Asteroid 101

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IMAGE 1

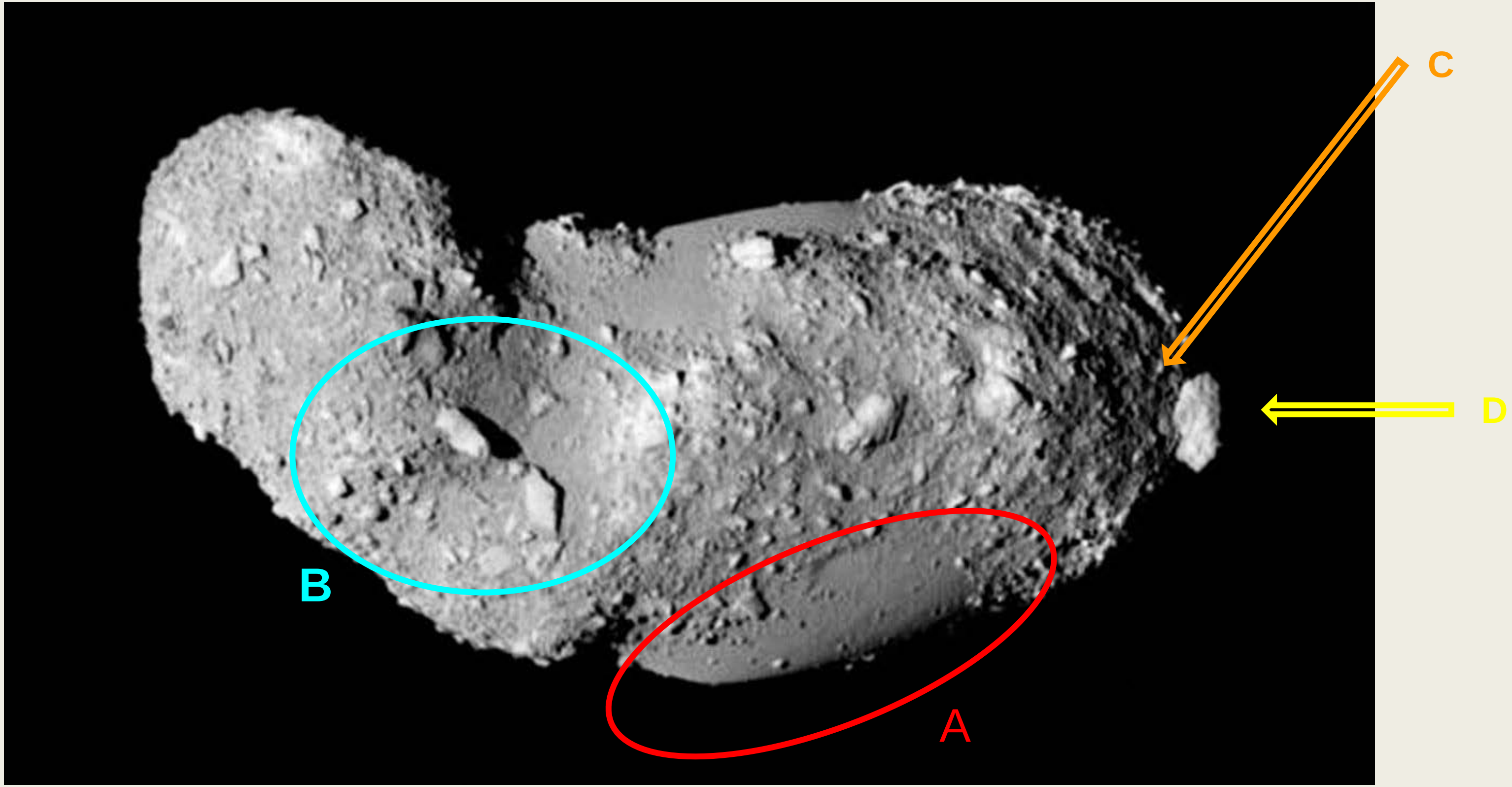
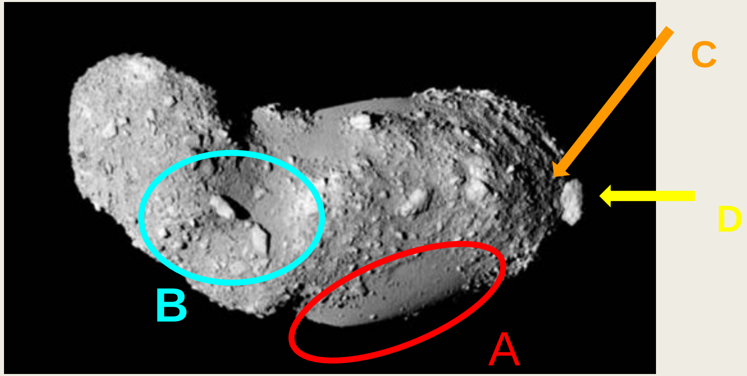


