Cassini-Huygens
Mars Exploration Rover

Mallorca, 9.10.2006

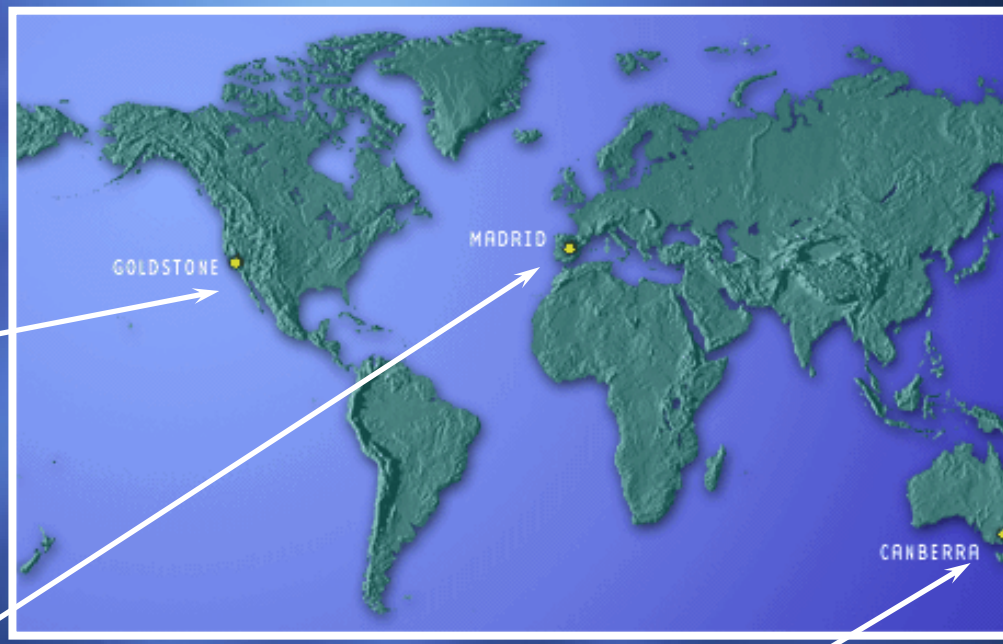
Otfrid G. Liepack

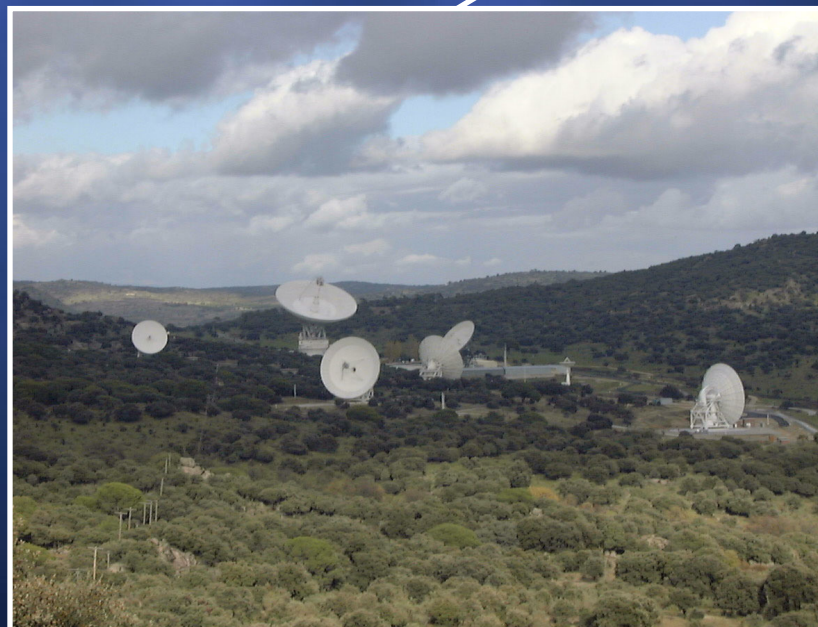
Jet Propulsion Laboratory, Pasad

Contents

Deep Space Network (DSN)
Saturn Cassini-Huygens
Mars Exploration Rover
References

Deep Space Network

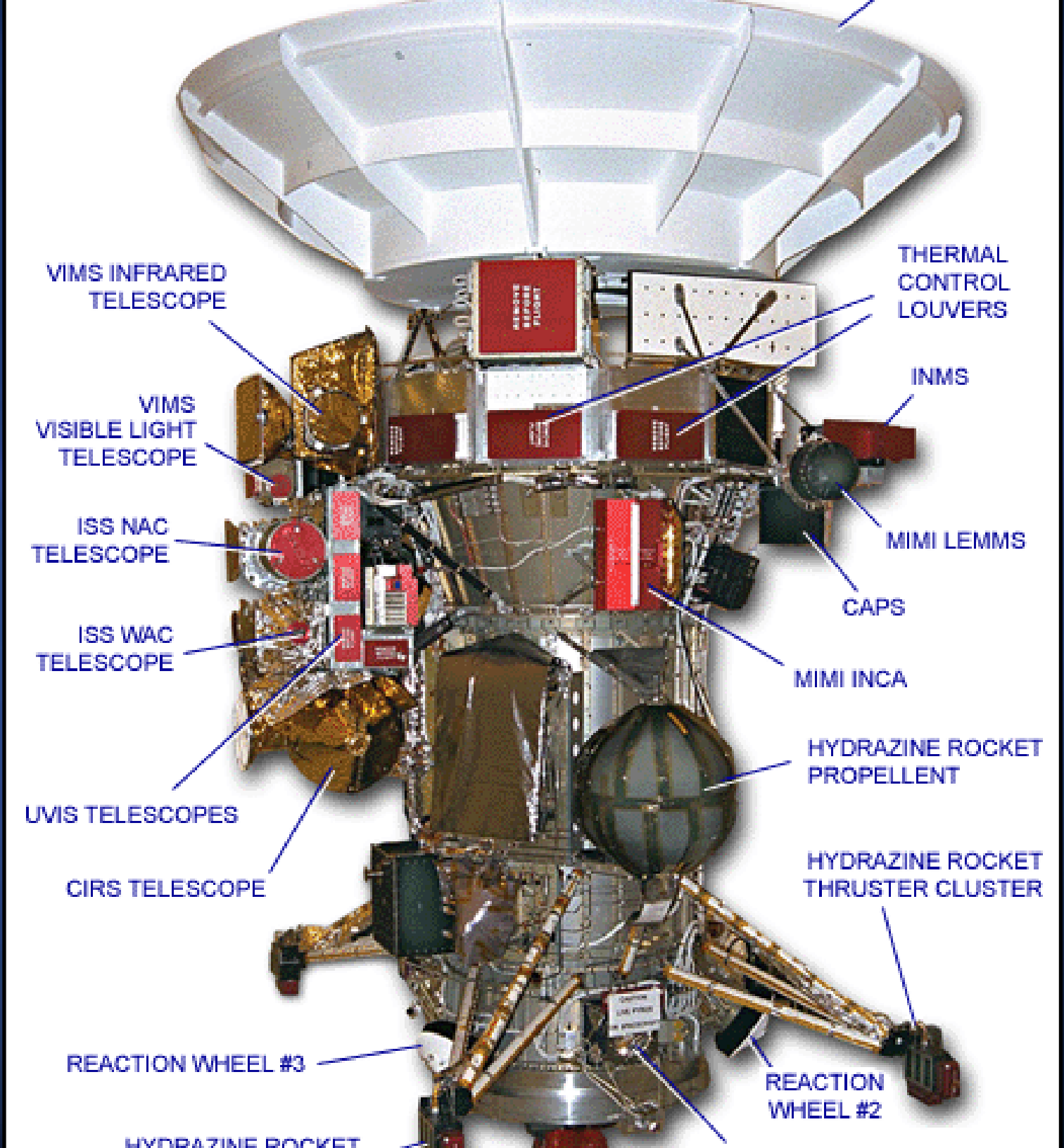




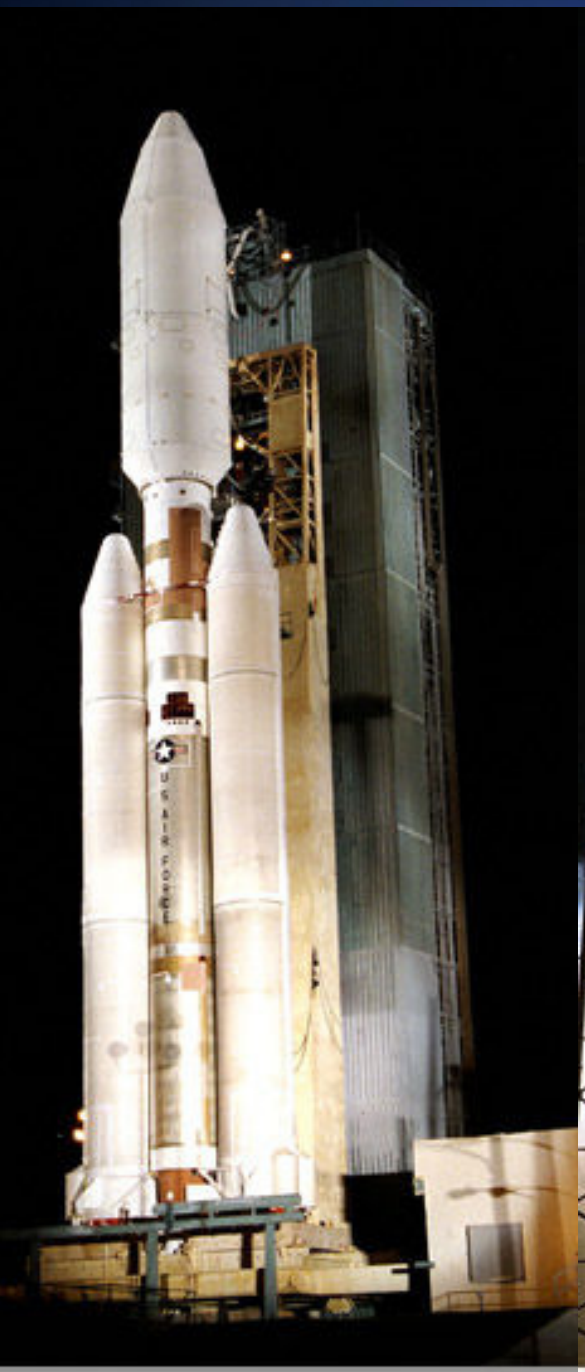
International Mission

Cassini Orbiter Cassini-Huygens

assini-
uygens



Launch

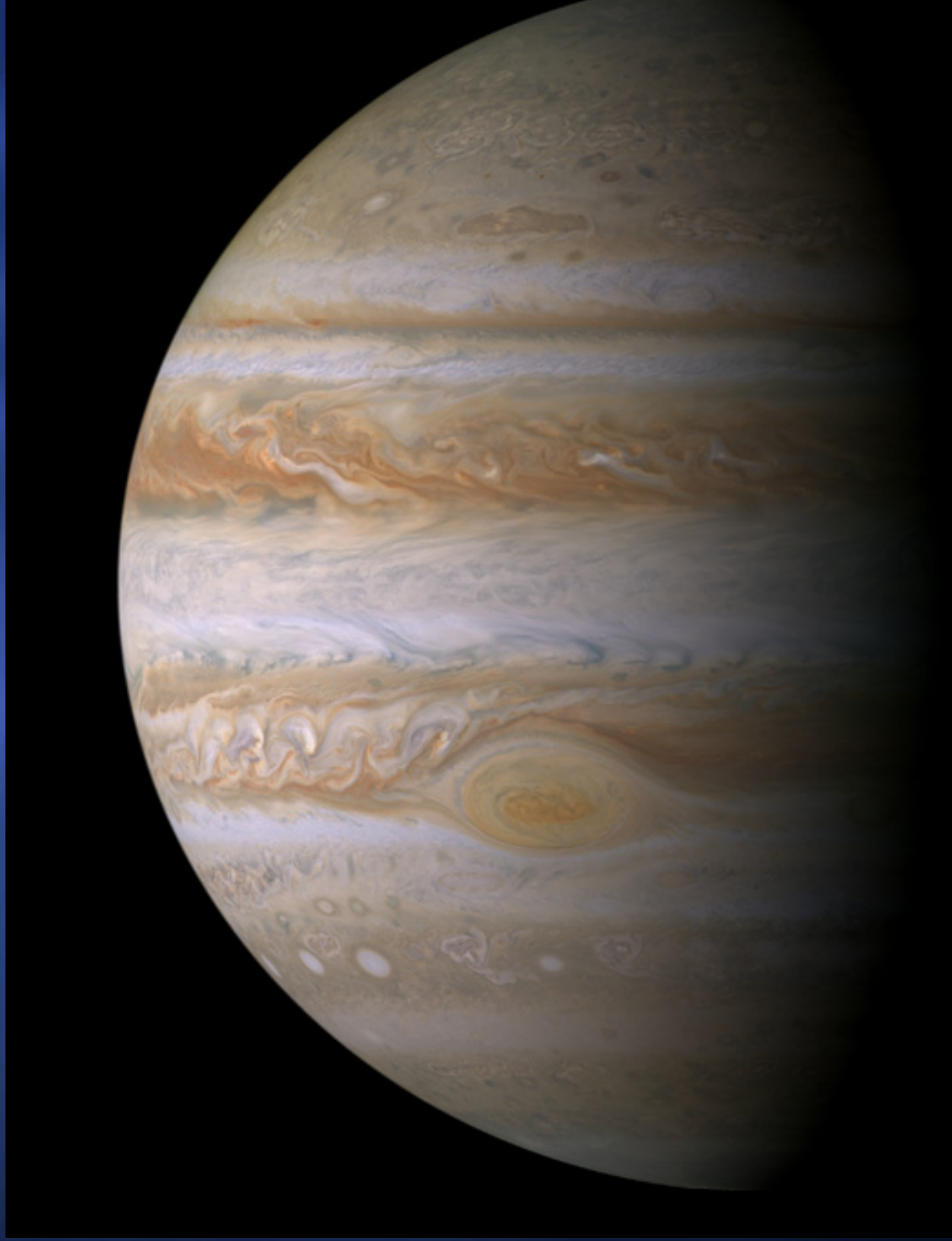


- Titan IV/Centauer 15.October 1997

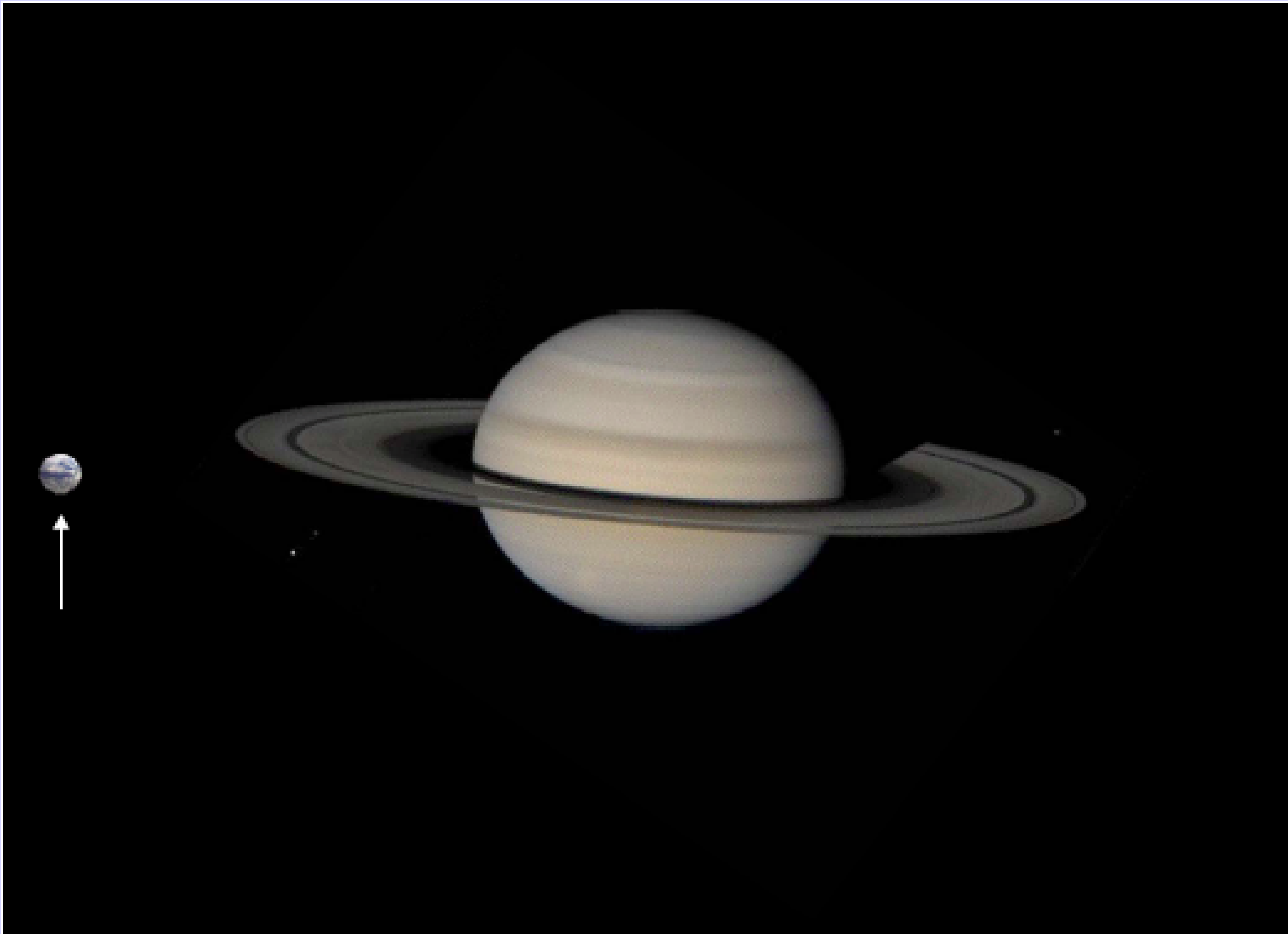
Cruise

QuickTime™ and a
YUV420 codec decompressor
are needed to see this picture.

