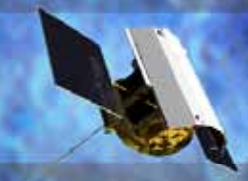
MESSENGER
MErcury Surface, Space ENvironment, GEochemistry, and Ranging



Revealing Mercury:

One year of images from MESSENGER, the first spacecraft to orbit the Solar System's innermost planet

Presented by:

Dr. Nancy L. Chabot

MDIS (Mercury Dual Imaging System) Instrument Scientist

Johns Hopkins University Applied Physics Laboratory

Possible due to:

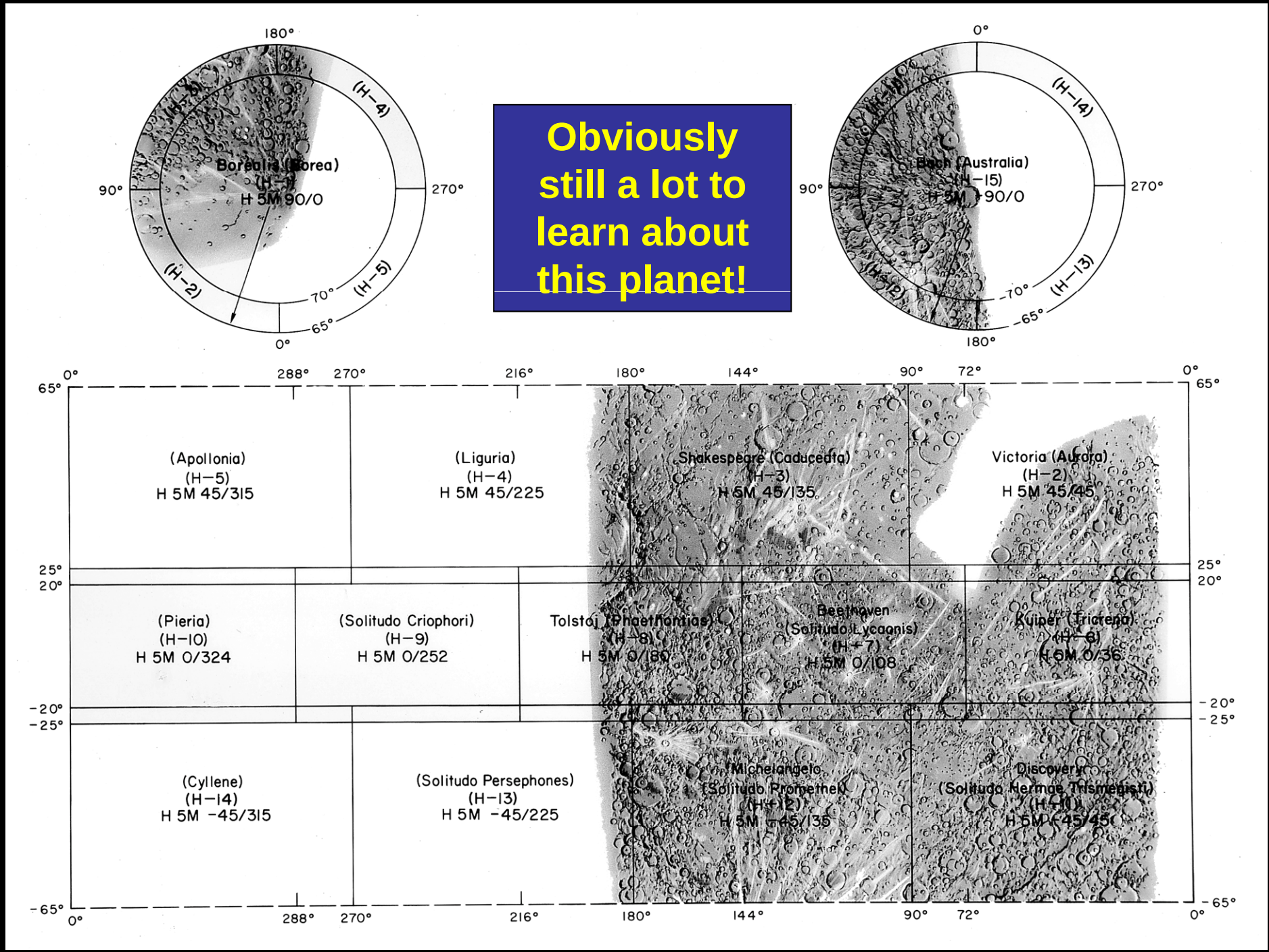
The efforts of many!

