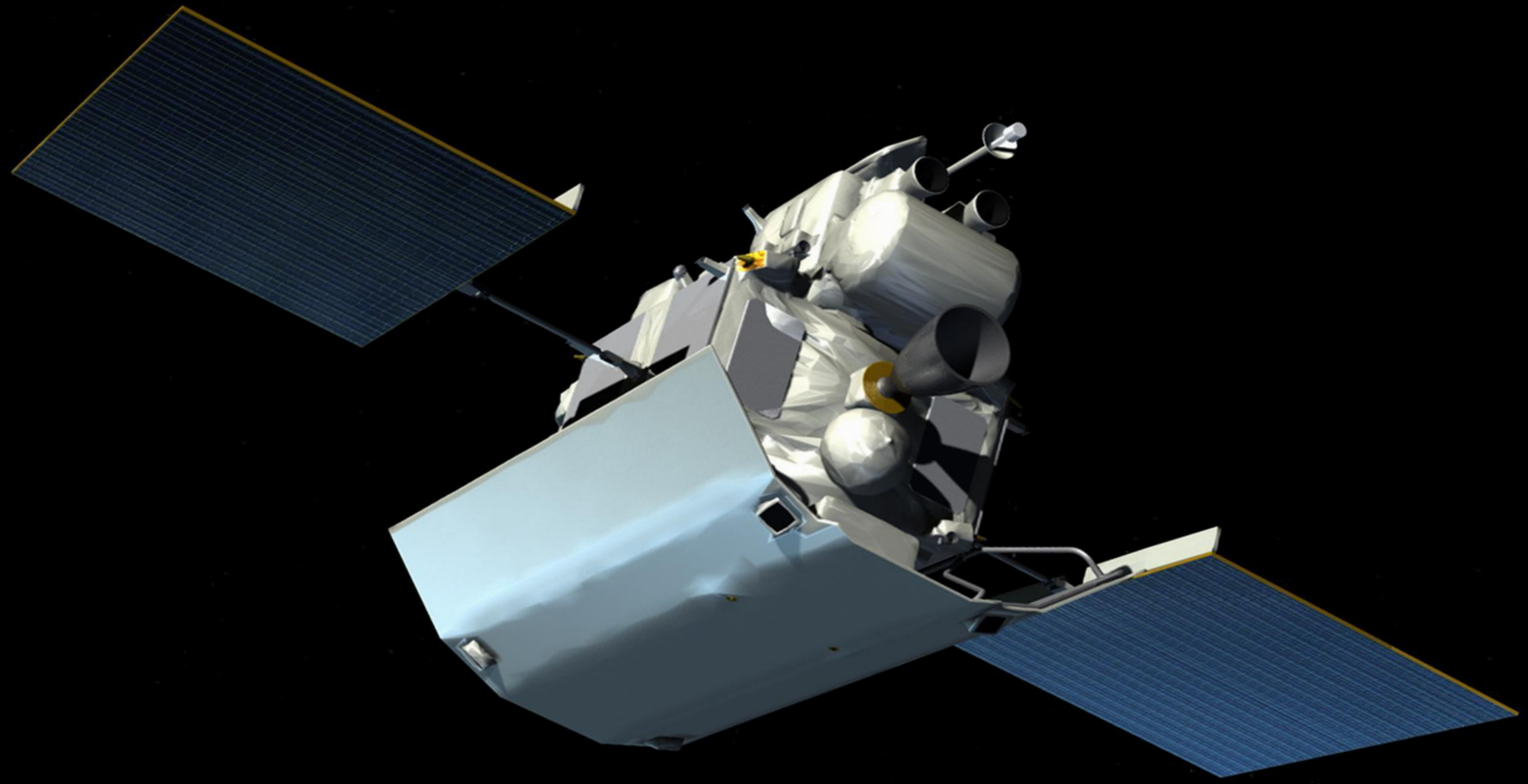
MESSENGER

MErcury Surface, Space ENvironment, GEochemistry, and Ranging

NASA Returns To Mercury in 2011 with MESSENGER



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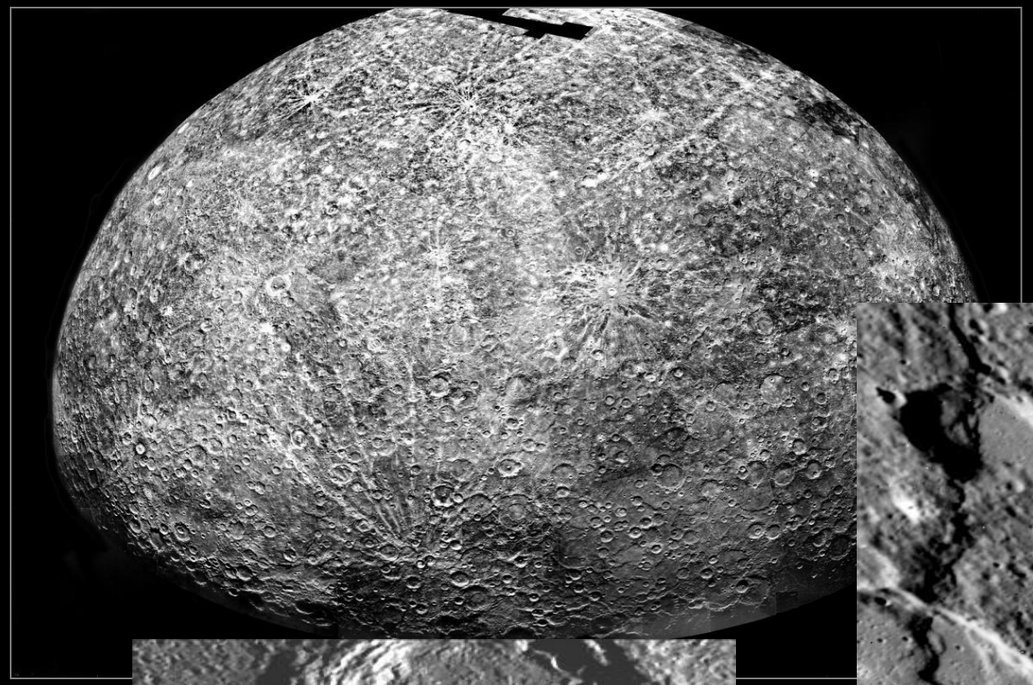
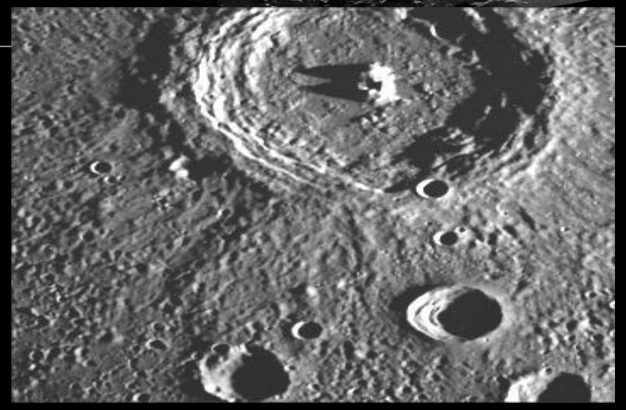
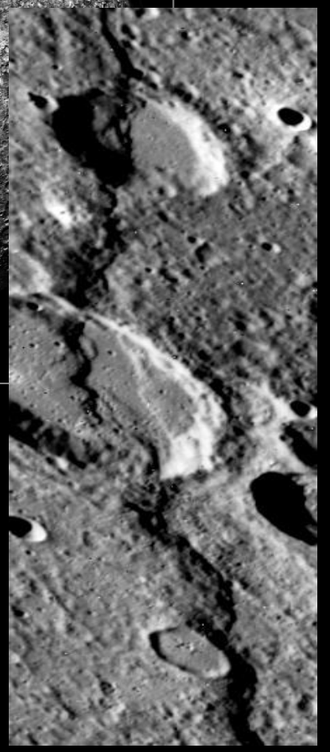
- This is the first mission to Mercury since Mariner 10 in 1975
- It will fully map the entire surface of Mercury
- It is carrying instruments to study mysteries of Mercury's geology, thin atmosphere, tiny polar caps, and magnetic field







