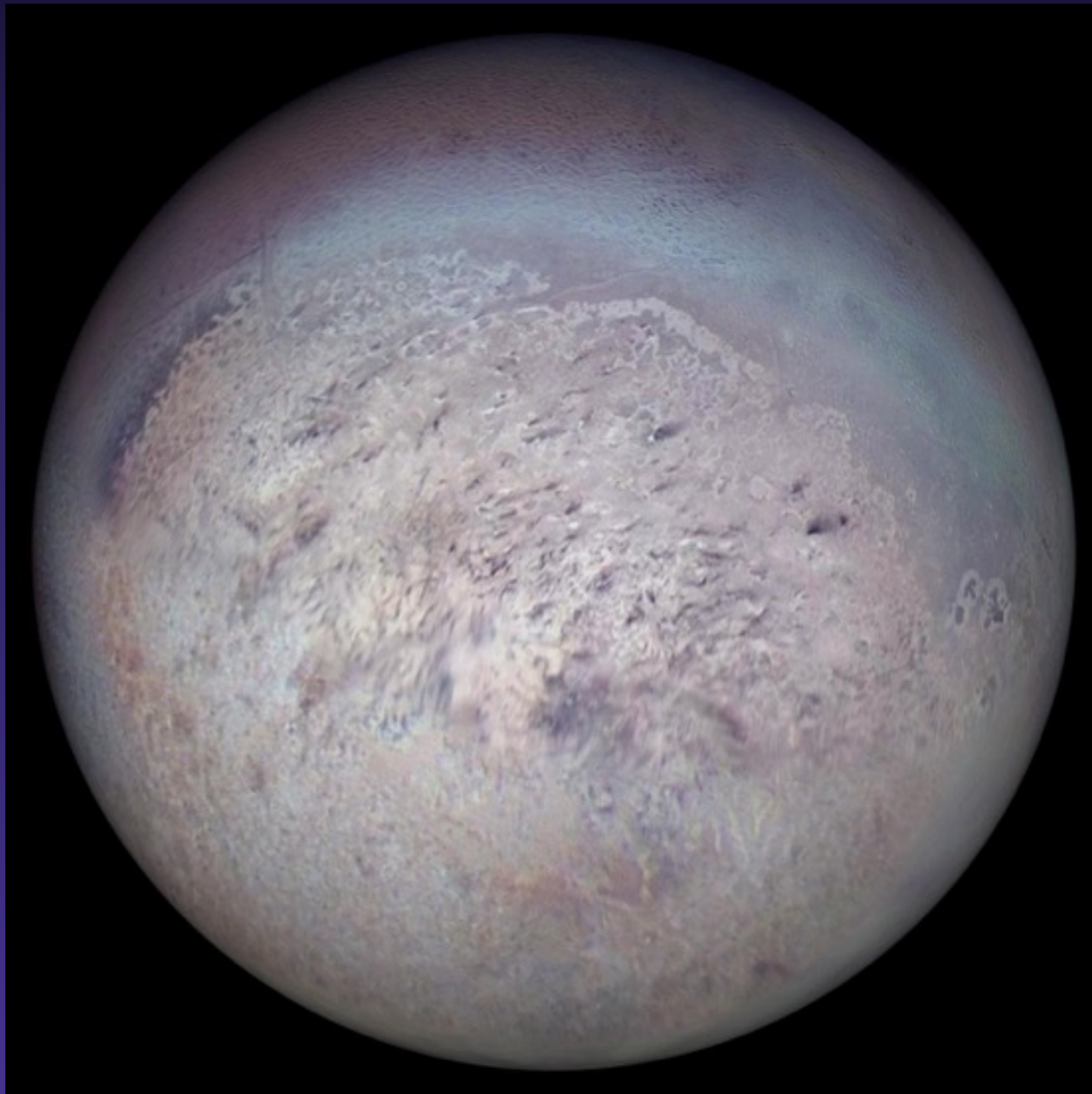


# Triton



*Michael Zevin  
Earth 390  
March 2, 2016*

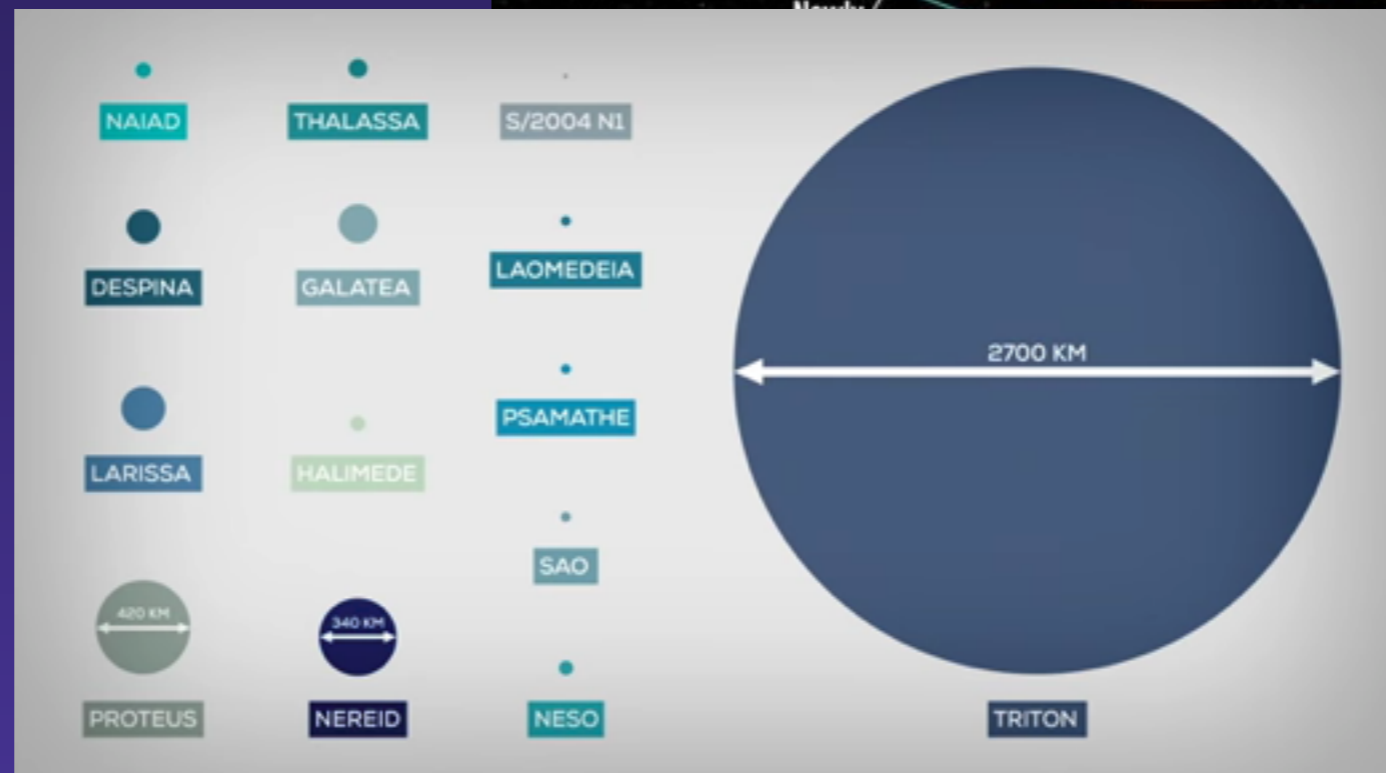
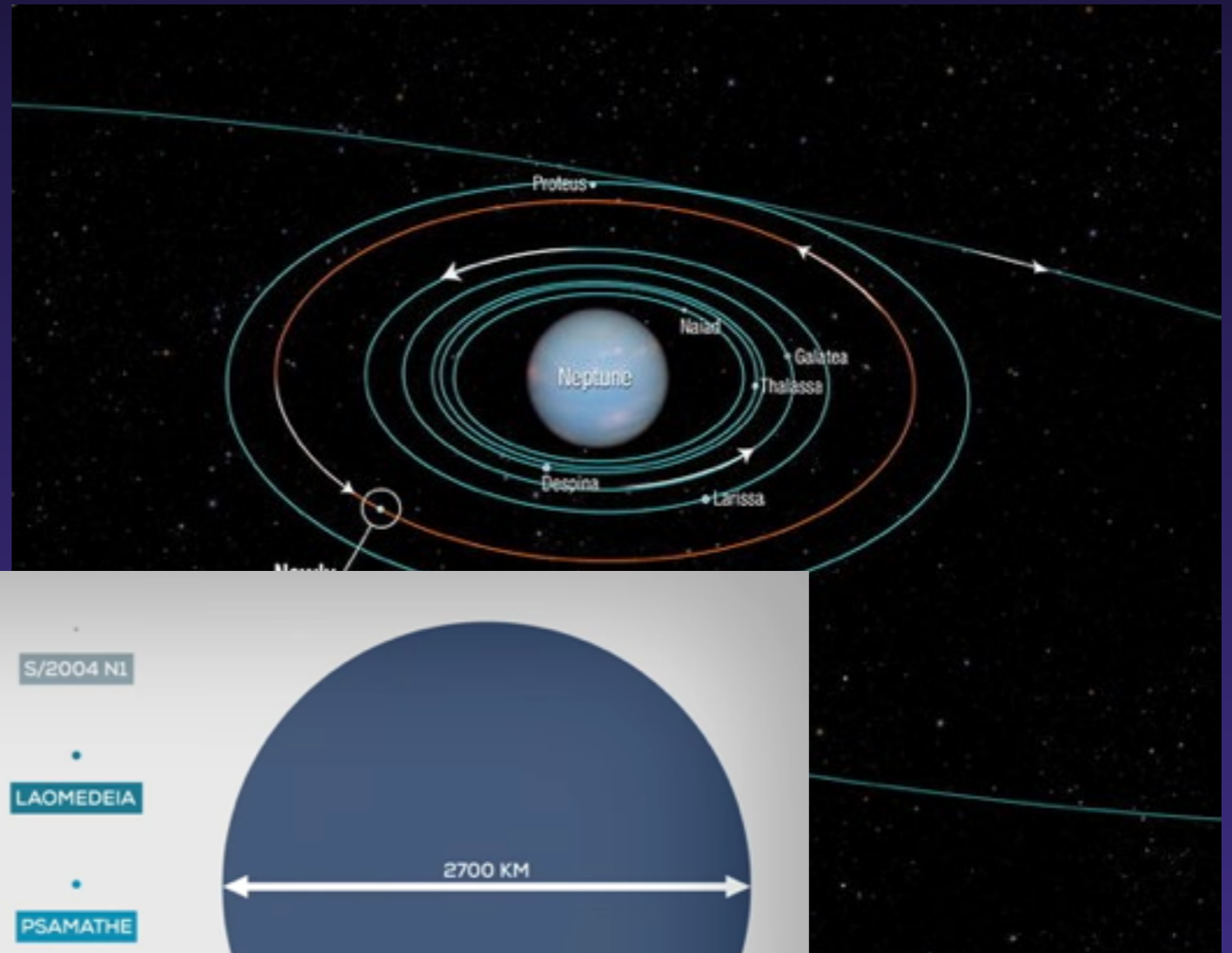