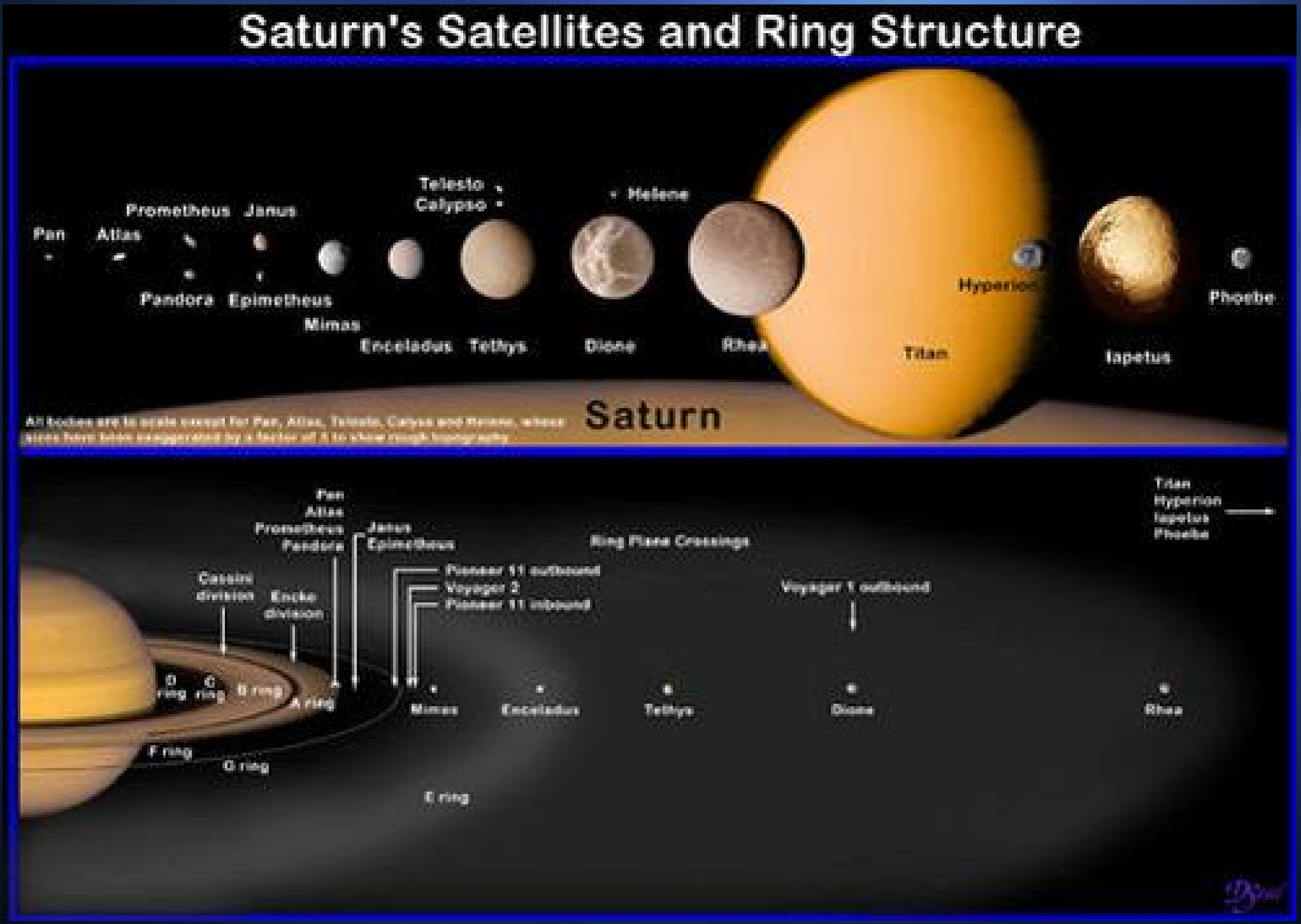
upiter 2000



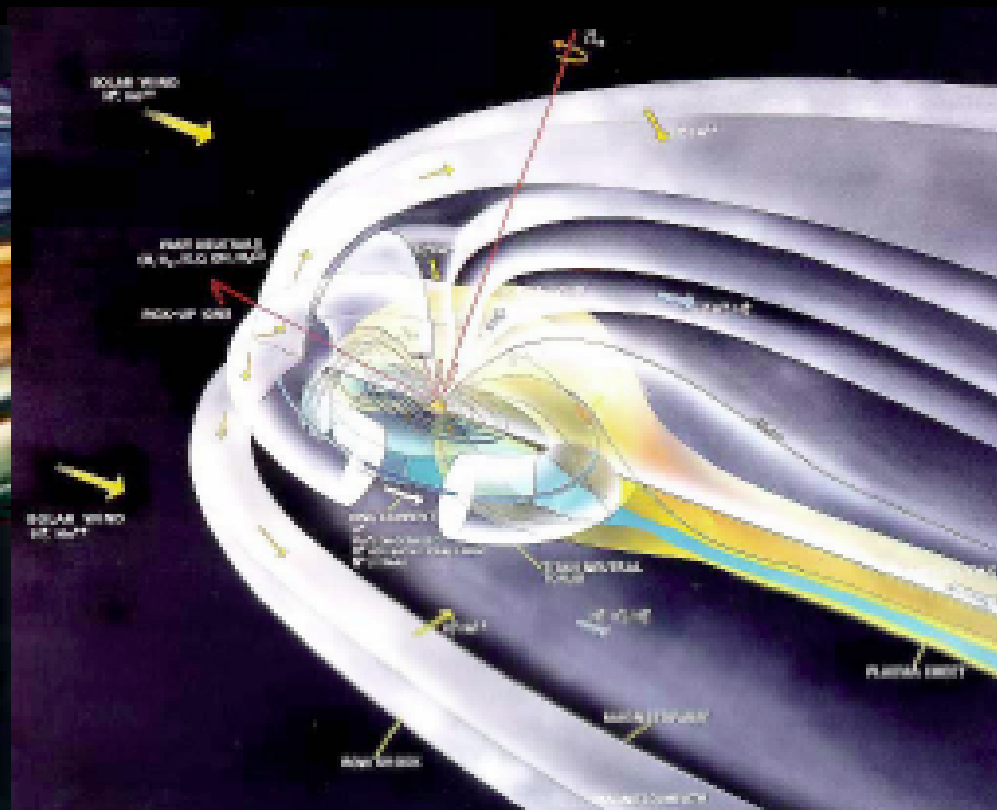
Saturn - Earth



Saturn System



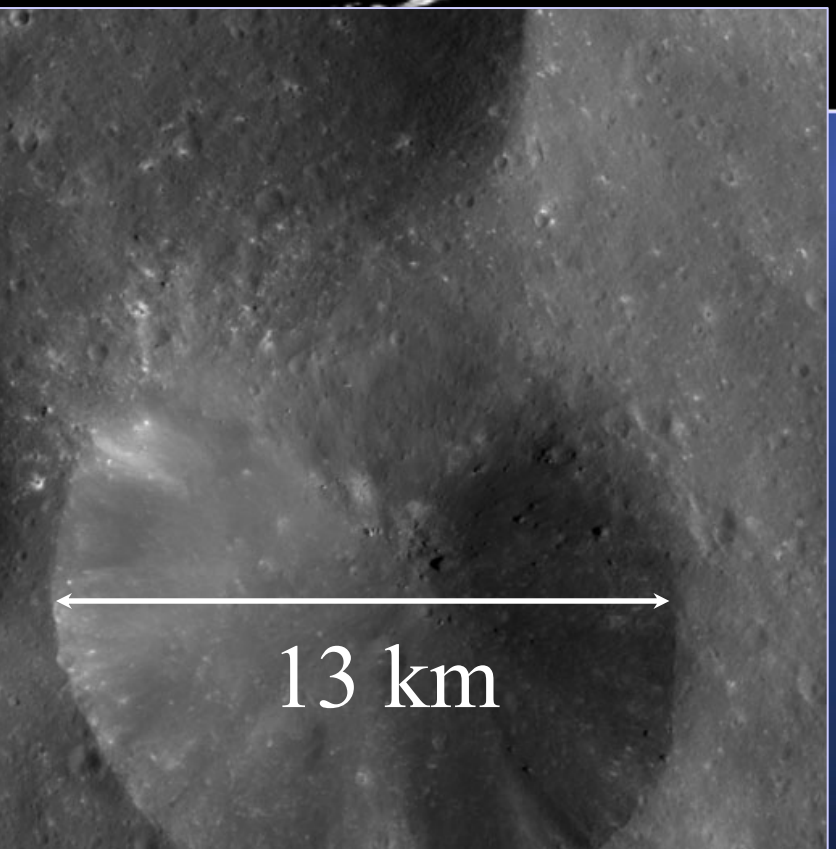
Science Objective



Science Objective

Phoebe from Voyager 2 distance: 2.2 million km

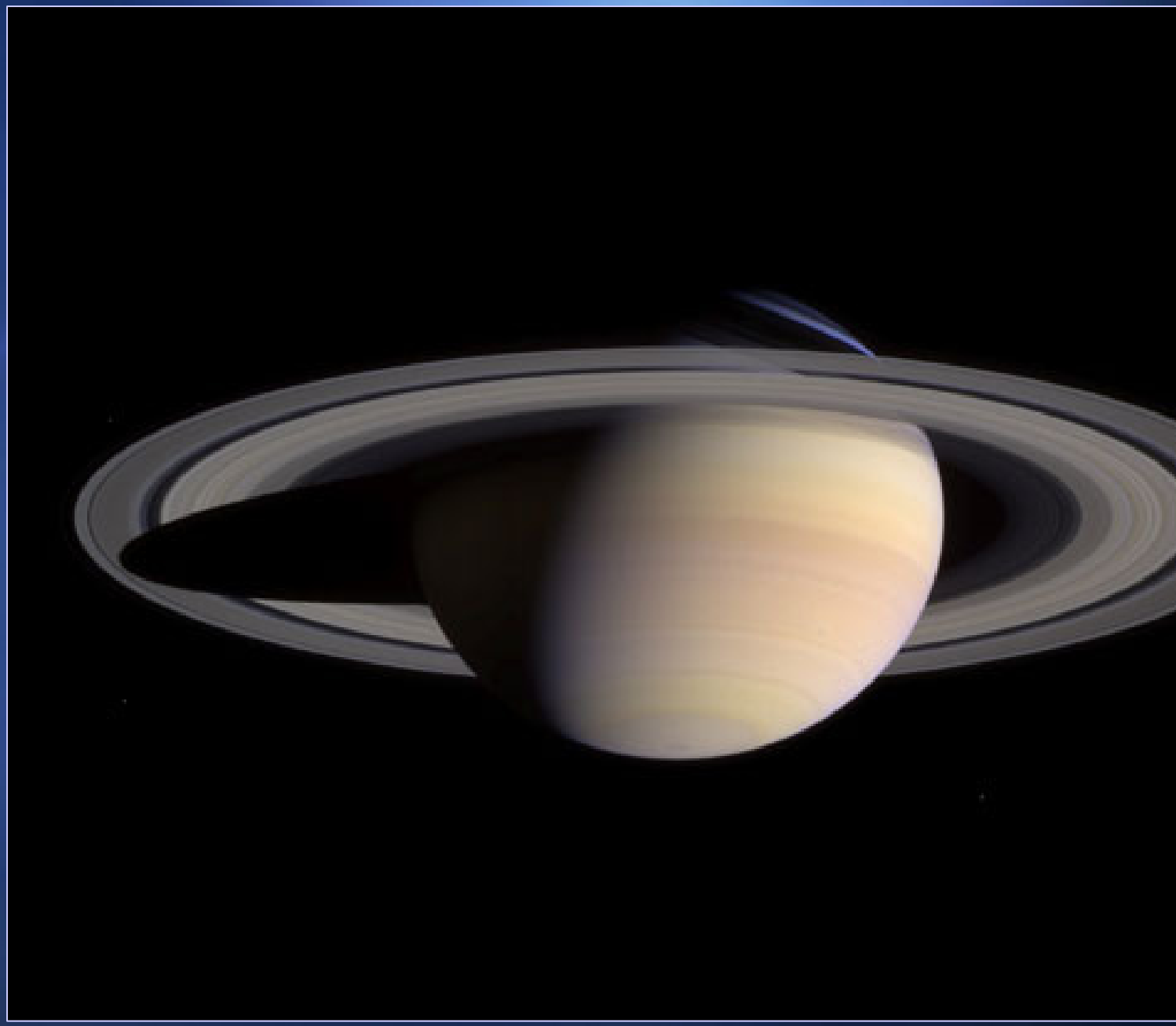
Phoebe



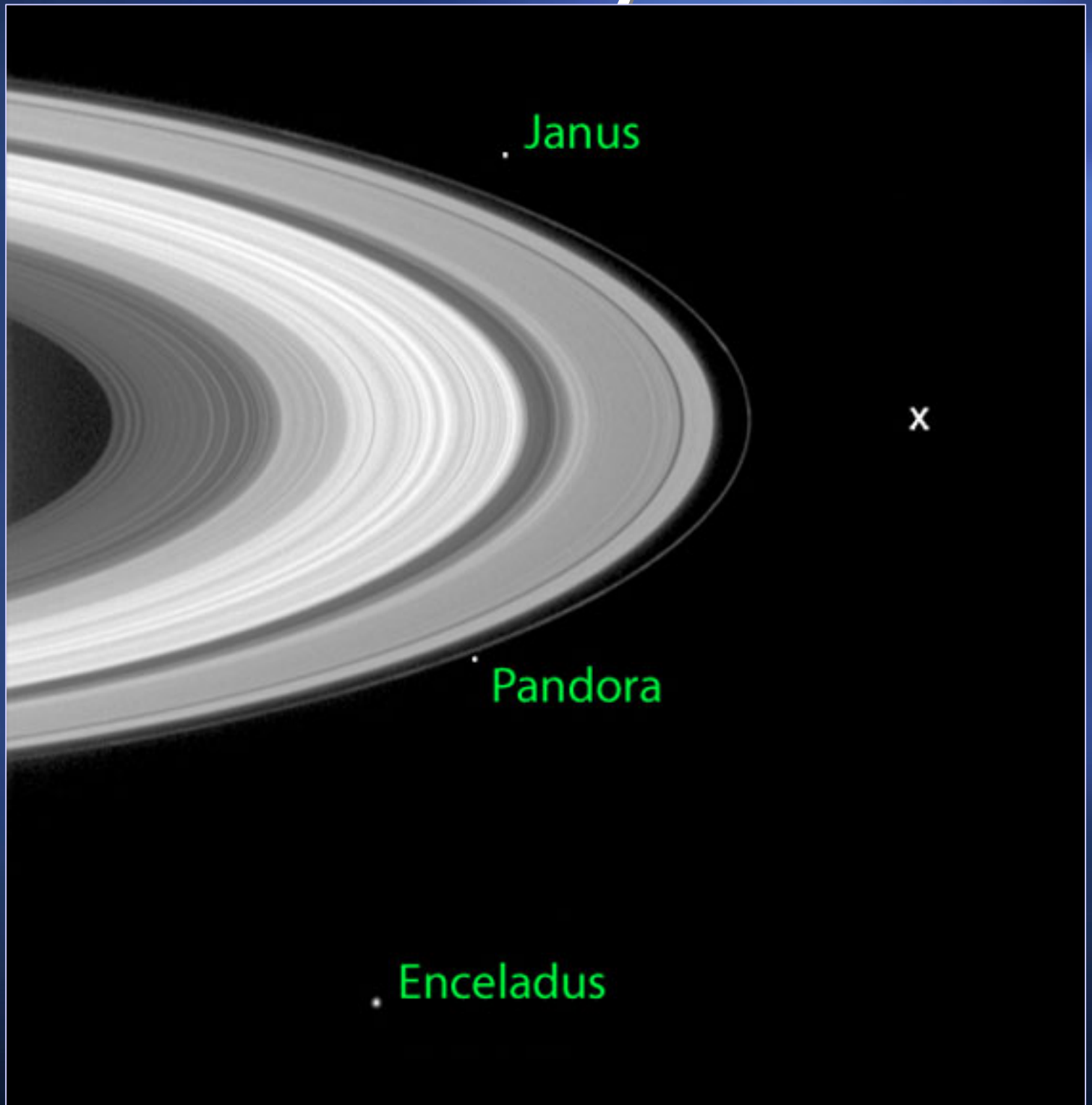
Saturn May 2004

2004

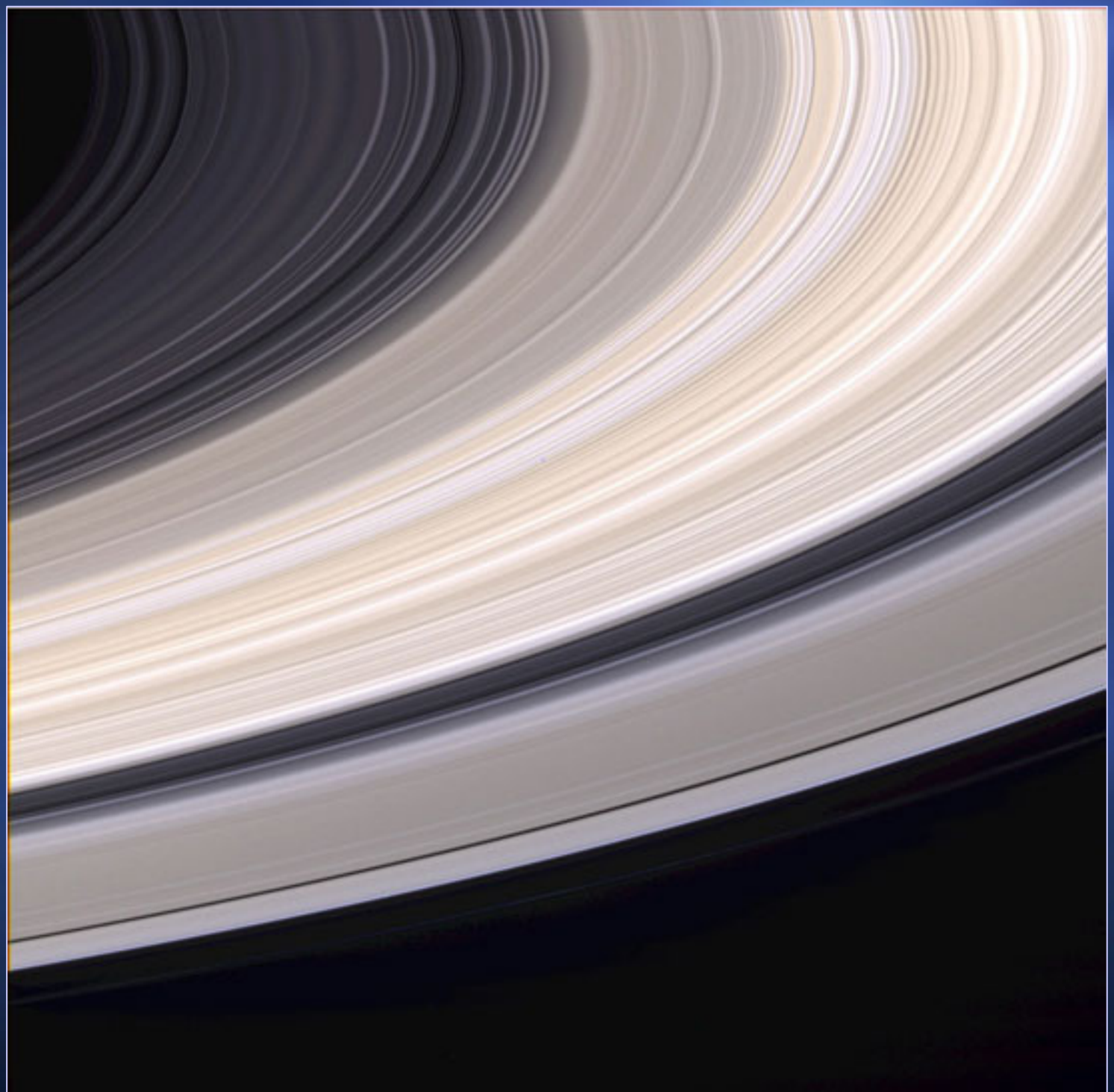
