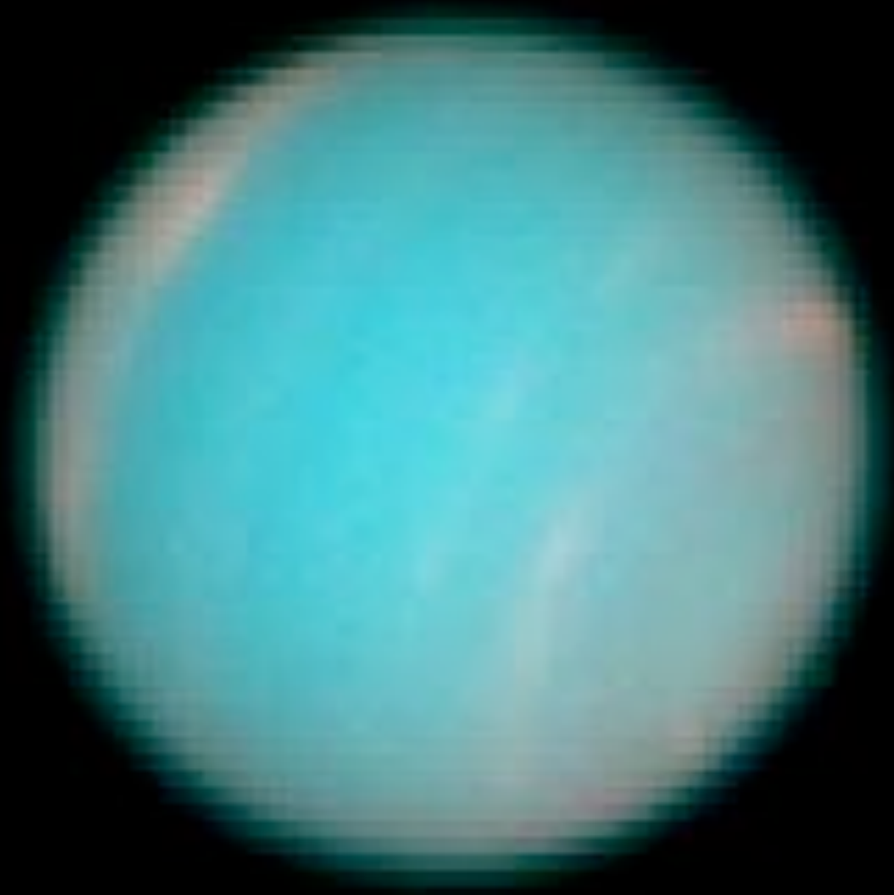

E Ring & Enceladus
G
μ Ring & Mab
ν

The Uranus Dark Spot

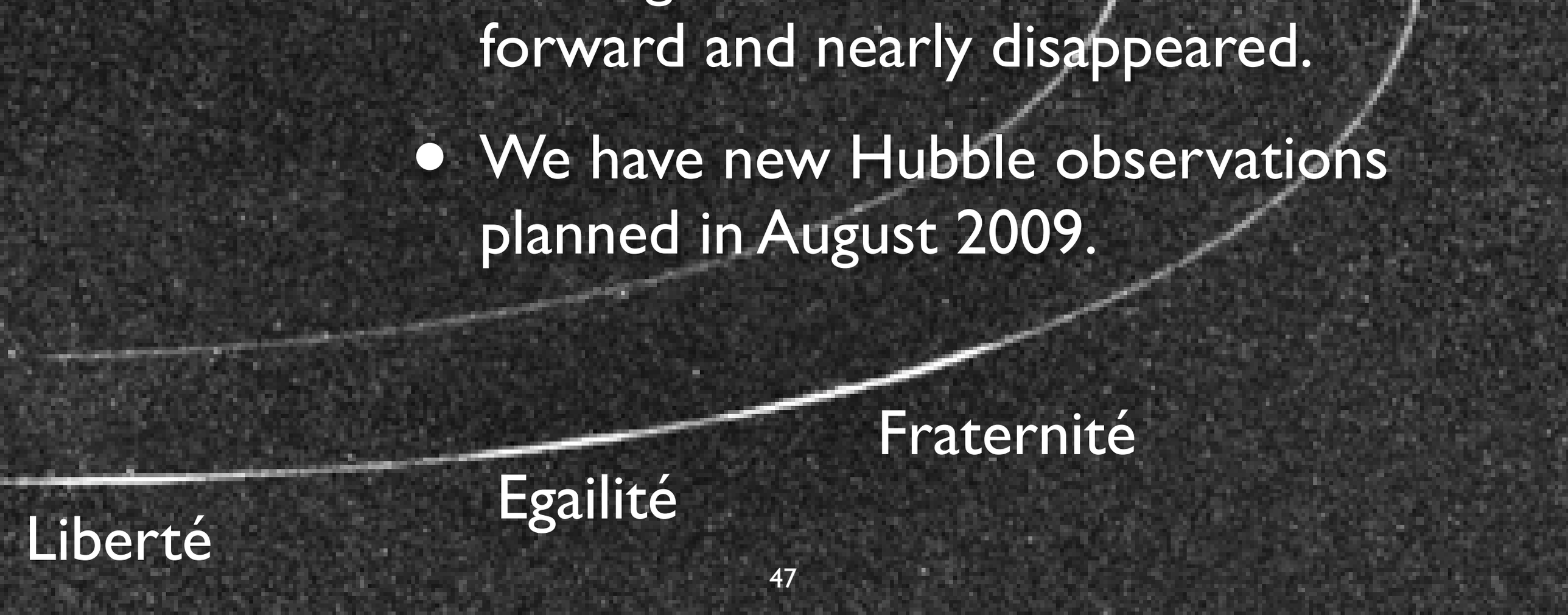


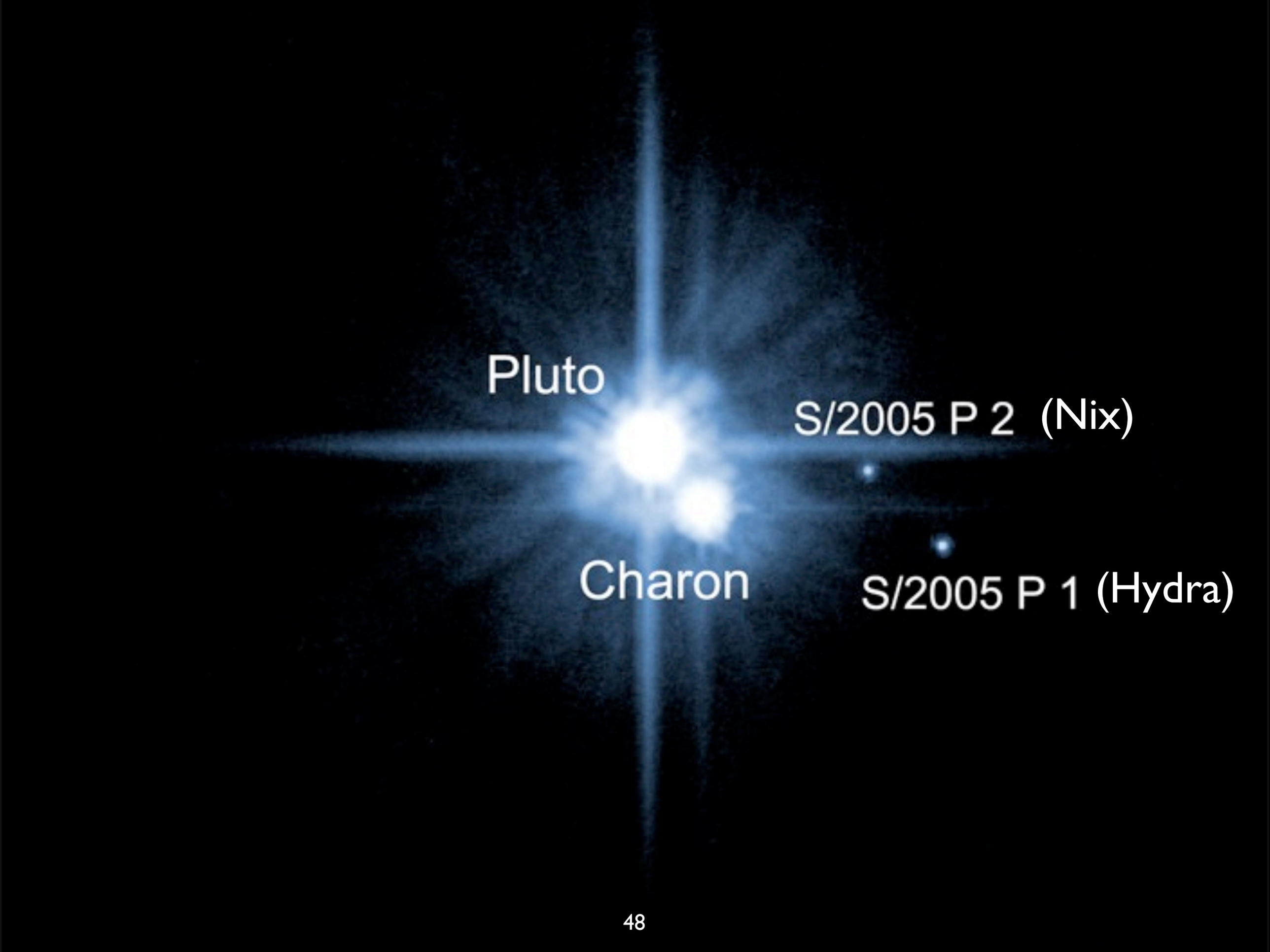