NORTHWESTERN  
UNIVERSITY

# Moons of Neptune

*14 and counting...*

- 7 “regular” moon & 7 “irregular” moons
- Triton: 99.5% of the mass of all Neptune’s moons



# Discovery

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*Quick discovery after a predicted planet*

- Neptune mathematically predicted by Le Verrier on August 31 1846
- Neptune observed by Johann Galle on September 23 1846
- Triton discovered on Oct 10 1846 by William Lassell

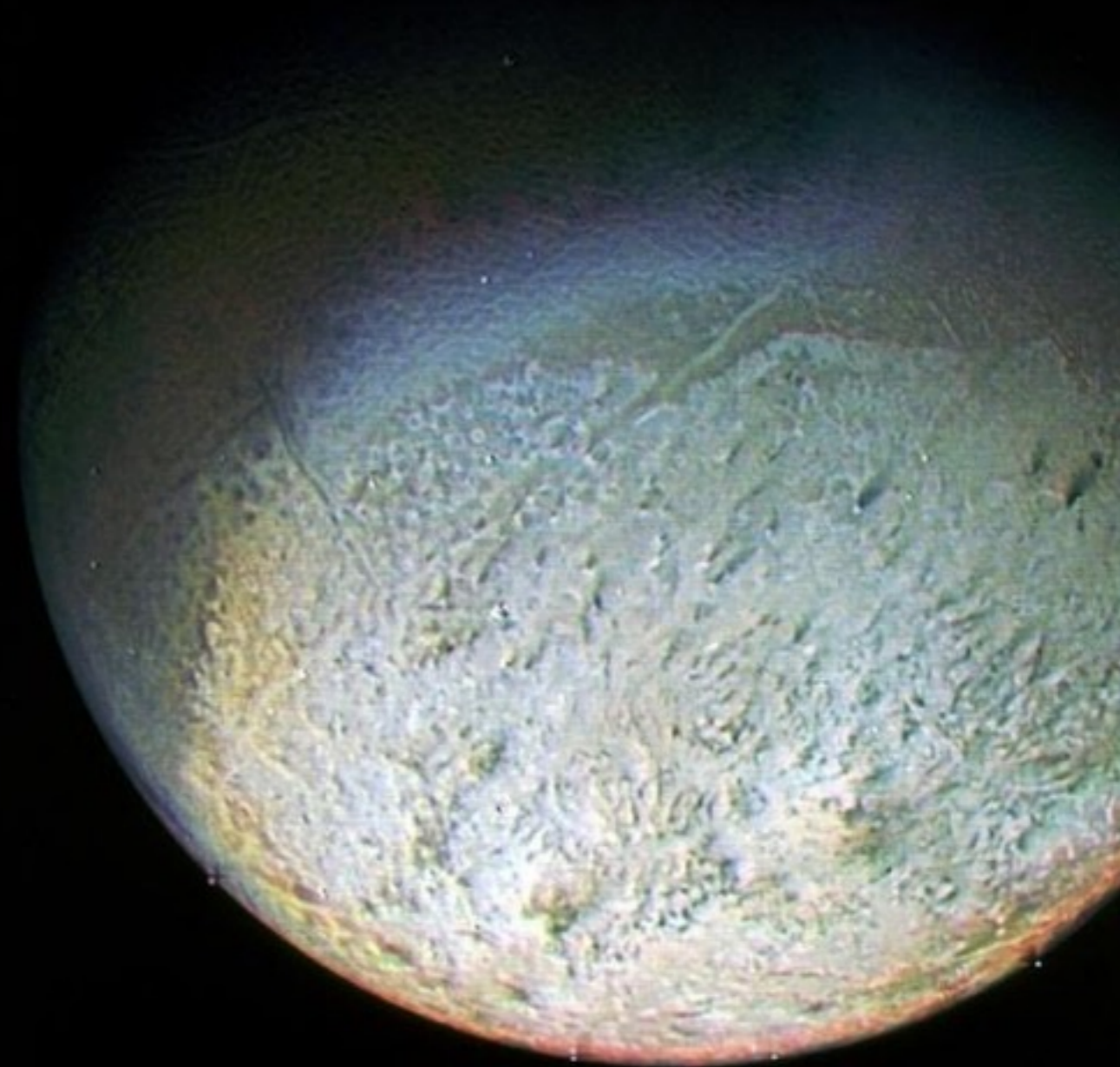


# Exploration

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## *Voyager II fly-by*

- Voyager II launched in August 1977 and reached Neptune in August 1989
- Performed close fly-by of Triton
- Passed within 40,000 km of surface



