



***Dawn: The mission to the  
beginning of time***

**Bonnie J. Buratti, PhD**

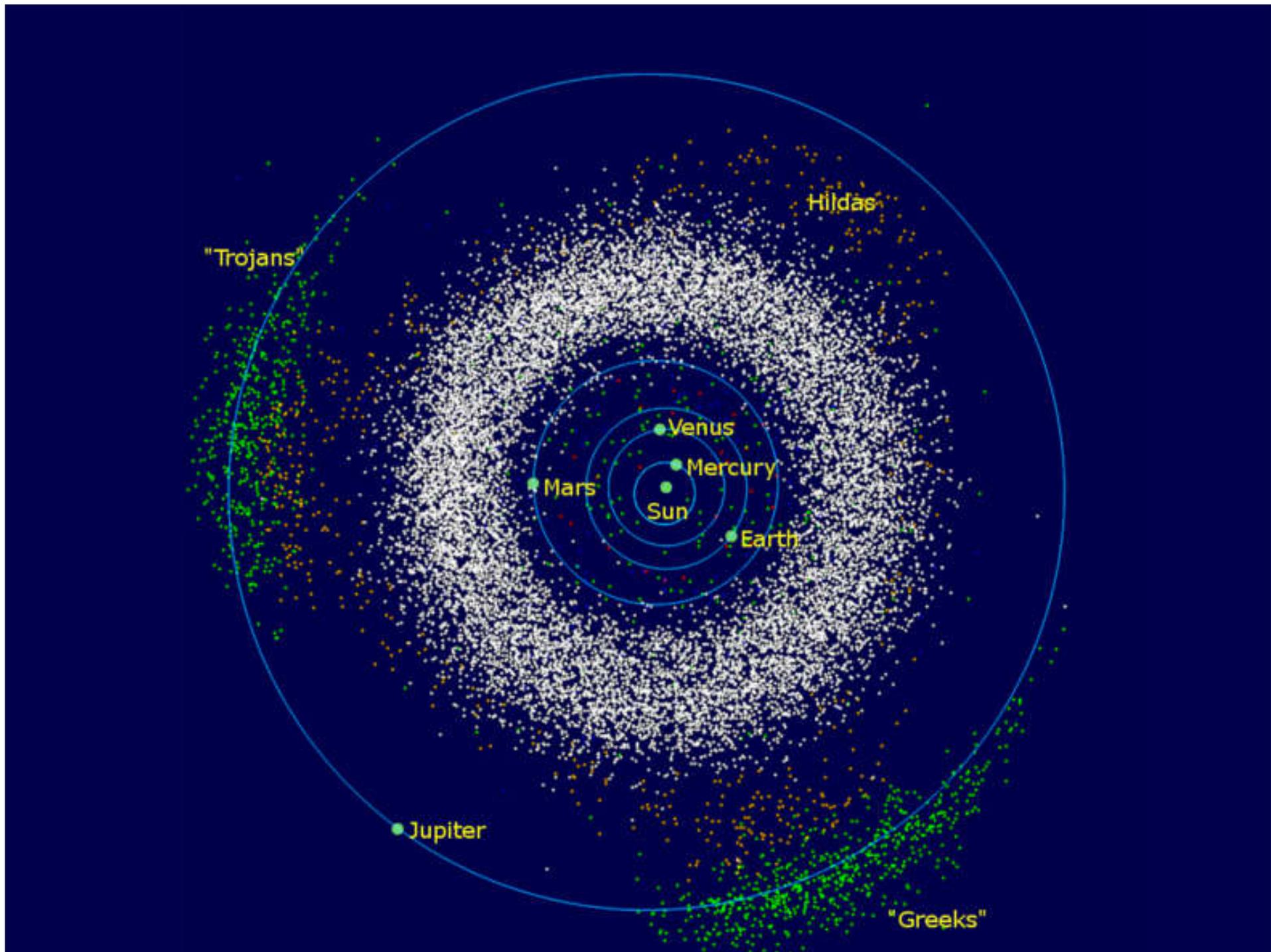
Principal Scientist

NASA Jet Propulsion Laboratory

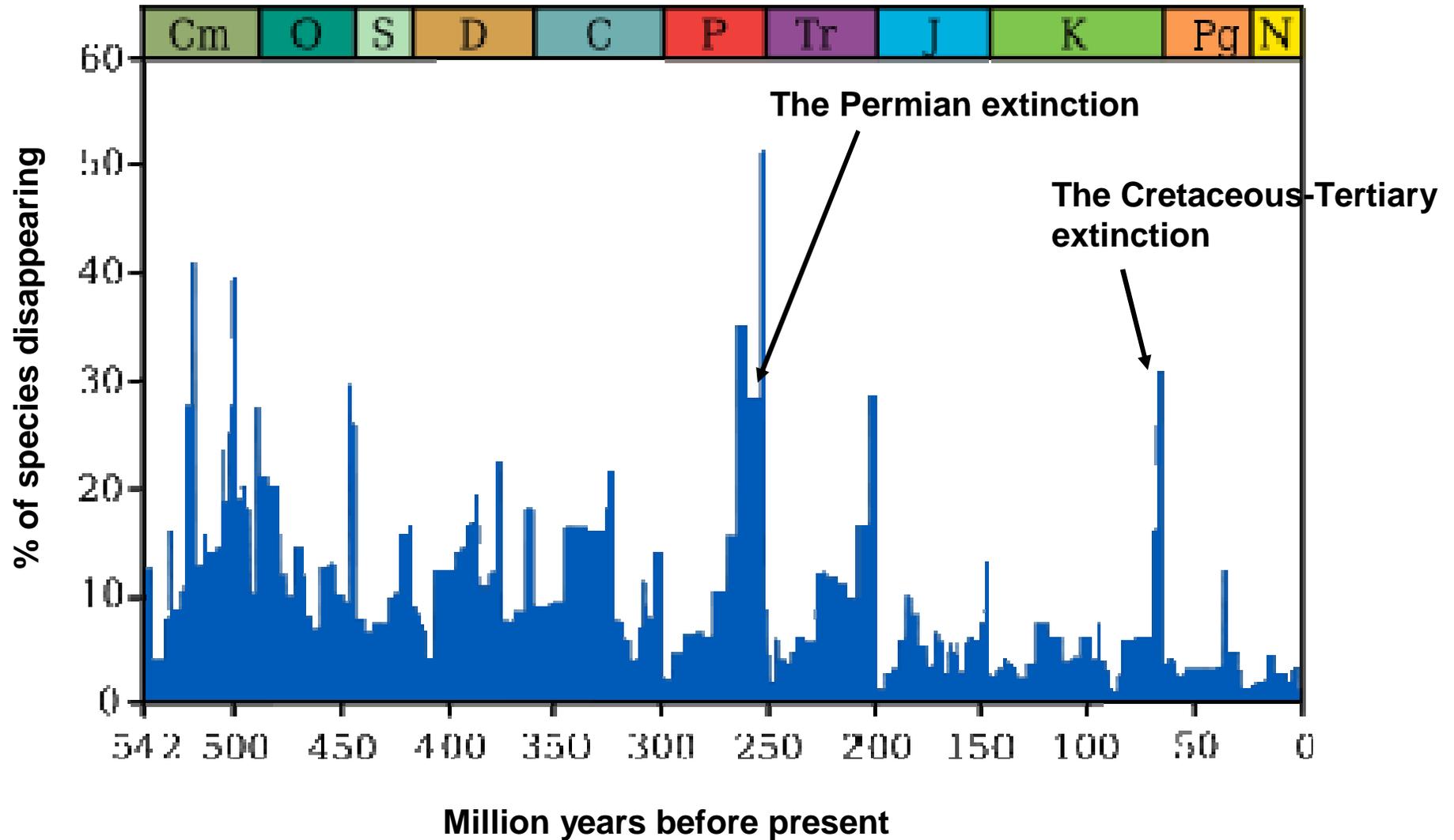
California Inst. Technology

*Dawn* Participating Scientist

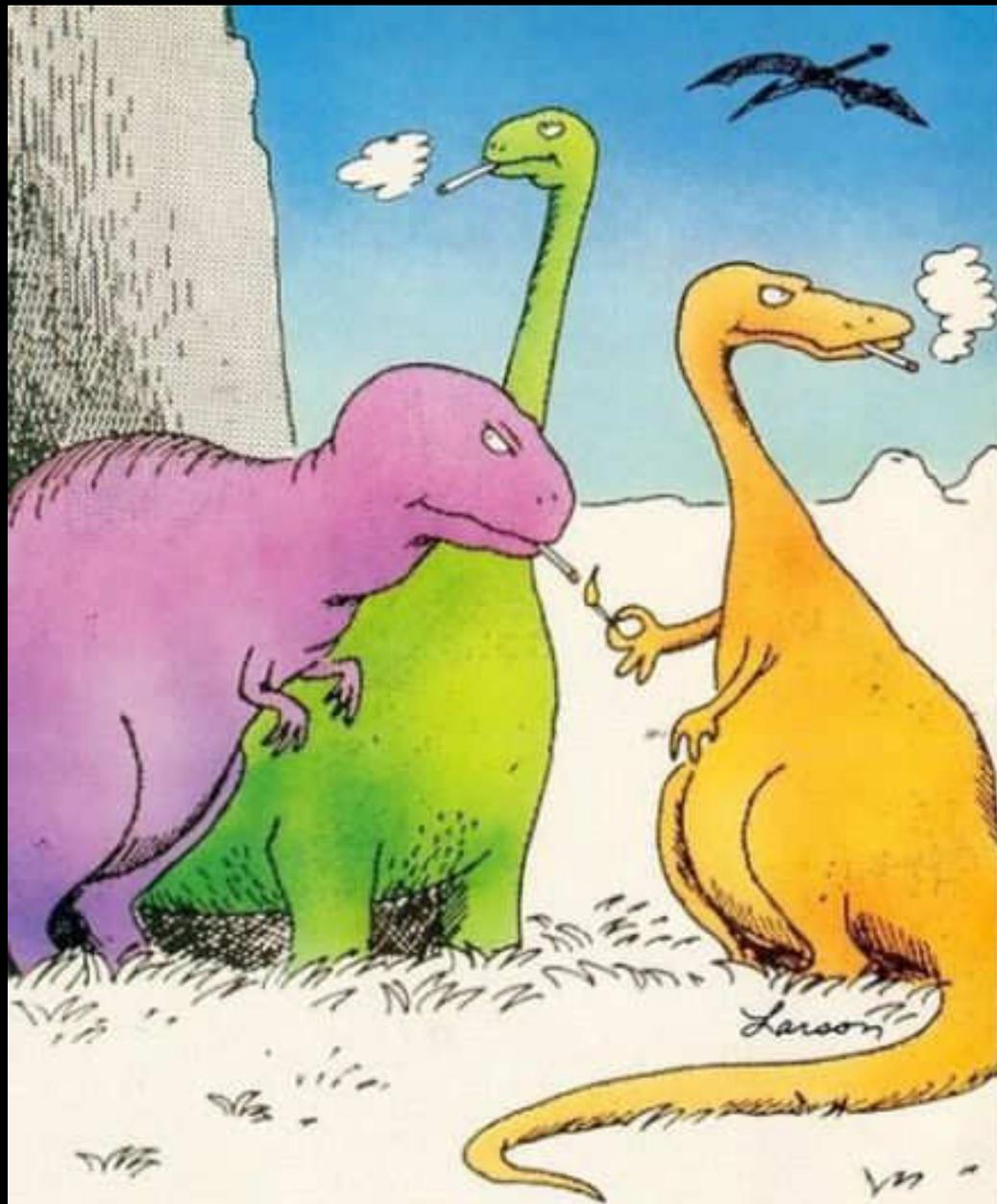




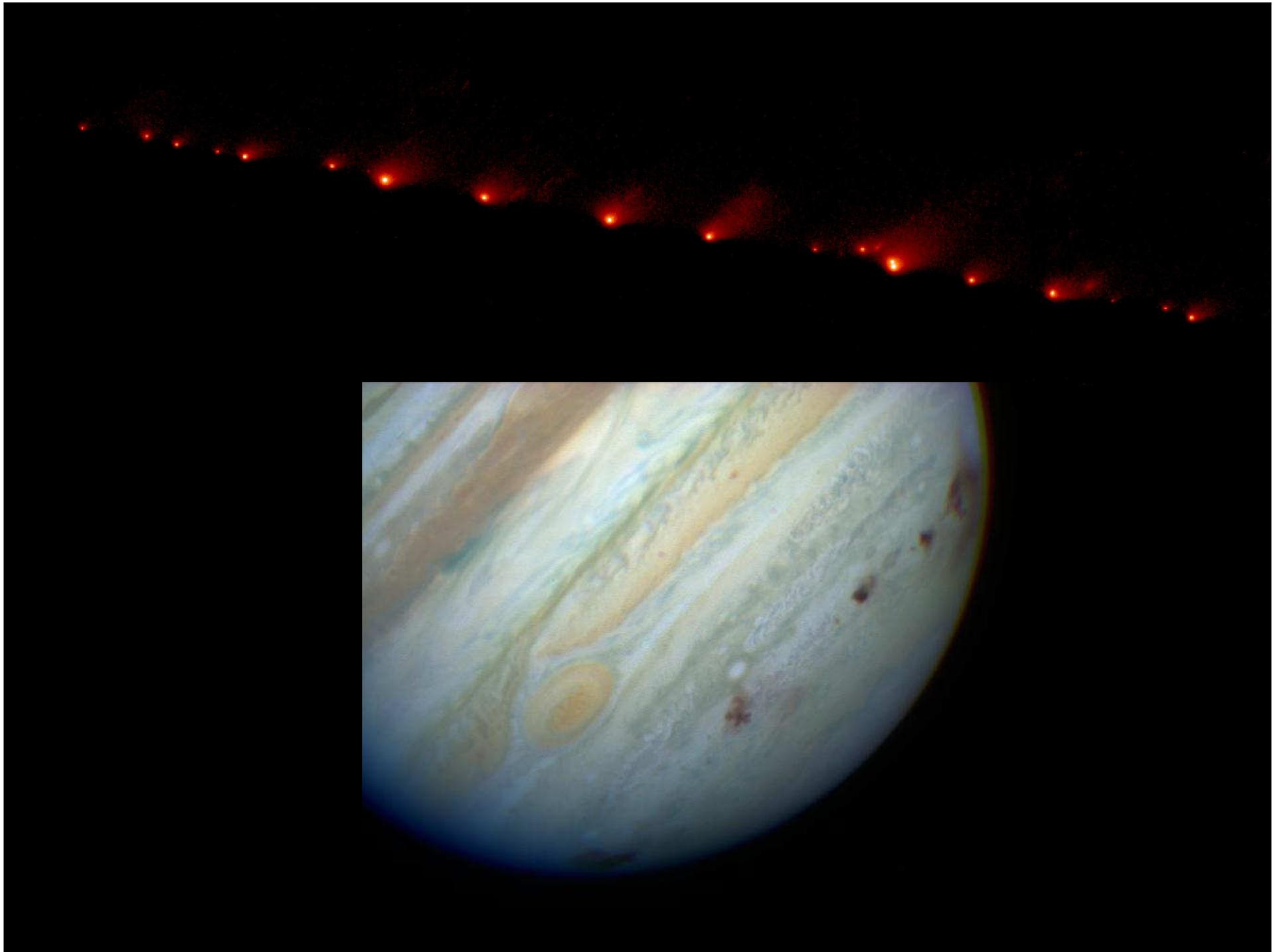