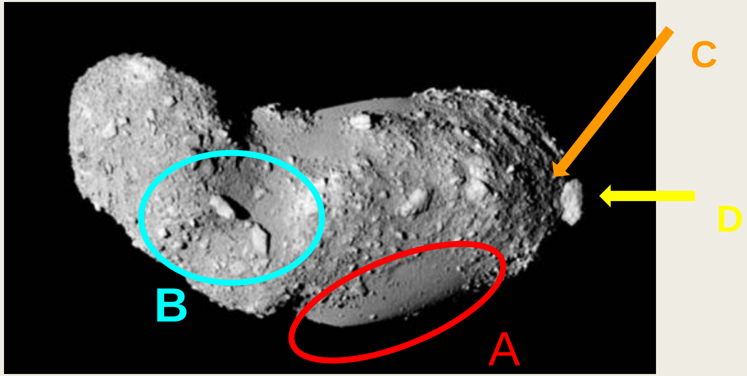
Image 1

Background



- Asteroid Itokawa
- About 300m in diameter
- S-type – rich in silicates
- Information collected from the Hayabusa mission shows that Itokawa was formed from other parent bodies
- Porosity is about 40%
- Bulk density is 1.9g/cm3
- Ordinary chondrite

Image 1
Features



- Smooth surfaces (A)
- Boulders/regolith fragments (B)
- Regolith- large boulders, some fine dust as well
- *Lack of craters*

Image 1

Regolith/Boulders

- Regolith/boulders formed through impacts from other bodies in space
- Gravitational attraction pulled the fragments to Itokawa – indicates strong gravitational pull
- The abundance of boulders and rubble could indicate that this asteroid formed from other parent bodies
- Certain fragments are younger than others, seeing as some regolith had to be present for other fragments to be overlaying it
    - example: C must have been present before D, because D is sitting on top of C

Image 1
Surface

- Smooth parts (A) likely formed first - evidenced by the regolith fragments (B) which have settled on top

- Relatively rounded edges to fragments indicate softer impact with surface and/or weathering

- Lack of craters could indicate evidence of seismic activity and/or weathering from outside forces

