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Dawn's Operations in Cruise from Vesta to Ceres



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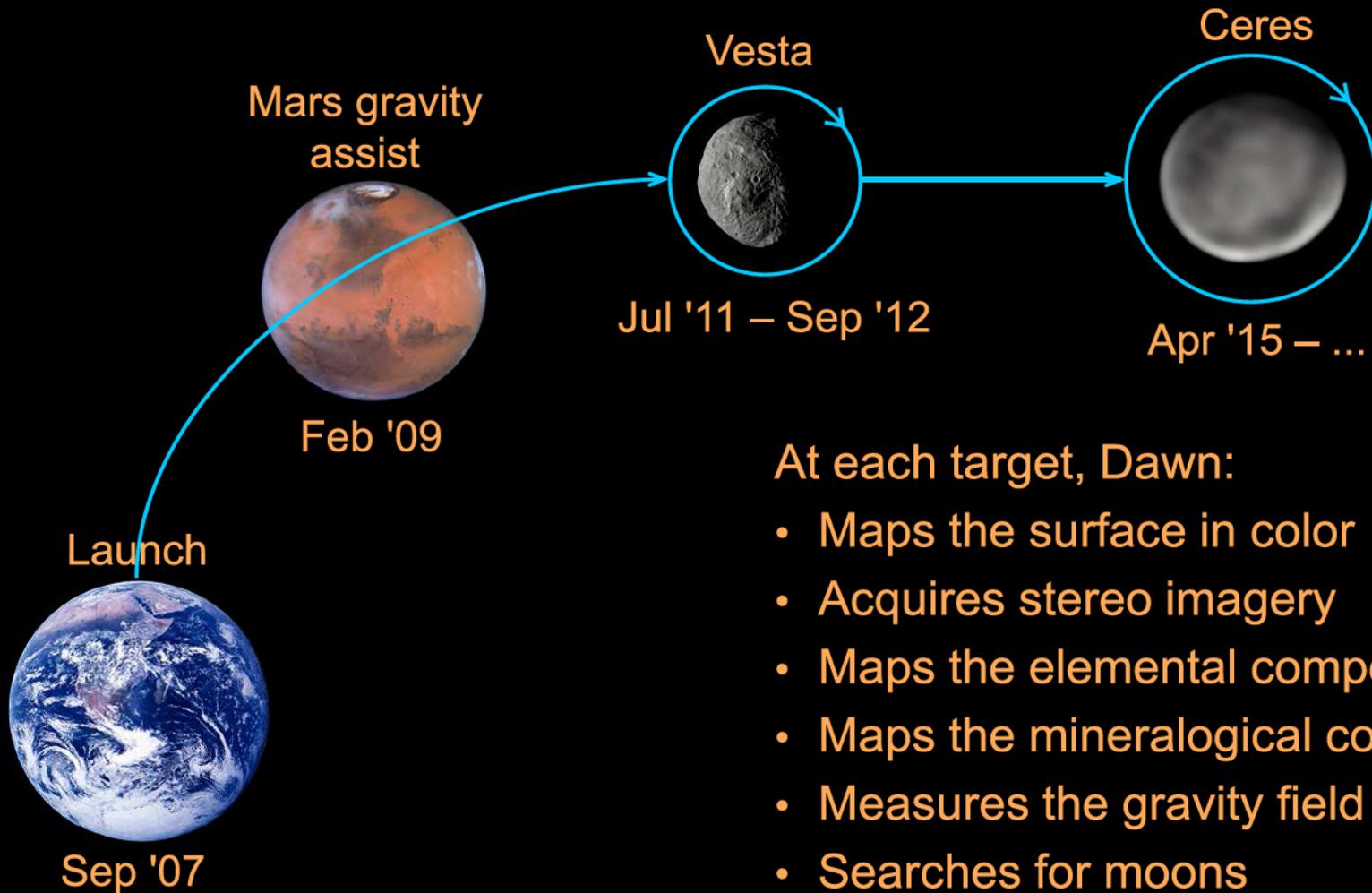
UCLA

JPL *Orbital*



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Mission Itinerary



At each target, Dawn:

- Maps the surface in color
- Acquires stereo imagery
- Maps the elemental composition
- Maps the mineralogical composition
- Measures the gravity field
- Searches for moons

Note: Text not to scale.