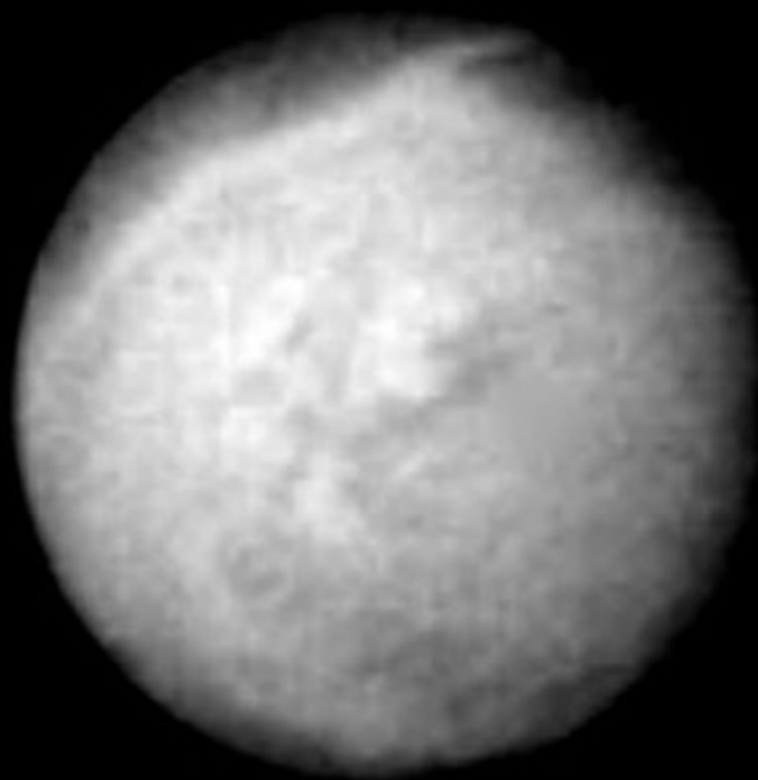
# Exploration

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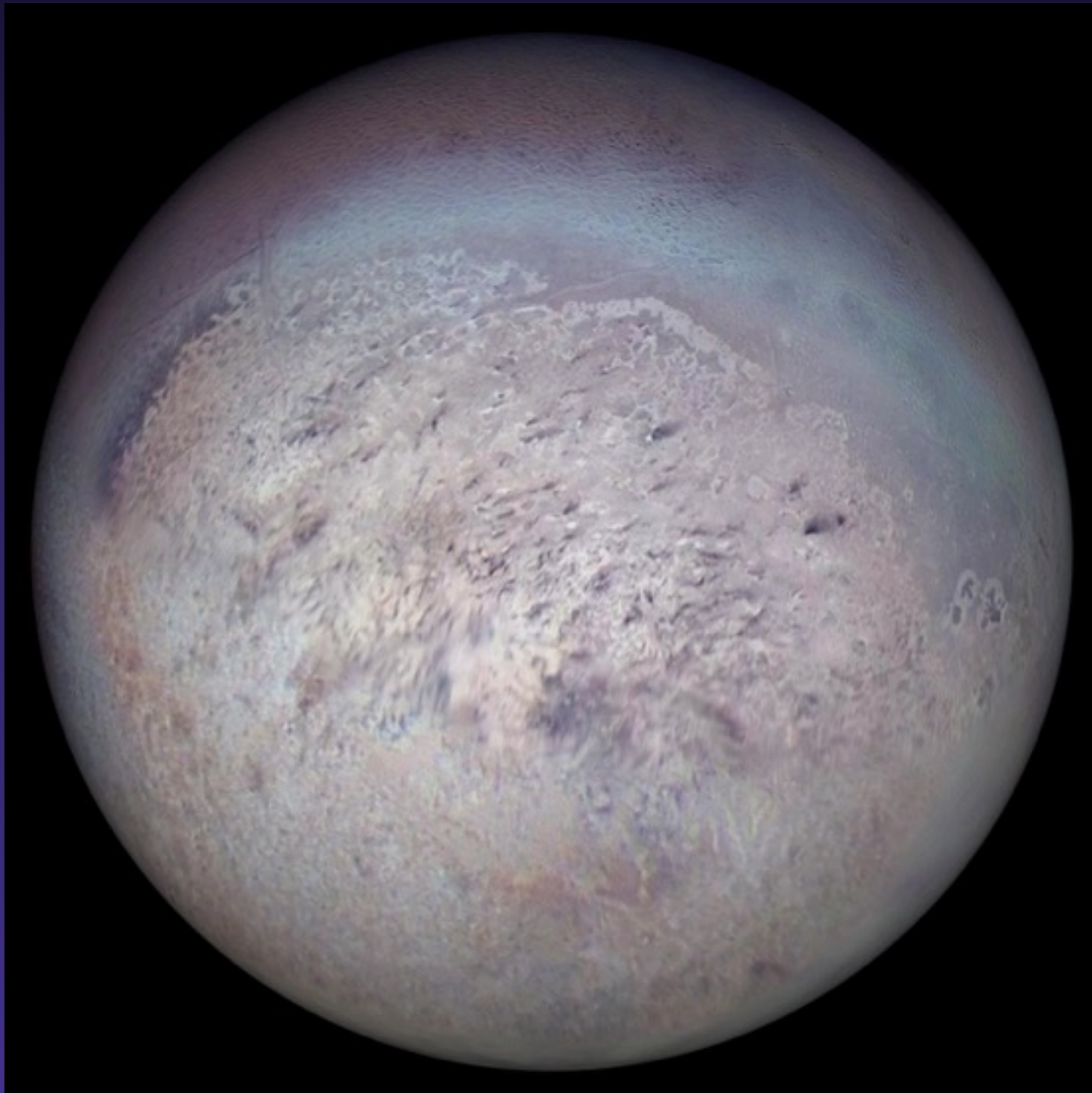
# Exploration

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# Characteristics

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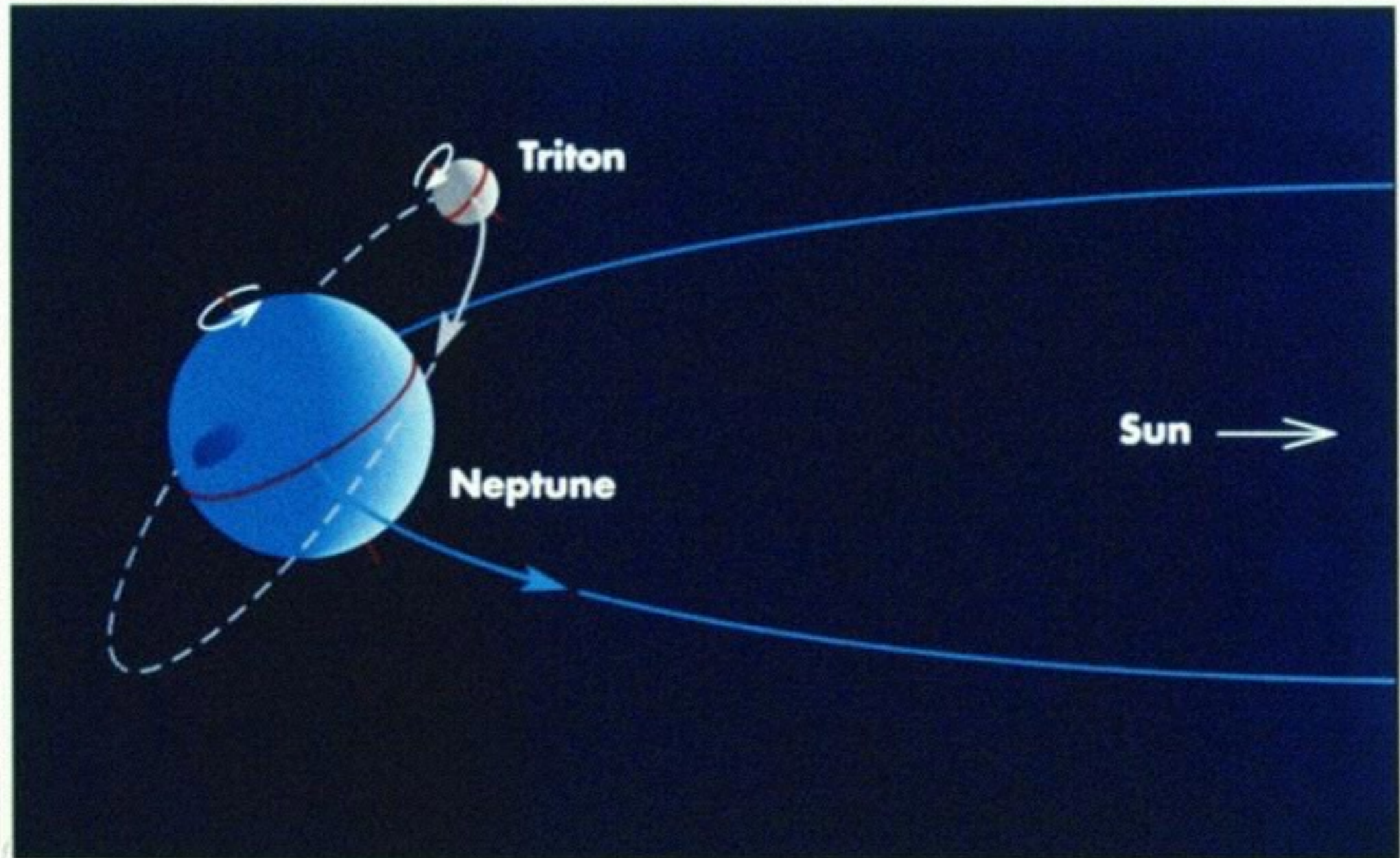


- Radius: **1353 km**
- Mass: **0.4% Earth**
- Albedo: **76%**
- Temperature: **38 K**
- Density:  $2 \text{ g/cm}^3$ 
  - $\sim 2/3$  rock,  $\sim 1/3$  ice
- Inclination: **157 deg**
- Period: **5.9 days**
- Synchronous Rotation
- Geologically Active