March 10, 2012

Mariner 10: The First Mercury Mission

- Mariner 10 was launched Nov. 3, 1973.
- After an encounter with Venus on Feb. 5, 1974, it flew by Mercury three times: March 29, 1974; Sept. 21, 1974; and March 17, 1975
- **Mariner 10 was the only mission to Mercury until MESSENGER**

Map of Mercury after Mariner 10



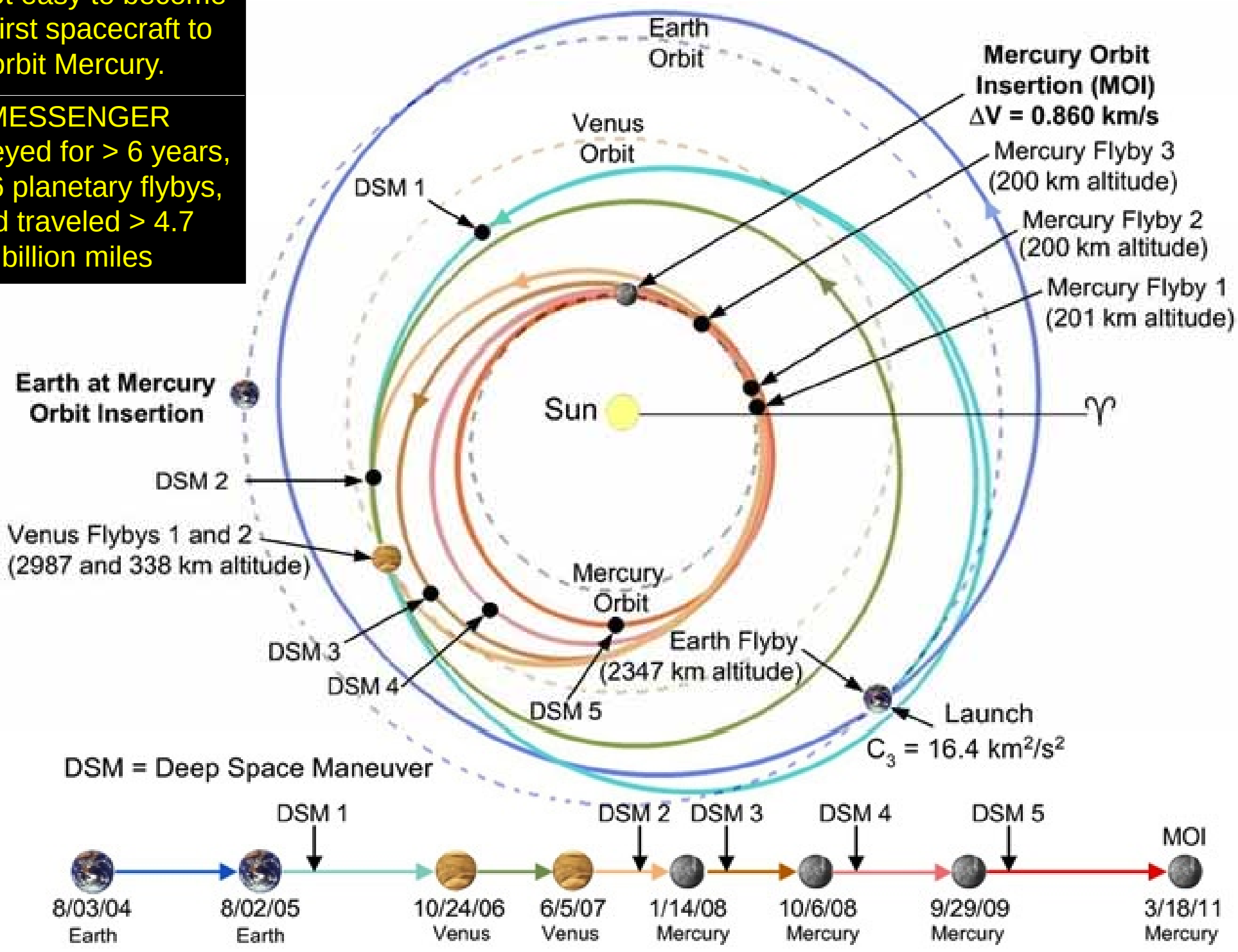
MESSENGER

MErcury Surface, Space Environment, GEochemistry and Ranging

- Launched in 2004, the first mission to Mercury in 30 years
- **The First Mercury Orbiter!**
- Goal: Comprehensive investigation of Mercury's surface, interior, exosphere and magnetosphere

It's not easy to become the first spacecraft to orbit Mercury.