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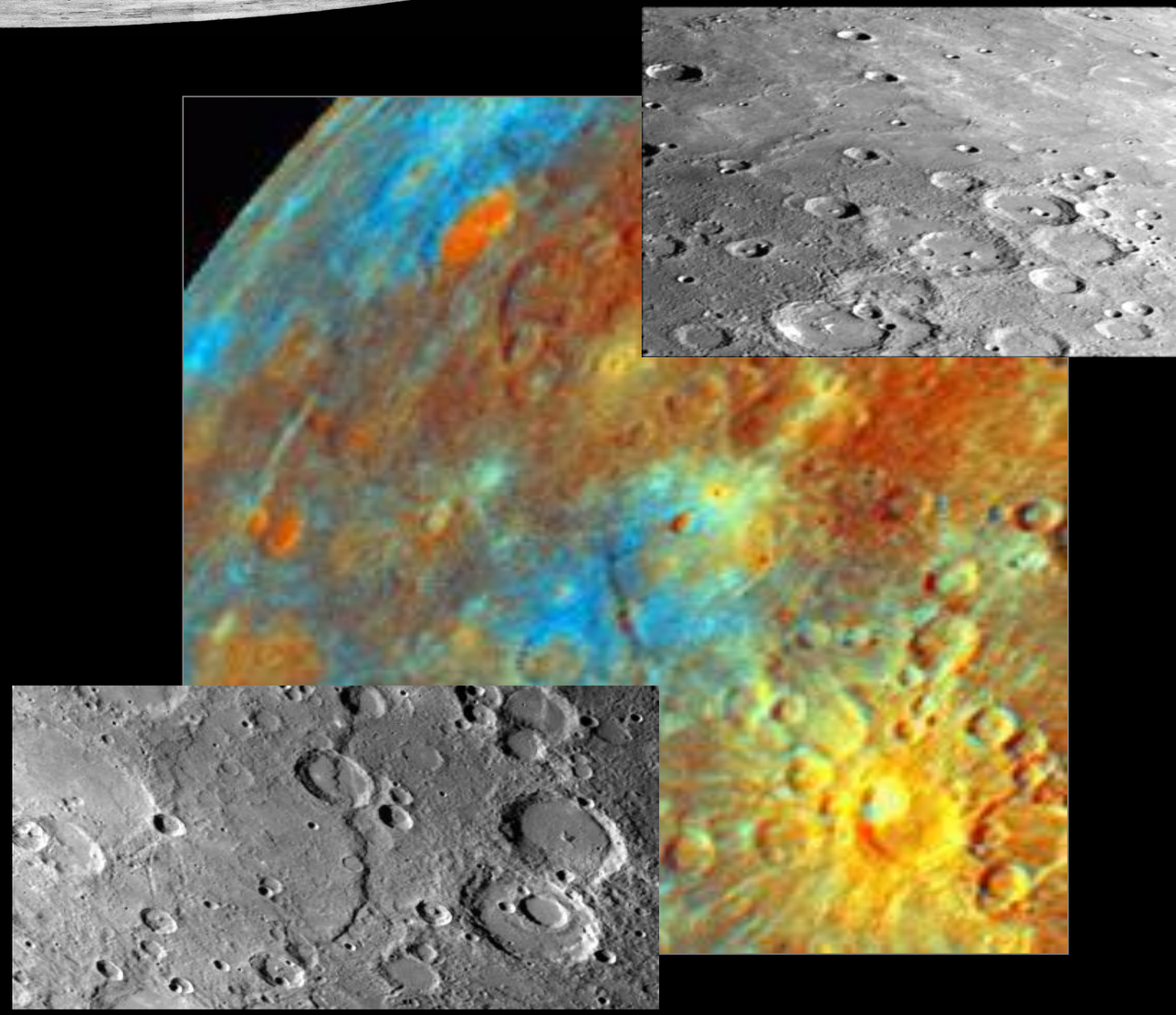
Key questions for MESSENGER to answer:

- Why is Mercury so dense and iron-rich?
- What is the geologic history of Mercury?
- What is the structure of Mercury's core?
- What is the nature of Mercury's magnetic field?
- What are the unusual materials at Mercury's poles?