# Characteristics

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## *Retrograde Orbit*

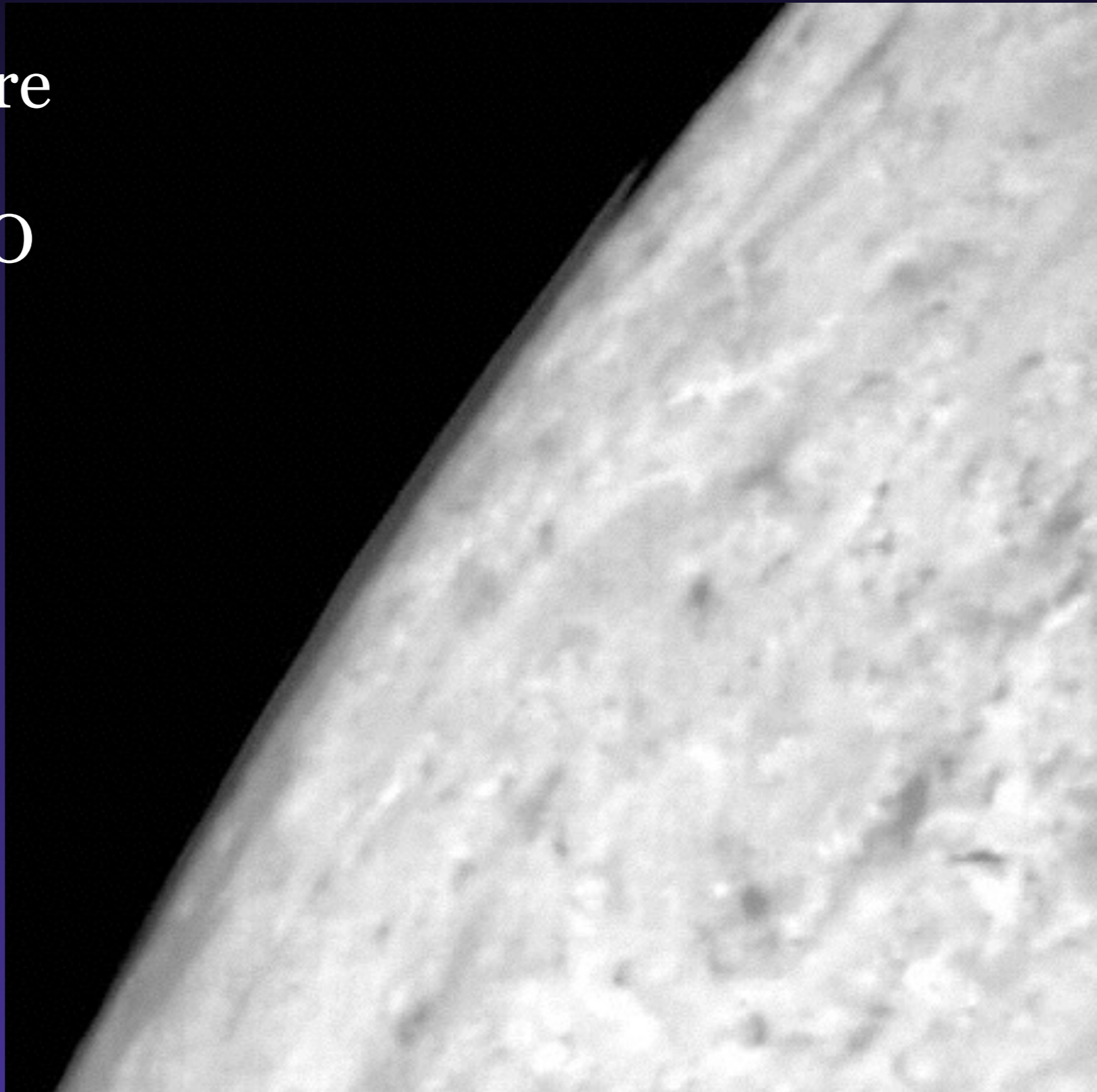




# Atmosphere

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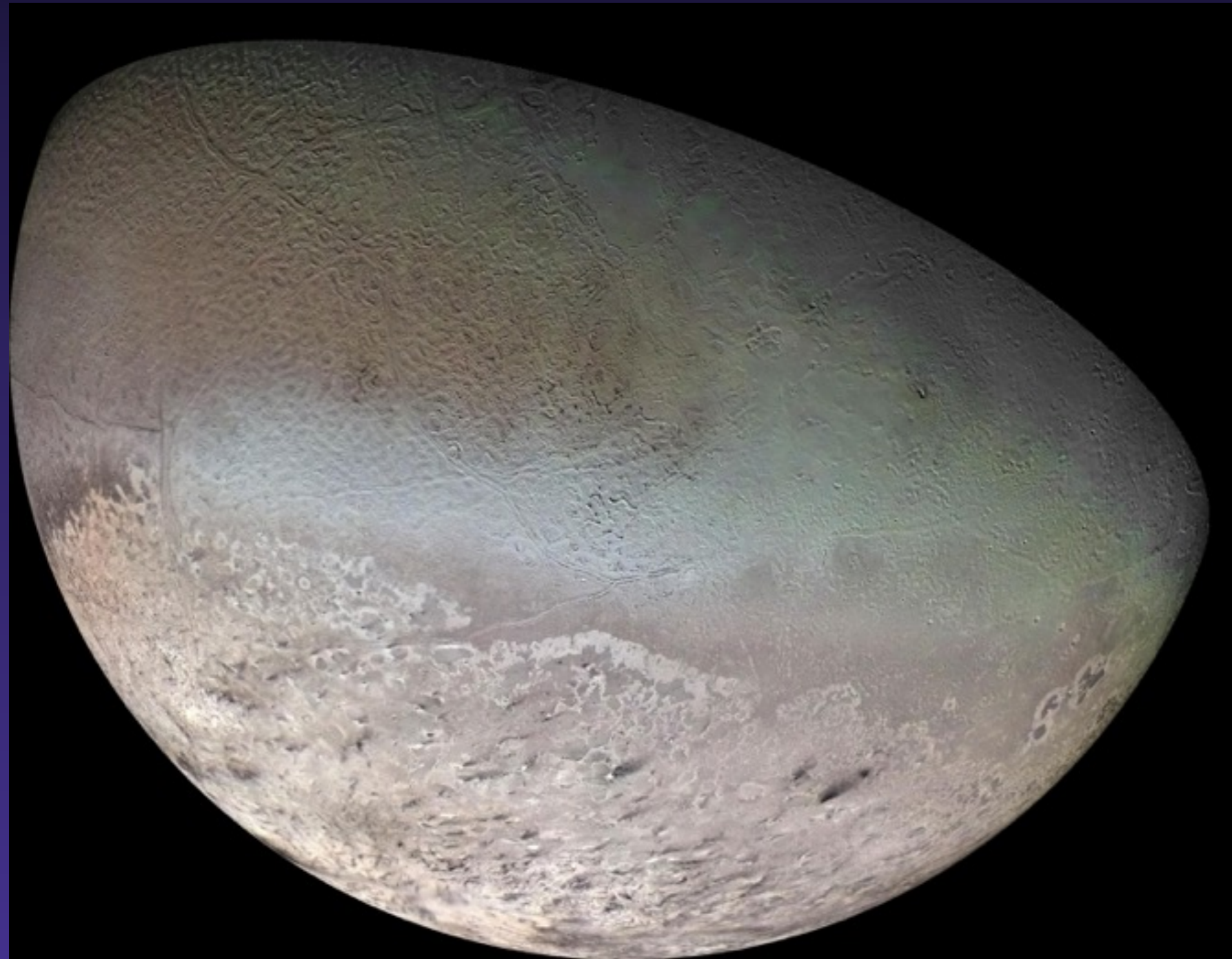
- Tenuous atmosphere of Nitrogen, with trace amounts of CO and methane
- Pressure:  $\sim 1.5$  Pa (0.015 millibar)
- Seasonal winds capable of moving particles
- Heating up?



# Surface

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## *Composition*



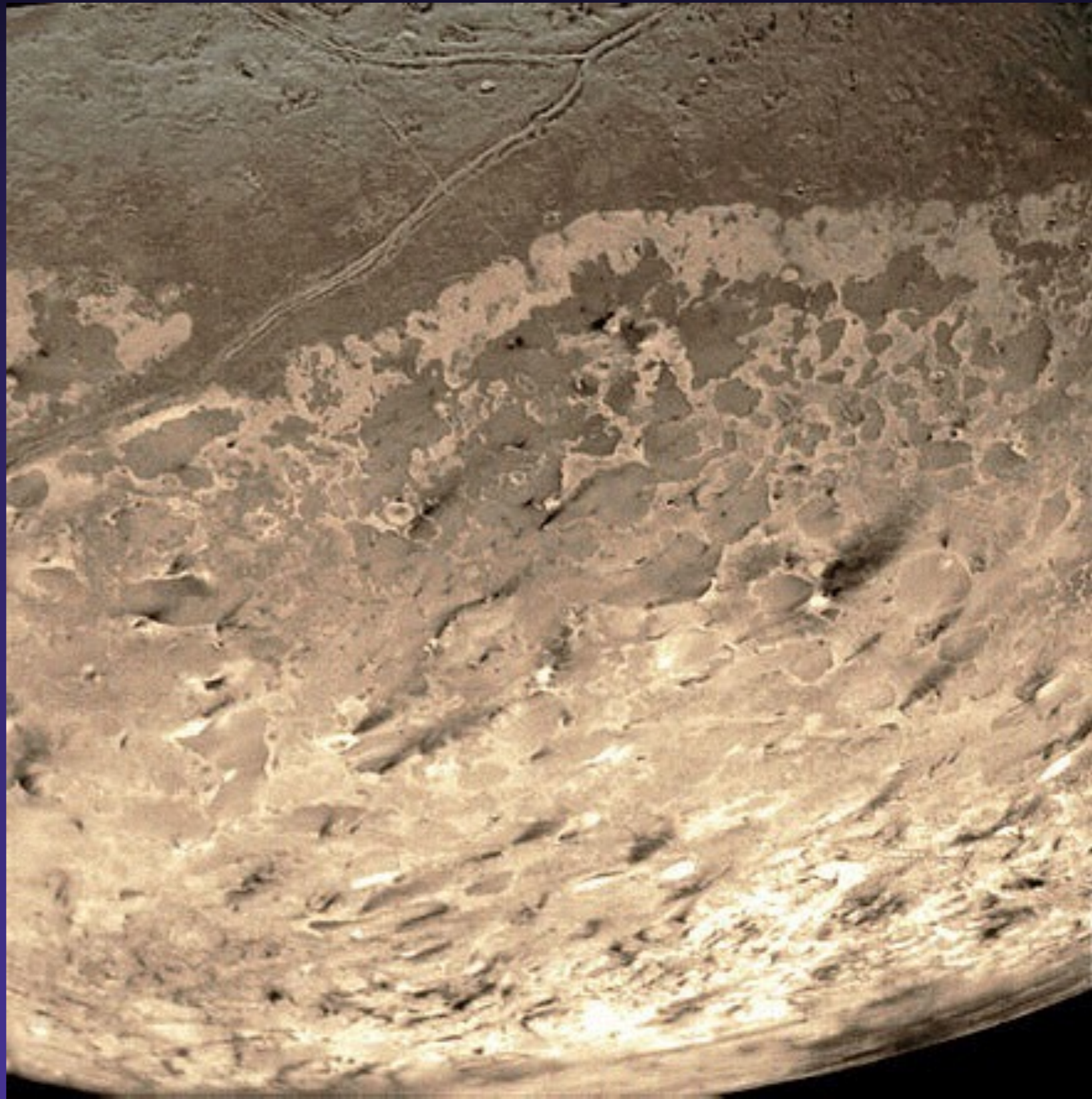
- ~55% N, 30% H<sub>2</sub>O, 15% CO<sub>2</sub>
- Surface features indicate differentiation
- Enough rock for radioactive decay to power convention
  - Subsurface ocean?