# Mass extinctions in the geologic record

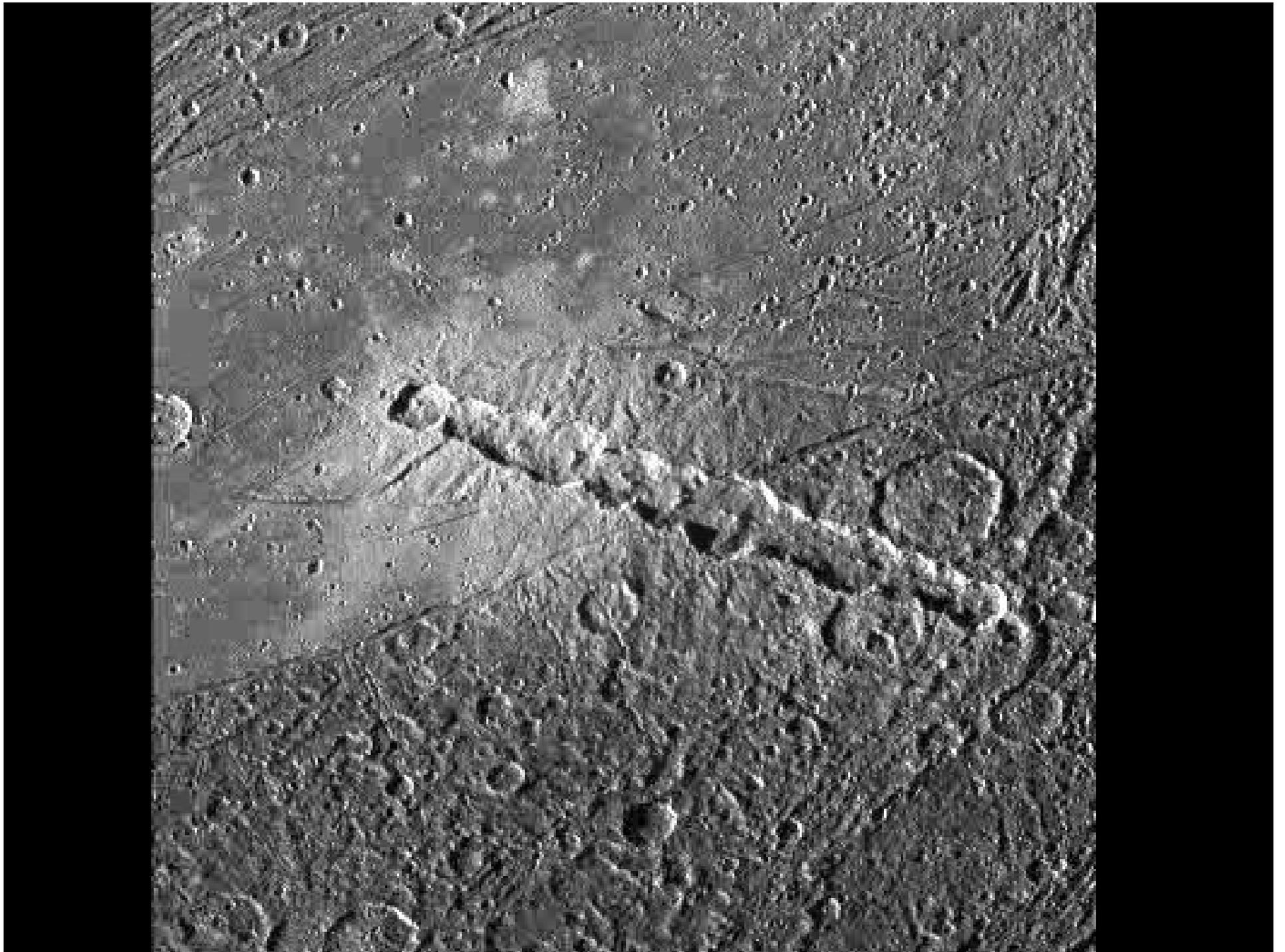






**The real reason dinosaurs became extinct.**



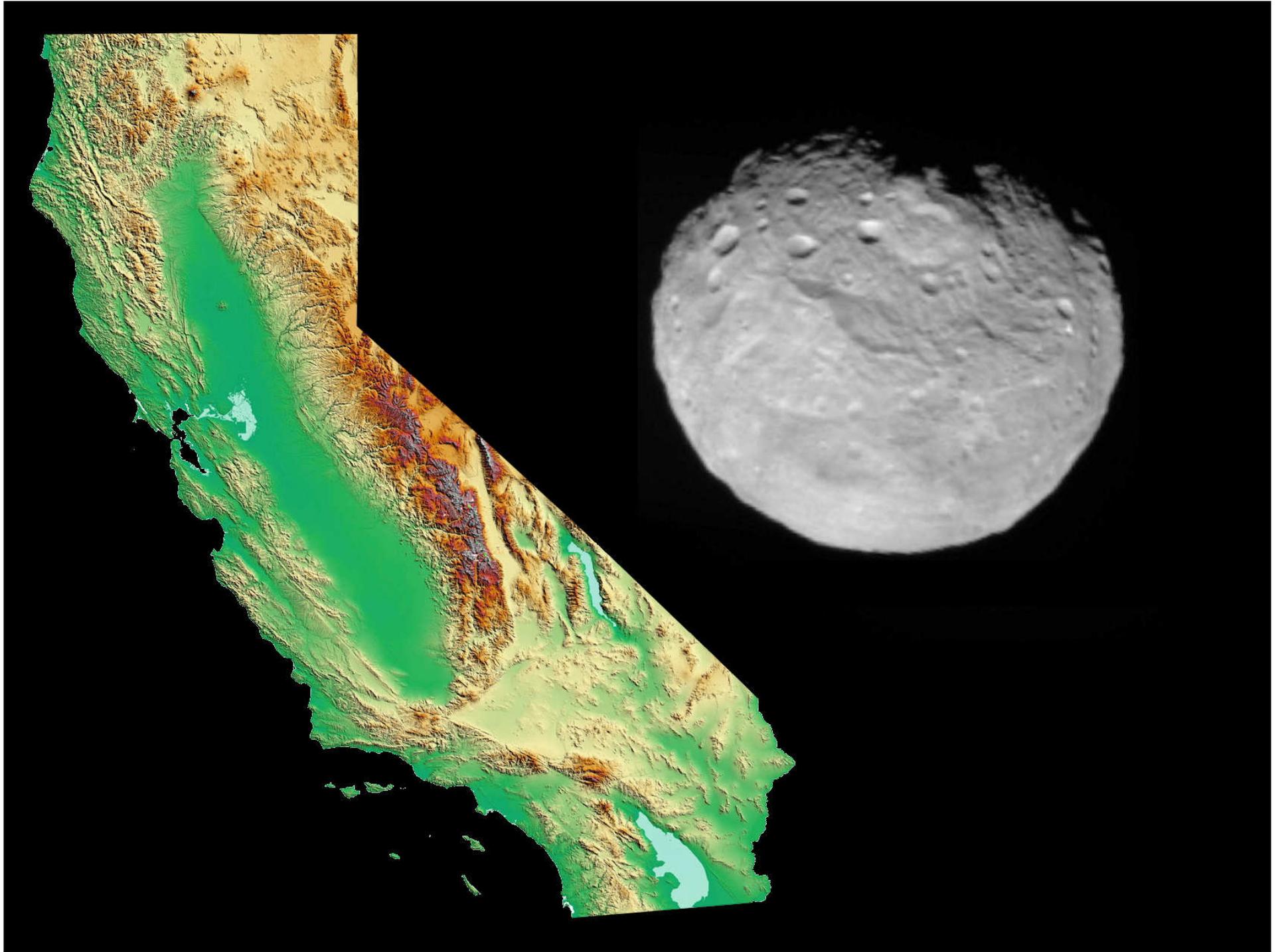




# Discovery of 4 Vesta

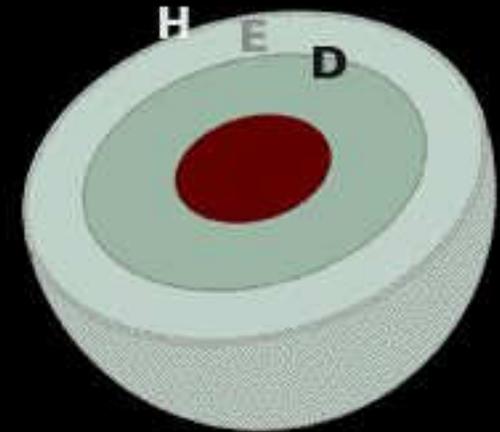
- Discovered in 1807 by Heinrich Olbers; 9% of asteroid belt mass
- Back then Vesta was a planet; since Olbers had already discovered Pallas; Gauss was honored with naming Vesta