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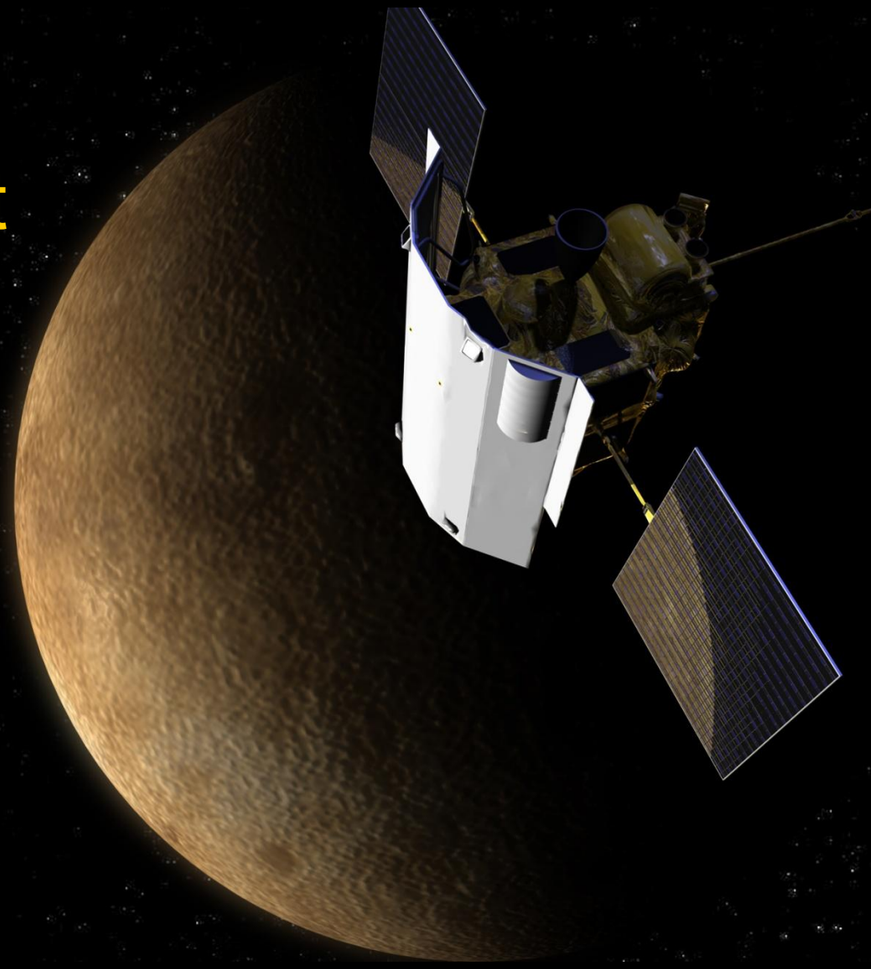
What do we already know about Mercury?

- Mercury's density is the highest of any planet
- It's exotic atmosphere is the thinnest among all the terrestrial planets
- It is the only terrestrial planet, besides Earth, to possess a magnetic field
- Temperatures on Mercury vary from the highest in the solar system at its equator to among the coldest in its permanently shadowed poles



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- MESSENGER was launched on August 3, 2004 from Cape Canaveral Air Force Station, Florida
- The probe used flybys of Earth, Venus, and is using Mercury itself to get into Mercury's orbit
- The trip to Mercury is taking 7 years, but scientific research will be possible during that time.

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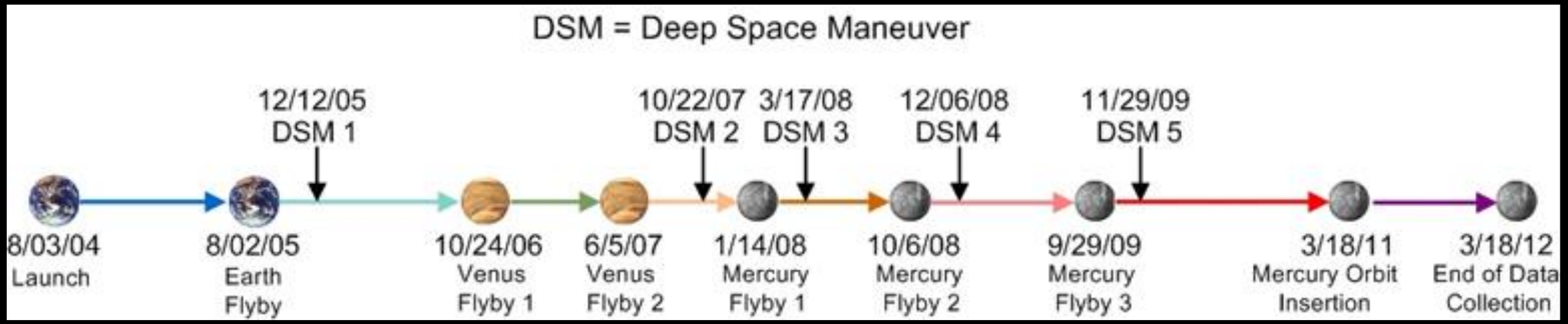

- MESSENGER used gravity assists from Earth, Venus, and Mercury to lower its speed
- Each gravity assist changed the shape, and tilt of MESSENGER'S orbit to get it ready for orbit insertion
- The first of two gravity assist flybys of Venus occurred on October 24, 2006.
- A second of two gravity assisted flybys of Venus occurred on June 5, 2007.

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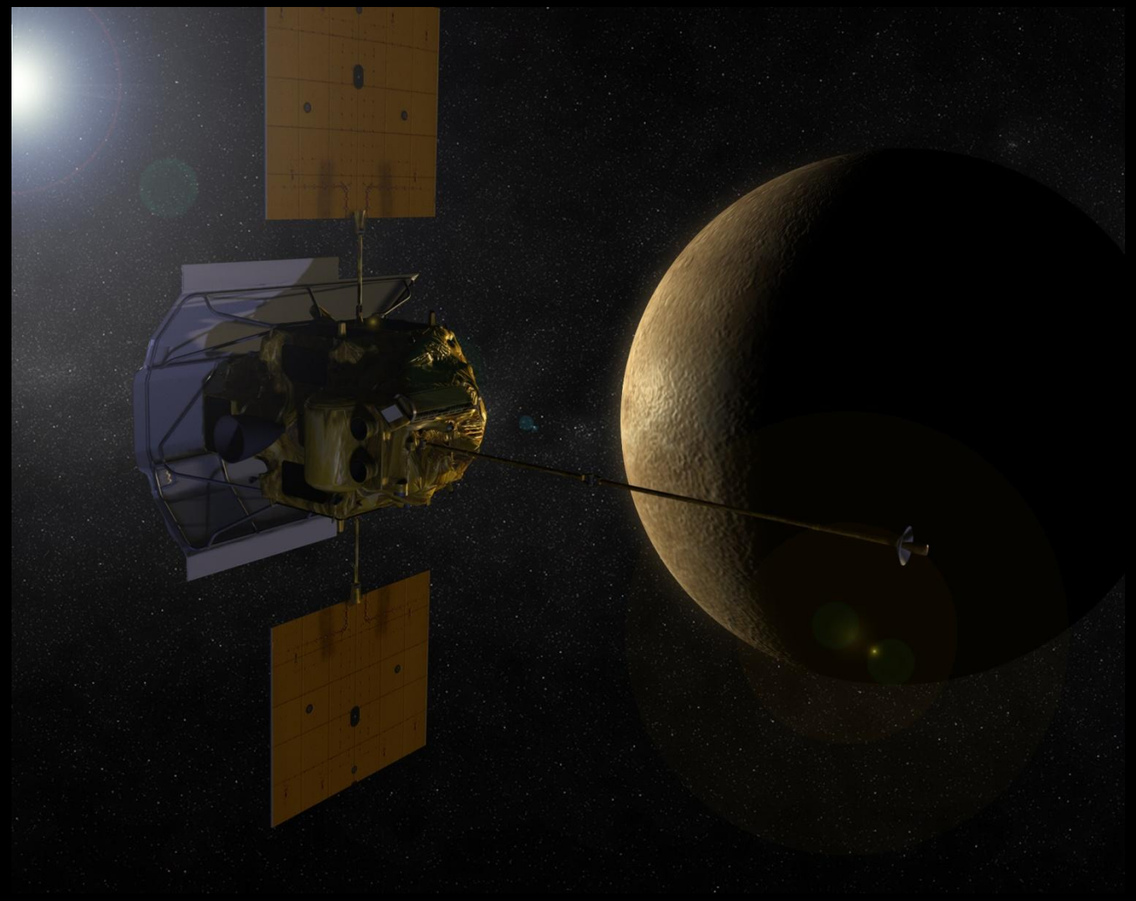