# Surface

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## *Cryovolcanism*

- Dust streaks: deposits left by nitrogen geysers
- Observed geysers at subsolar point (solar heating plays crucial role)



# Surface

## *Cryovolcanism*

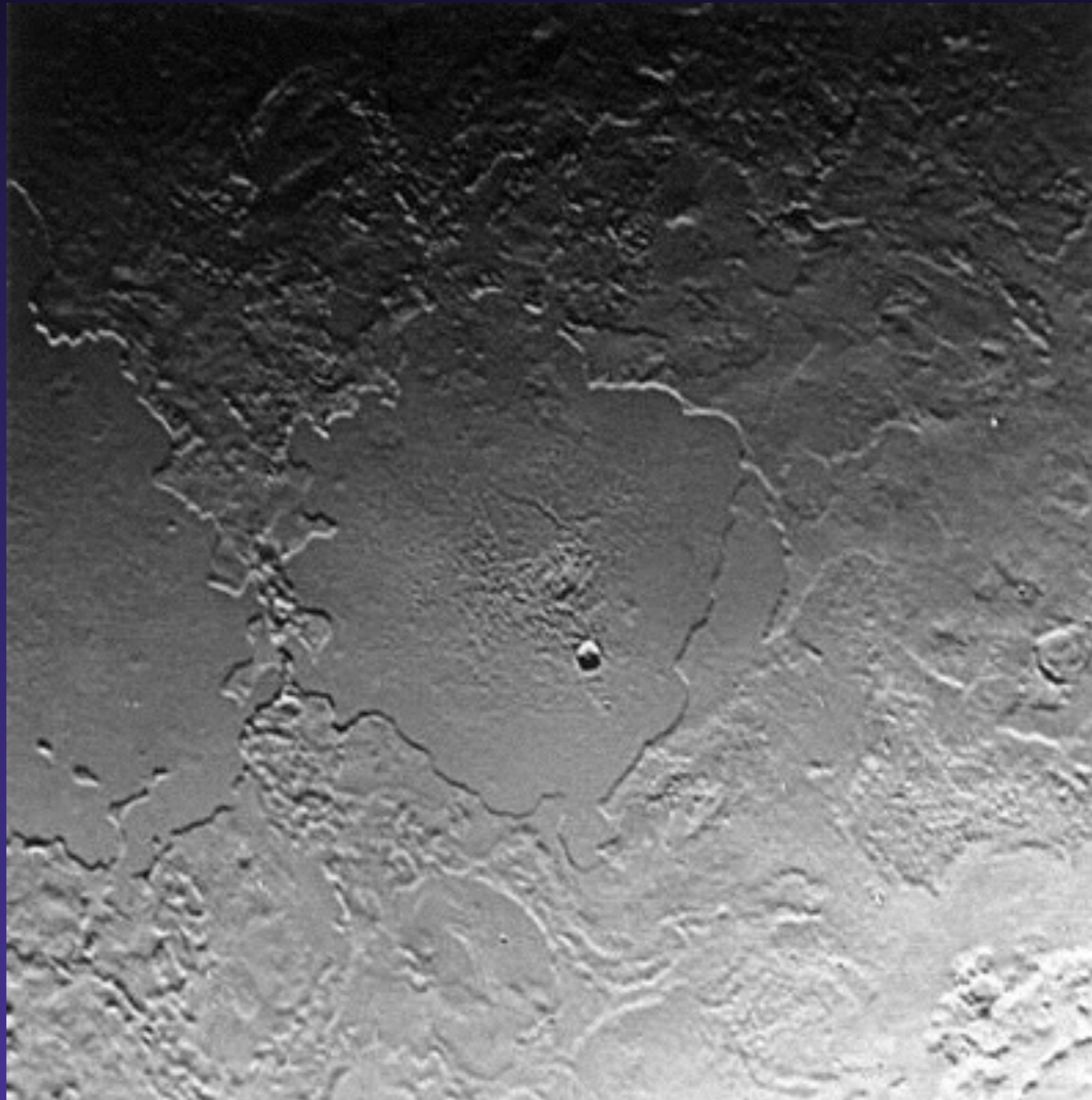


# Surface

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## *Cratering*

- Very few impact craters
- Surface between 50 million and 6 millions years old



# Surface

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## *Polar Cap*

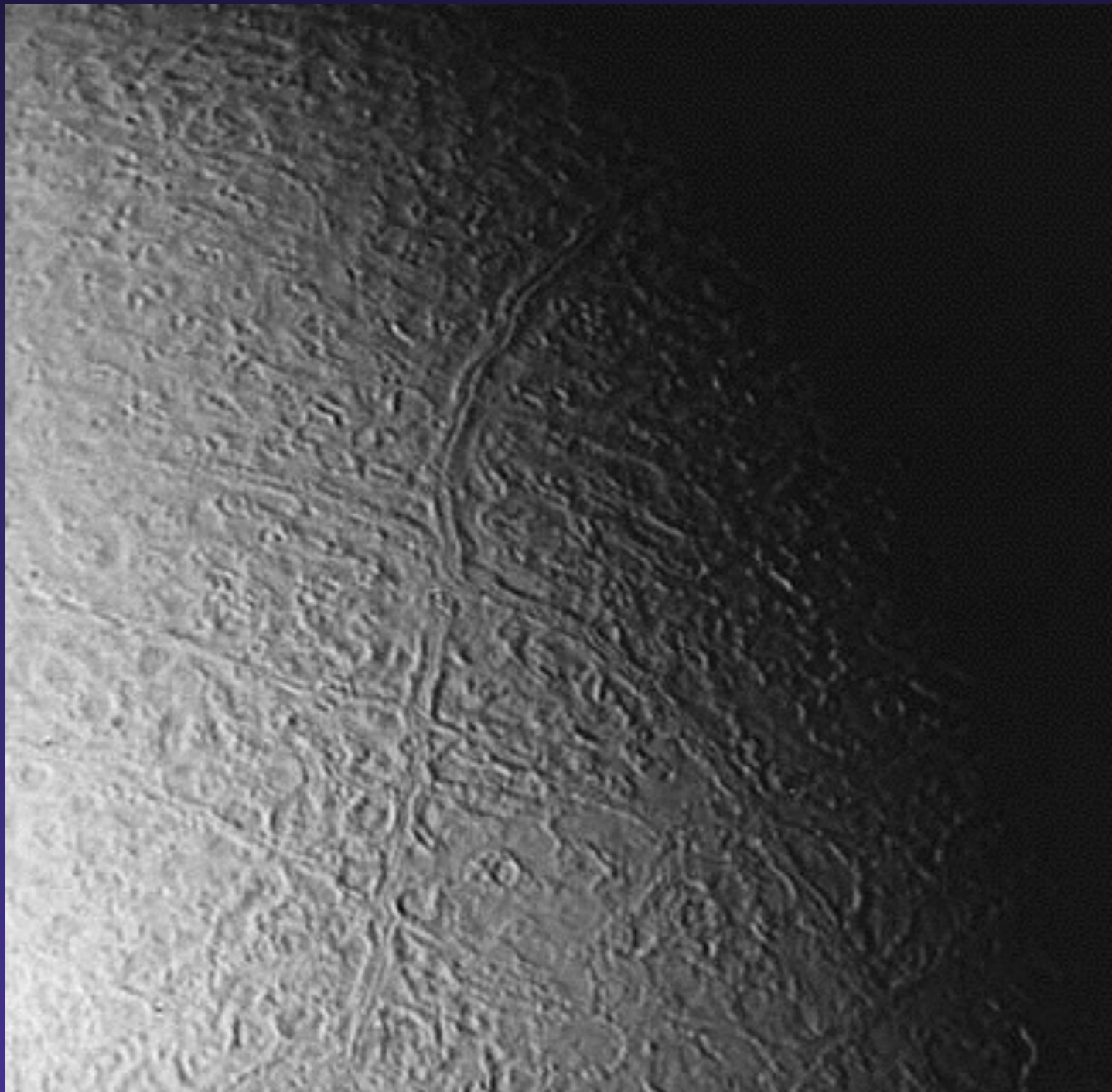


- Highly reflective icy polar cap
- Some ridges and valleys, possibly from freeze-thaw cycles
- Some evidence of tectonic activity with *strike-slip* faulting