# Pieces of 4 Vesta on Earth

Dar al-Gani 609  
HED Meteorite

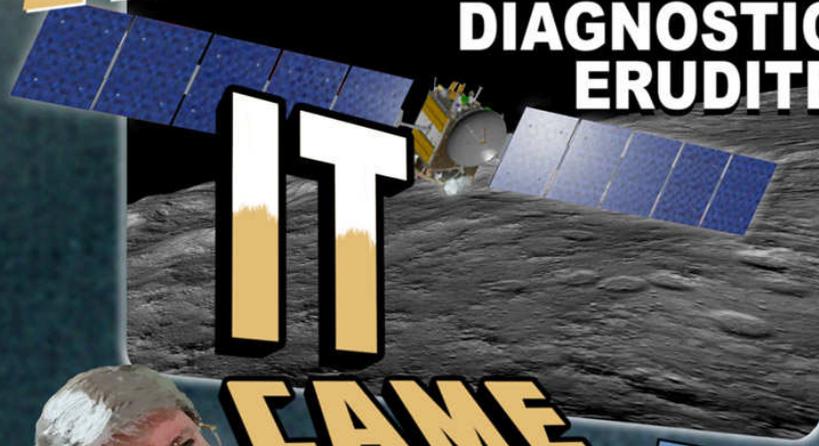


- The HED (Howardite, Eucrite, and Diogenite) meteorites are believed to come from 4 Vesta
- The V-type (vestoid) asteroids are believed to be chunks of Vesta; some are Near Earth Objects
- (Preliminary) *Dawn* shows S. Pole appears to more diogenitic (sampling deeper material)

FANTASTIC SCIENCE LEAPS AT YOU!

IN **ASTEROIDVISION**

AMAZING!  
DIAGNOSTIC!  
ERUDITE!



**IT**

**CAME  
FROM  
VESTA**

From Hans Tancredo's  
absonant science fact story!



*Starring*

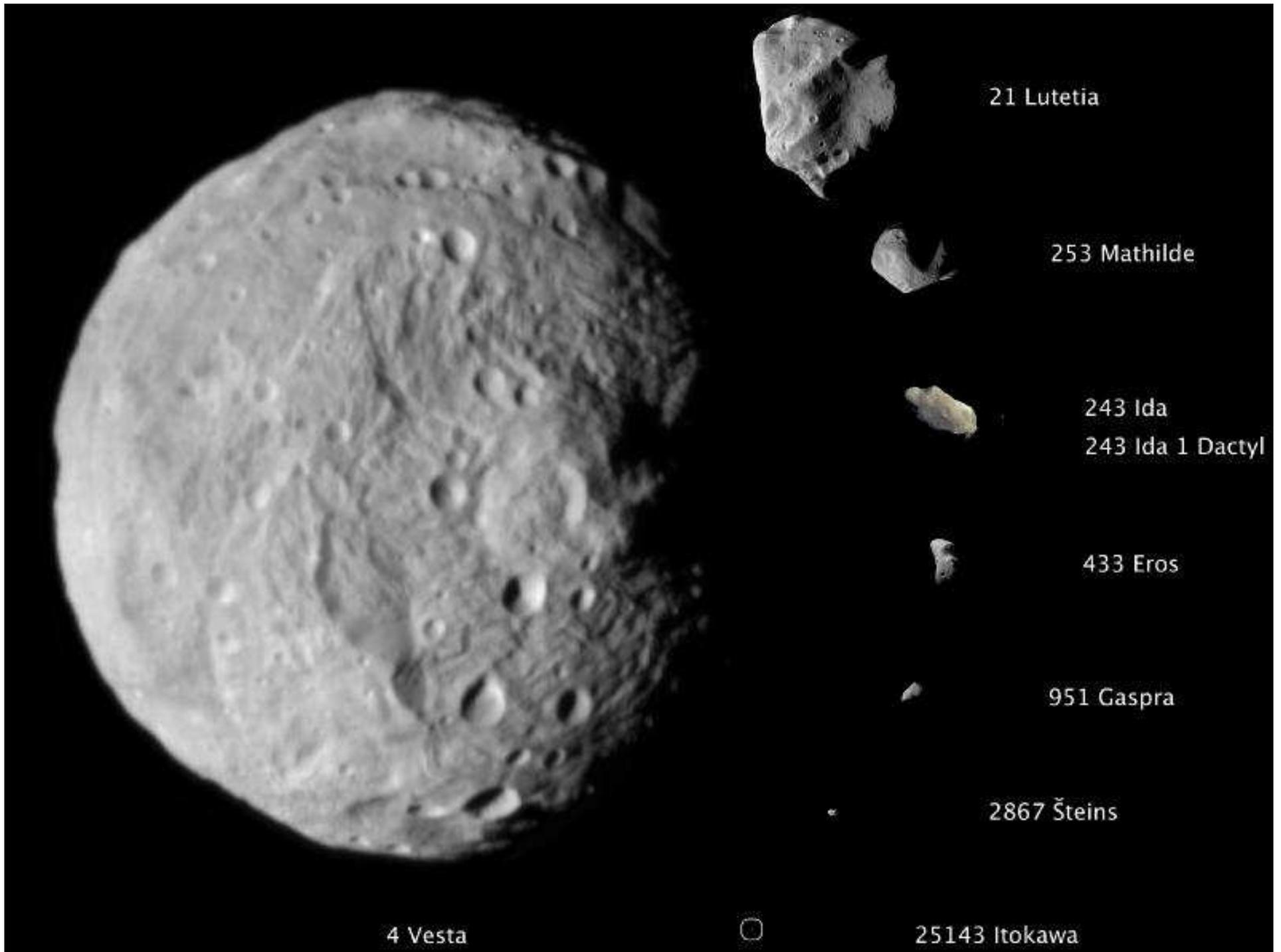
**Keyur PATEL · Carol RAYMOND**  
with **MARC RAYMAN · RAY MORRIS**  
**KATHY SCHIMMELS · TIM WEISE**  
and introducing  
**DR. CHRISTOPHER RUSSELL** as the P.I.



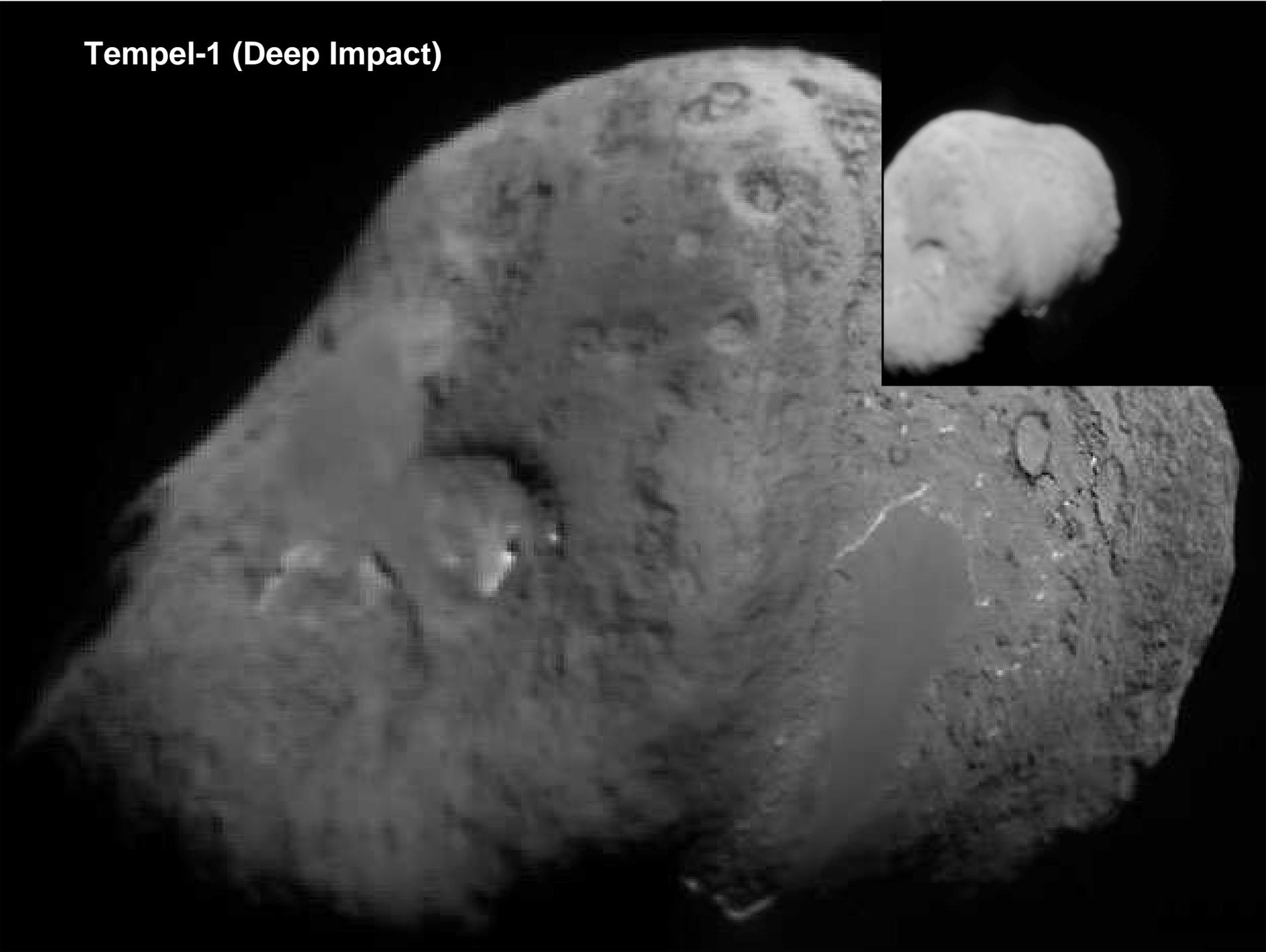
Produced by ROC E. METEOR for the JET PROPULSION LABORATORY · A NASA Release

# Why go to Vesta?

- **To understand the transport of asteroids and dark material – the building blocks of life – and water to the inner Solar System**
- **To understand how small bodies are interrelated**
- **To closely scrutinize an asteroid that has been processed (4 Vesta) with one that is relatively primordial (1 Ceres), revealing the conditions of the early Solar System**
- **Because it's there!**
- **For reasons yet unknown**