On March 18, 2011, the MESSENGER spacecraft will enter into orbit around Mercury, becoming the first spacecraft ever to orbit the Solar System's innermost planet.

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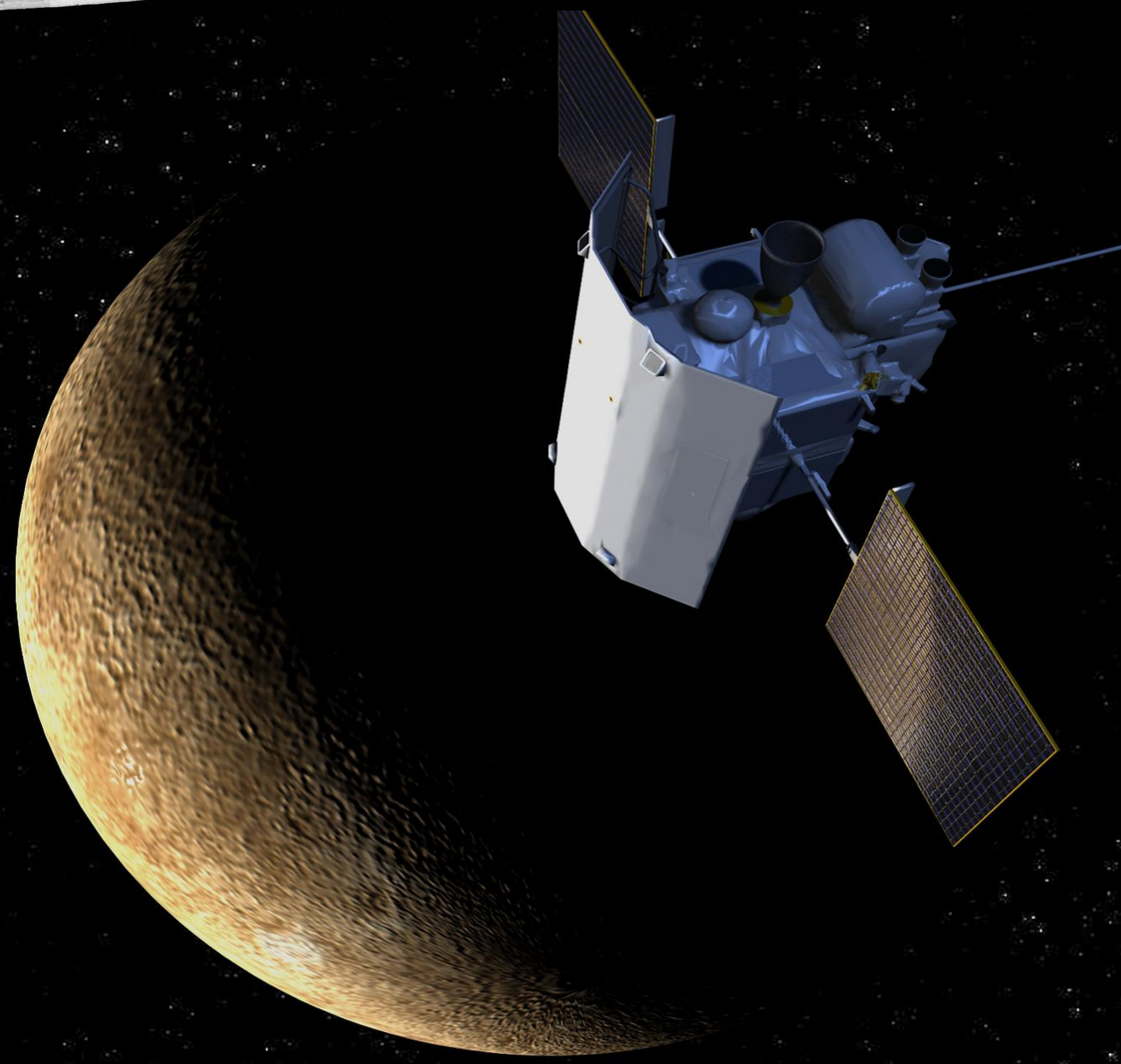
- The spacecraft will have an extremely elliptical orbit of Mercury at an altitude of 200 km (124 miles) at its lowest point and more than 15,193 km (9,420 miles) at its highest
- MESSENGER'S 12-month orbit will cover 2 Mercury solar days (sunrise to sunrise) which is equal to 176 Earth days