# Surface

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## *“Cantaloupe” terrain*



- Believed to be oldest terrain on Triton
- Depressions 30-40 km in diameter
- Possible explanations:
  - *Diapirism*
  - *Cryovolcanos*

# Origin

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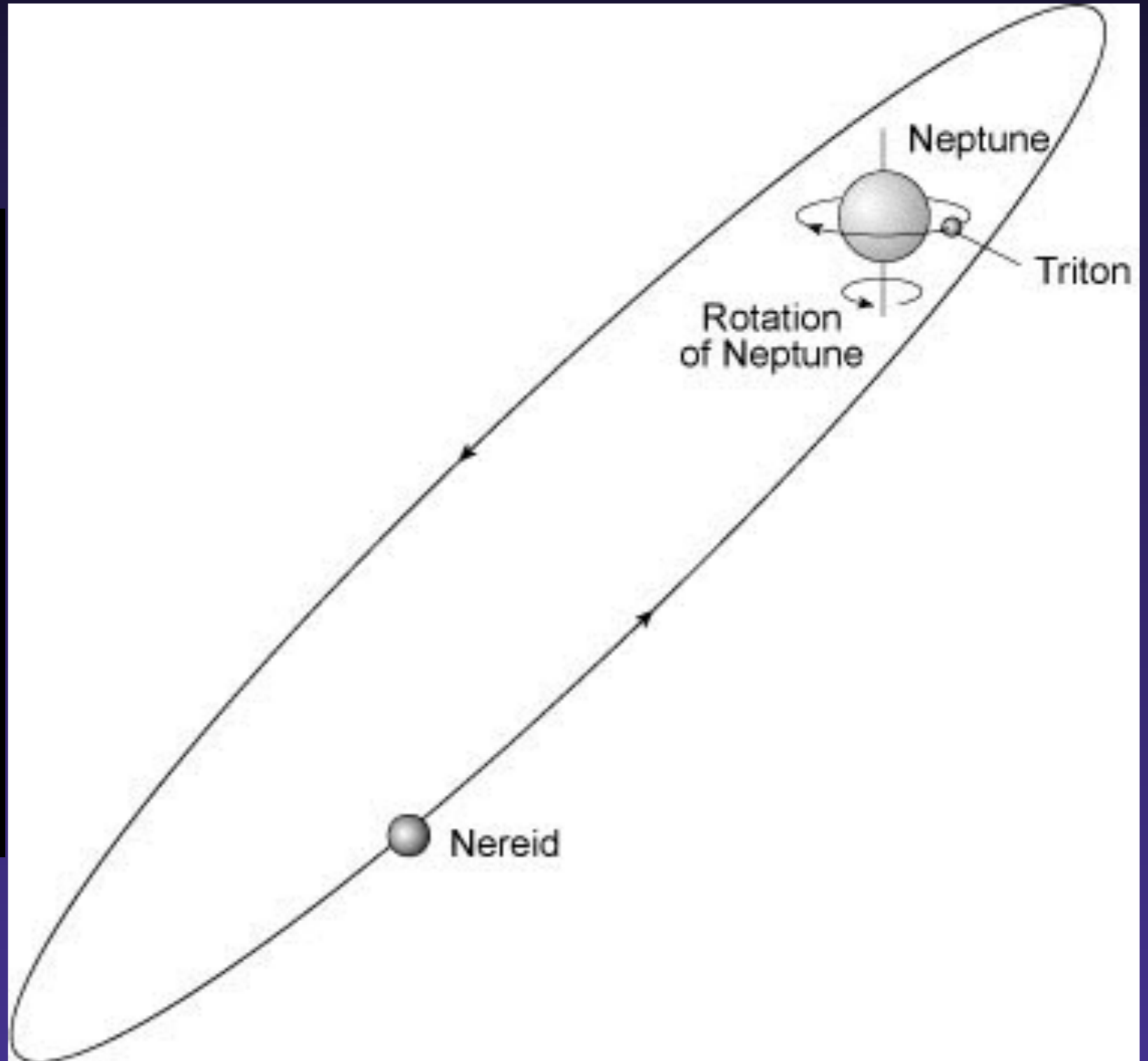
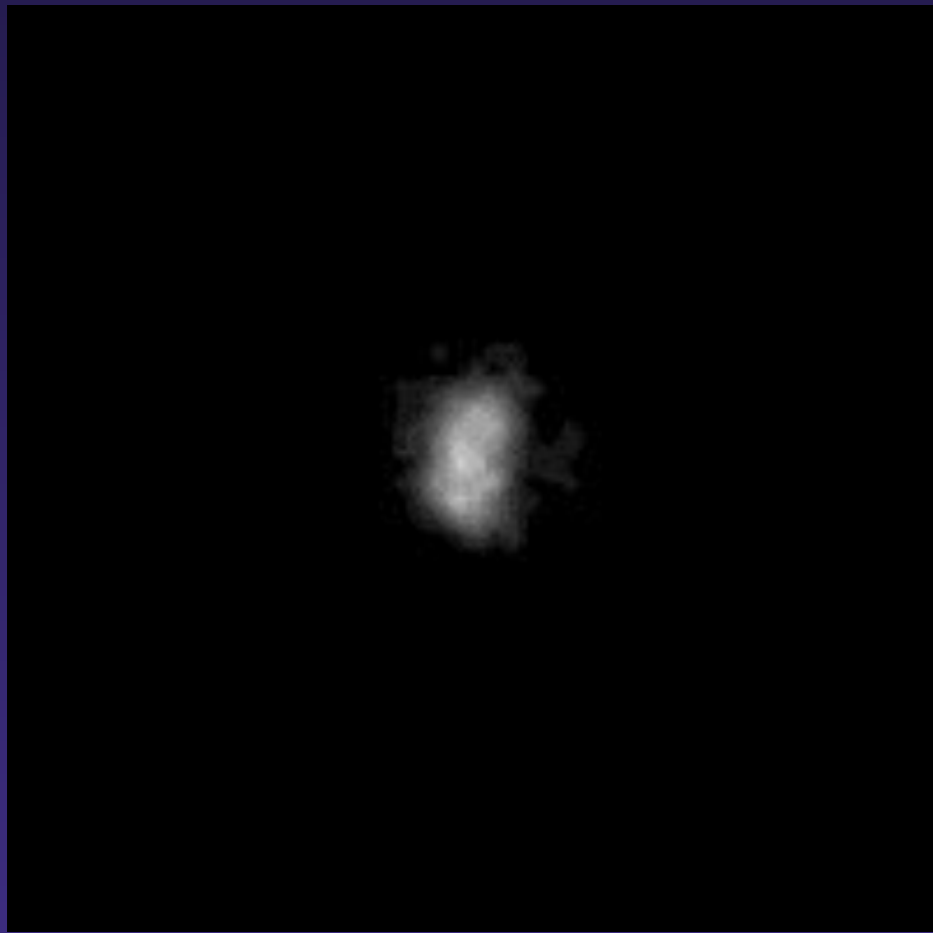
*Binary gravitational encounter*