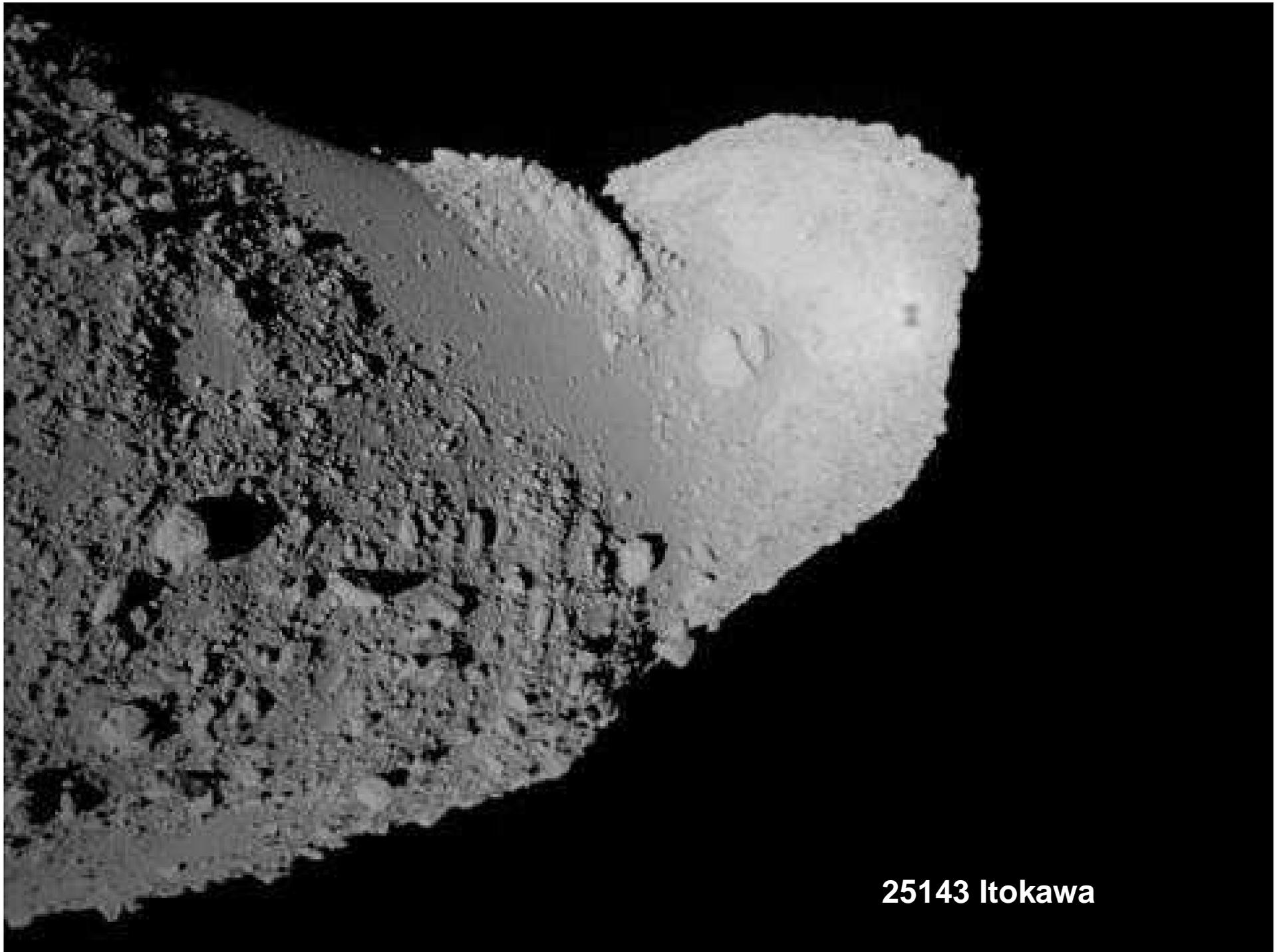
Tempel-1 (Deep Impact)



**Hartley-2 (Epoxi – Deep  
Impact follow-on)**

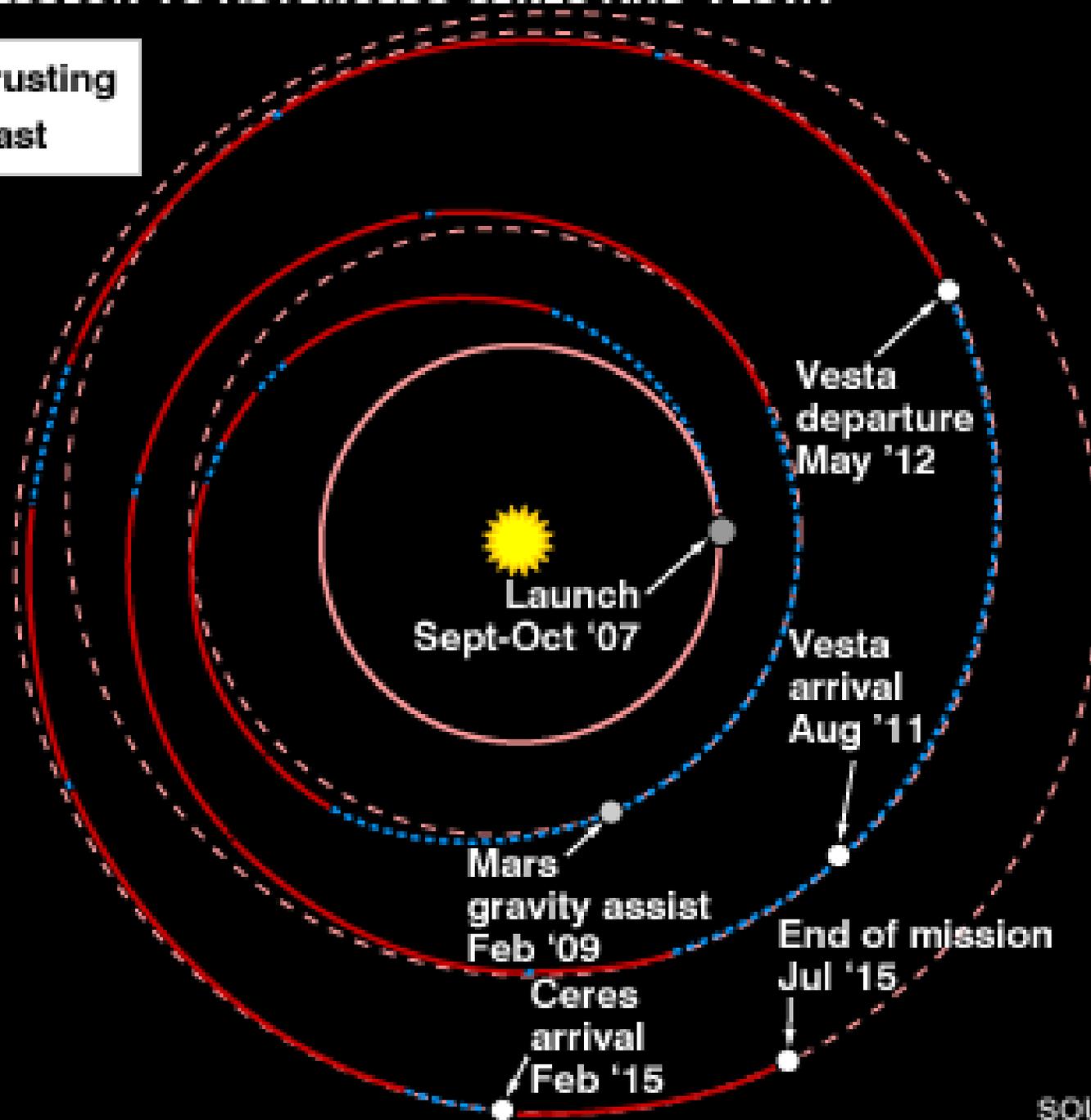
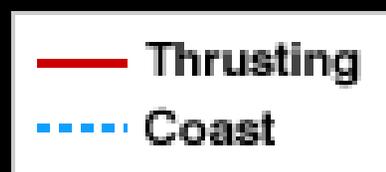




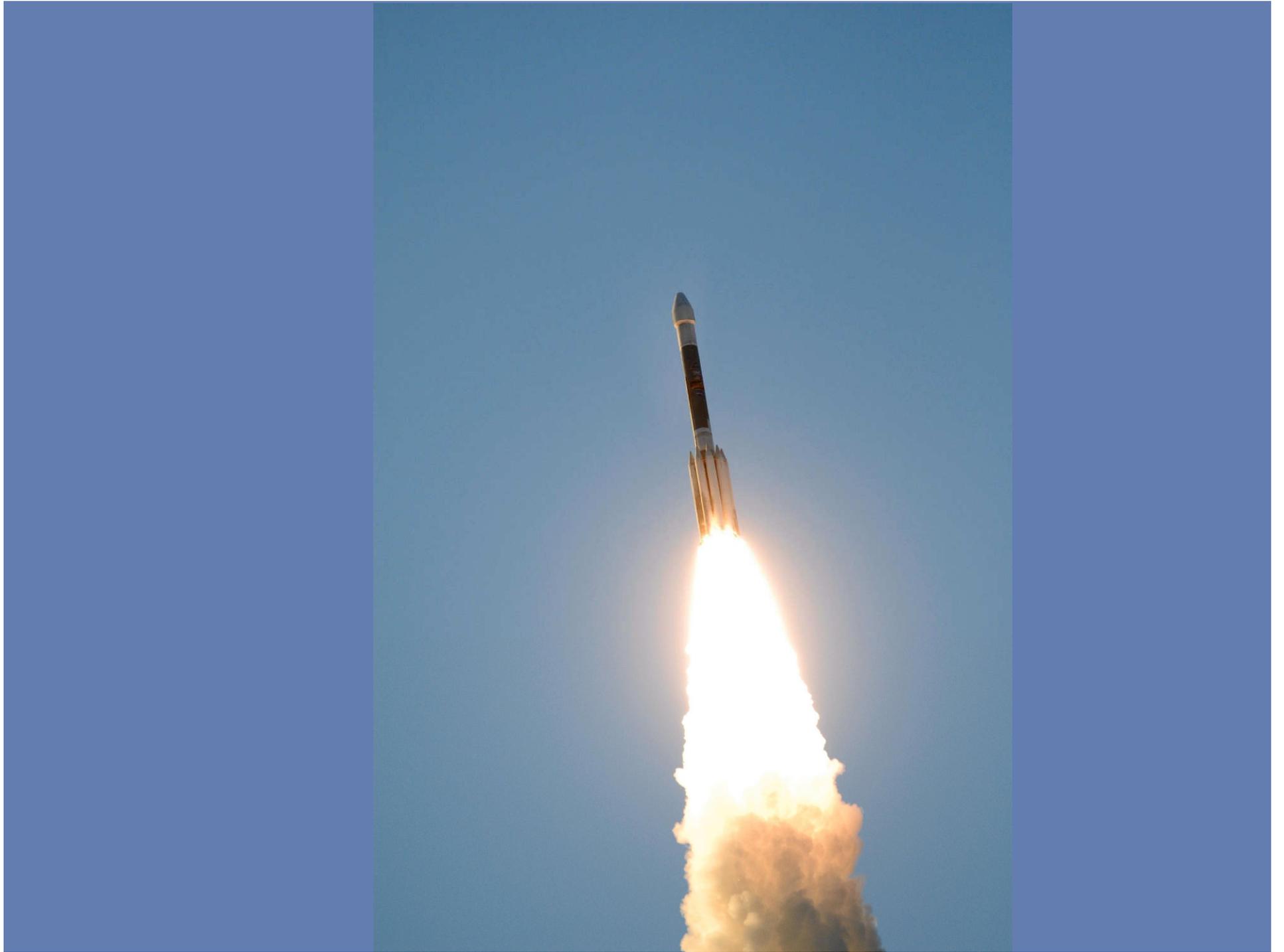


25143 Itokawa

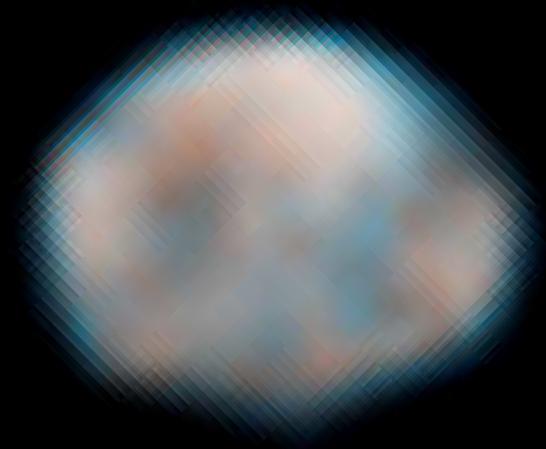
# DAWN MISSION TO ASTEROIDS CERES AND VESTA