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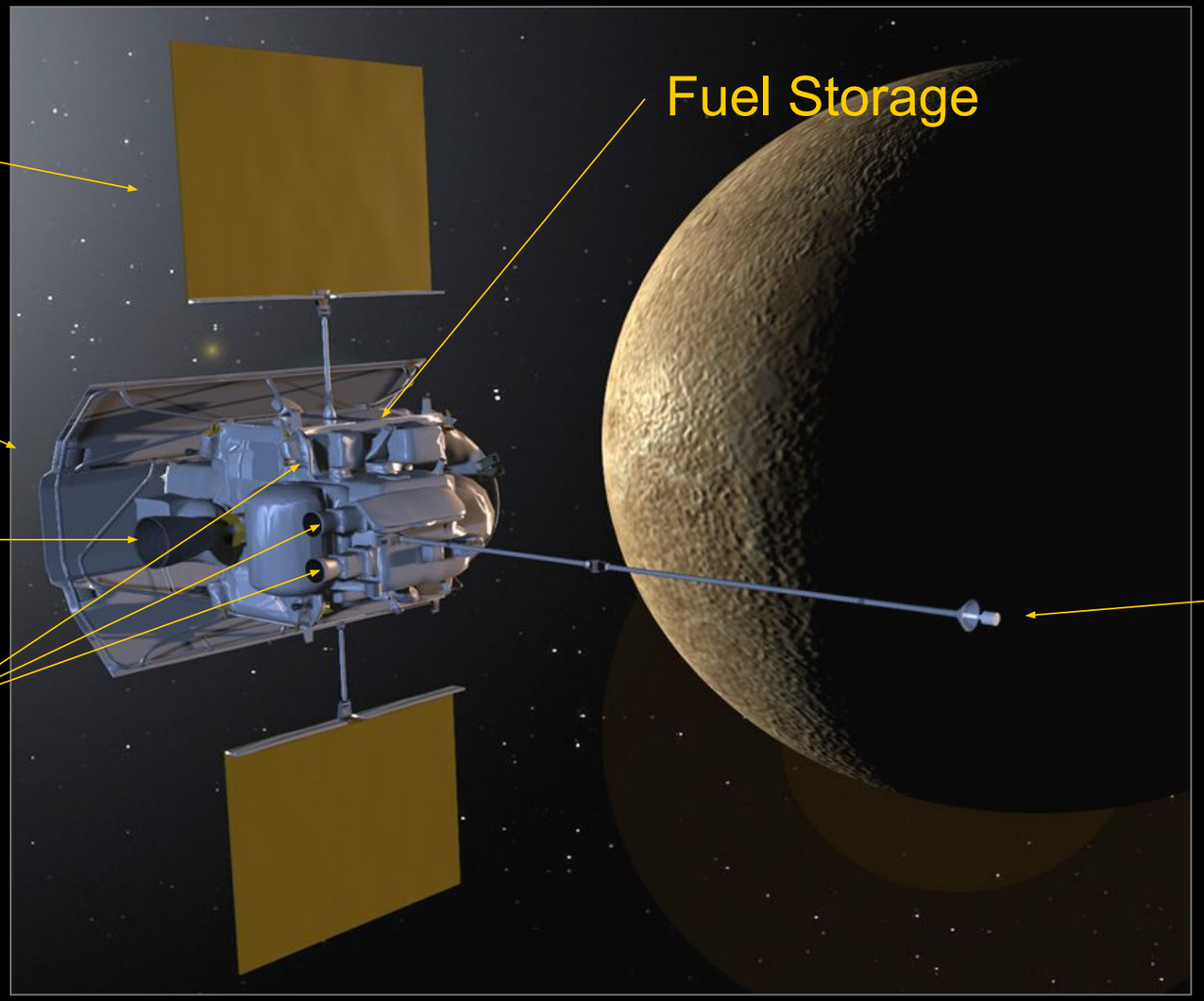

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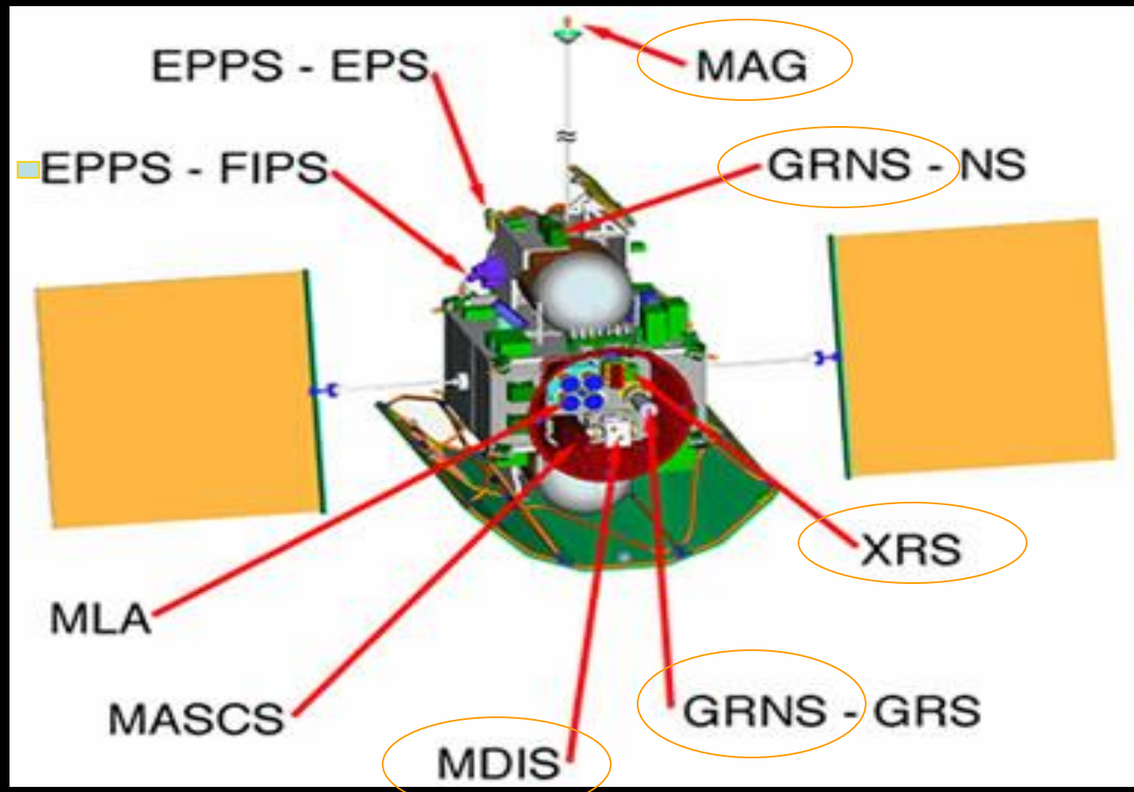
MESSENGER'S instruments:

- MDIS (Mercury Dual Imaging System)—map landforms, gather topographic information
- GRNS (Gamma-Ray and Neutron Spectrometer)—map surface elements on Mercury to determine if there is ice at the poles
- XRS (X-Ray Spectrometer)—detect emitted x-rays to measure various elements in the crust
- MAG (Magnetometer)—map Mercury's magnetic field