ce 28.2 mil. km



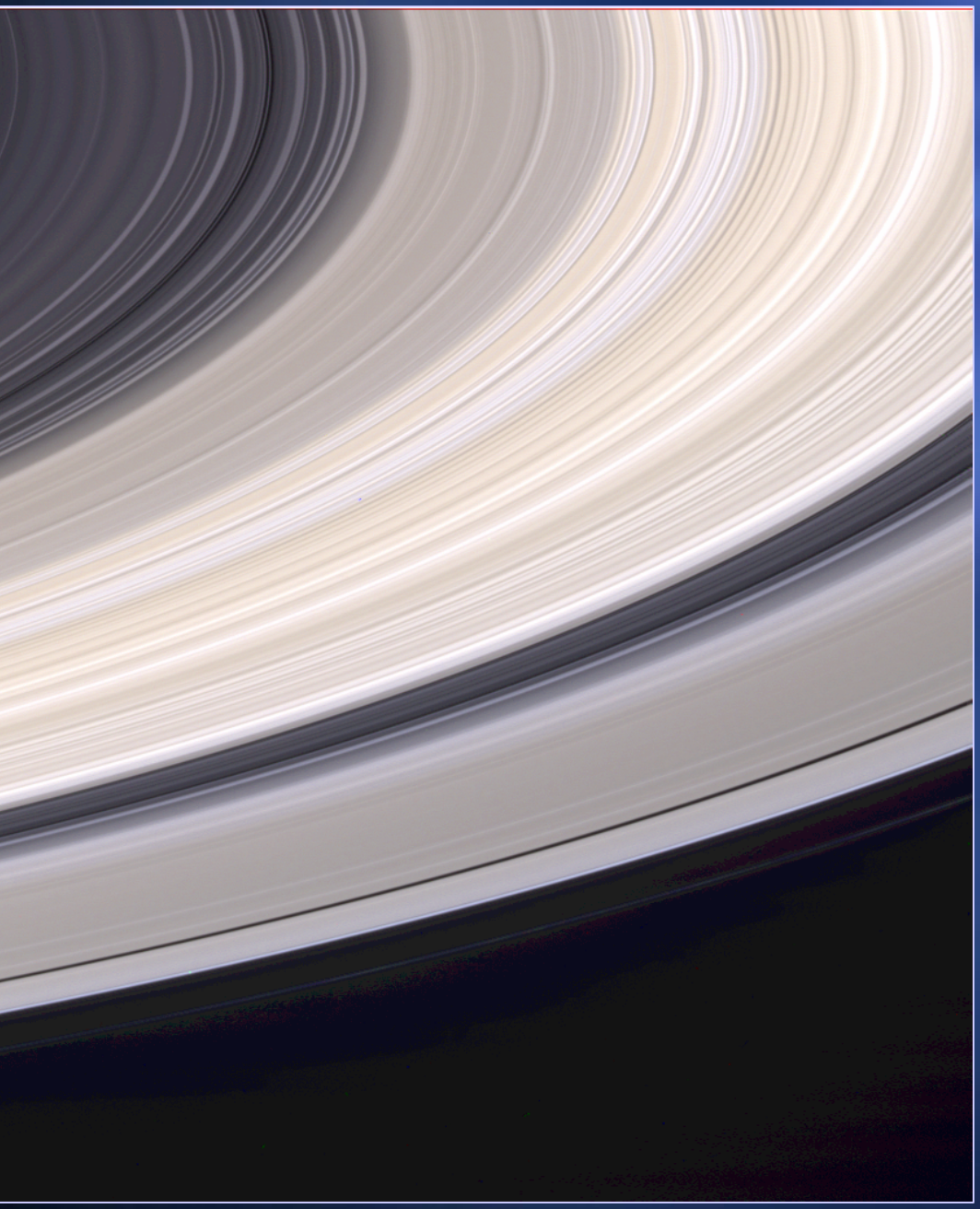
Saturn May 2004



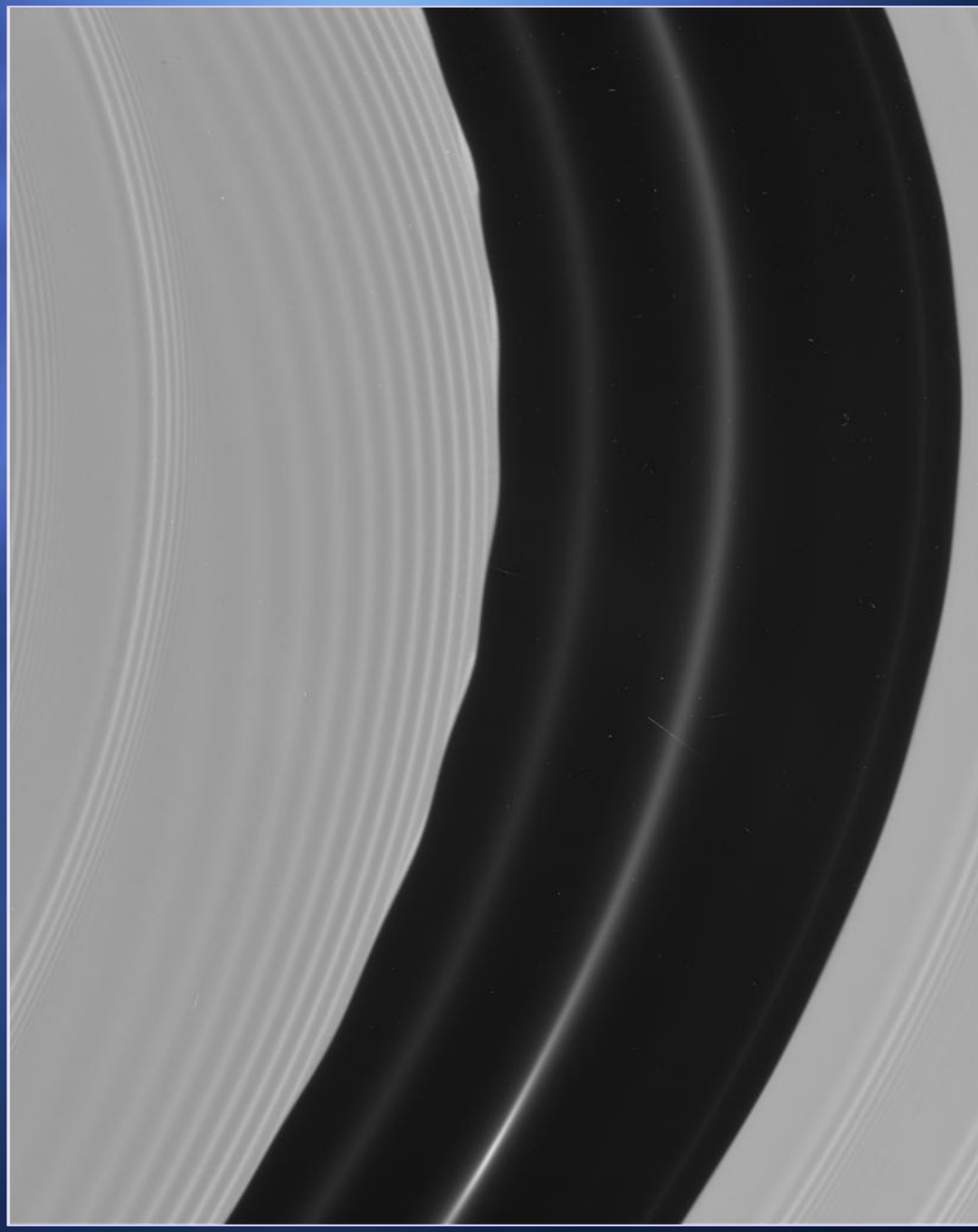
9 Days Before Arrival



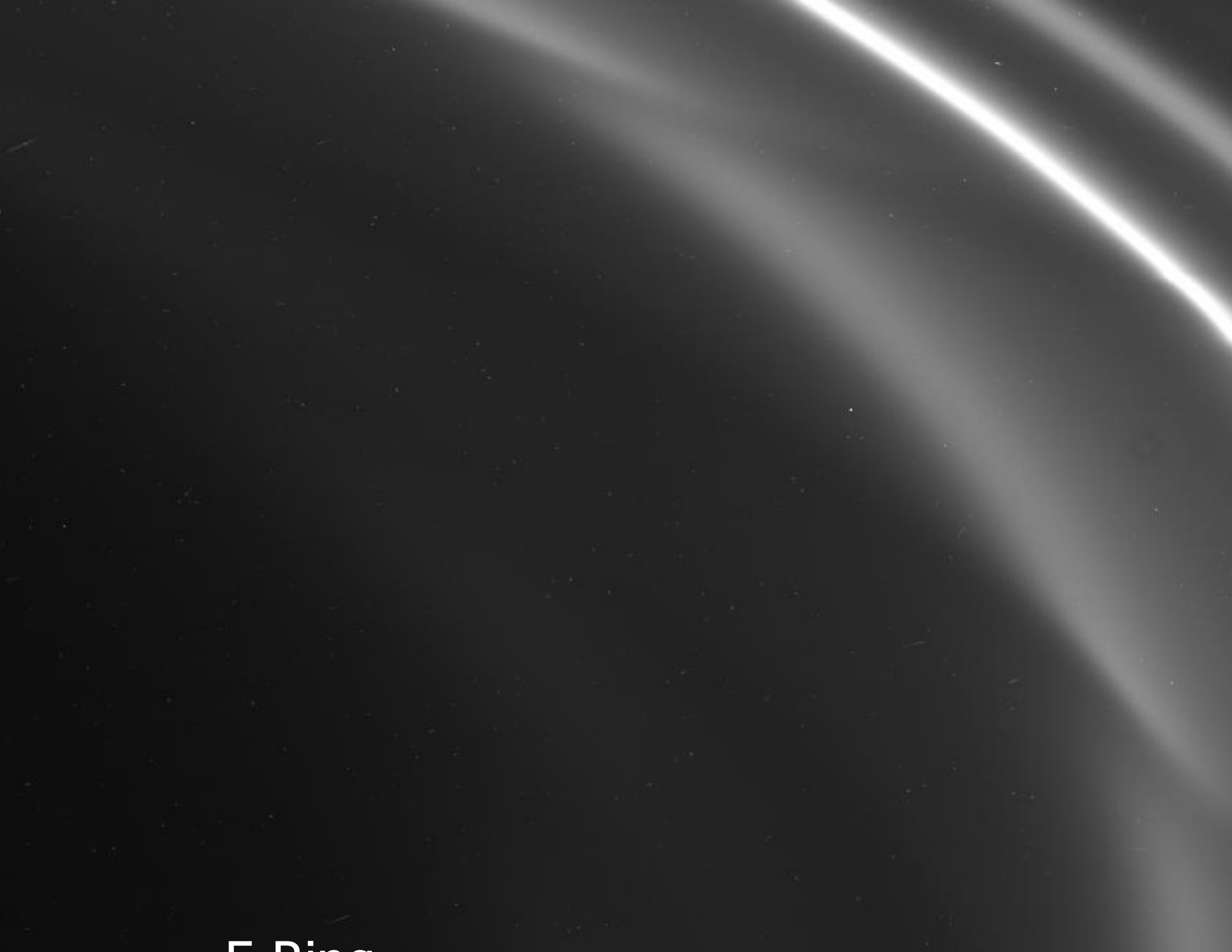
Arrival



re SOI



Encke Gap


E Ring

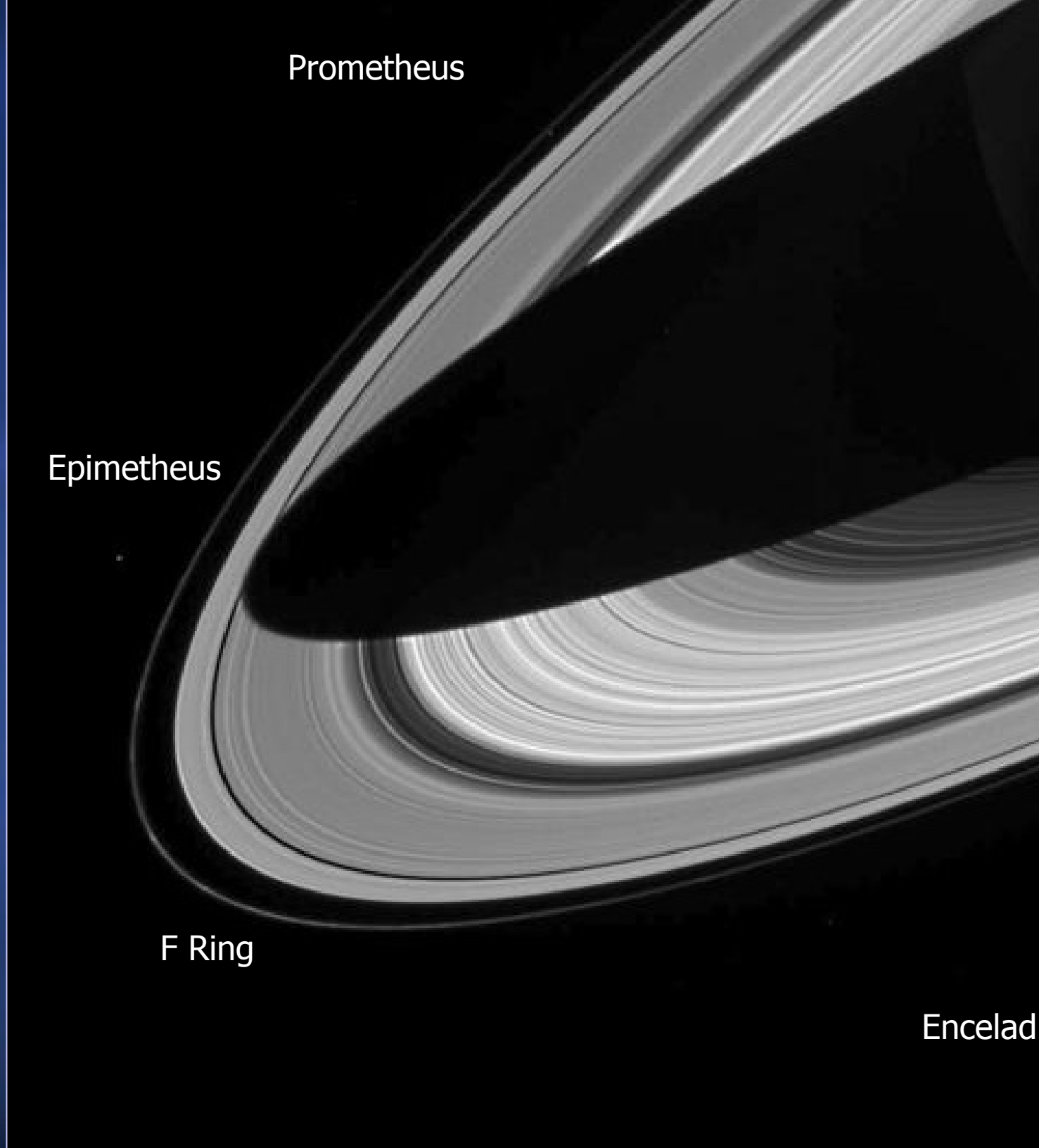
Monde

Ringbewegungen

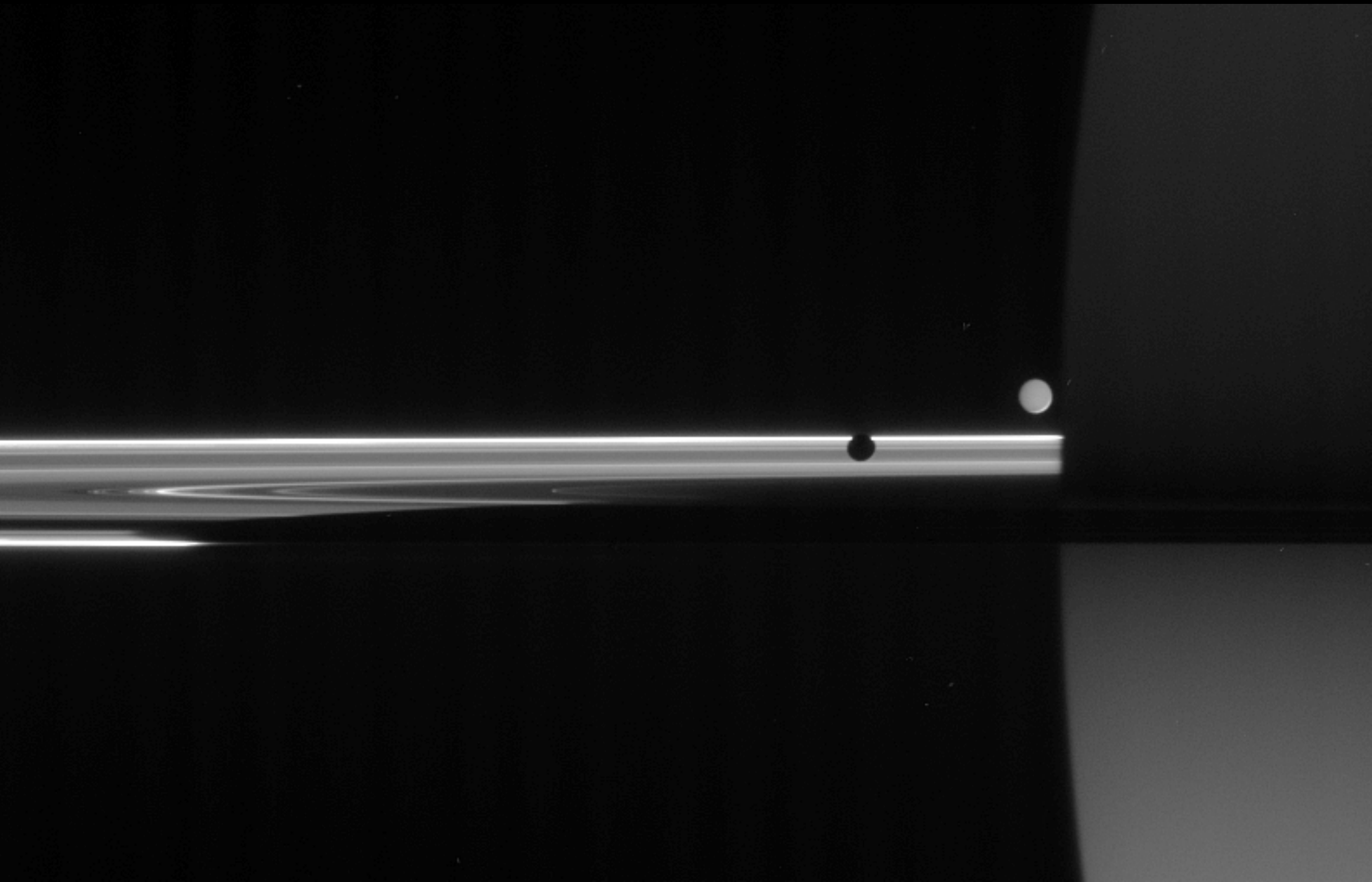
QuickTime™ and a
GIF decompressor
are needed to see this picture.