Vesta and Ceres Size

Mathilde

Lutetia



Vesta



Ceres



Pluto

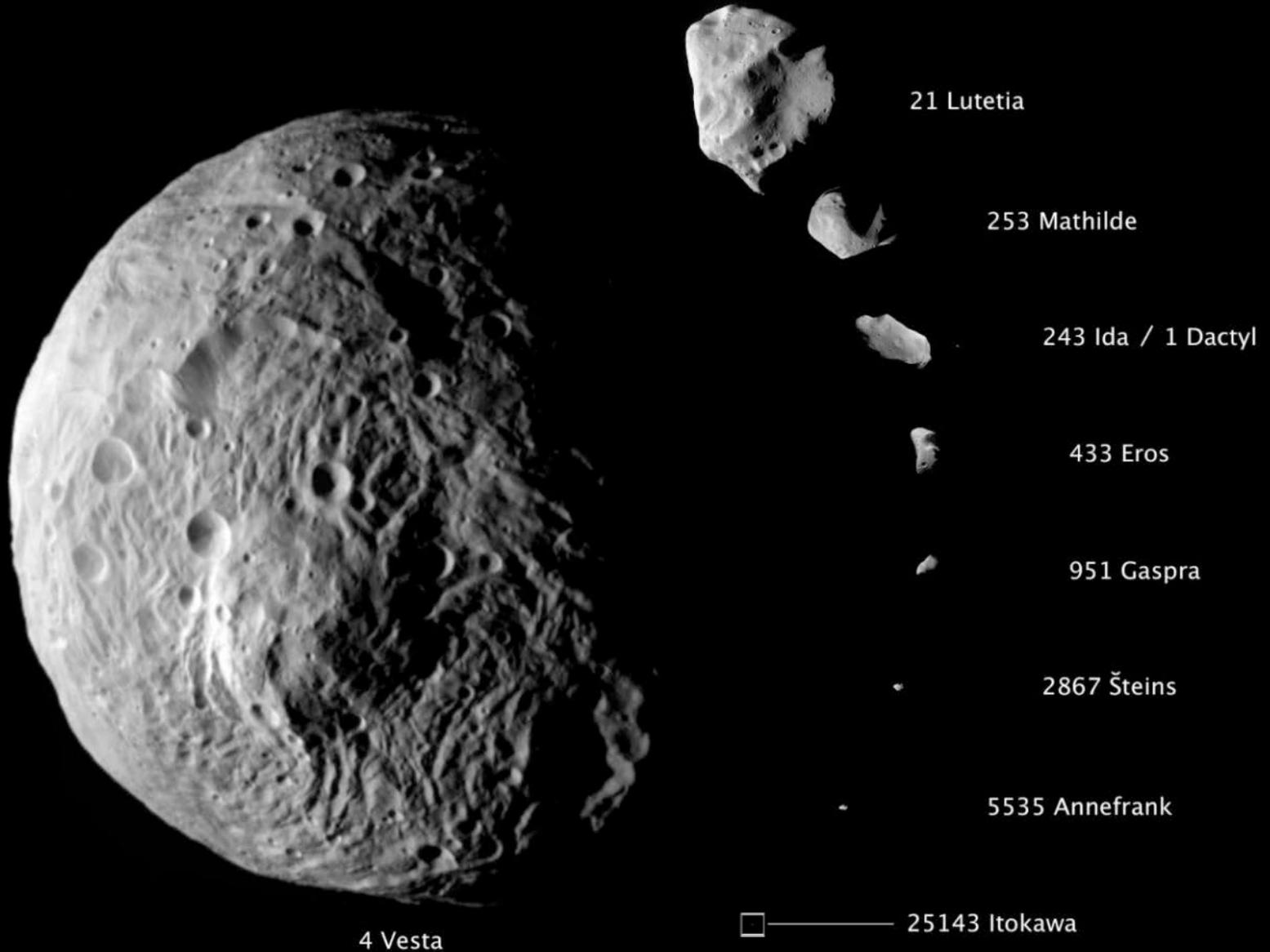