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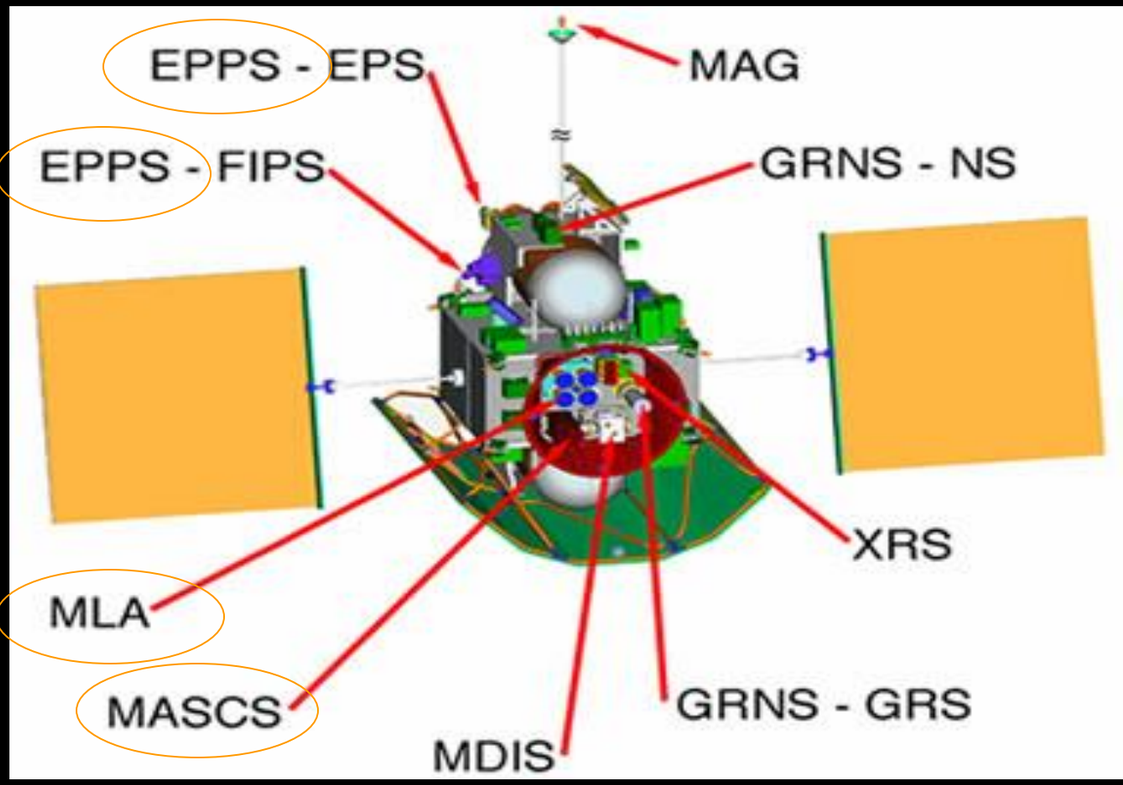
Systems

MESSENGER'S instruments:

- MLA (Mercury Laser Altimeter—measure the amount of time for light to go to the surface and back to map topography
- MASCS (Mercury Atmospheric and Surface Composition Spectrometer)—measure atmospheric gases and minerals on the surface
- EPPS (Energetic Particle and Plasma Spectrometer)—analyze Mercury's atmosphere
- RS (Radio Science)—study Mercury's mass and thickness of it's crust



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- On June 21, 2006 MESSENGER performed its final flip maneuver to keep its sunshade toward the Sun
- The sun is up to 11 times brighter on Mercury than we see on Earth and surface temperatures can reach 450°C (840°F)
- The sunshade of heat-resistant ceramic cloth will keep MESSENGER operating at room temperature

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- On June 5, 2007 Messenger made its closest approach to Venus and sent back data on the planet
- Venus Express is presently orbiting Venus, and the two spacecrafts sent back complimentary data on cloud structure, atmospheric conditions, magnetic fields, and atmospheric oxygen airglow

Messenger's MDIS camera took this picture on June 5 of Venus enshrouded in clouds

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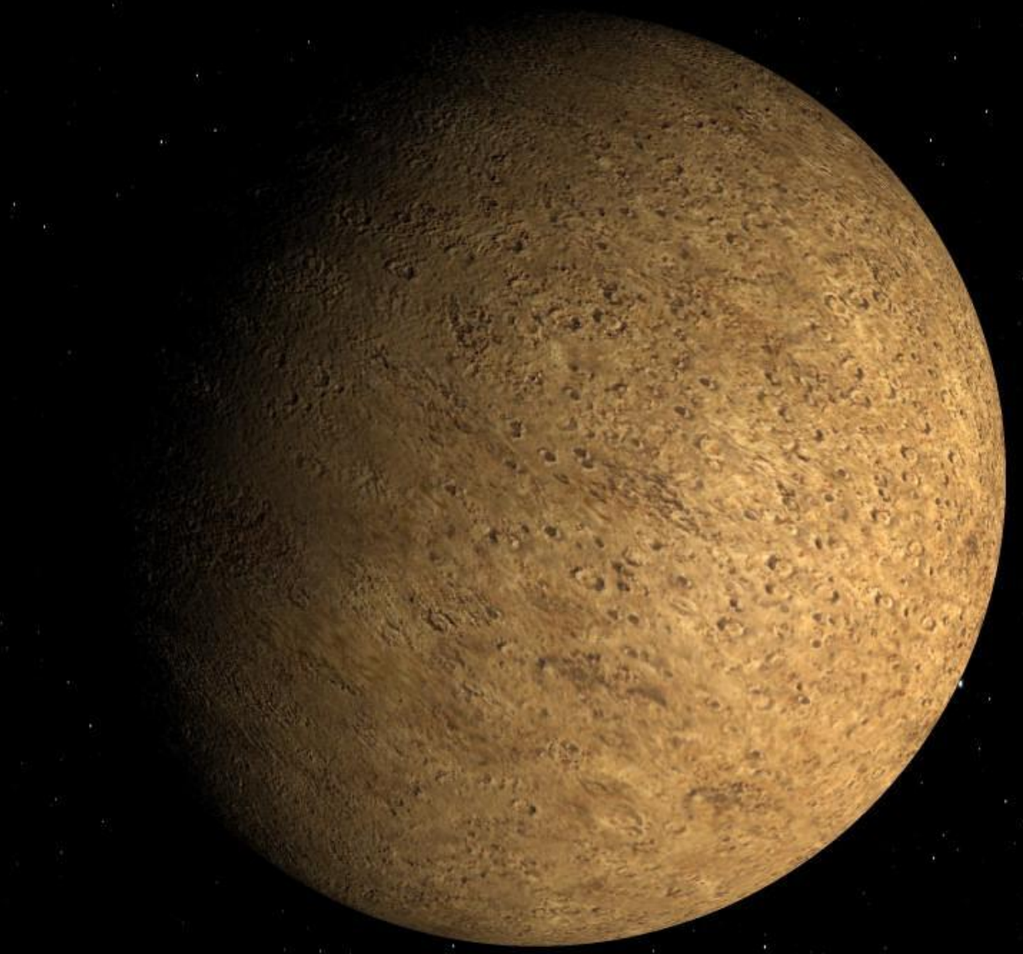
- Scientists pored over the 614 images of Venus sent back from Messenger that helped them calibrate the MDIS camera in preparation for its first flyby of Mercury on January 14, 2008