Rings

eladus: 499 km
netheus: 116 km
netheus: 102 km
y 2004
ance: 1.5 mil. km



Light in the Saturnian System

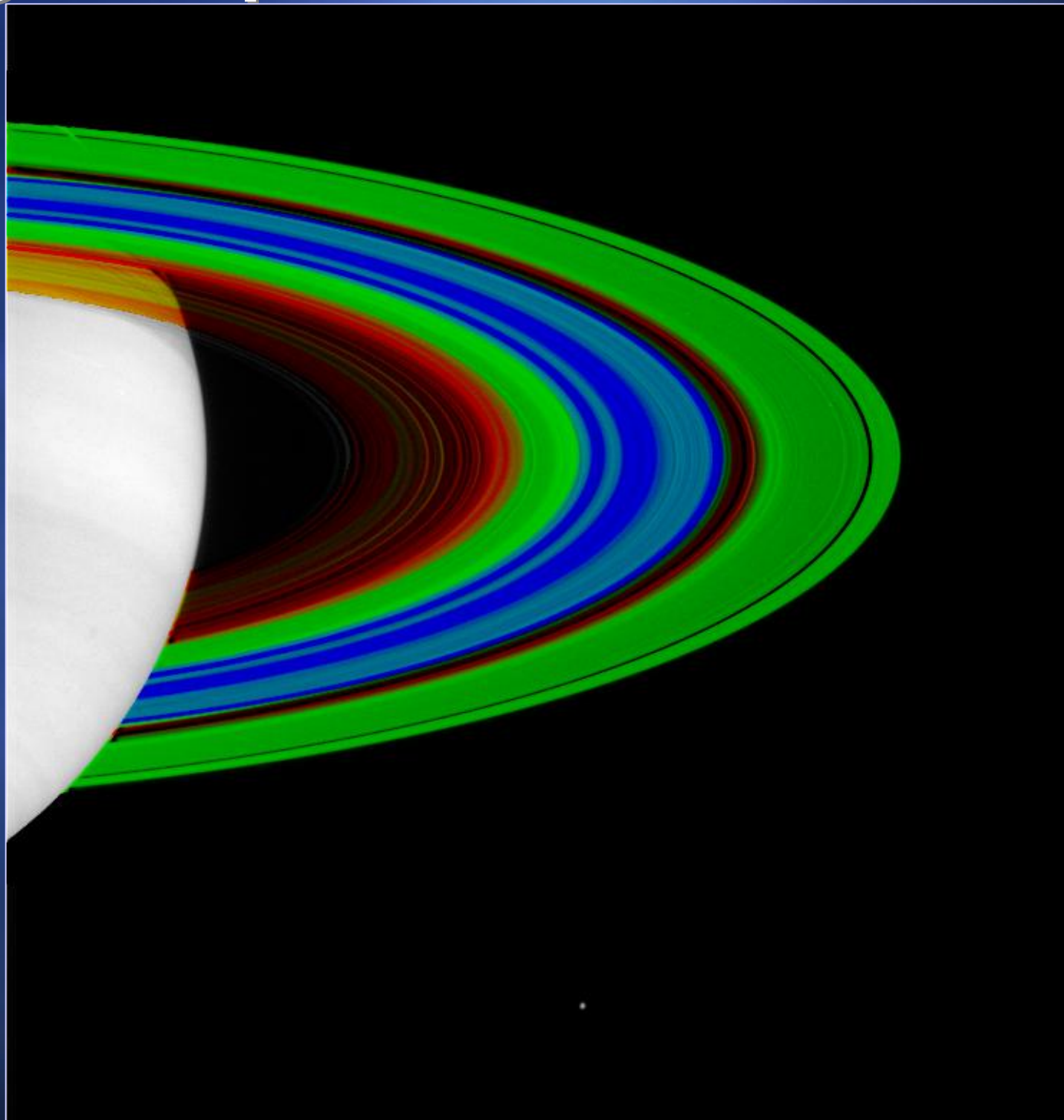


Ringtemperatures

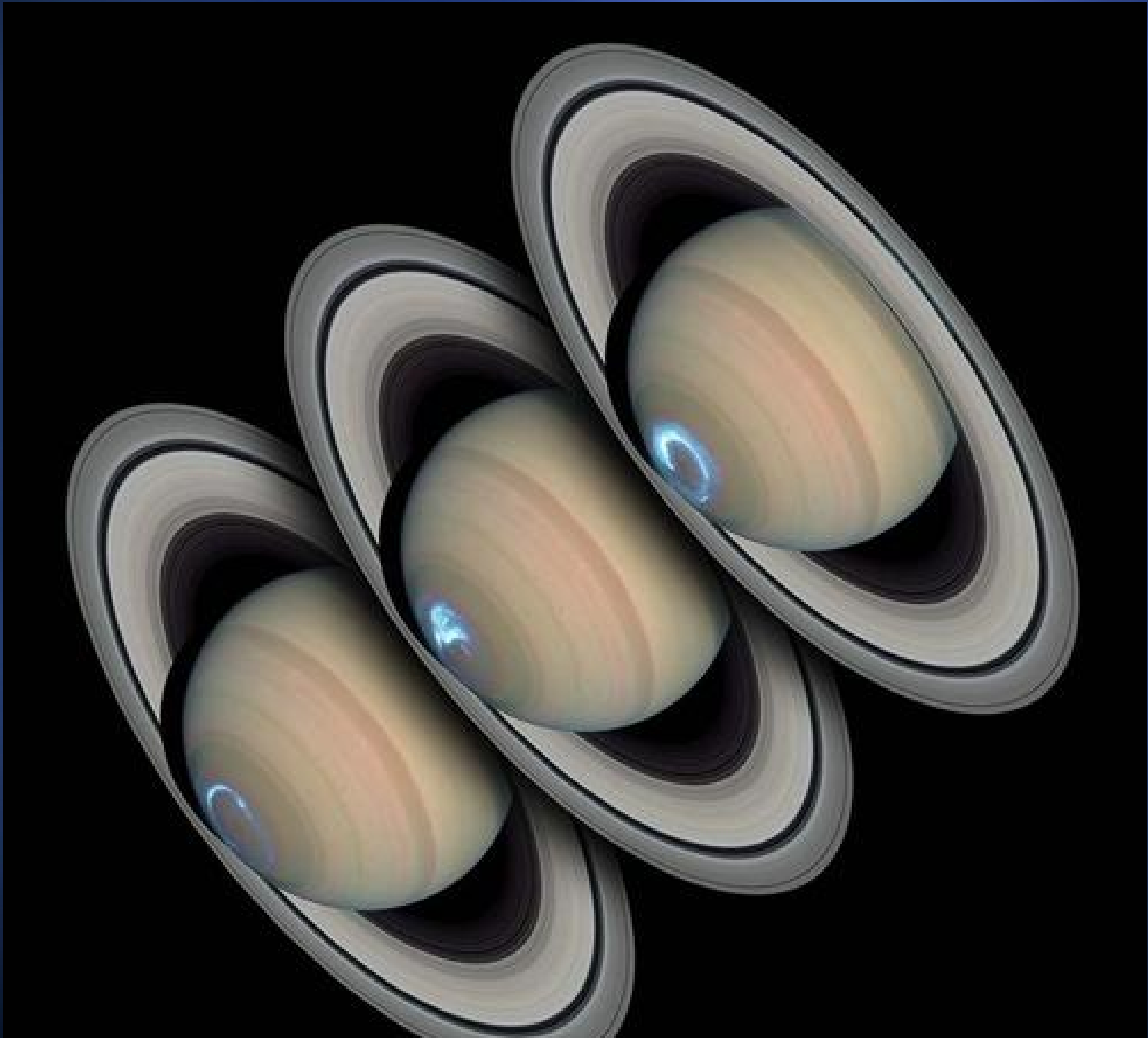
110 Kelvin

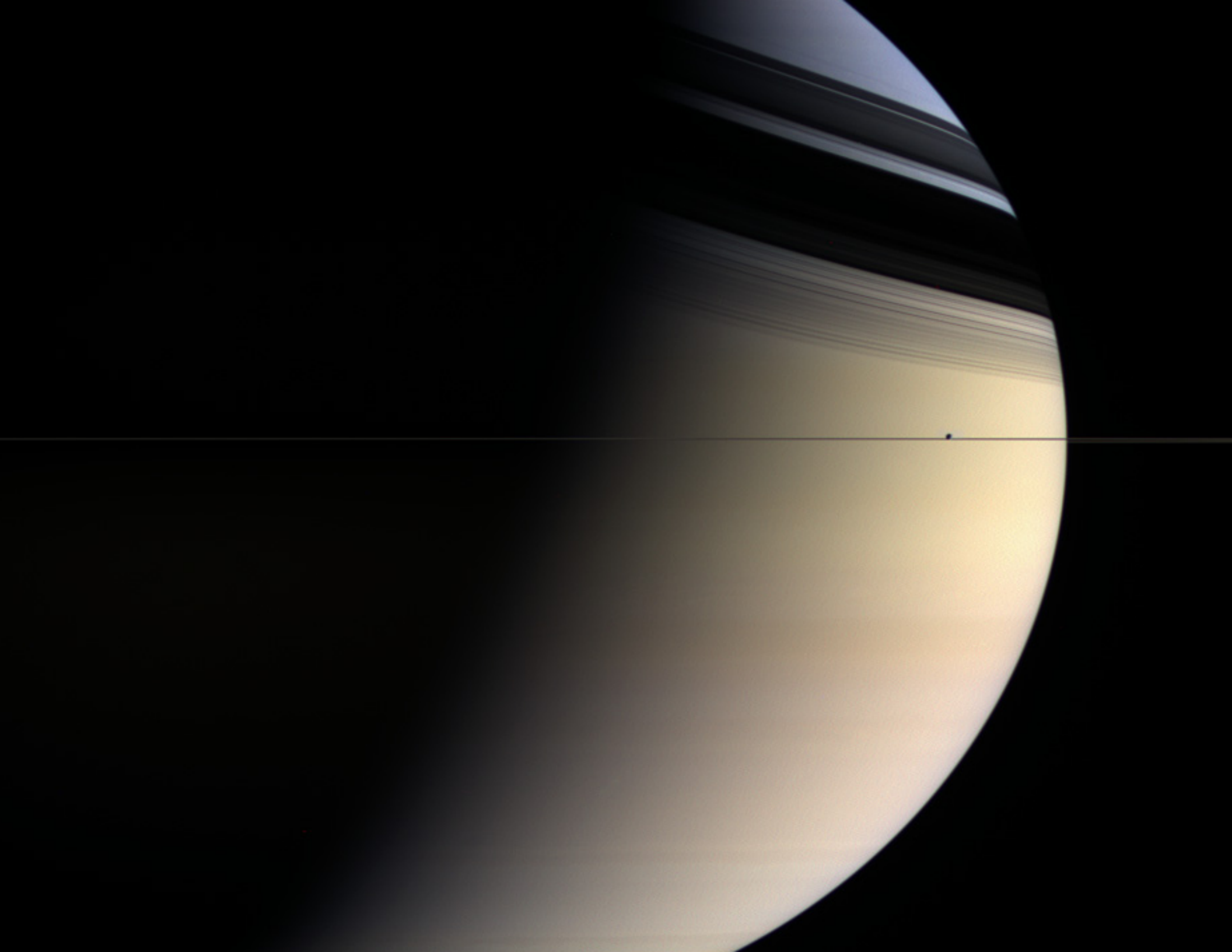
90 Kelvin

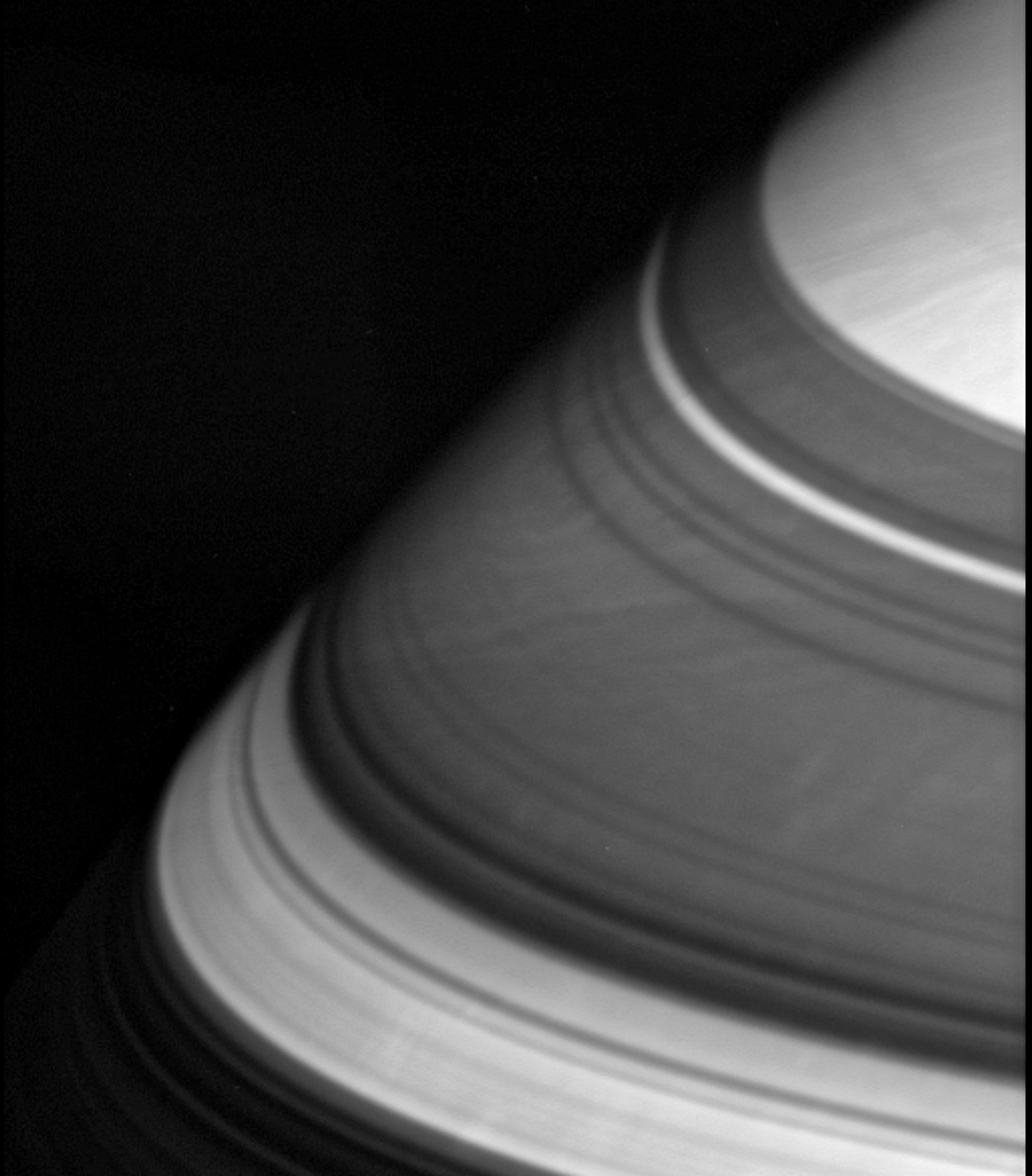
70 Kelvin



Aurora







Huygens Mission