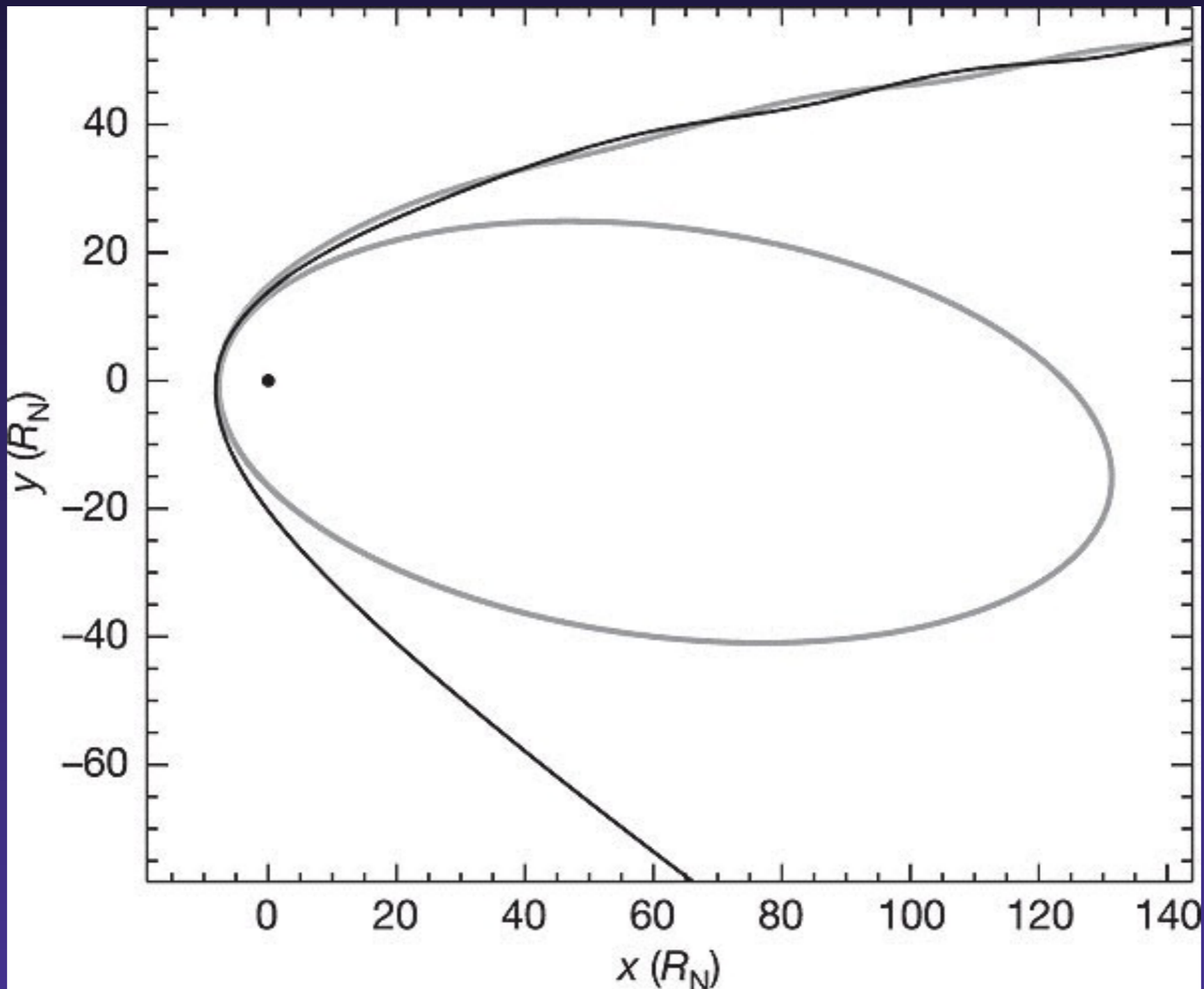
# Origin

## *Orbit of Nereid*



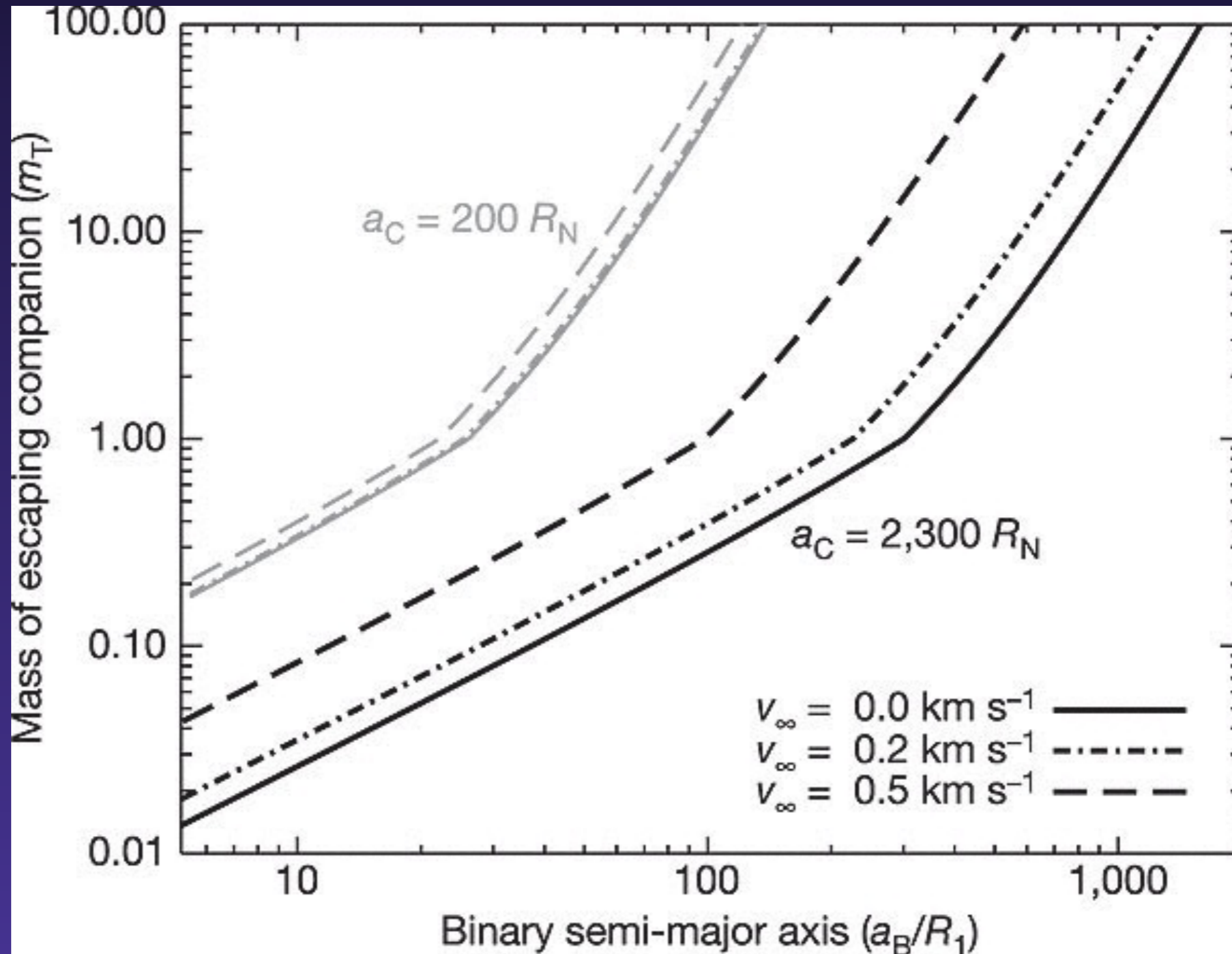
# Origin

## *Simulations*

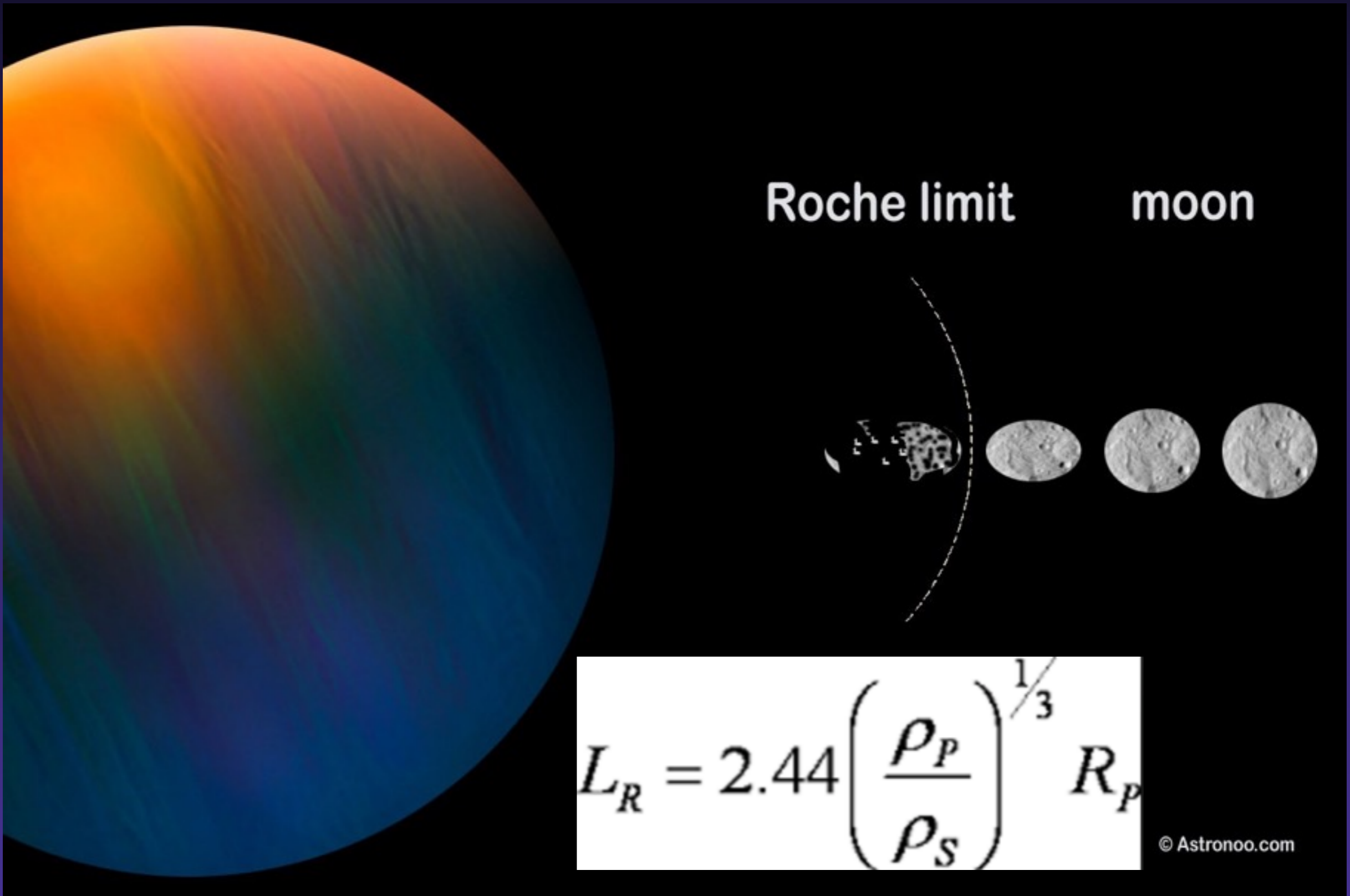


# Origin

## Simulations

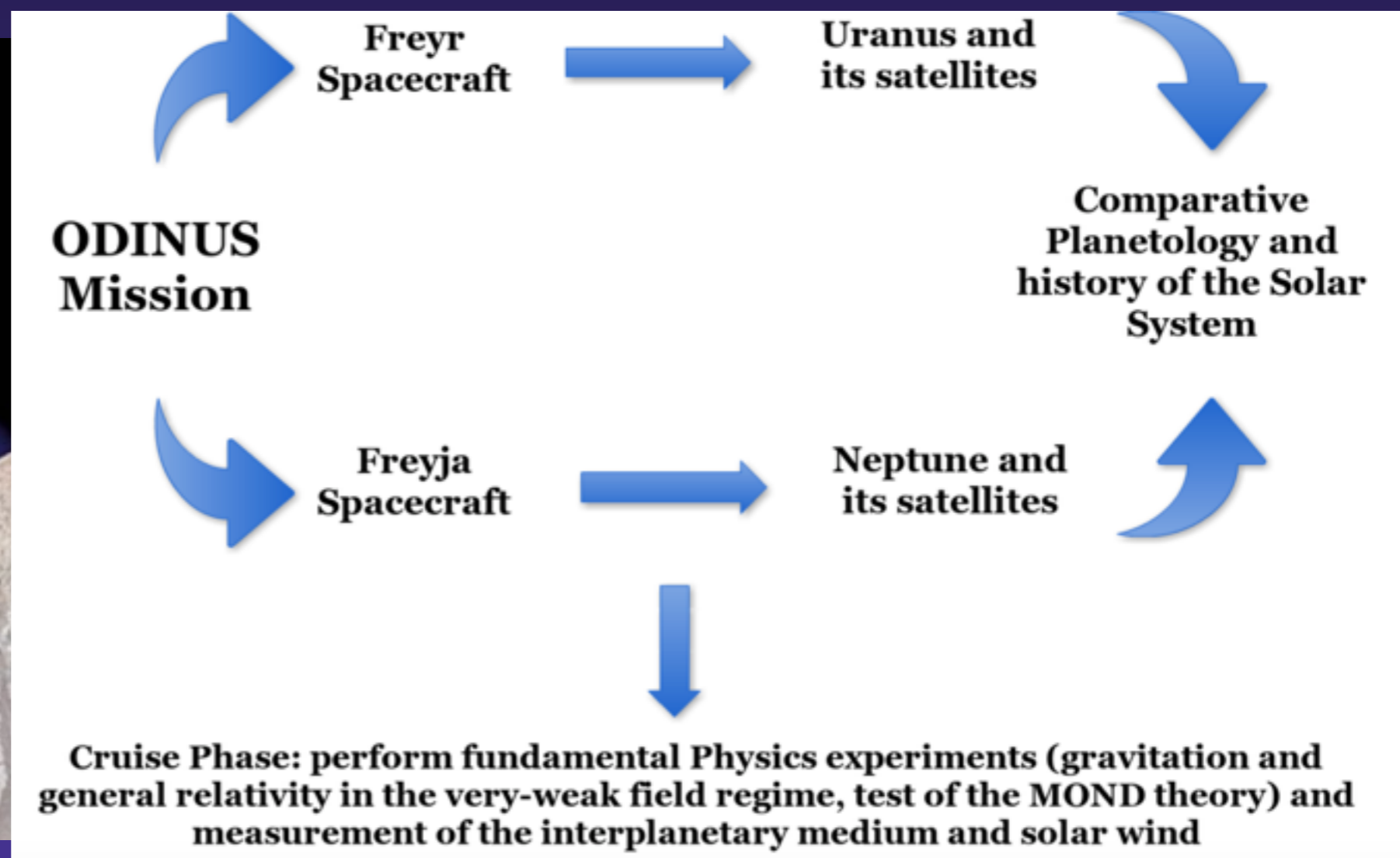