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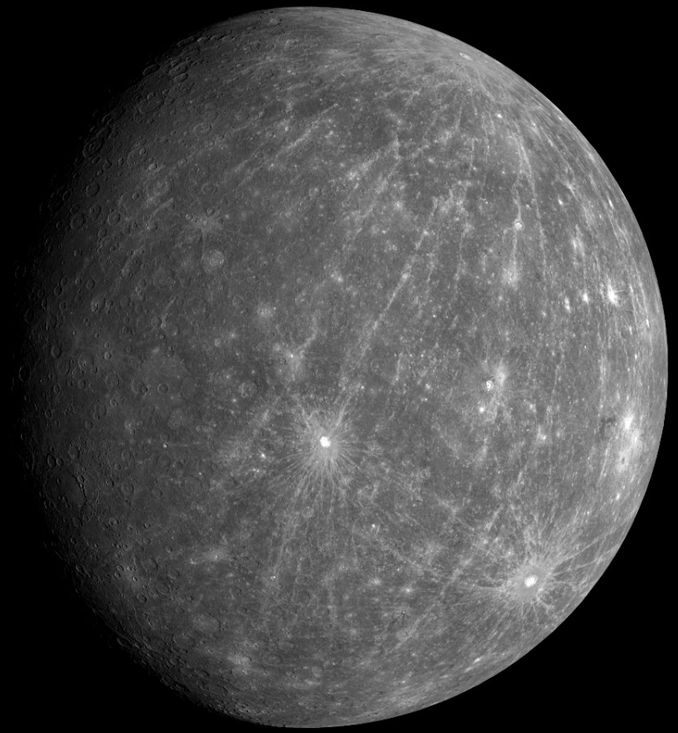

On October 6, 2008, the MESSENGER spacecraft passed a mere 200 kilometers (124 miles) above Mercury's surface for the mission's second flyby of its target planet.

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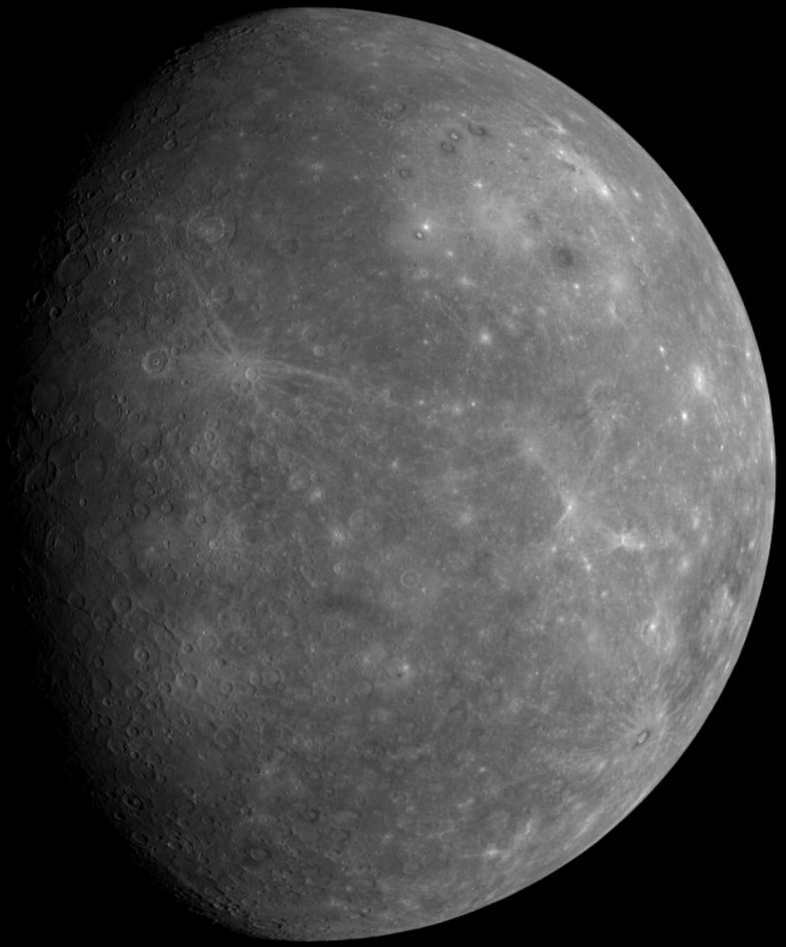

First image of the previously unseen side of Mercury.