- The regolith particles show evidence of space weathering and abrasion

IMAGE 2

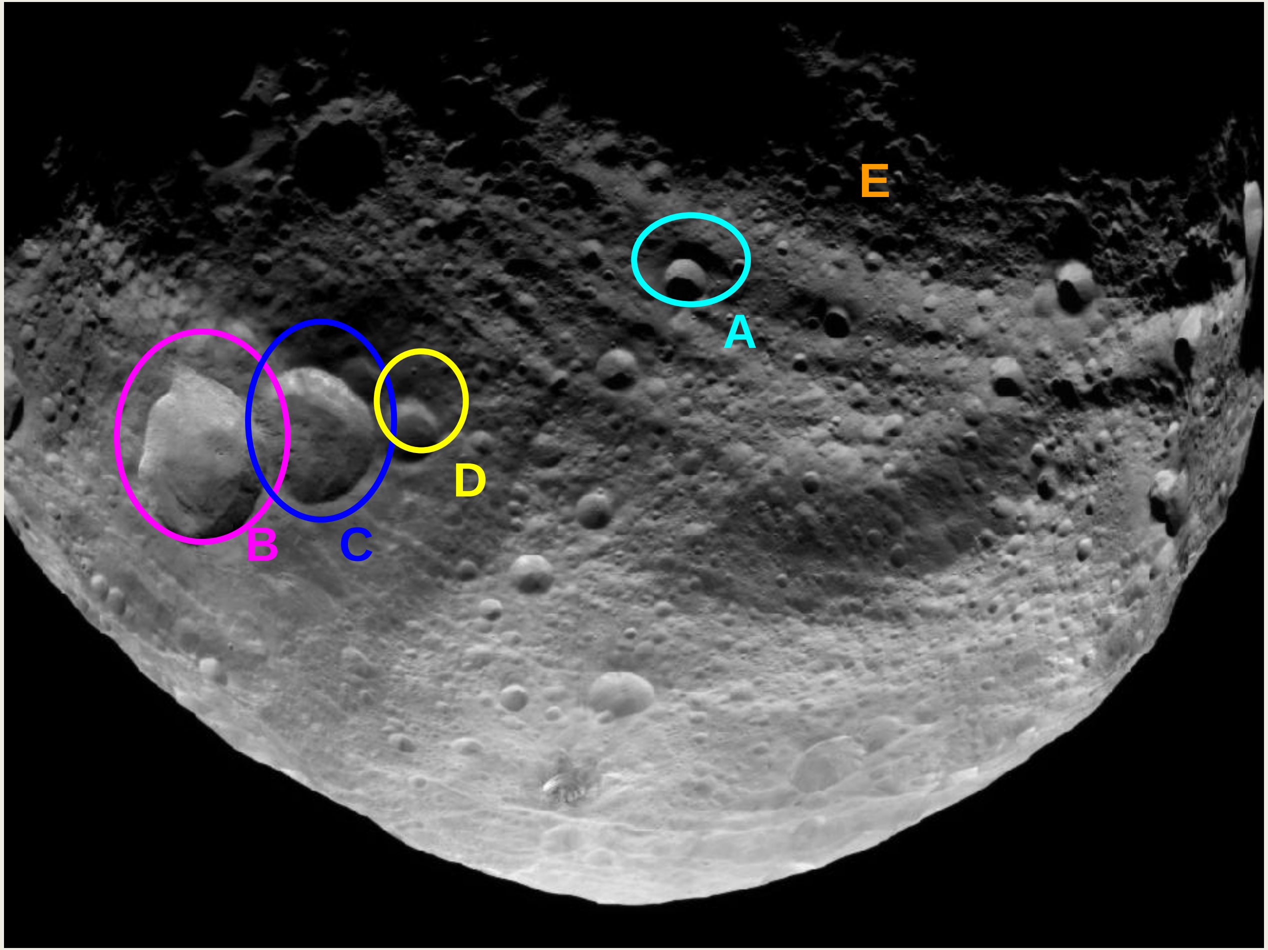


Image 2

Background

- Asteroid Vesta- second largest asteroid in asteroid belt, at about 530 km in diameter
- Regolith made of igneous rock, and evidence of many craters
- No evidence of volcanic activity
- Contains an iron core 220 km across
- Formed from many different parent bodies, leftover planetary material

Image 2

Features

- Impact craters (A-D)
- Relief shown - ridges- evidence of seismic activity (E)
- Spherical shape
- Evidence of steeper slopes - shadows