# Fate of Triton



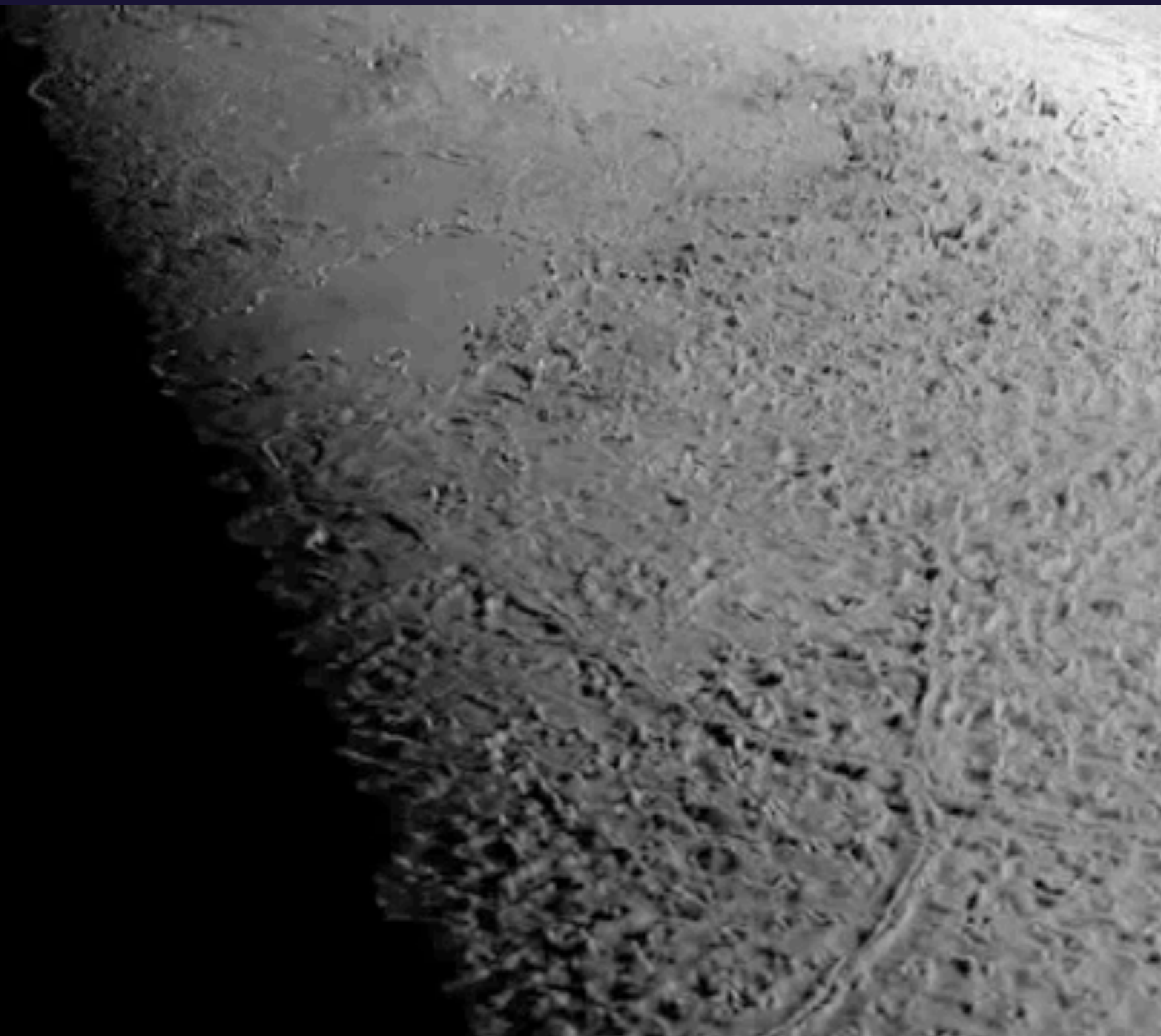
# Future Missions

- Neptune Orbiter - 2016 (deceased)
- New Frontiers Program: Argo (deceased)
- ODINUS by the ESA - 2034 (still breathing)
- OSS by ESA & NASA - ???



# Don't hold your breath

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