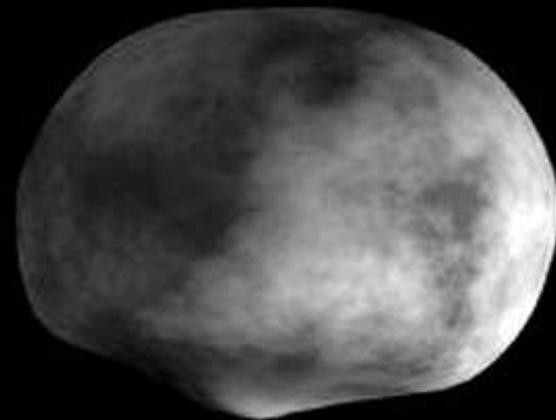
SOURCE: NASA



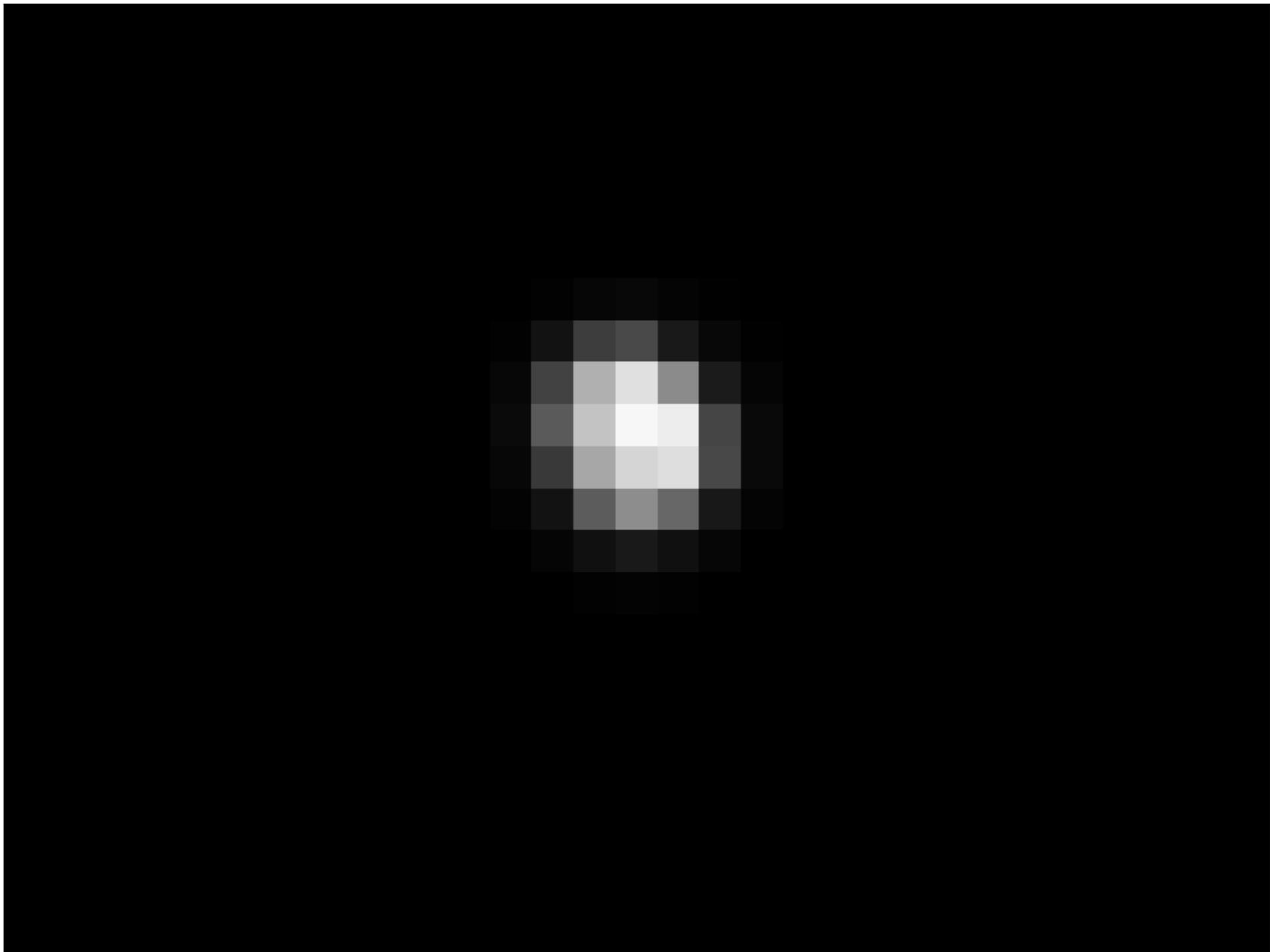
# Asteroid 4 Vesta from Hubble

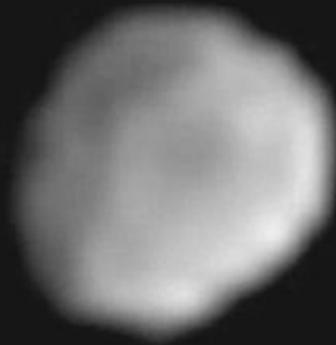


Best Hubble image

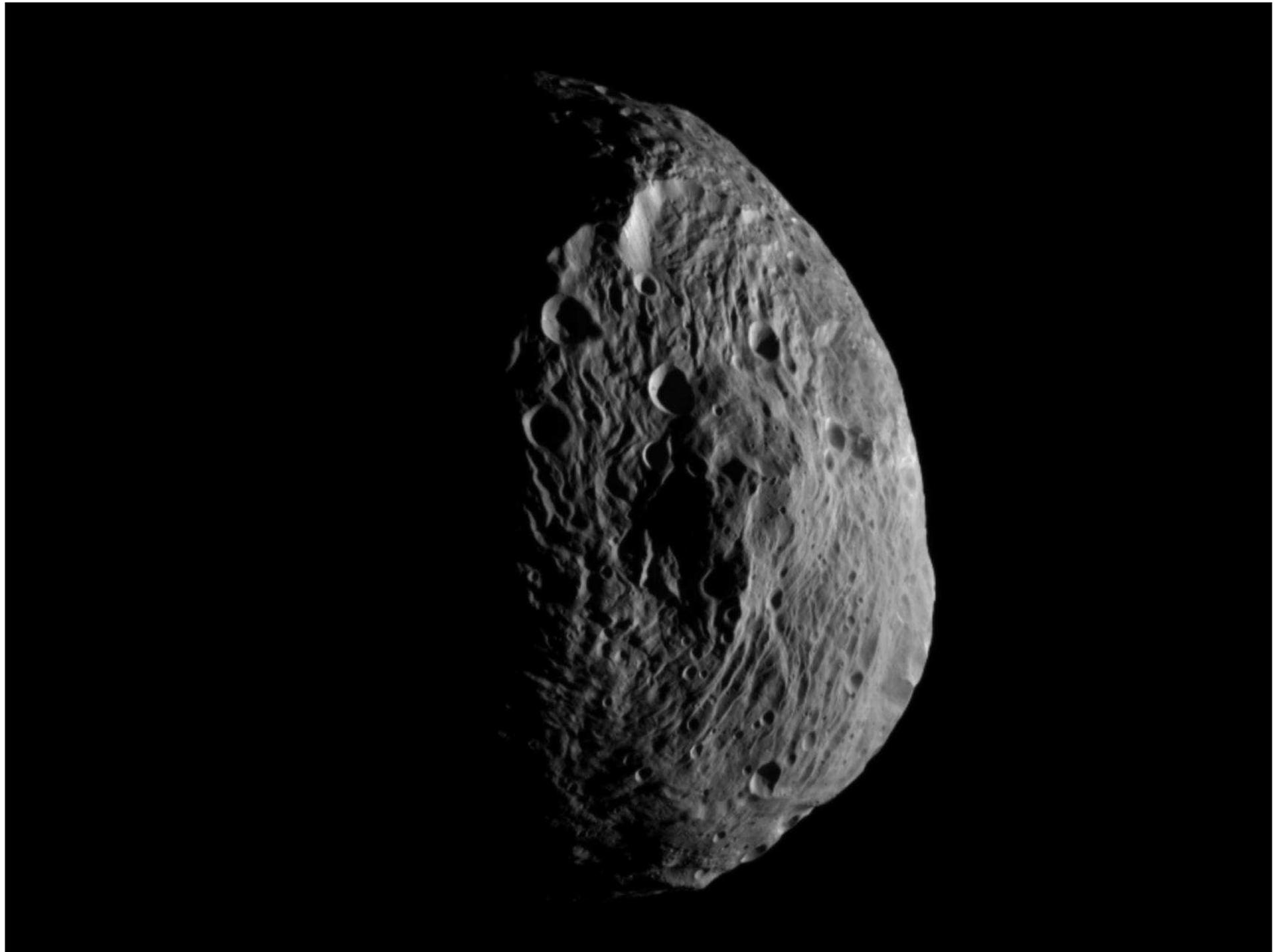


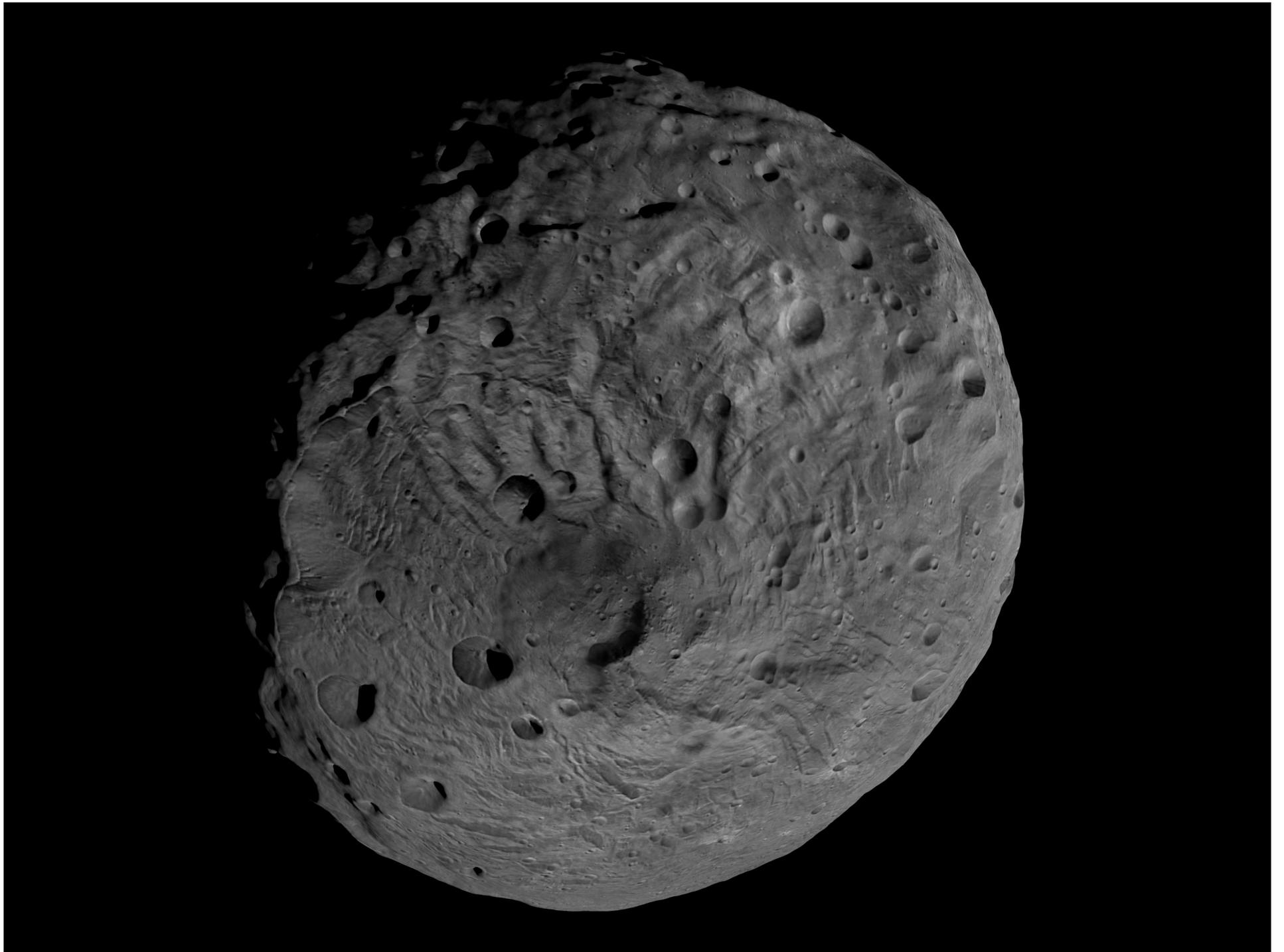
Computer model based on the image