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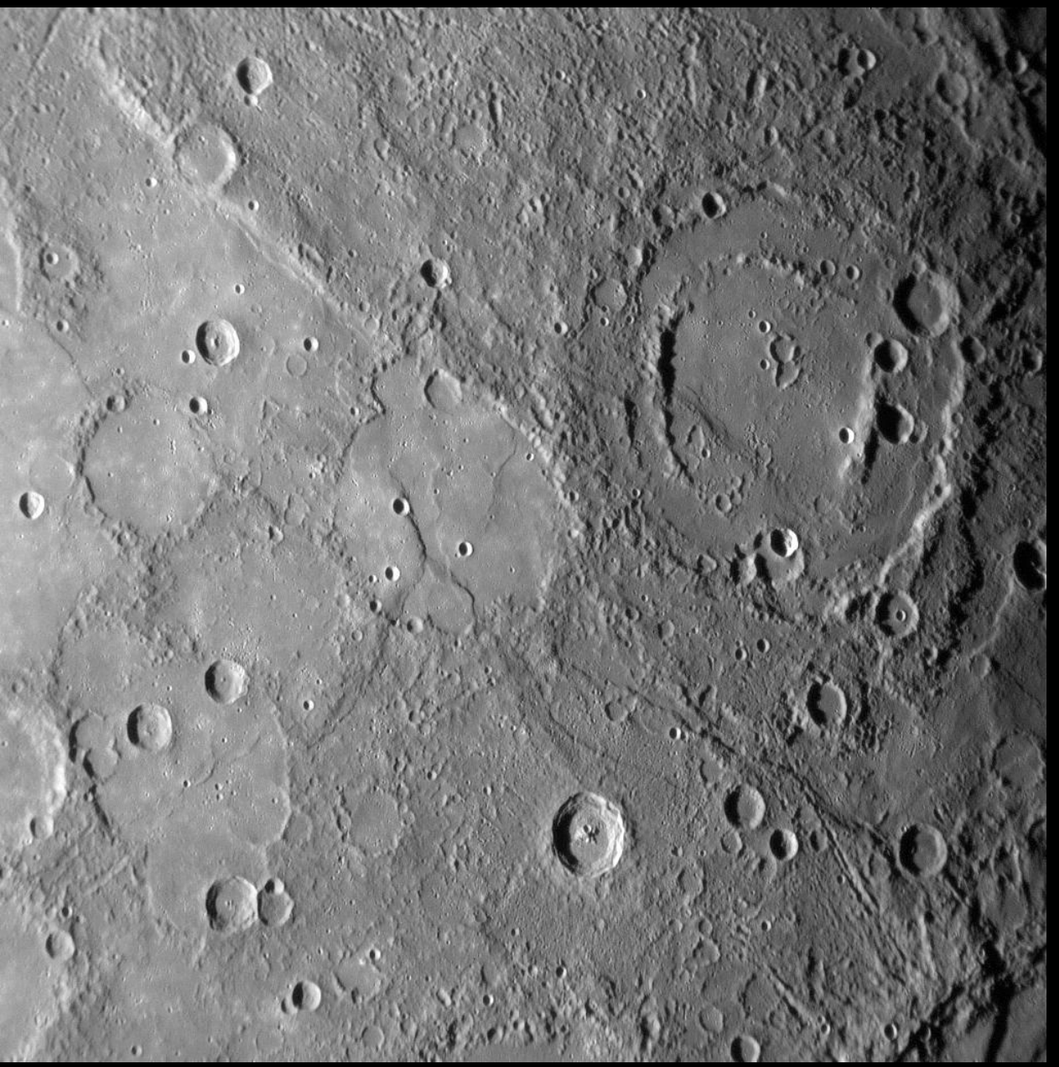

As MESSENGER sped by Mercury on January 14, 2008, the Narrow Angle Camera (NAC) of the Mercury Dual Imaging System (MDIS) captured this image before its closest approach with the planet. The scene is near Mercury's terminator (the line between the sunlit day side and dark night side of the planet), where shadows are long and height differences accentuated, revealing rising crater walls that tower over the floors below.

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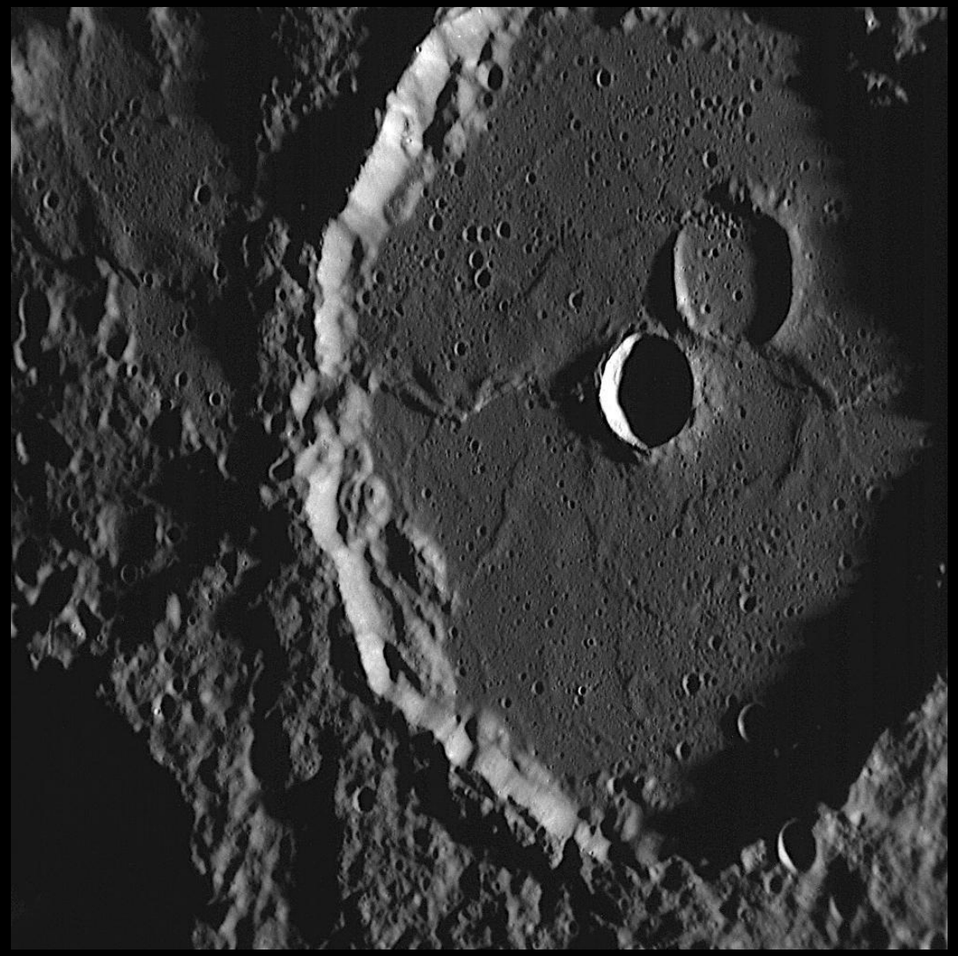

Machaut is the name of a crater, approximately 100 kilometer (60 mile) in diameter, first seen under high-sun conditions by Mariner 10 in the 1970s.

Credit: NASA/Johns Hopkins University Applied Physics Laboratory/Carnegie Institution of Washington

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http://www.nasa.gov/mission_pages/messenger/main/index.html

http://www.nasa.gov/home/hqnews/2010/jul/10-170_Messenger_New_Info.html

http://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=2004-030A

http://www.nasa.gov/mission_pages/messenger/multimedia/index.html