Neptune Cloud Patterns from Hubble ACS

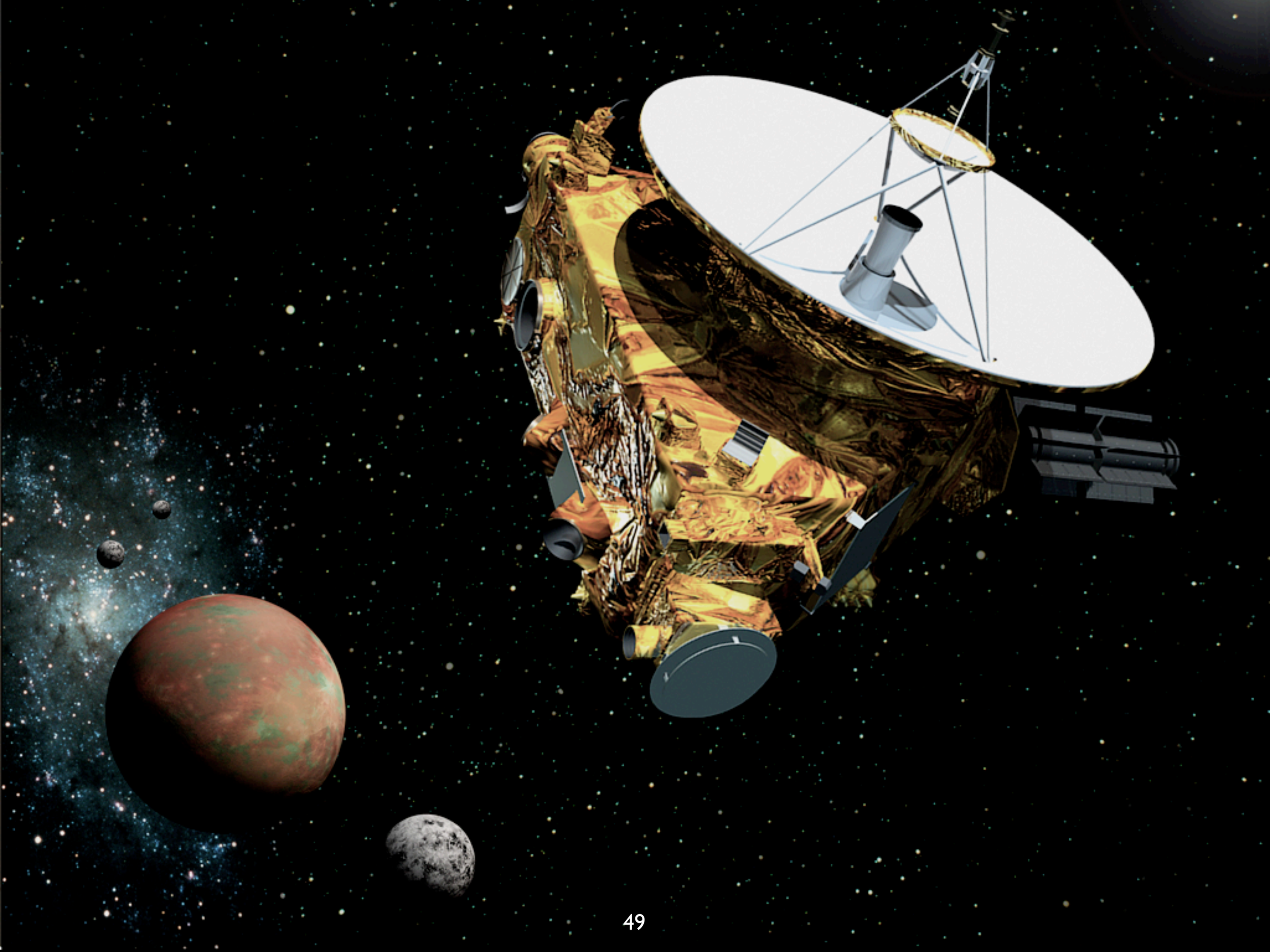




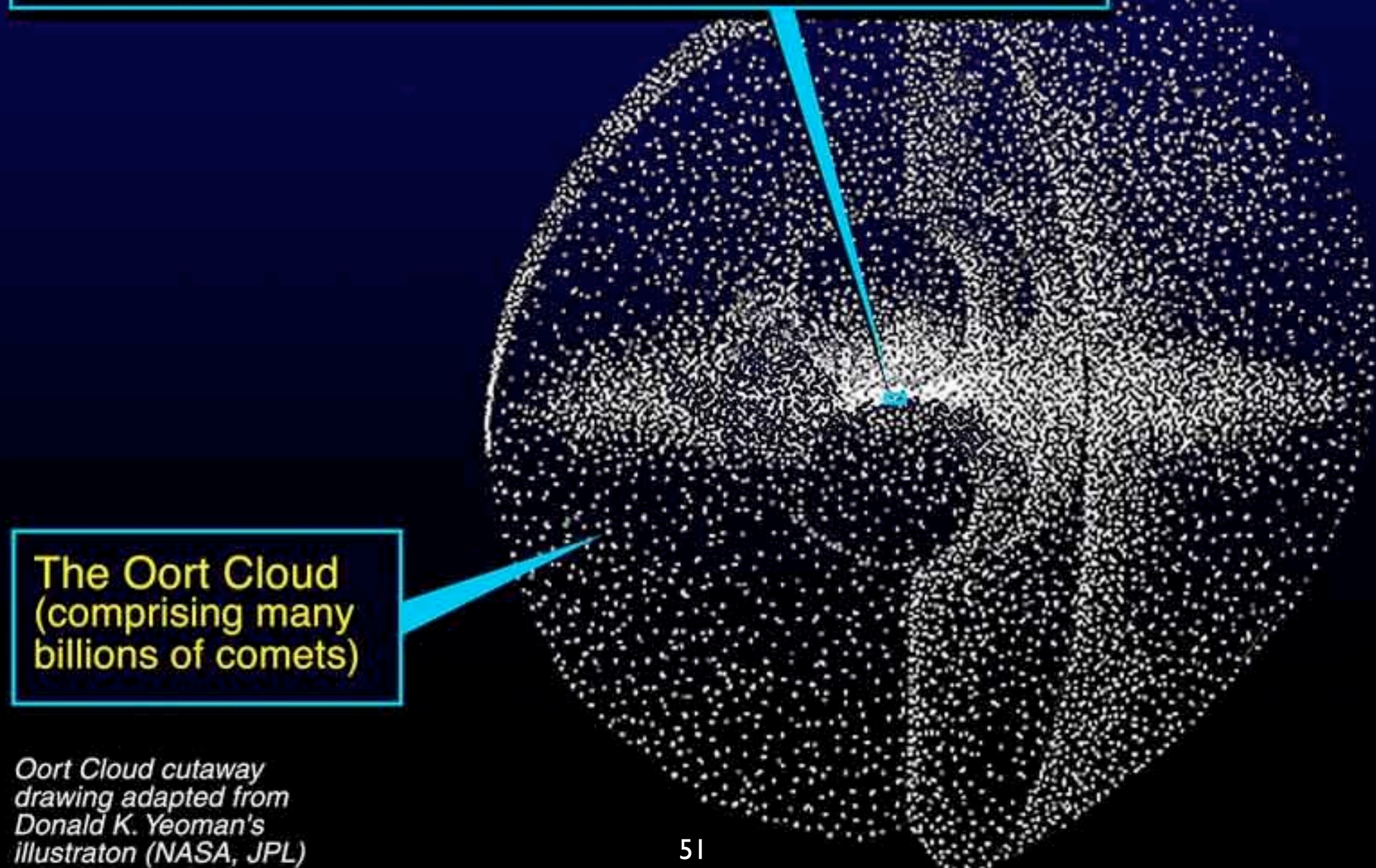
- Three major arcs plus a smaller leading arc (Courage) were imaged by Voyager in 1989.
- Egalité and Fraternité appear to be stable for twenty years.
- Courage and Liberté have shifted forward and nearly disappeared.
- We have new Hubble observations planned in August 2009.




Pluto
S/2005 P 2 (Nix)
Charon
S/2005 P 1 (Hydra)



Namaka
Makemake
Luna
Hi'iaka
Haumea
Dysnomia
Eris
Charon
Earth
Ceres
Pluto



Oort Cloud cutaway drawing adapted from Donald K. Yeoman's illustraton (NASA, JPL)