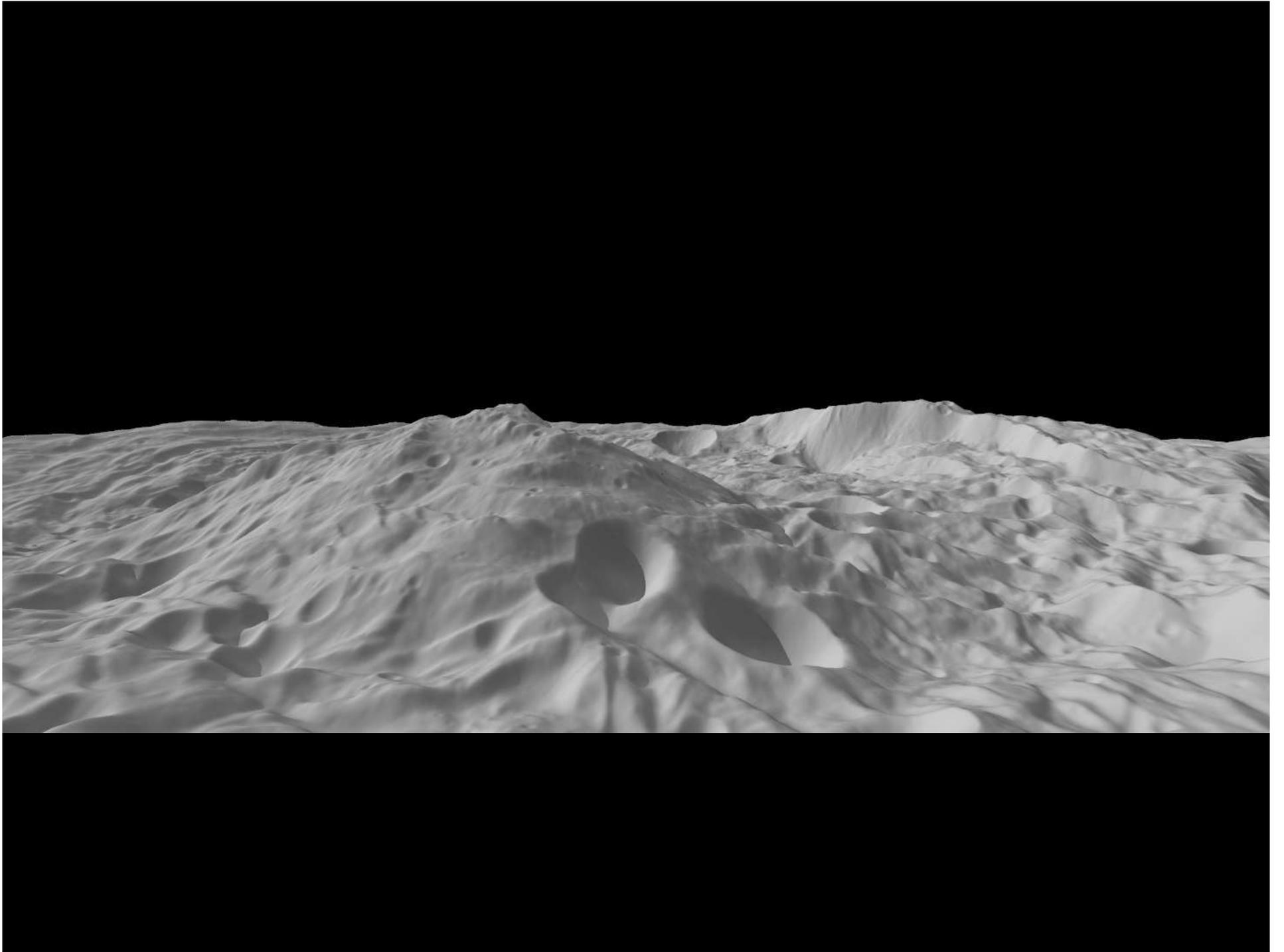


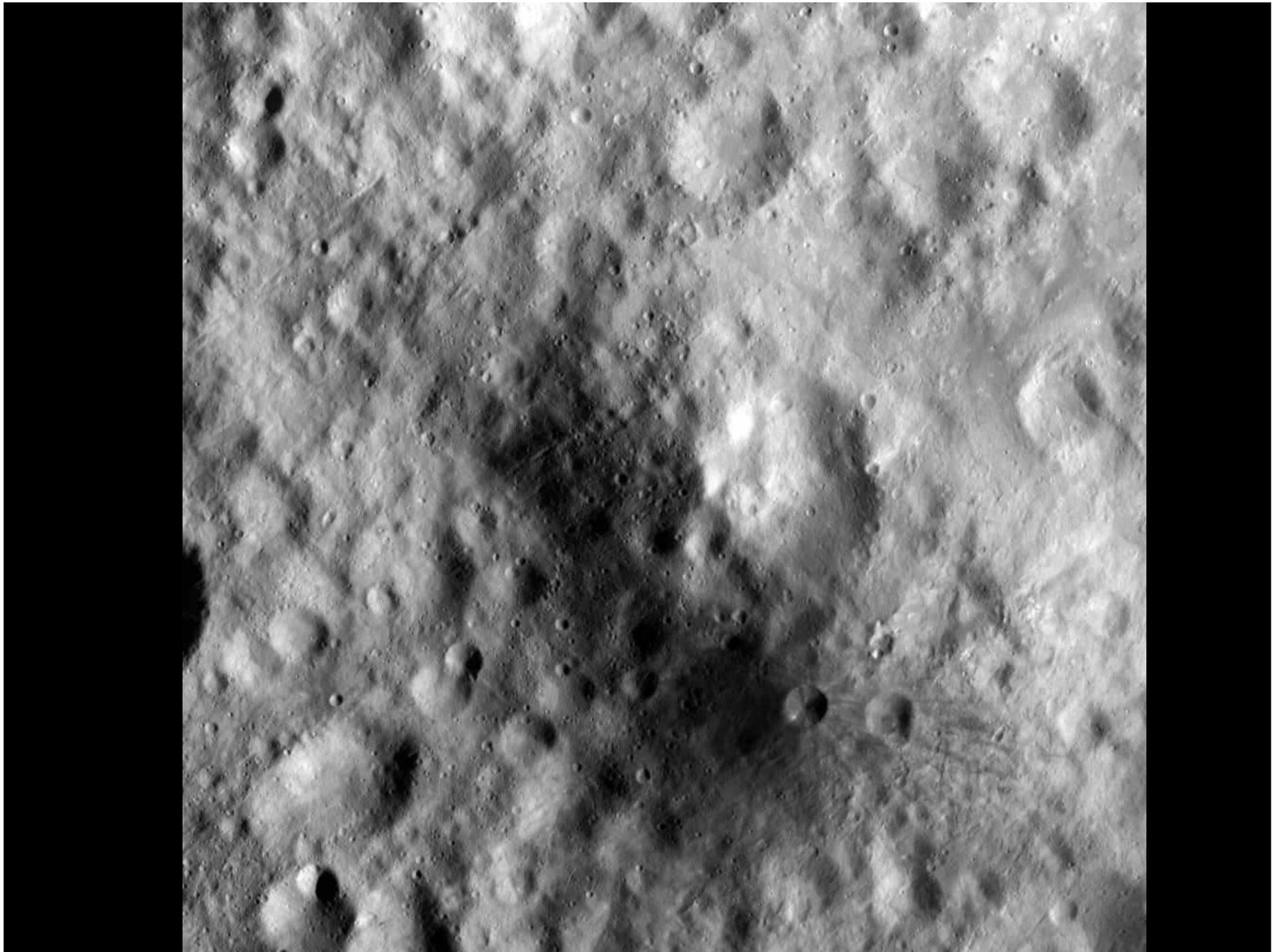


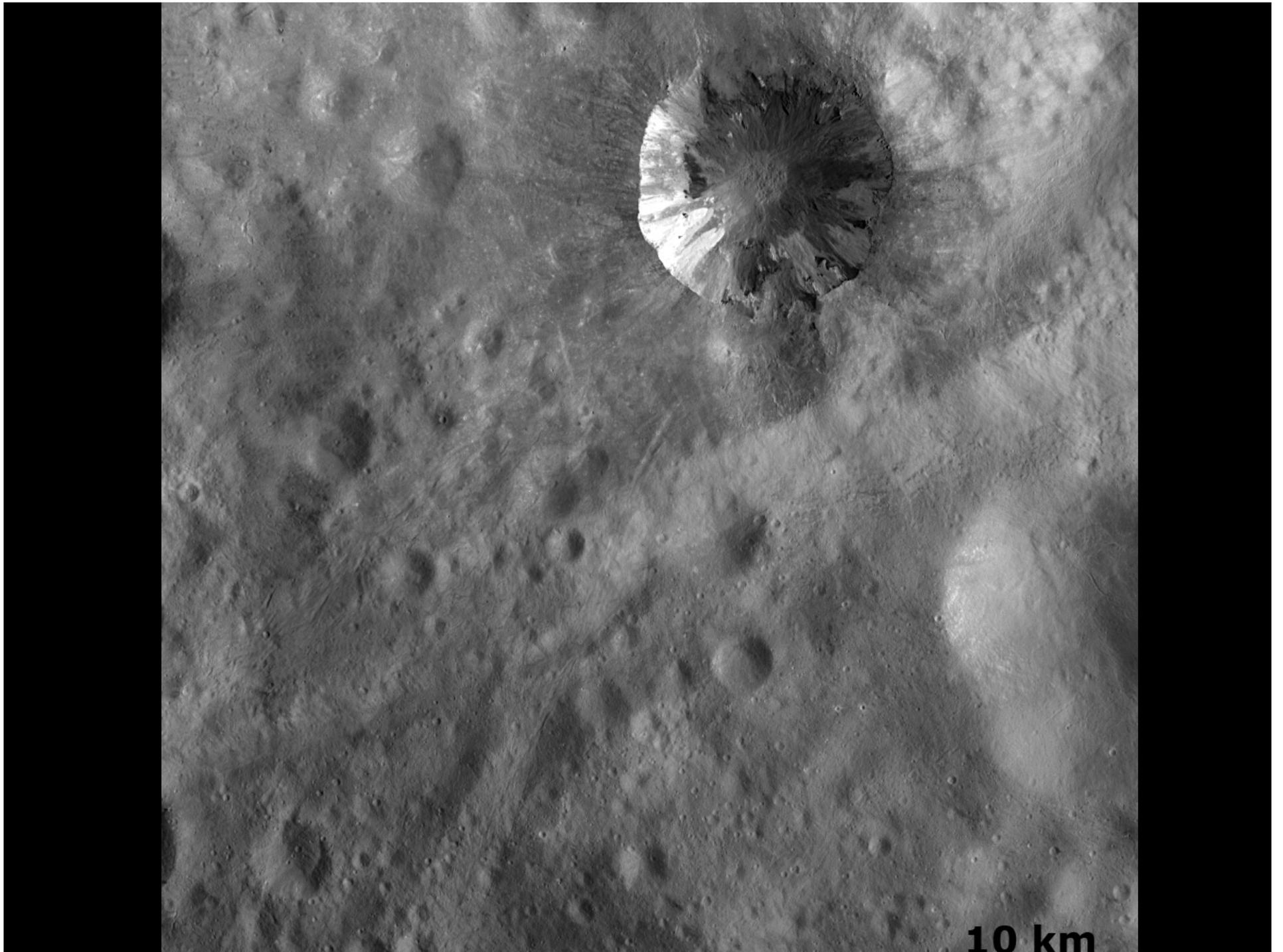




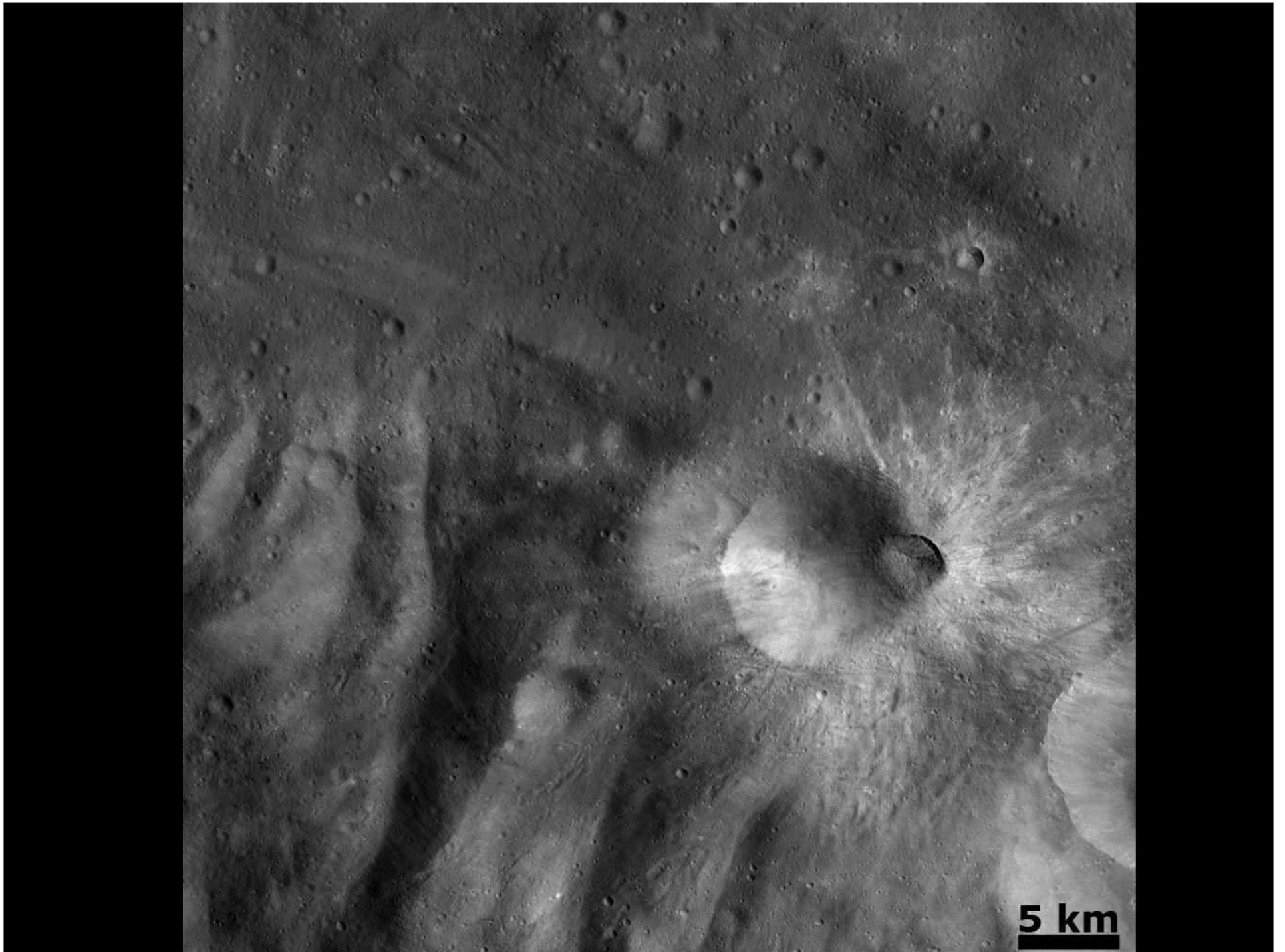




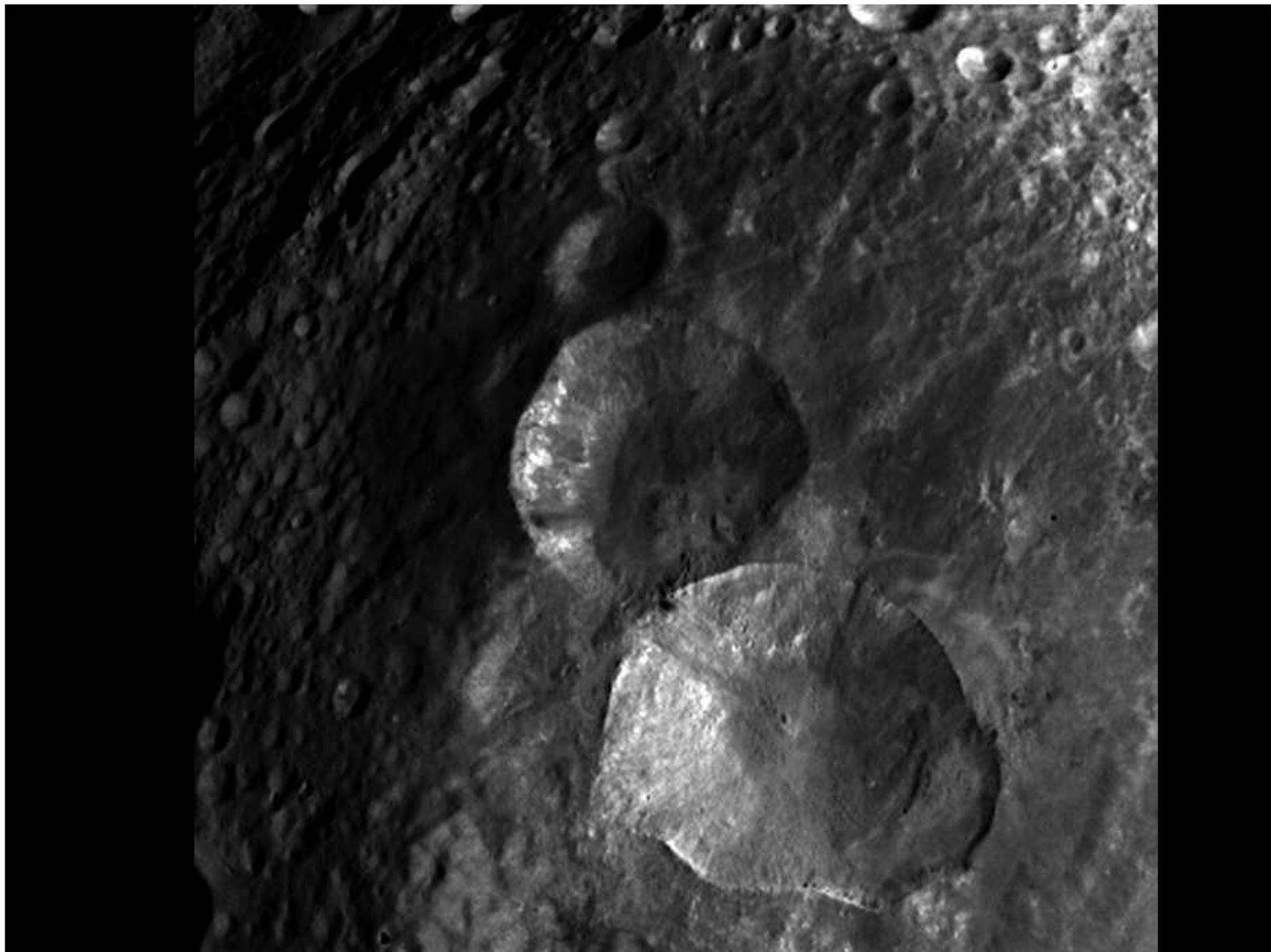


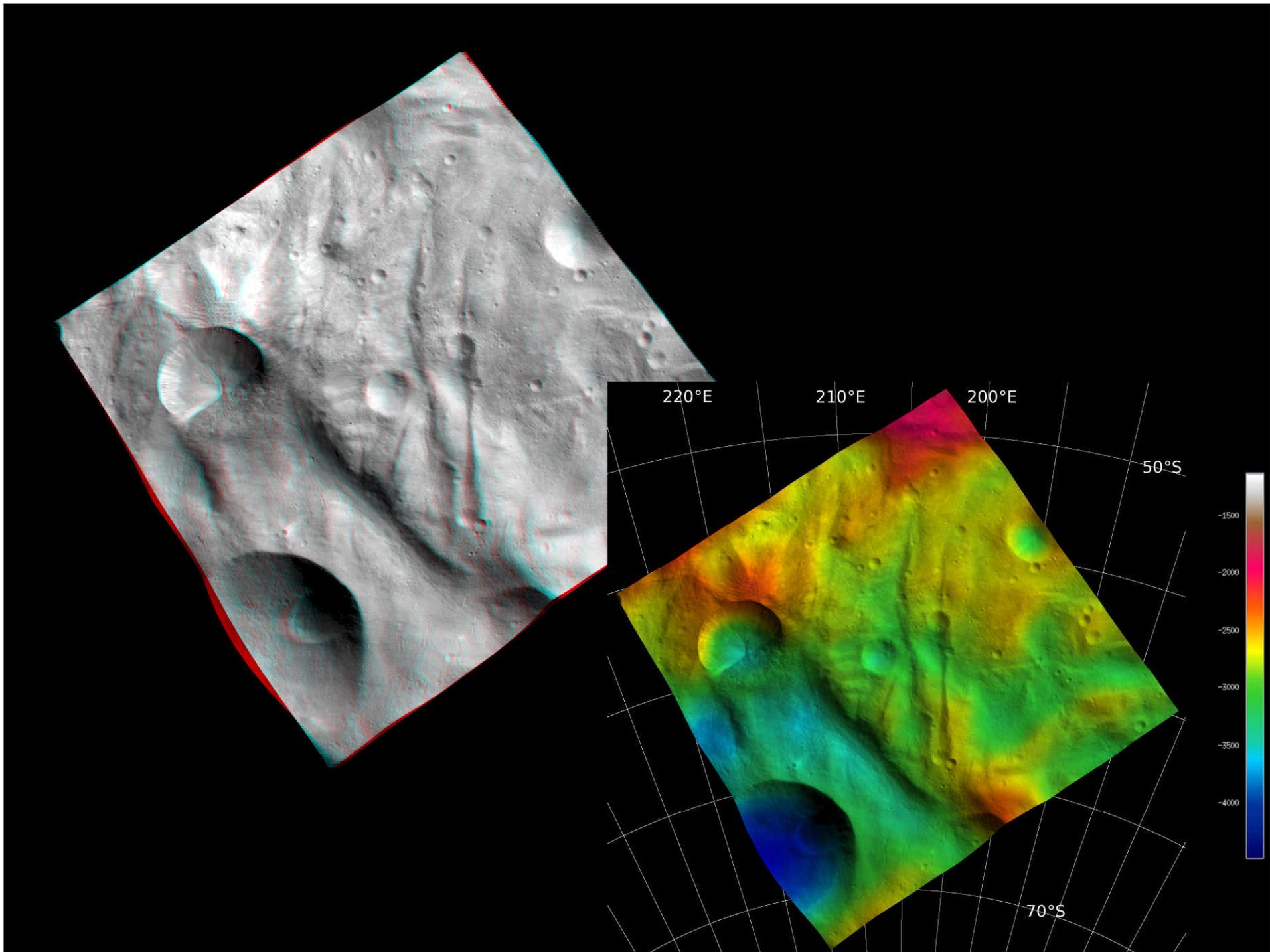


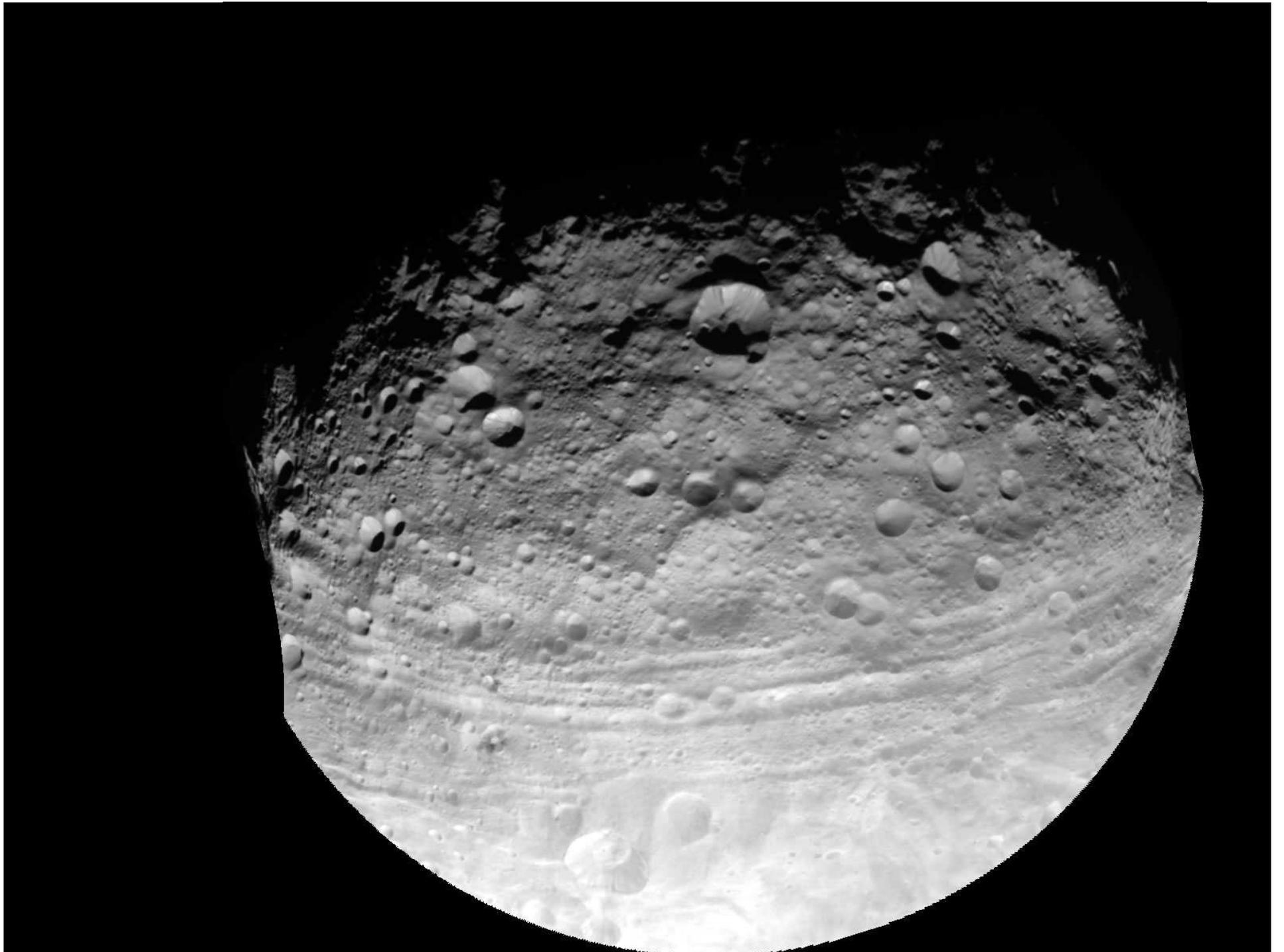
10 km

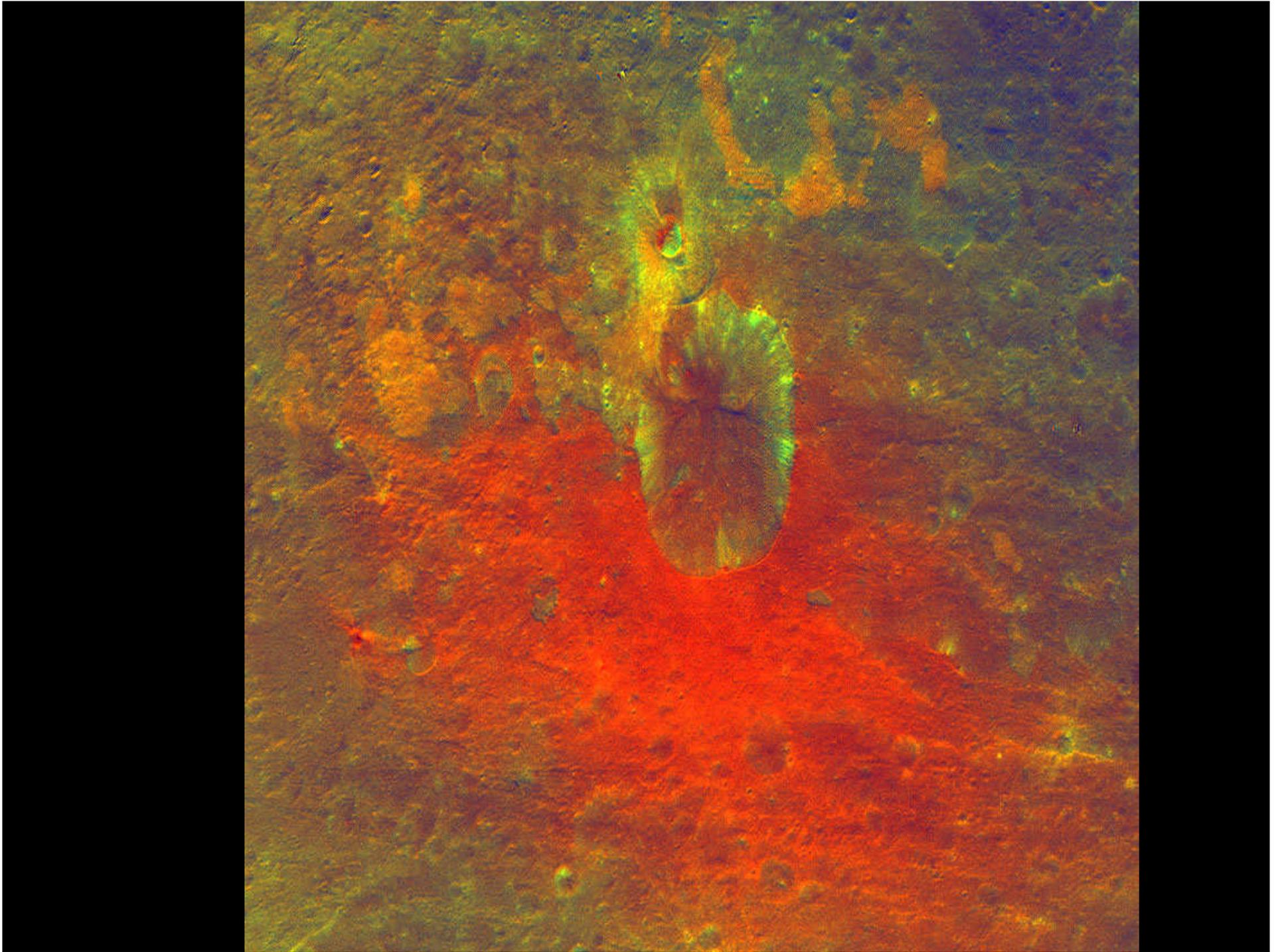