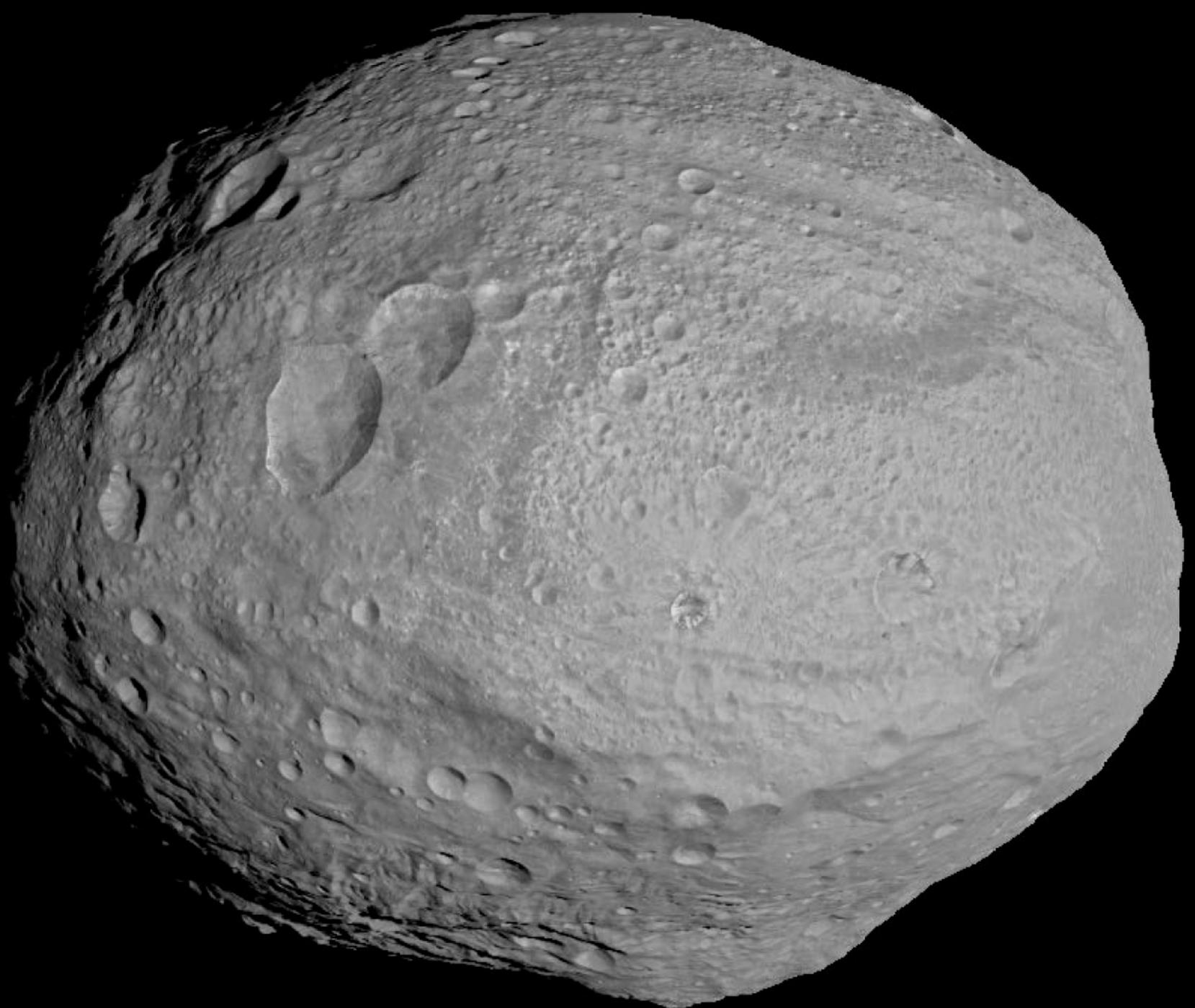
California
(smog not shown)