QuickTime™ and a
YUV420 codec decompressor
are needed to see this picture.

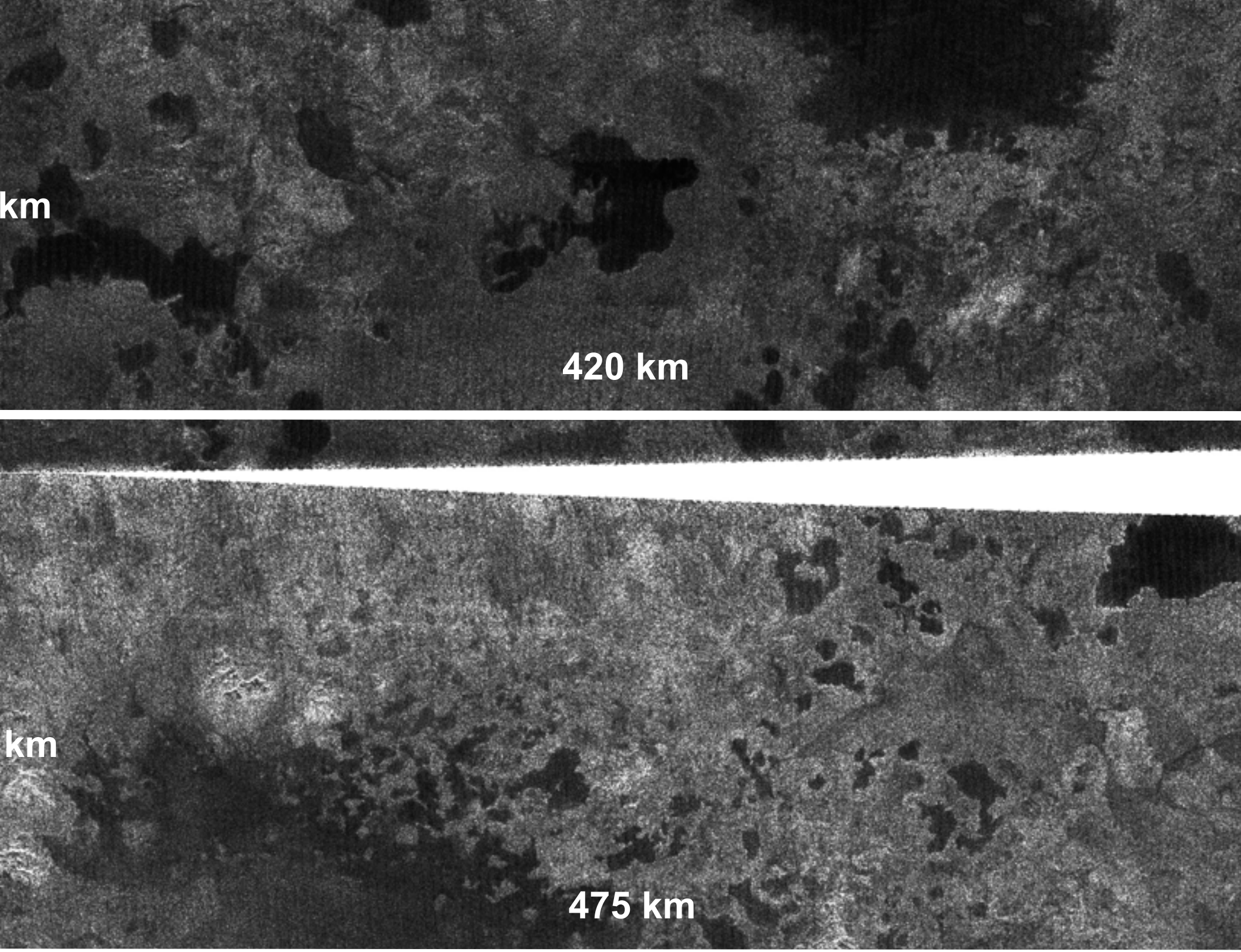
QuickTime™ and a
YUV420 codec decompressor
are needed to see this picture.

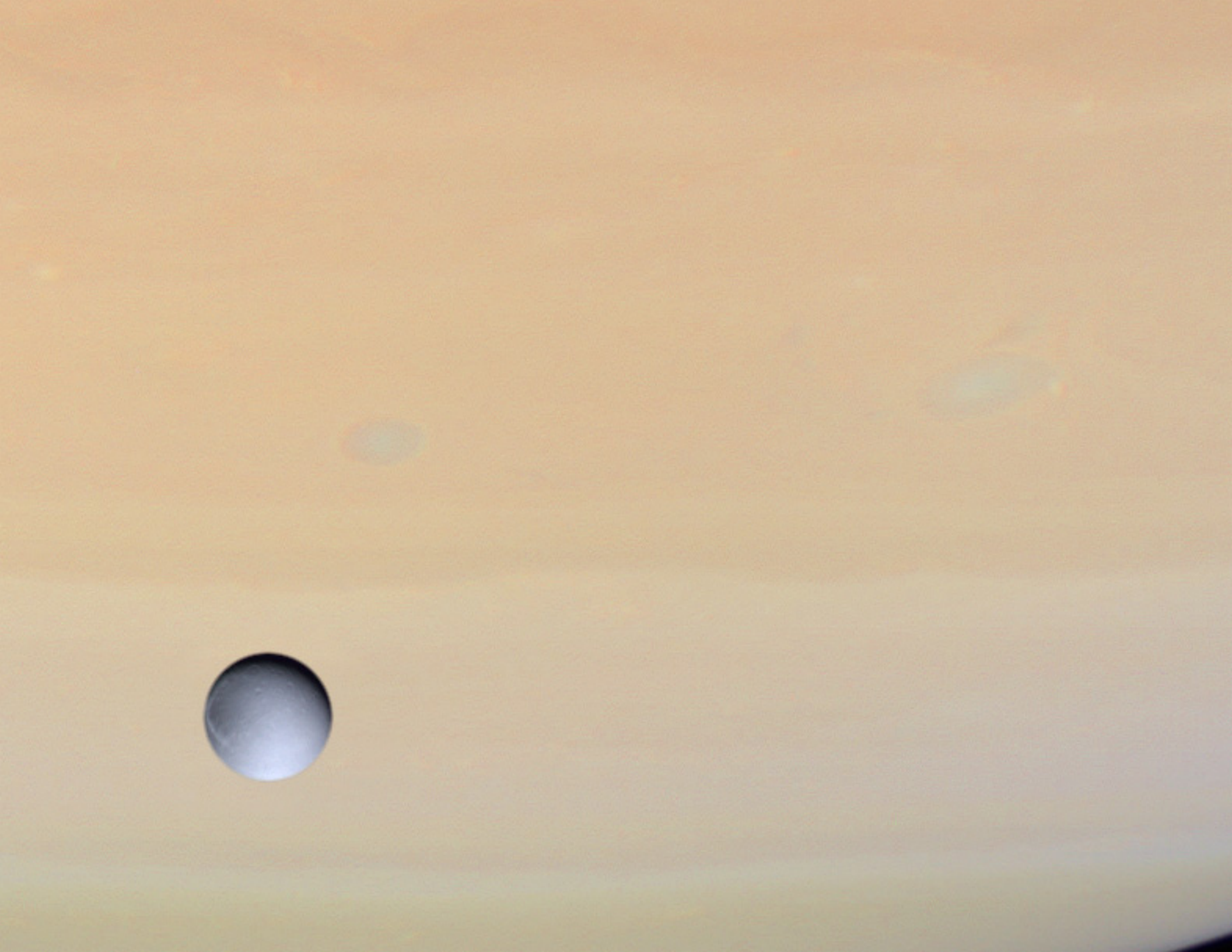
2.2004

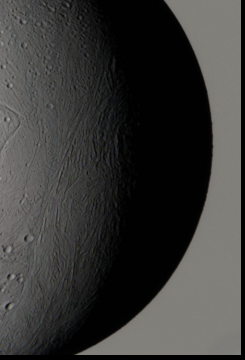
QuickTime™ and a
YUV420 codec decompressor
are needed to see this picture.