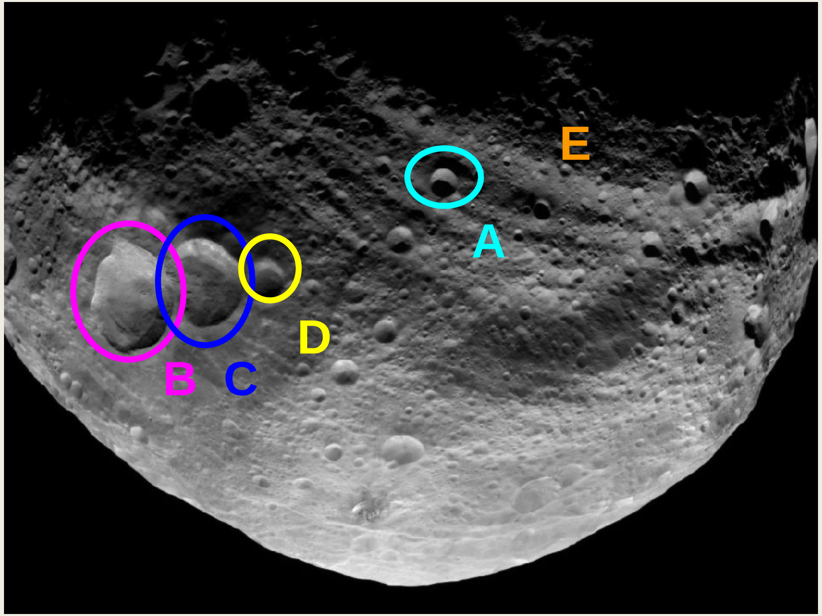


Image 2

Impact Craters

- Impact craters form in three phases:
  - the compression phase - energy from impactor is transferred to the surface, impactor explodes
  - excavation phase - material ejected from impact moves radially outwards with shock waves, crater is formed
  - modification phase - final crater is formed, fallback occurs
- The type of crater (simple vs. complex) is determined by the amount of energy/size of the impact

Image 2
Impact Craters

- Craters B, C, and D are complex craters - unsure of what level due to camera angle/picture quality
- Craters B, C, and D were therefore formed by high-energy impactors
- Crater B is younger than crater C, evidenced by the walls/ejecta cutting into the smaller, older crater
- Crater A is a simple impact crater - evidenced by the smooth, bowl-shaped depression
- Crater A was therefore formed by a relatively low-energy impactor

Image 2

Ridges and Surface

- Since the ridges shown (E) were likely formed through seismic activity, the craters must be younger than the ridges, or they would have been wiped away due to the tectonic reshaping
- All craters shown also overlay the ridges, so the ridges would be older
- Spherical shape due to strong gravitational attraction and weathering