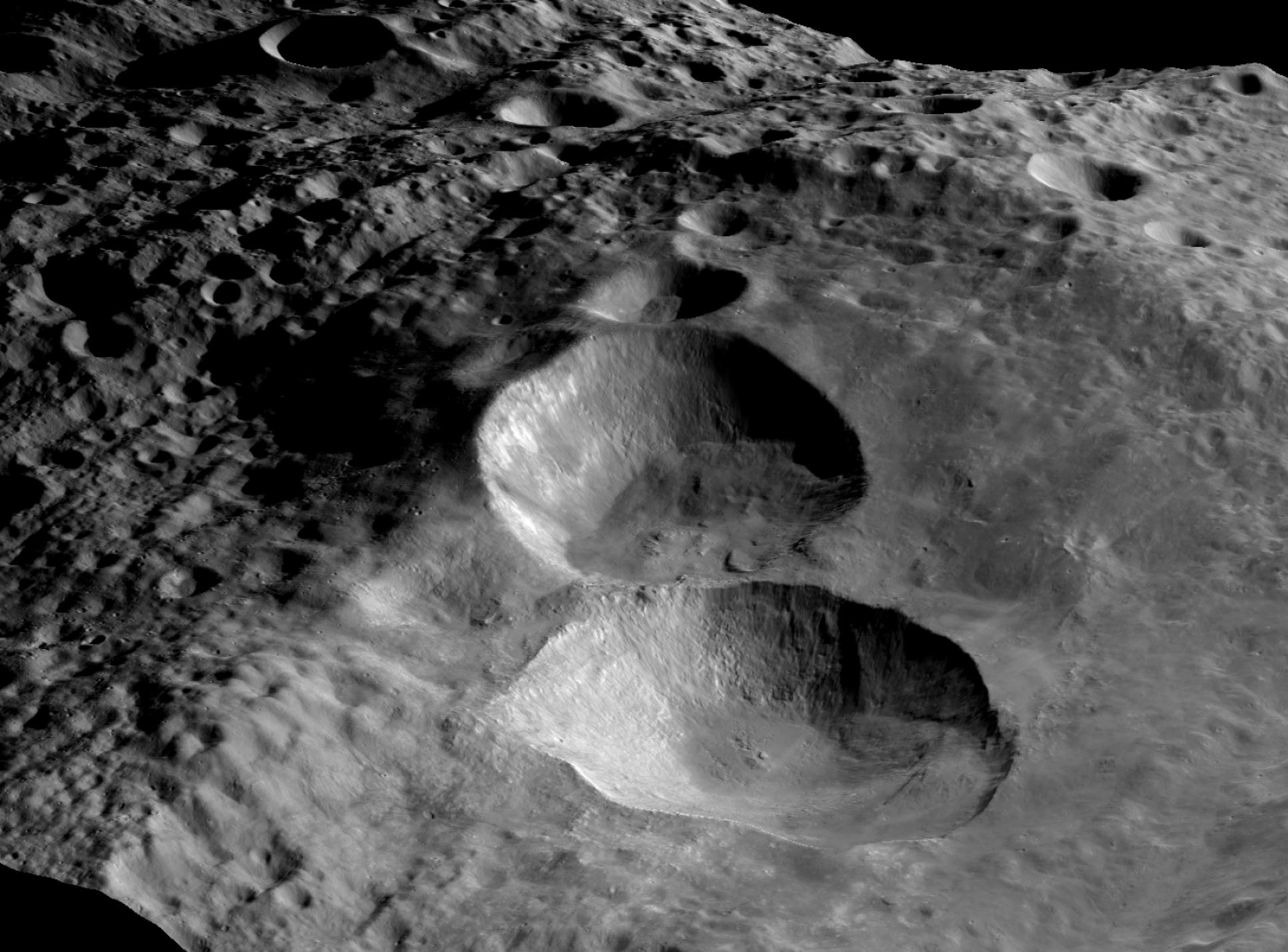
Earth's moon

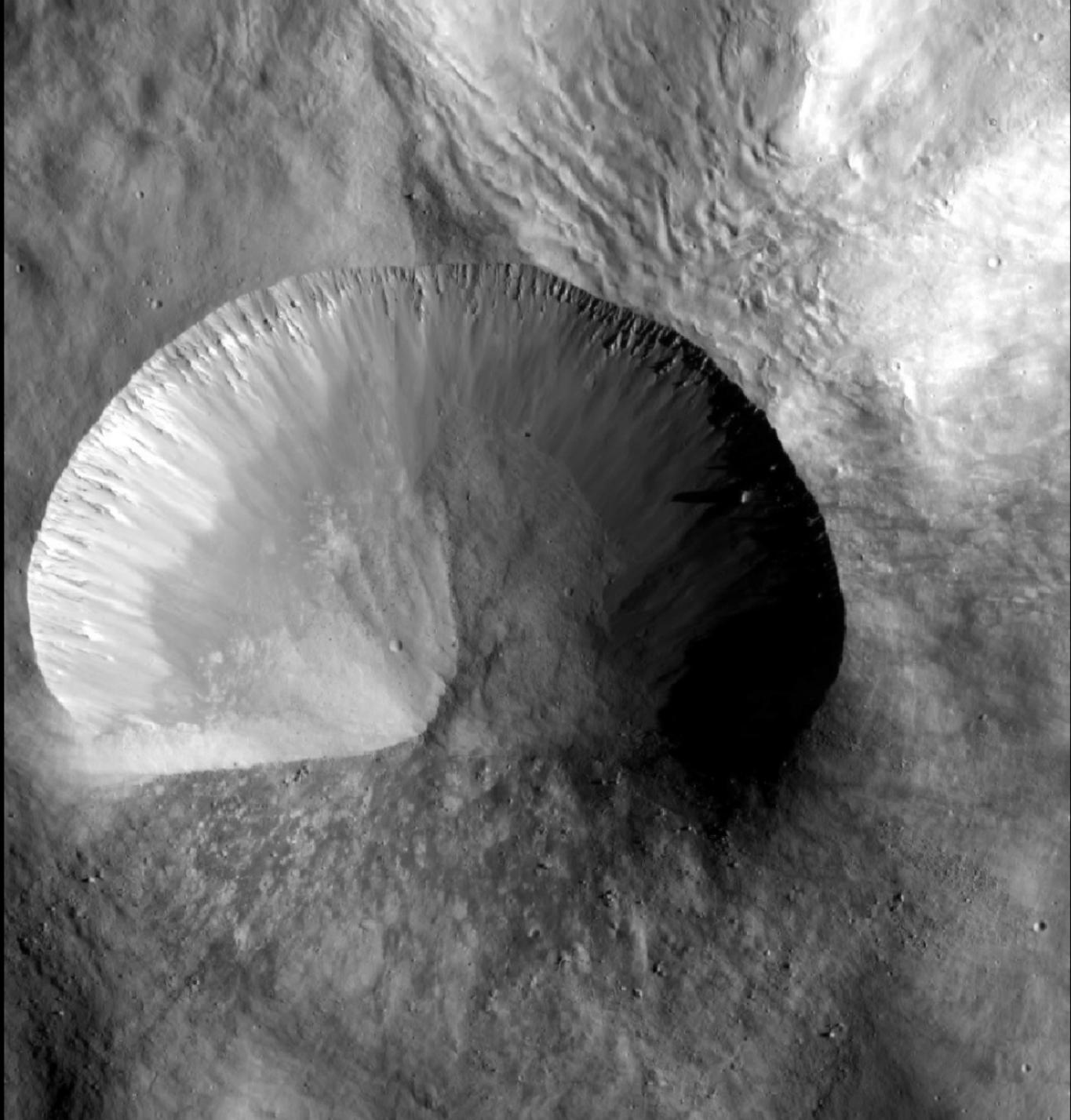
Vesta and Ceres Size in Context



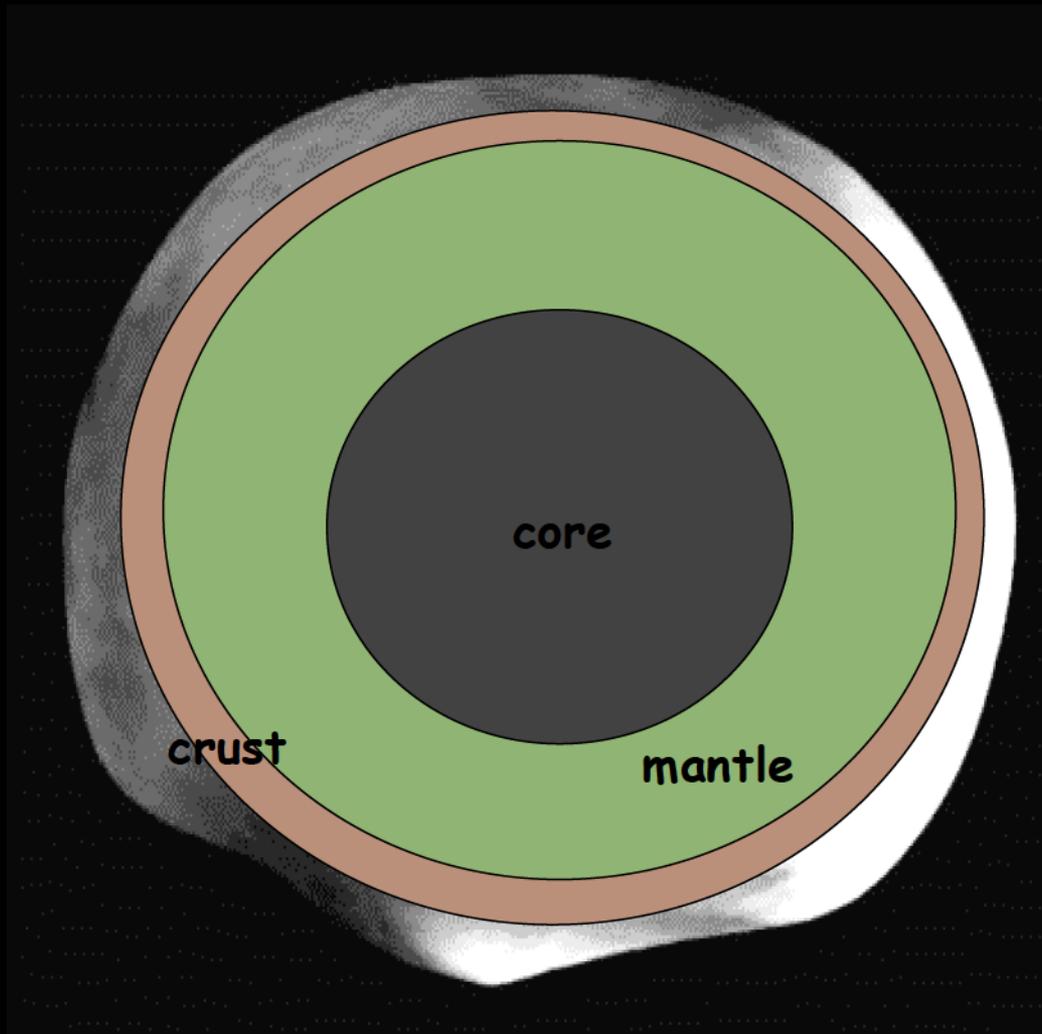




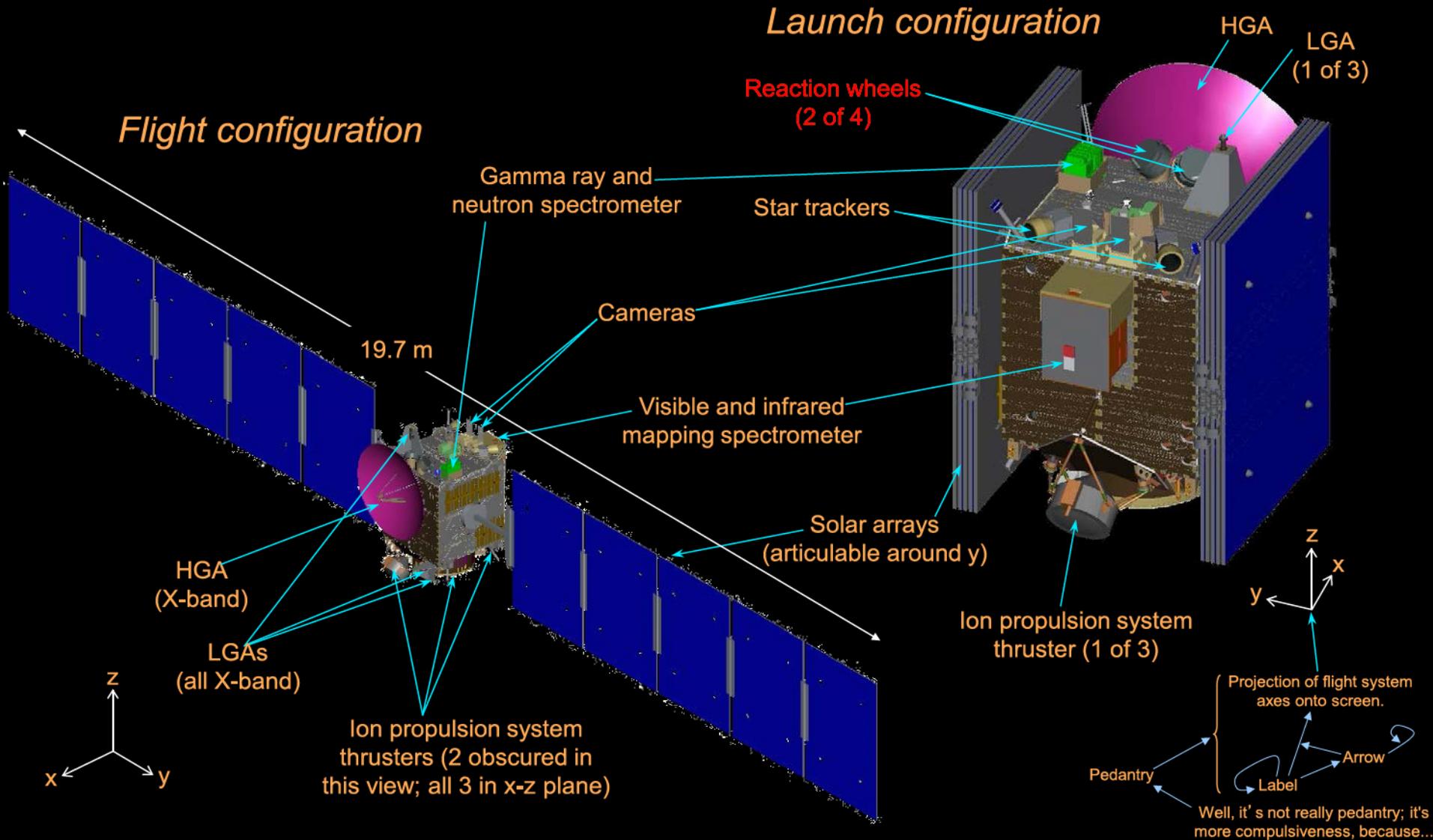




Vesta Interior Structure

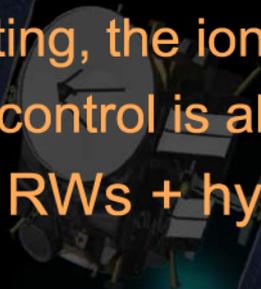


Flight System Overview



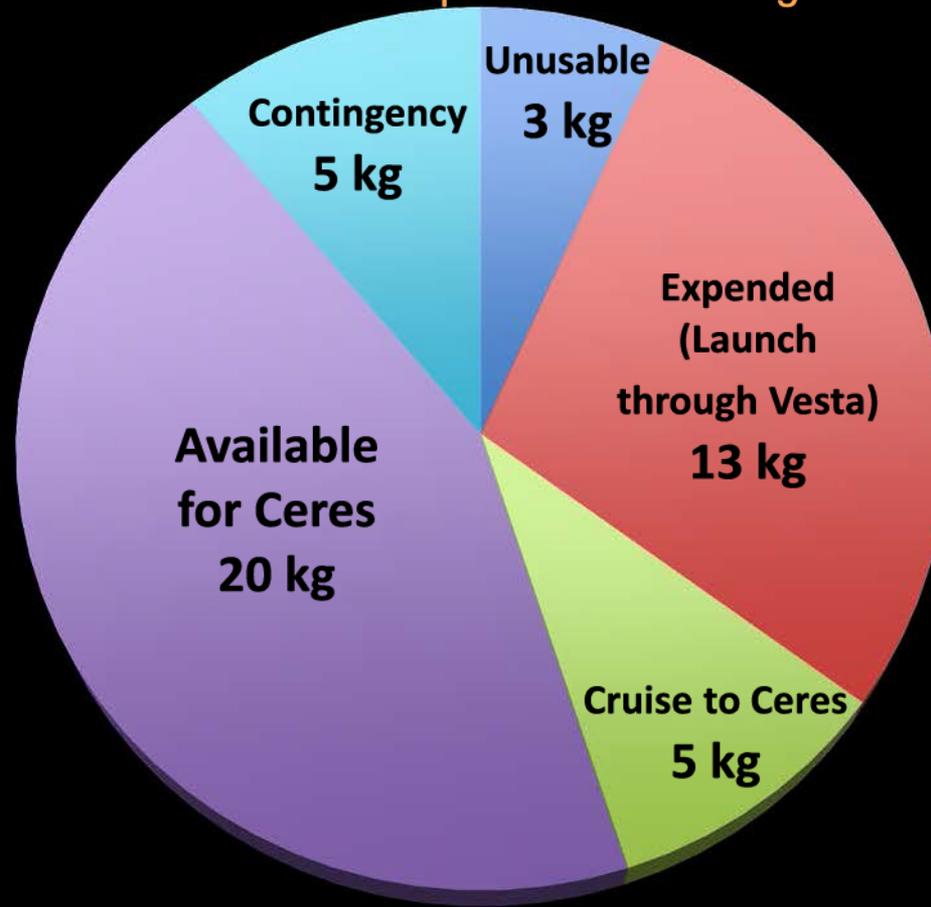
Reaction Wheel (RW) History

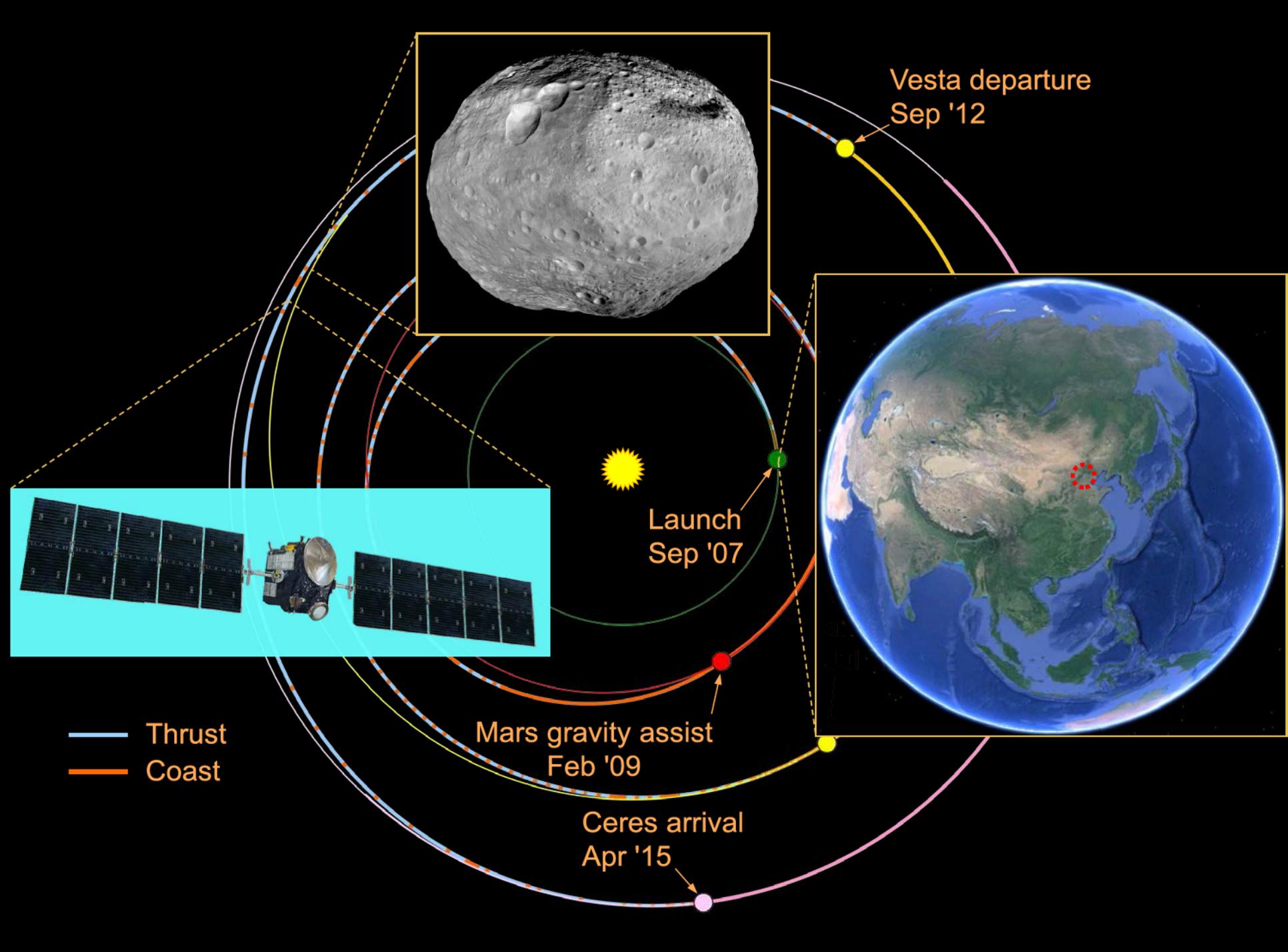
- RW4 failed in June 2010.