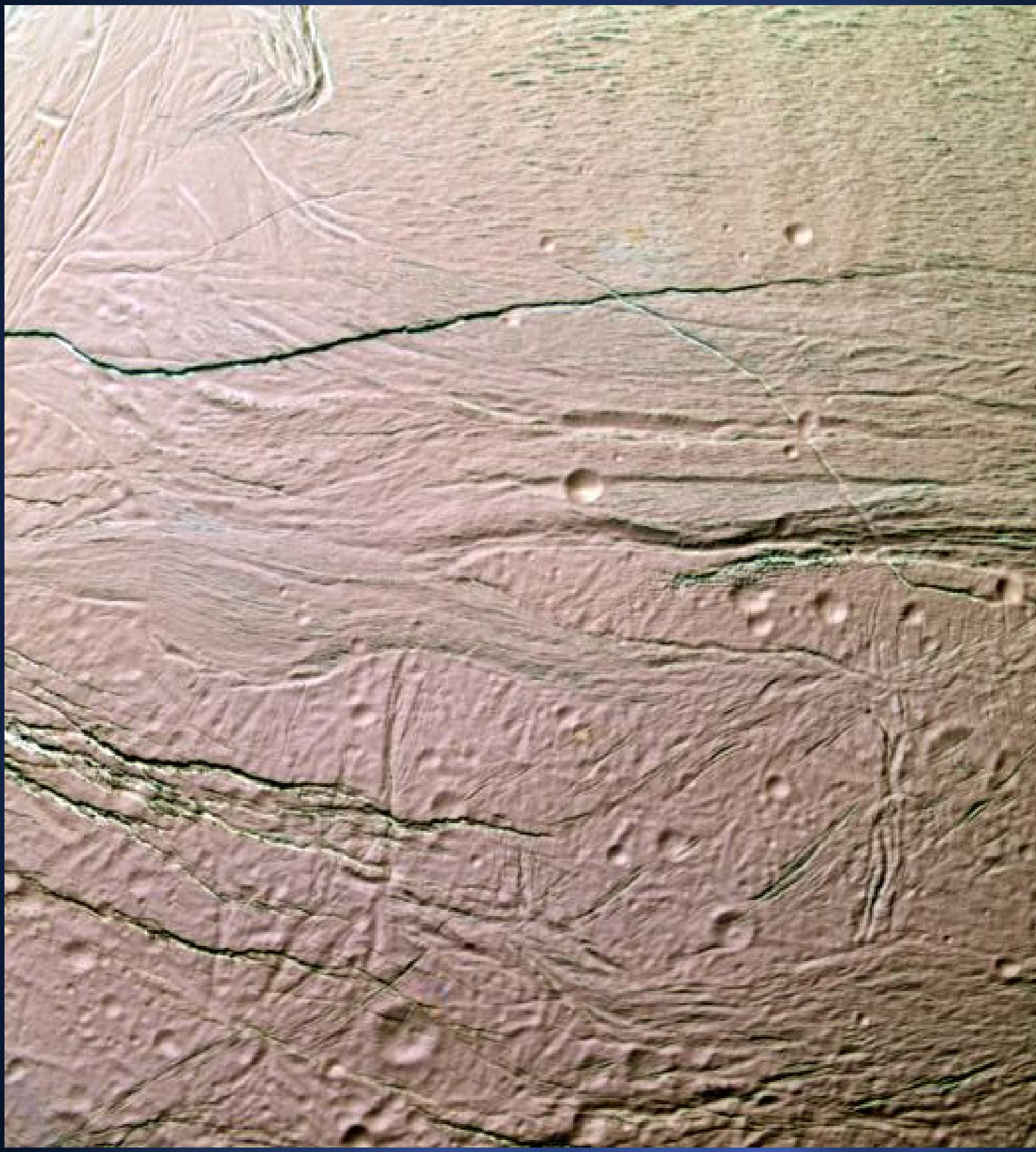
15.1.2

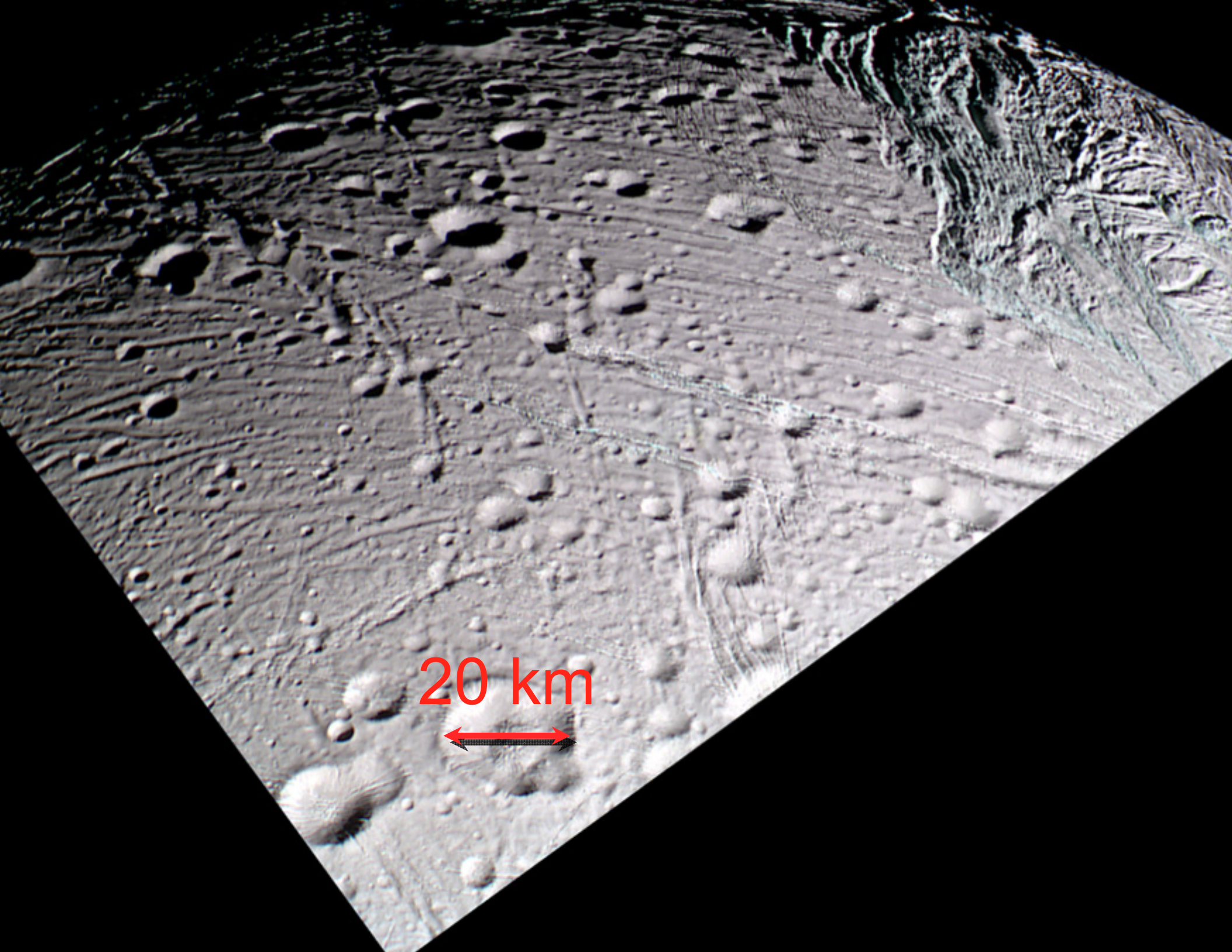
m
340 km


km
420 km
km
475 km








20 km

Cassini Tour Overview

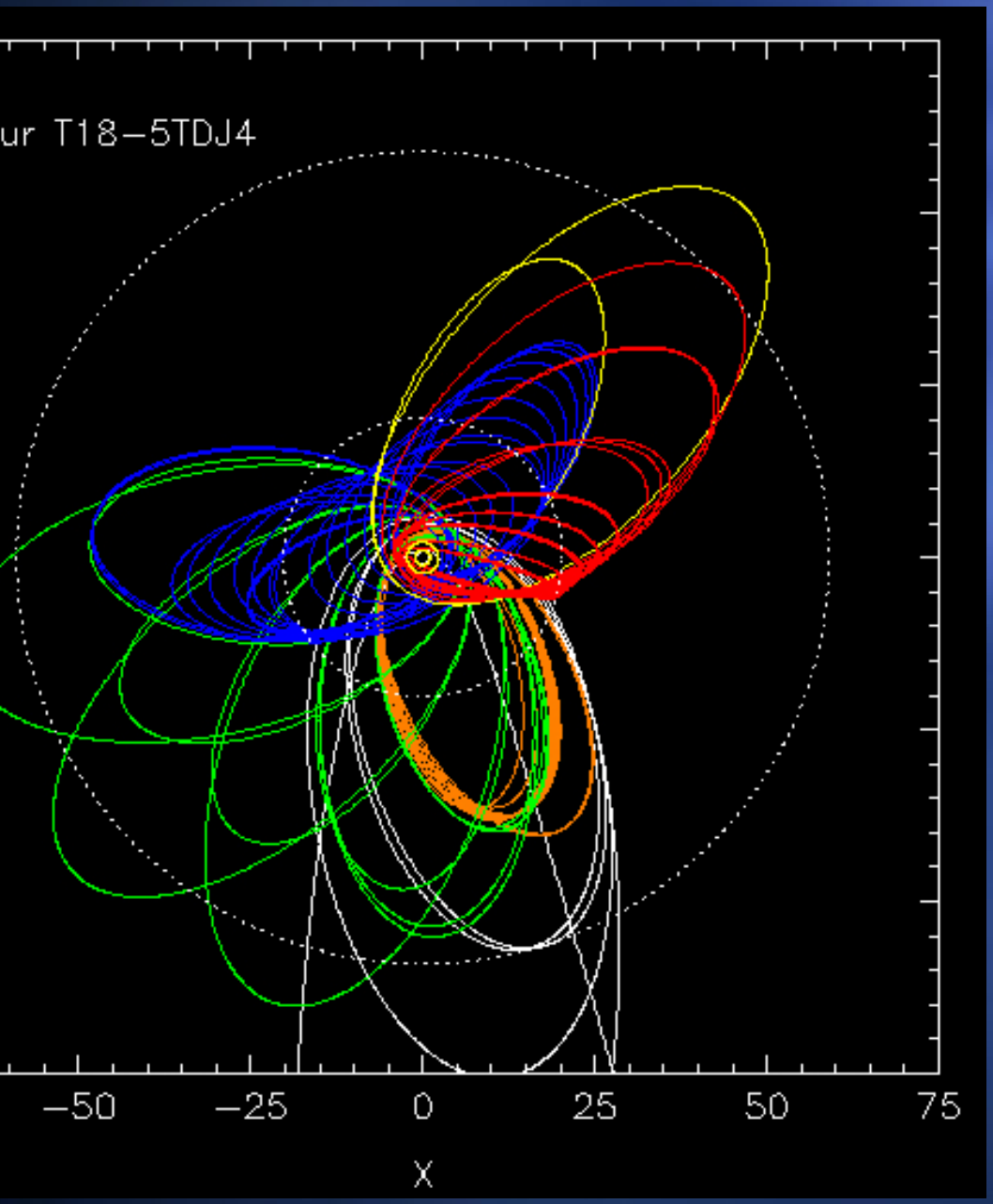
74 Orbits

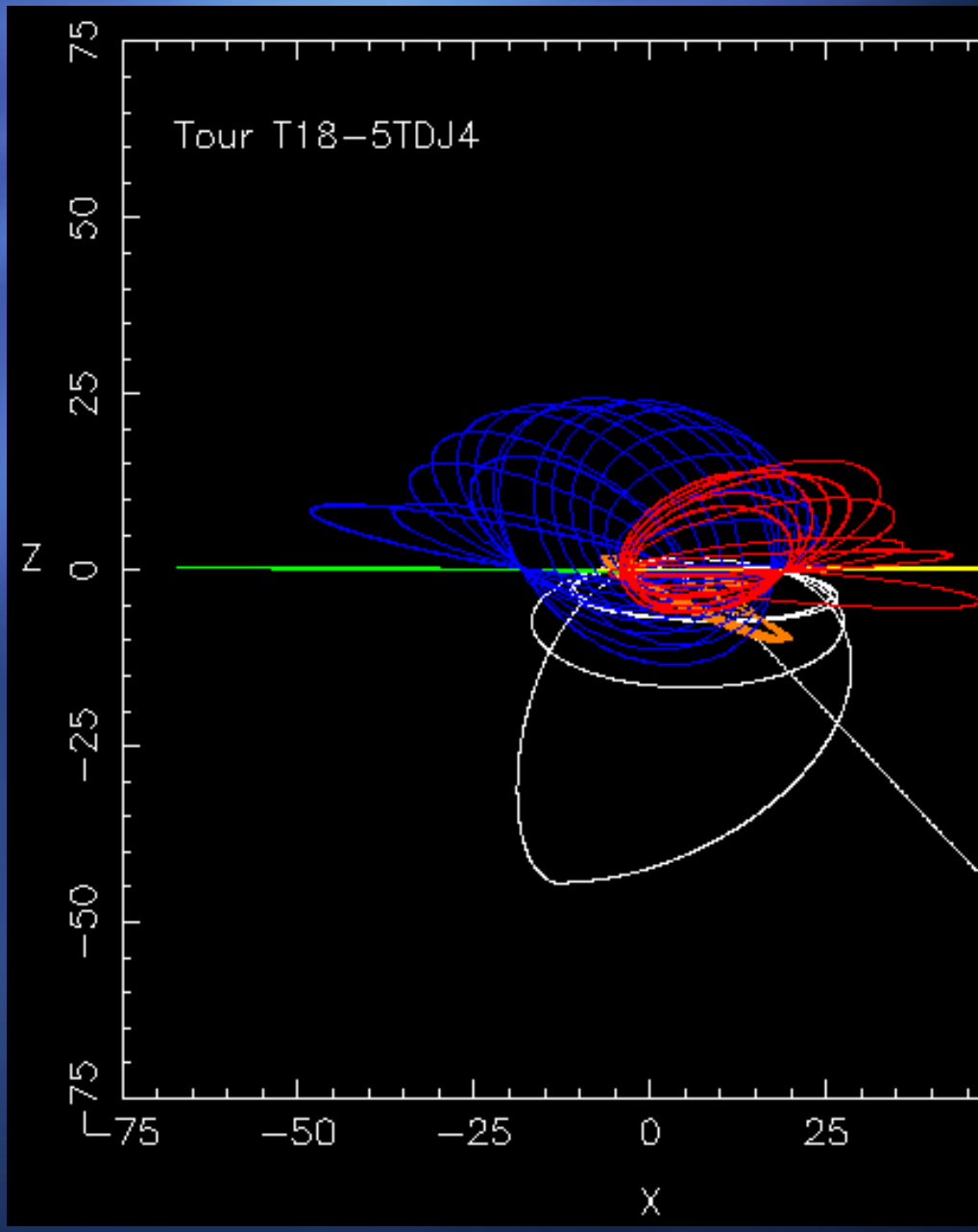
45 Close Flybys at Titan

8 Close Flybys at Moons

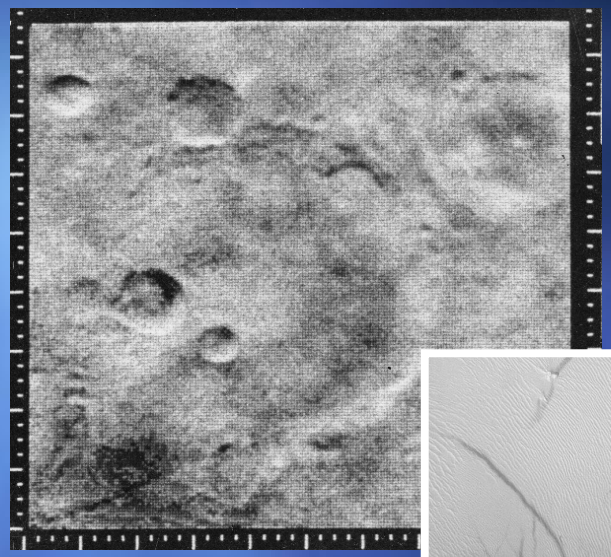
- 3 Enceladus
- Phoebe
- Hyperion
- Dione
- Rhea
- Iapetus
- 30 Flybys at distance of 100.000 km
- Saturn and Ring observations

Tour Phase


ur T18−5TDJ4
−50
−25
0
25
50
75
X


Tour T18−5TDJ4
75
50
25
Z
0
−25
−50
−75
−75
−50
−25
0
25
X

US Mars Missions



Mariner 4, Flyby: 14.July 1965

Mariner 6, Flyby: 31.July 1969

Mariner 7, Flyby: 5.August 1969

Mariner 9, Orbit: 13.November 1971

Viking 1, Lander: 19.June 1976

Viking 2, Lander: 7.August 1976

Mars Pathfinder, Landung: 4.July 1997

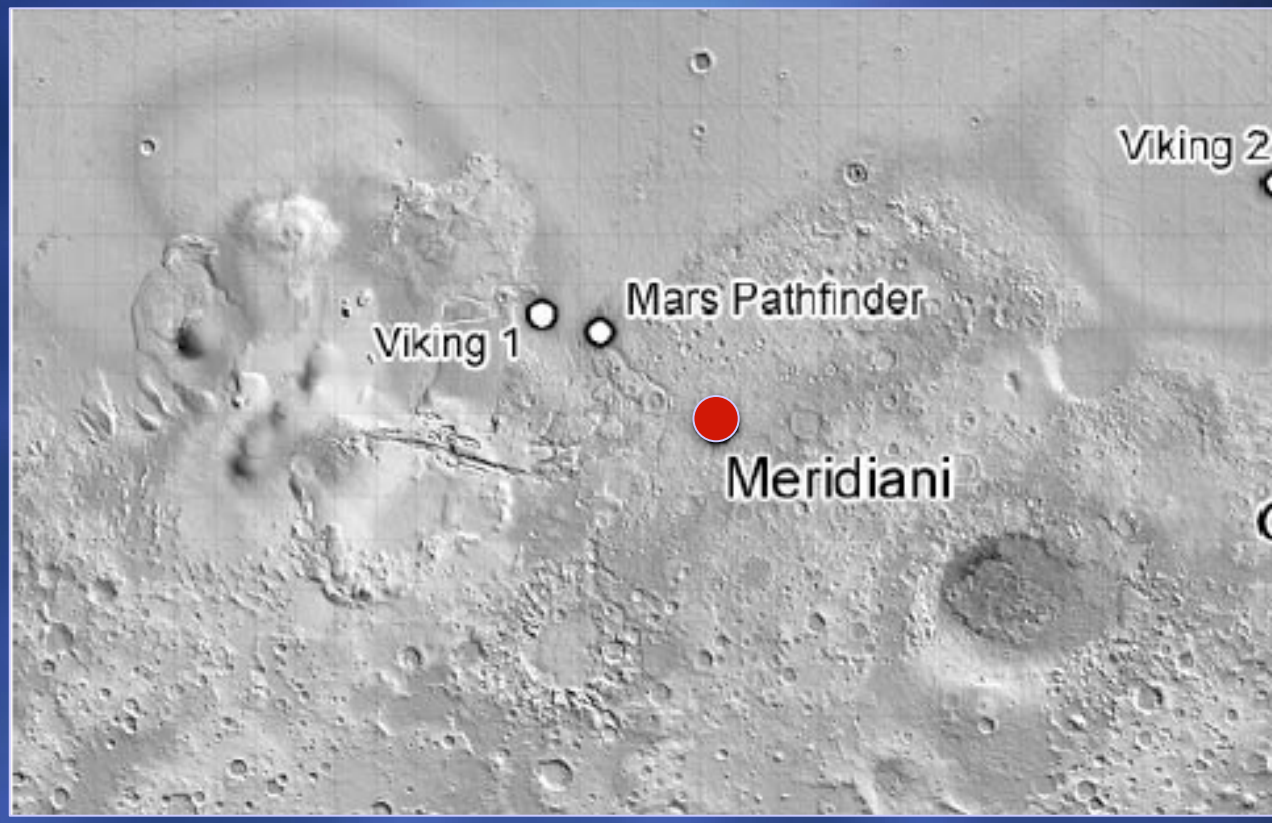
Mars Global Surveyor, Orbiter: 12.September 1997

Mars Odyssey, Orbiter: 24.Oktober 2001

Mars Reconnaissance Orbiter, Orbiter: May 2005

Launch June 2003

MER Overview



rit (A, Gusev)

- Start: 10.6.2003
- Landing: 3.1.2004
- Distance: SOL 959 6876 m (not moved since SOL 805)