IMAGE 3

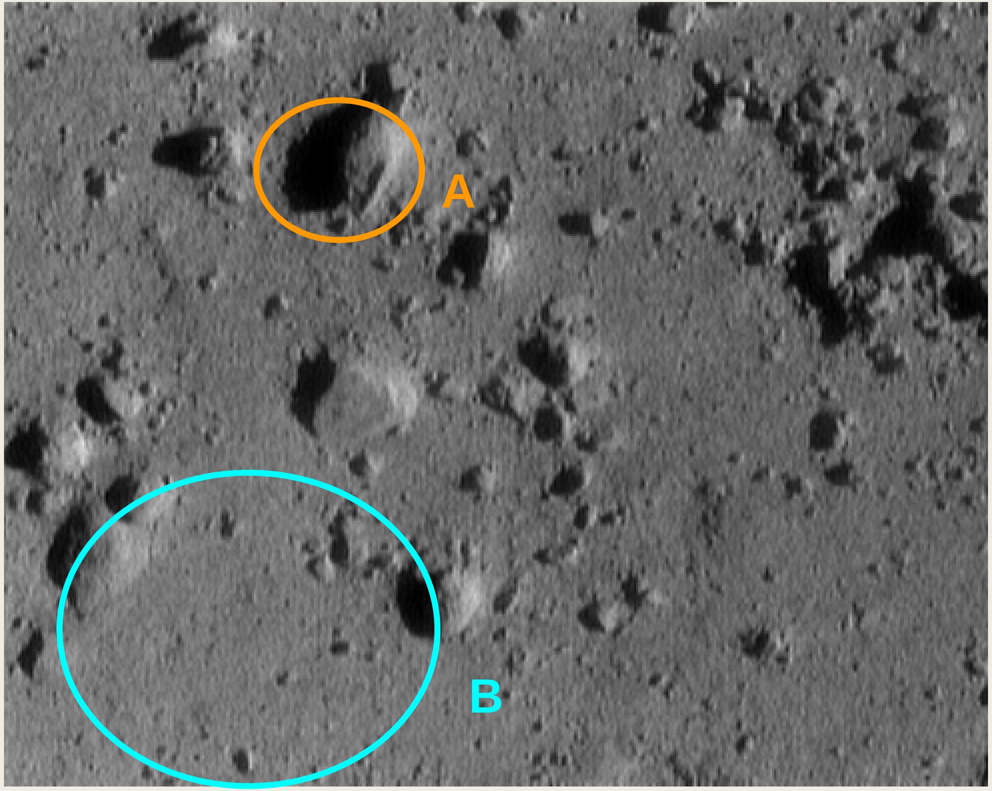


Image 3

Background

- 17 km of the surface of 433 Eros

- About 4315 km across

- S-taxonomic class

- Very different regolith from asteroid Itokawa

- 10m-100m of deep layer of fine dust (smooth) with few boulders and pebbles (rough)

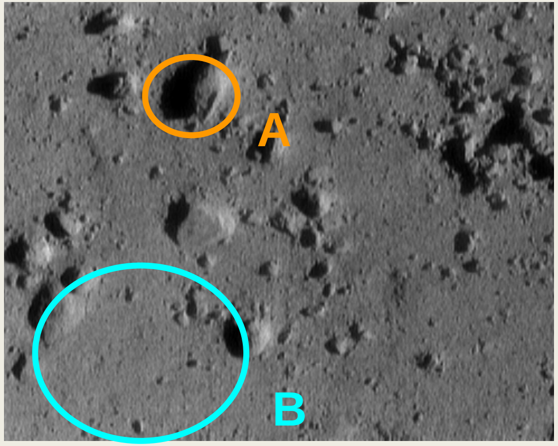


Image 3
Features

- Boulders/regolith fragments (A)

- Deep layer of fine dust(10- 100 meters thick)

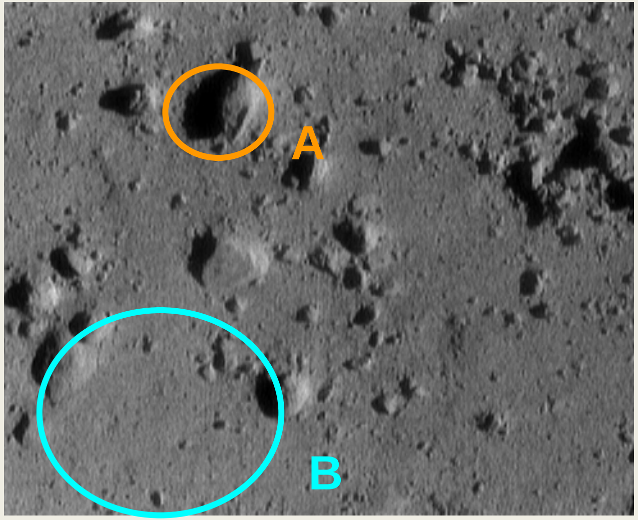


Image 3

Boulders/Regolith

- Boulders/regolith (A) – evidenced by shadows
- Patches of dust and pebbles (B)
- Dust would have formed during the formation of the asteroid and/or through repeated impacts
- Boulders/regolith would have formed during impacts with other bodies and been pulled back to the surface through gravity

Image 3
Surface

- The fine layer of dust formed first because the boulders were placed after
- Relatively rounded edges to fragments indicate softer impact with surface and/or weathering
- Lack of craters - possibly because of seismic shaking that wiped away evidence of cratering, or space weathering