 - Mission continued smoothly with 3 RWs.
- All RWs powered off in August 2010 to preserve lifetime.
 - During ion thrusting, the ion engine controls two axes.
 - When coasting, control is all-hydrazine.
- "Hybrid" control (2 RWs + hydrazine) installed on spacecraft in April 2011.
- 3 RWs powered on in May 2011 for beginning of Vesta approach phase.
- RW3 failed in August 2012 during Vesta departure phase.
 - Departure continued smoothly with hydrazine control.
- RWs remain off for the flight from Vesta to Ceres.



Hydrazine Conservation

- The day RW3 failed, the project began an intensive hydrazine conservation campaign, assessing ~ 50 changes.
 - That effort was extremely productive. Among the changes implemented:
 - We reduced the spacecraft rotation rate from $0.1^\circ/\text{s}$ to $0.025^\circ/\text{s}$.
 - We increased the interval between pauses in thrusting for telecom from 1 week to 4 weeks.





Vesta departure
Sep '12

Launch
Sep '07

Mars gravity assist
Feb '09

Ceres arrival
Apr '15

— Thrust
— Coast

Ion Thrusting Progress

- Dawn has achieved the greatest propulsive Δv and the longest powered flight by any spacecraft.
- Δv
 - Today: 8.7 km/s
 - End of mission: 11 km/s \approx Delta II 7925H Δv
- Powered flight time
 - Today: 3.9 years
 - › 64% of time since launch
 - › $2.8 \cdot 10^{-8}$ % of time since Big Bang
 - End of mission: 5.5 years



Selected Near-Term Milestones

- Reduce ion throttle level and power on TWTA: tomorrow at 00:35
- Power TWTA off: tomorrow at 02:38
- Increase ion throttle level: tomorrow at 02:39
- Attend presentation of "DEM Simulation of Sampling Tool Mechanism for Low Gravity Bodies": ~ 2 minutes from now
- Eat lunch: ~ 13:00
- Return to Los Angeles: October 4 at 12:00
 - Note to self: Buy cat food on the way home from the airport