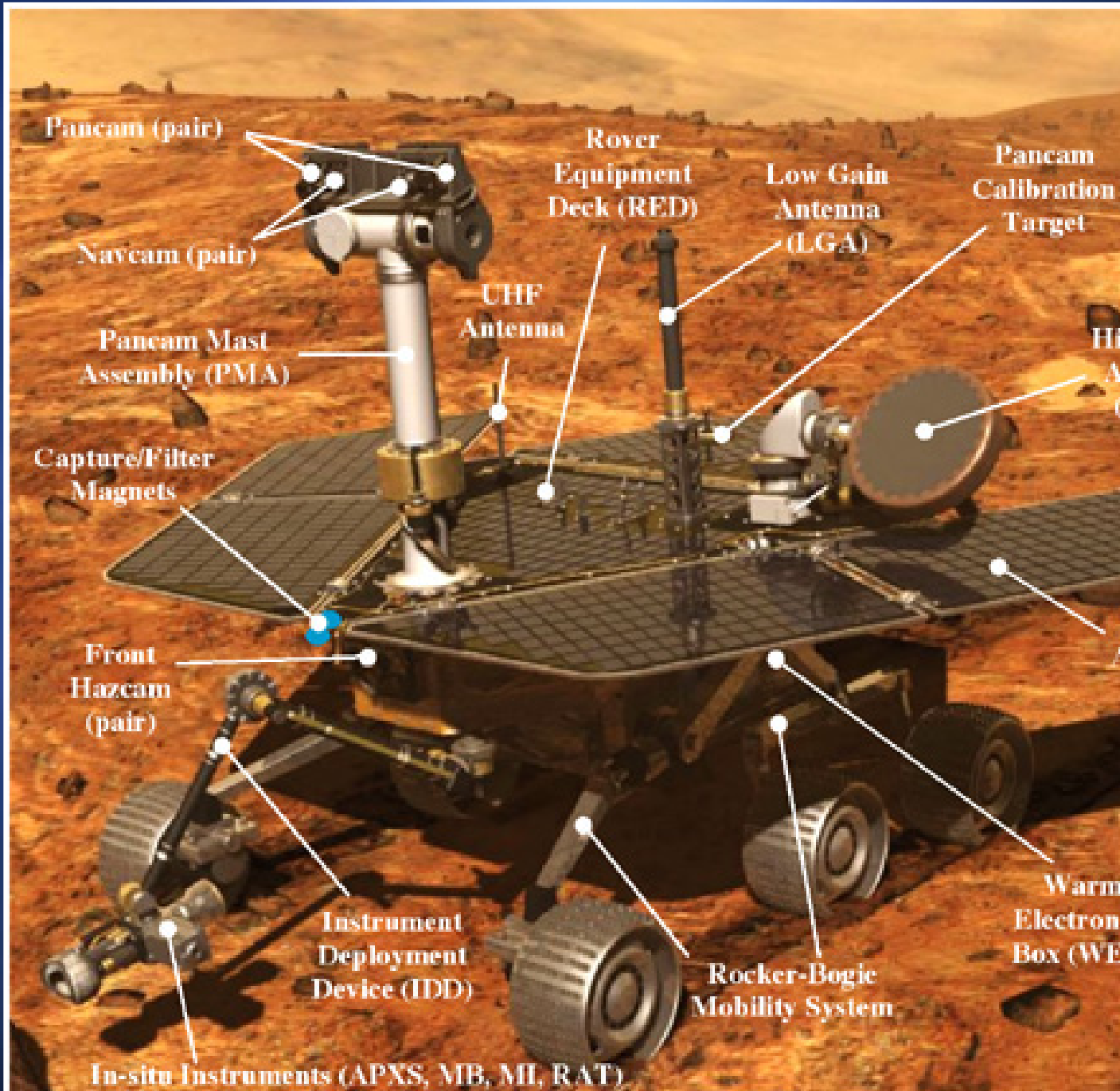
portunity (B, Meridiani)

- Start: 7.7.2003
- Landing: 24.1.2004
- Distance: SOL 939 9139 m

Rover Overview

e Goals:
ere ever water ?
e
y (Areology)
ng manned missions

ss: 180 kg
wer: 140 W
signed for:
- 90 SOL
- 40 m/SOL



Technology

Communication

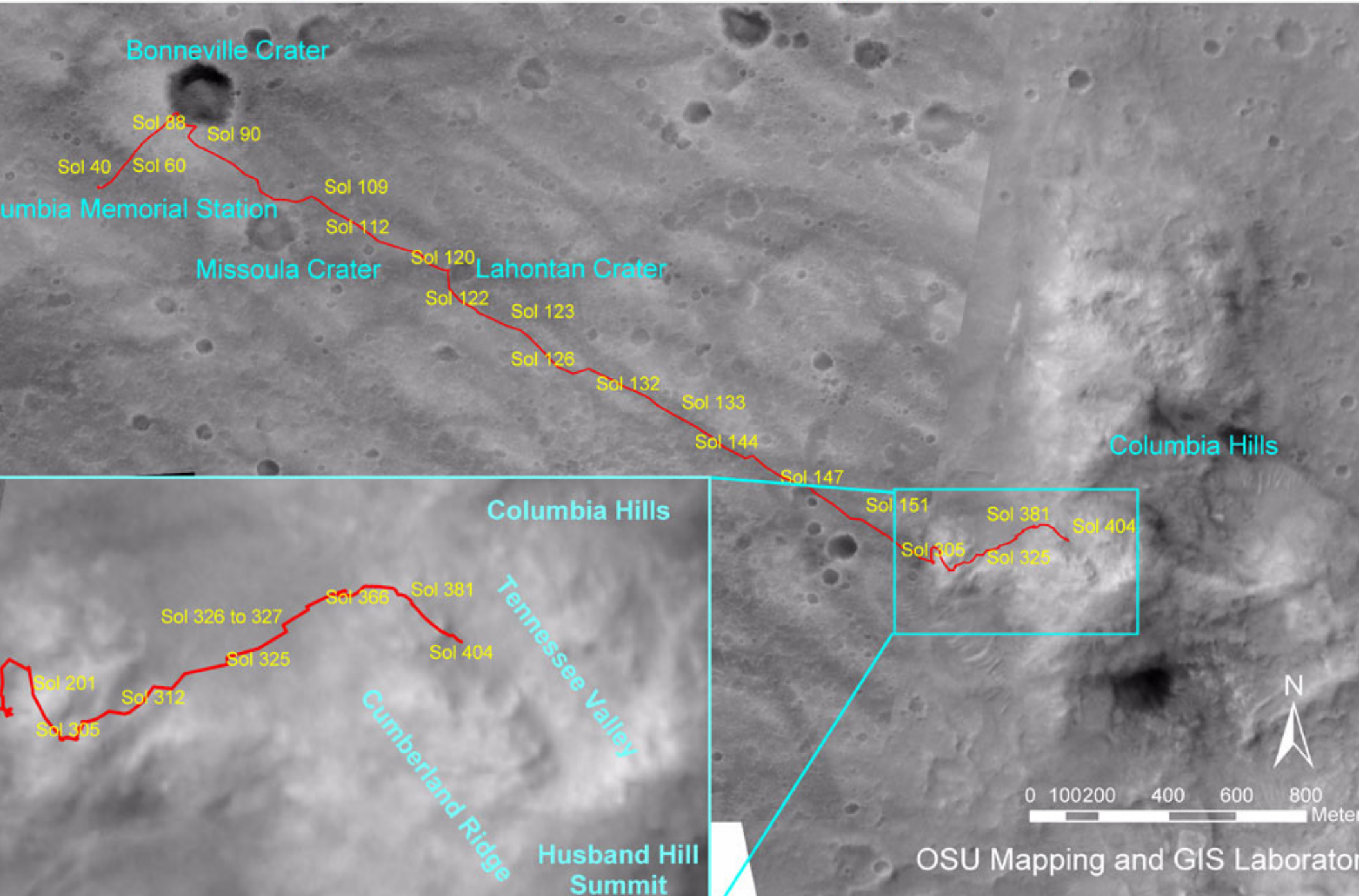
- Datarates:
  - MER - Earth 3.500 bits/sec and 12.000 bits/sec
  - MER - Orbiter: 128.000 bits/sec (4x faster than modem)

Relay link is more efficient: Mars Global Surveyor, Odyssey, Mars Express Reconnaissance Orbiter

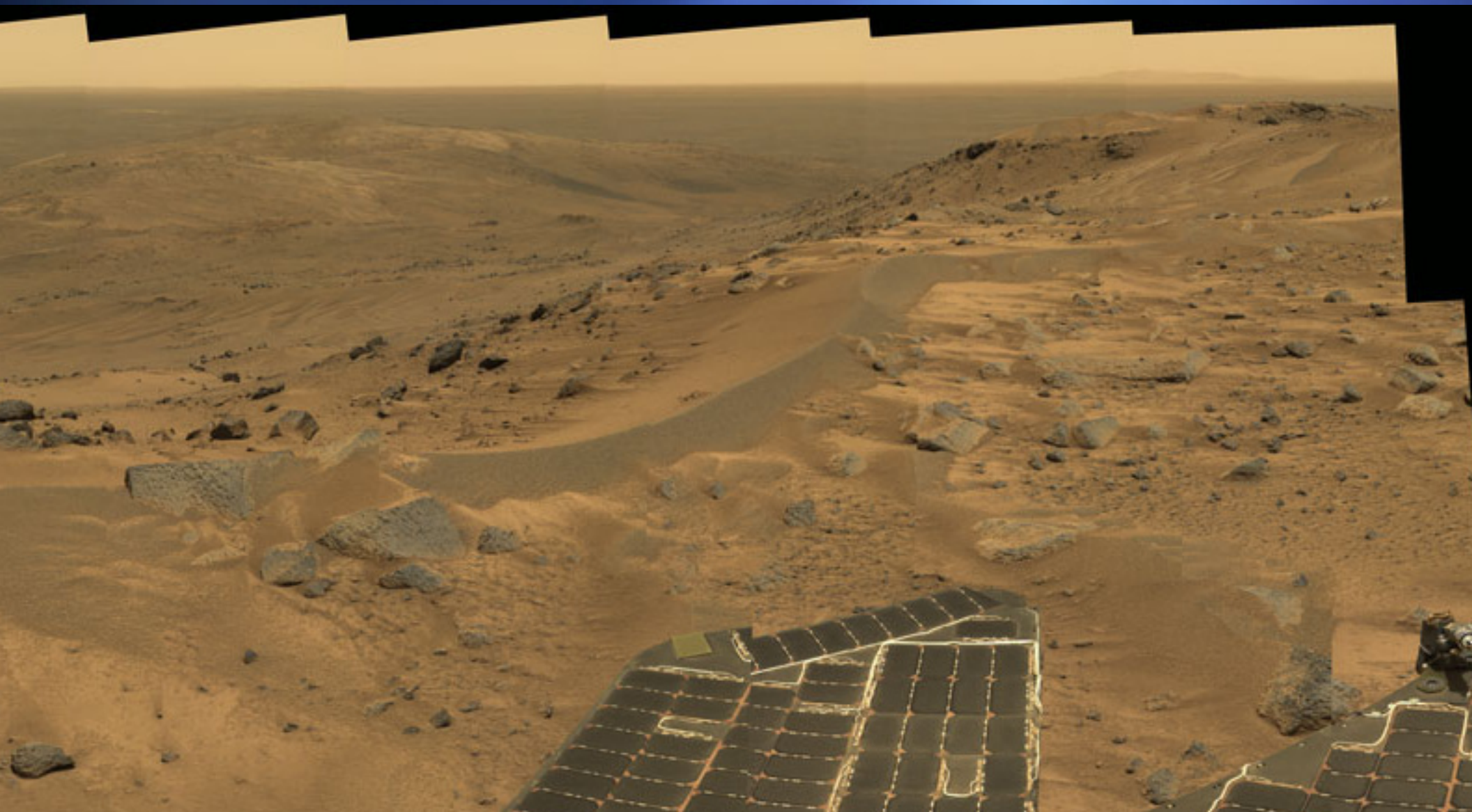
- MER to Orbiter : up to 60 Mbits in 8 minutes; direct link 90 minutes
- Operations more efficient

Spirit Map

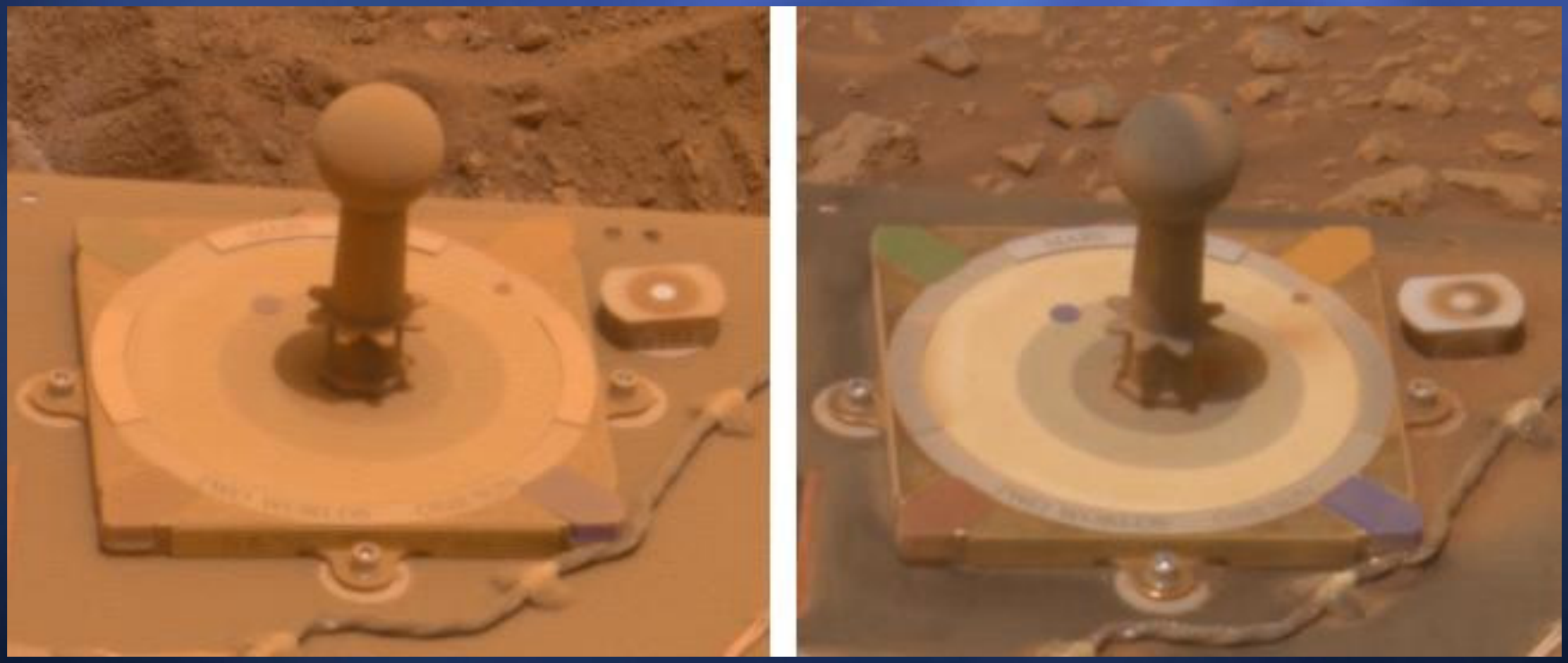
Spirit Rover Traverse Map (Sol 404)