**5 km**









## What we have learned: A summary

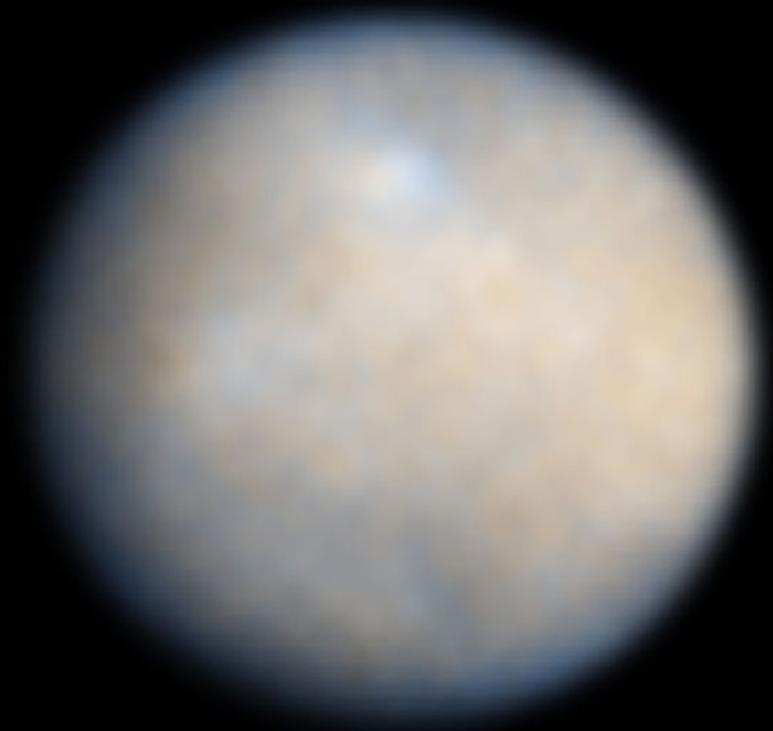
Vesta is like a small planet. It seems to have a core, crust and mantle.

There is a huge diversity of geologic features on Vesta: Mountains (the largest in the Solar System!), craters, hills, ridges, and smooth plains. There is much bright and dark material.

Parts of Vesta have impacted the Earth

# The Future

- **High resolution mapping at 4 Vesta**
- **Analyzing, modeling, thinking, and correlating**
- **On to 1 Ceres (30% of asteroid mass): more primitive; hydrated, but still differentiated (possibly even liquid mantle)**



Best Hubble image of Ceres