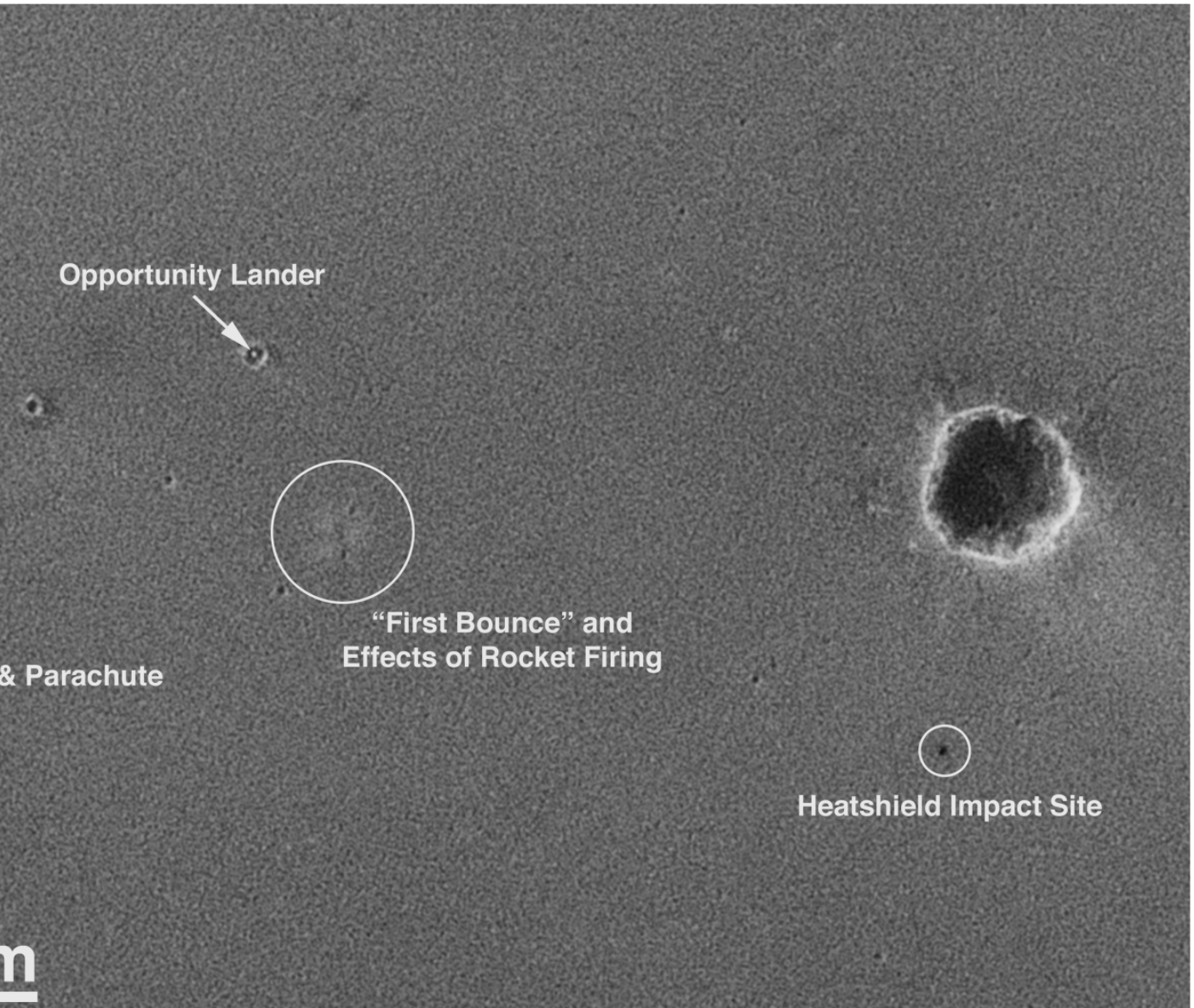
Spirit SOL 582

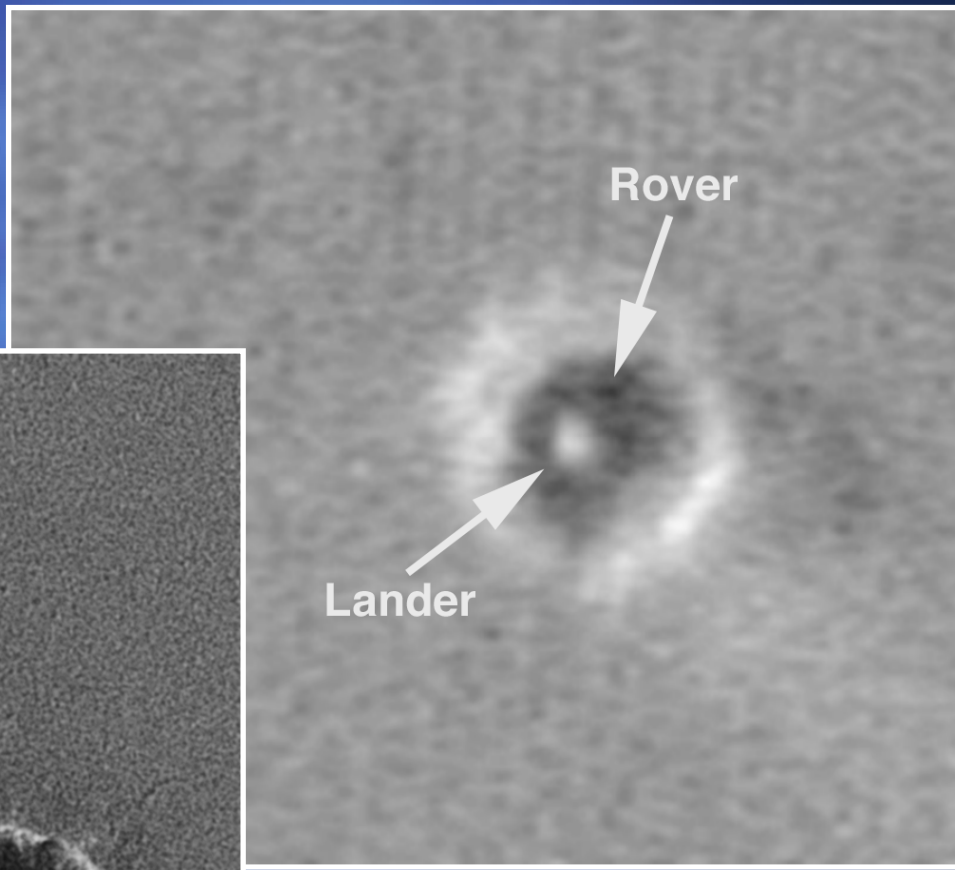


Spirit Cleaning

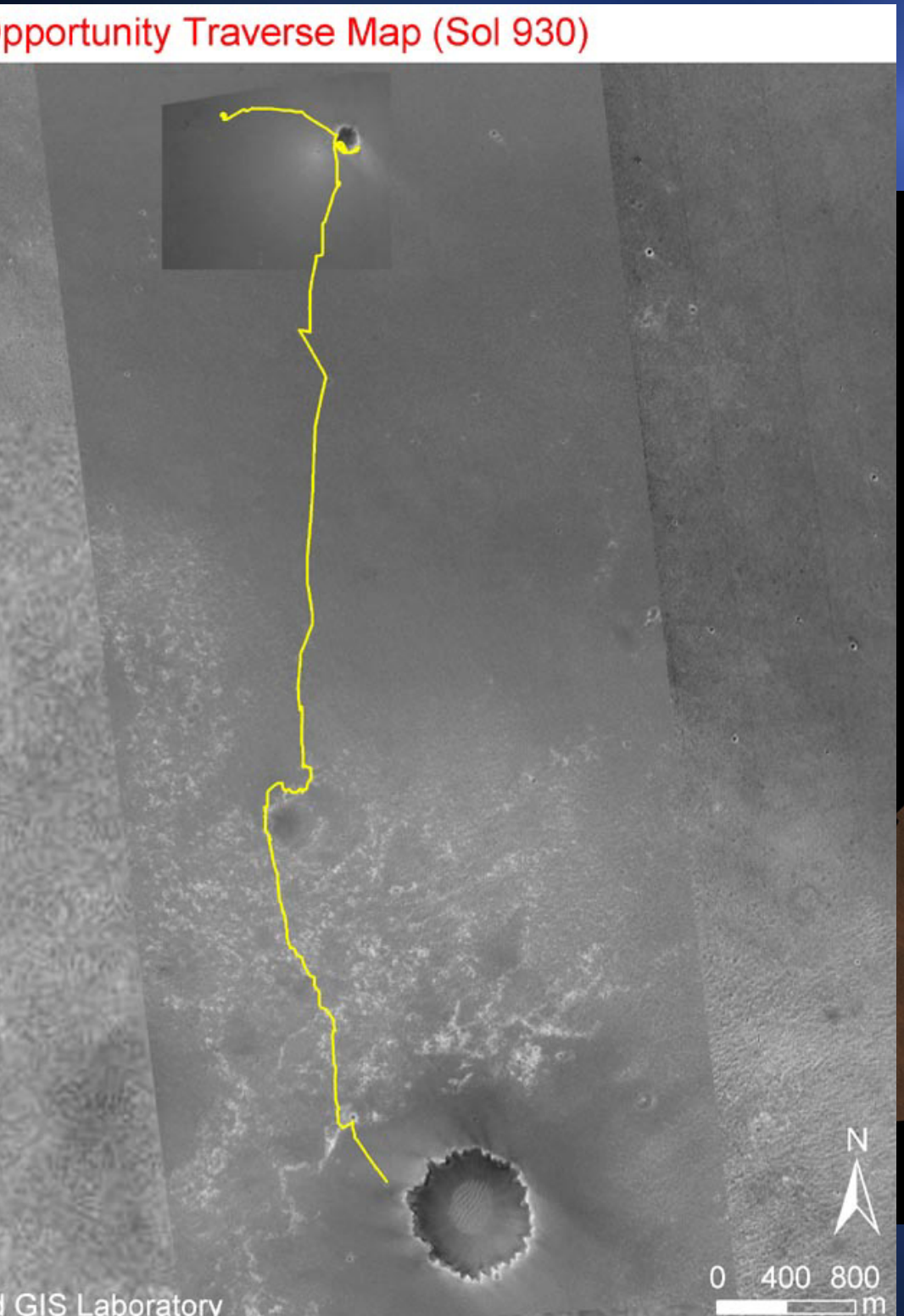


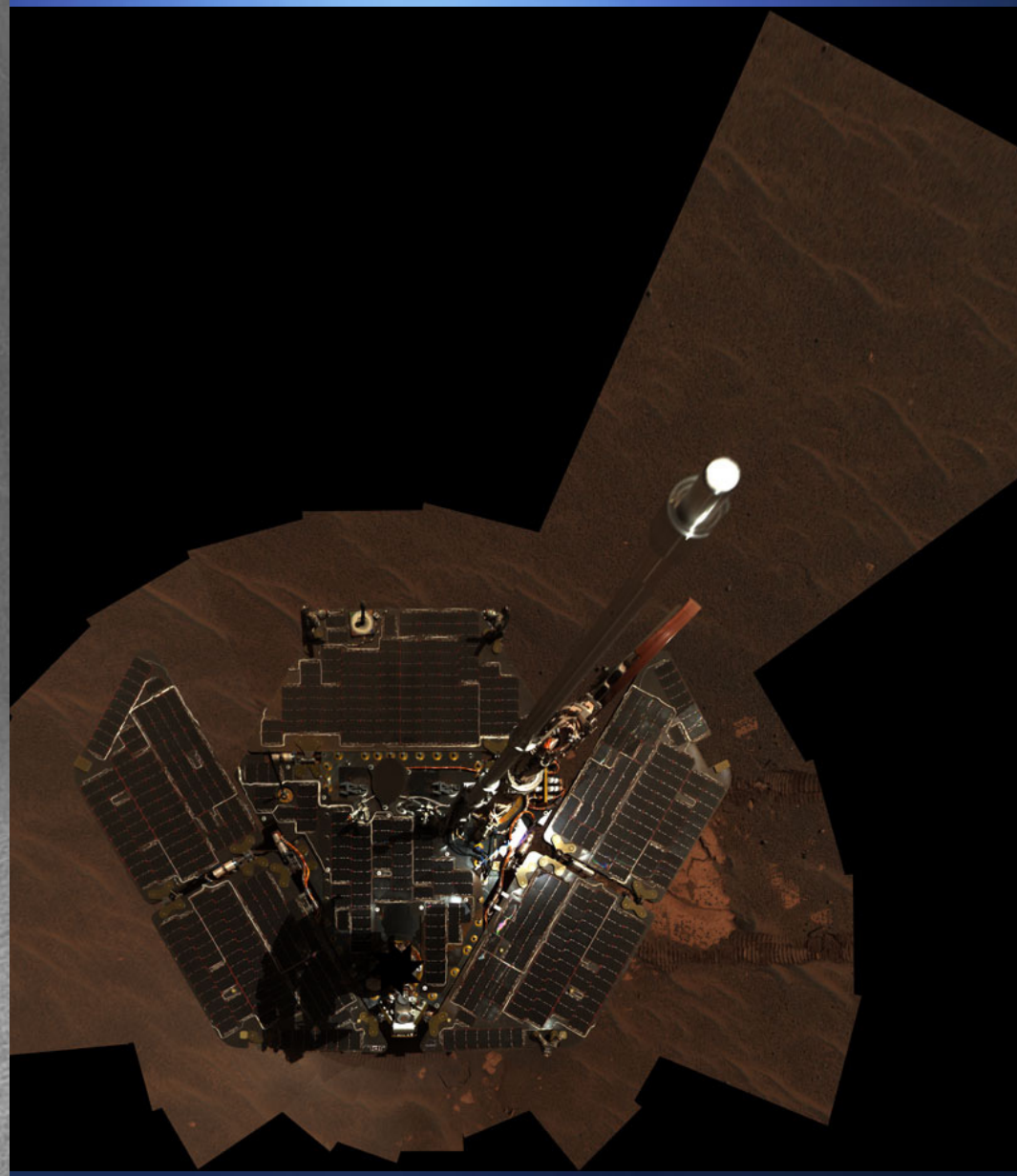
Opportunity



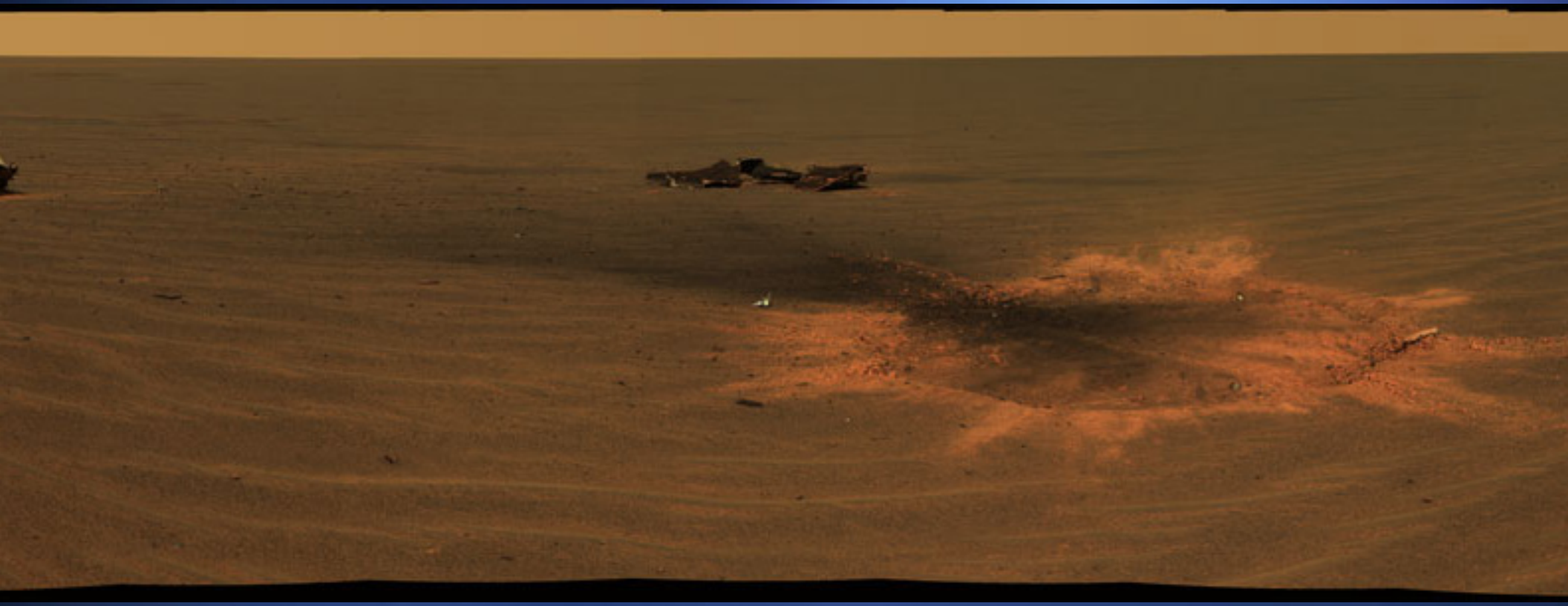


Opportunity Map

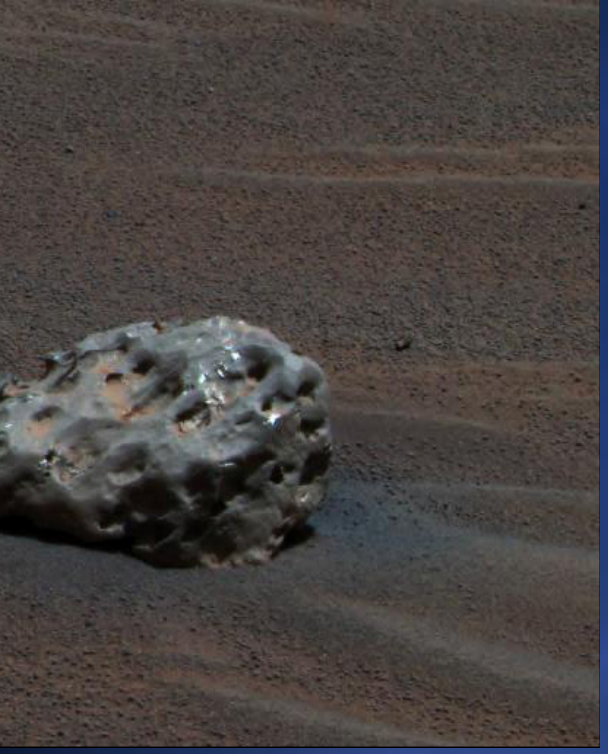




Opportunity Heatshield



Opportunity



Opportunity May 2005

QuickTime™ and a
DV/DVCPRO - NTSC decompressor
are needed to see this picture.

SOL 842

Planned Missions

penix

- Launch: August, 2007
- Arrival: May, 2008
- <u>Instrumente:</u>
- Mars Descent Camera
- Stereo Imager
- Meteorology Suite
- Robot Arm and Camera
- Thermal Evolved Gas Analyzer
- Microscopy Electrochemistry & Conductivity Analyzer

Science Laboratory

ch: 2009

l: 2010

<u>tive:</u>

rover looking for water and life

You are here

References

JPL: http://www.jpl.nasa.gov

Cassini: http://saturn.jpl.nasa.gov/home/index.cfm

MER: http://marsrovers.jpl.nasa.gov/home/index.html

MER: http://marsoweb.nas.nasa.gov/landingsites

MRO: http://marsprogram.jpl.nasa.gov/mro

Phoenix Mission: http://phoenix.lpl.arizona.edu

Mars Clock: http://www.giss.nasa.gov/tools/mars24