MESSENGER journeyed for > 6 years, had 6 planetary flybys, and traveled > 4.7 billion miles



Insert movie: MESSENGER_trajectory.mp4 here

It's not easy to become the first spacecraft to orbit Mercury.

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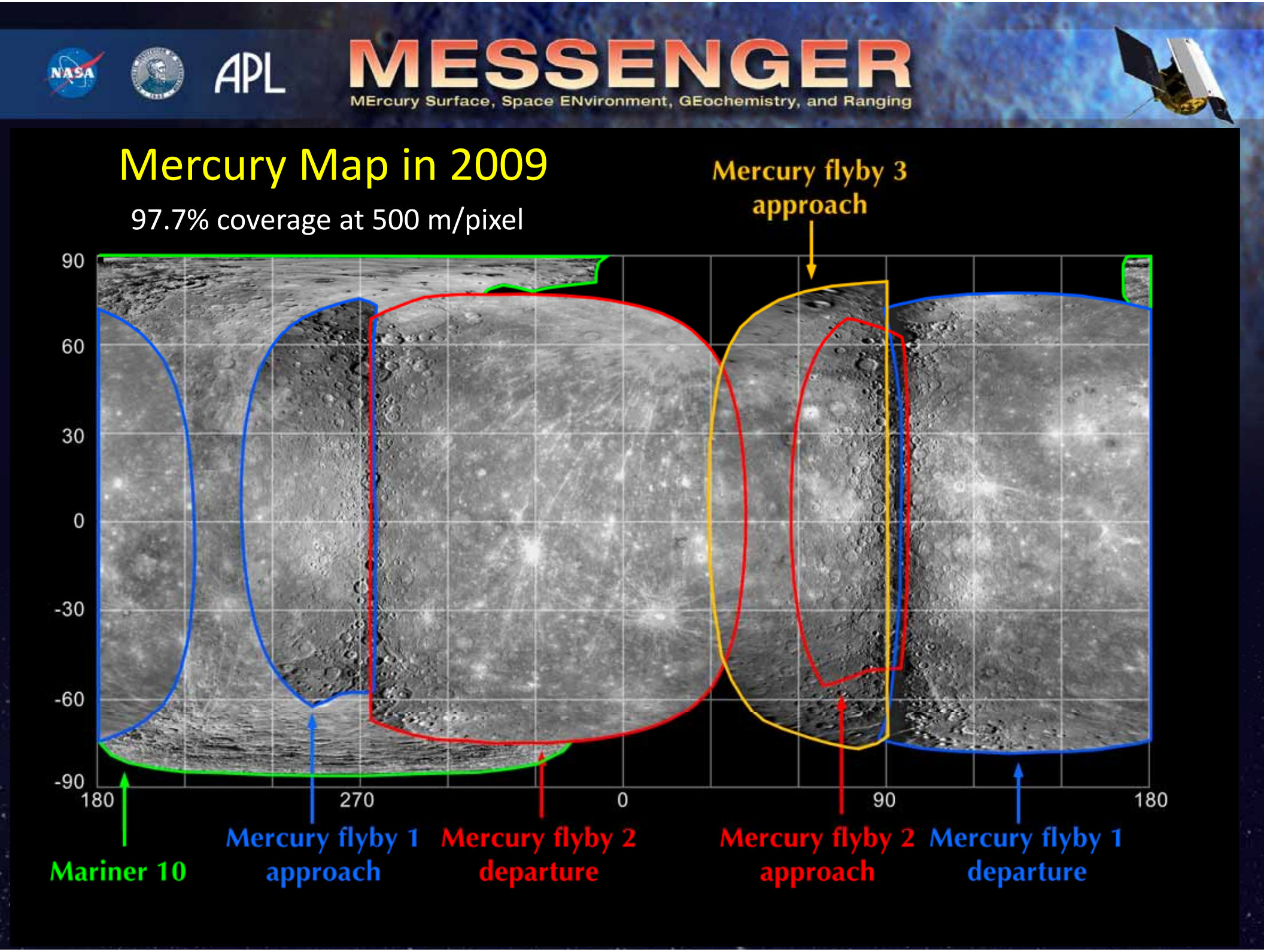
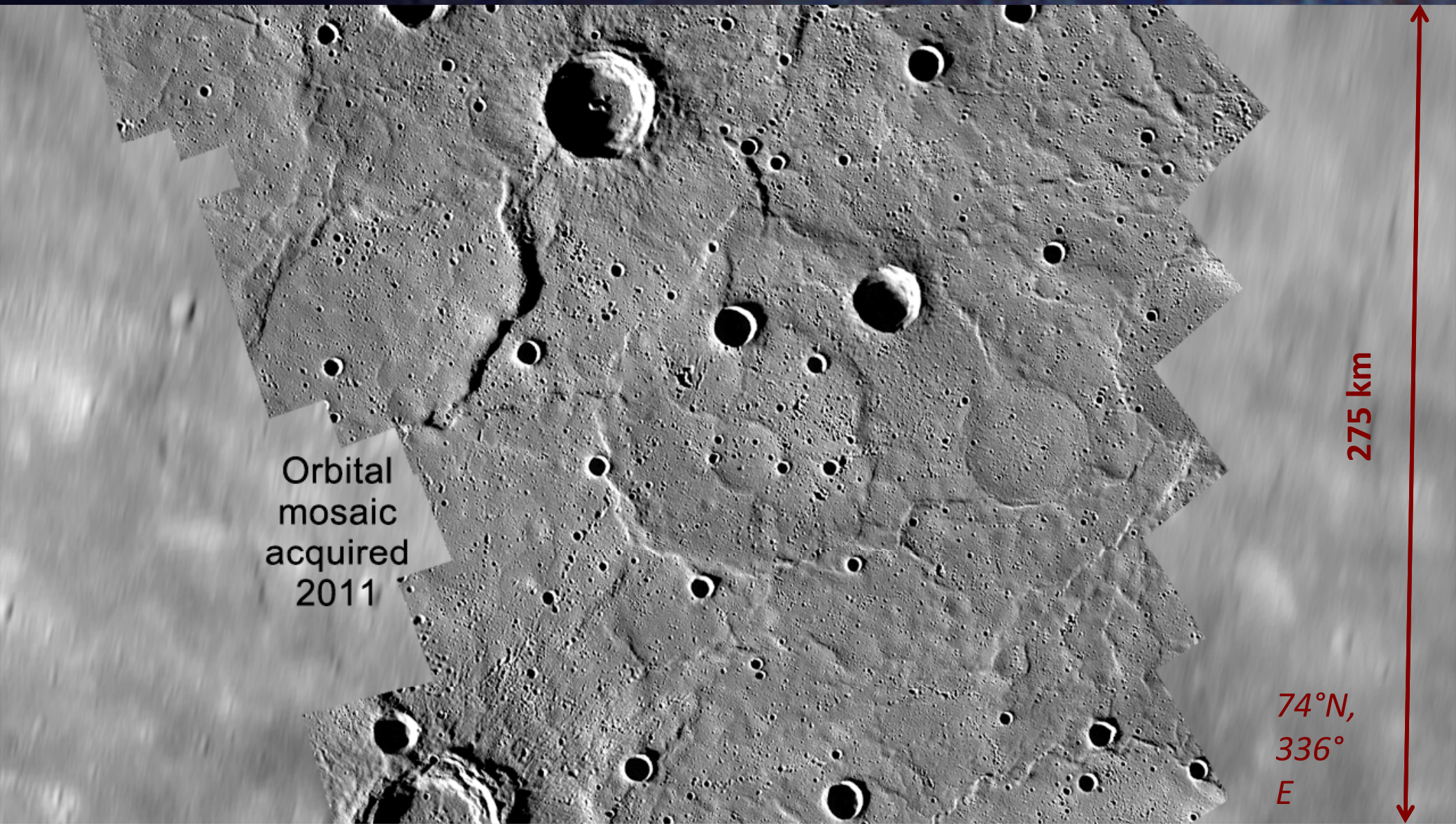

MESSENGER
MErcury Surface, Space ENvironment, GEochemistry, and Ranging
APL
Mercury Map in 2009
97.7% coverage at 500 m/pixel
Mercury flyby 3 approach
90
60
30
0
-30
-60
-90
180
270
0
90
180
Mariner 10
Mercury flyby 1 approach
Mercury flyby 2 departure
Mercury flyby 2 approach
Mercury flyby 1 departure

MESSENGER
MErcury Surface, Space ENvironment, GEochemistry, and Ranging

View from 2009 Mercury Map

MESSENGER
MErcury Surface, Space ENvironment, GEochemistry, and Ranging

View from 2009 Mercury Map + Orbital Images

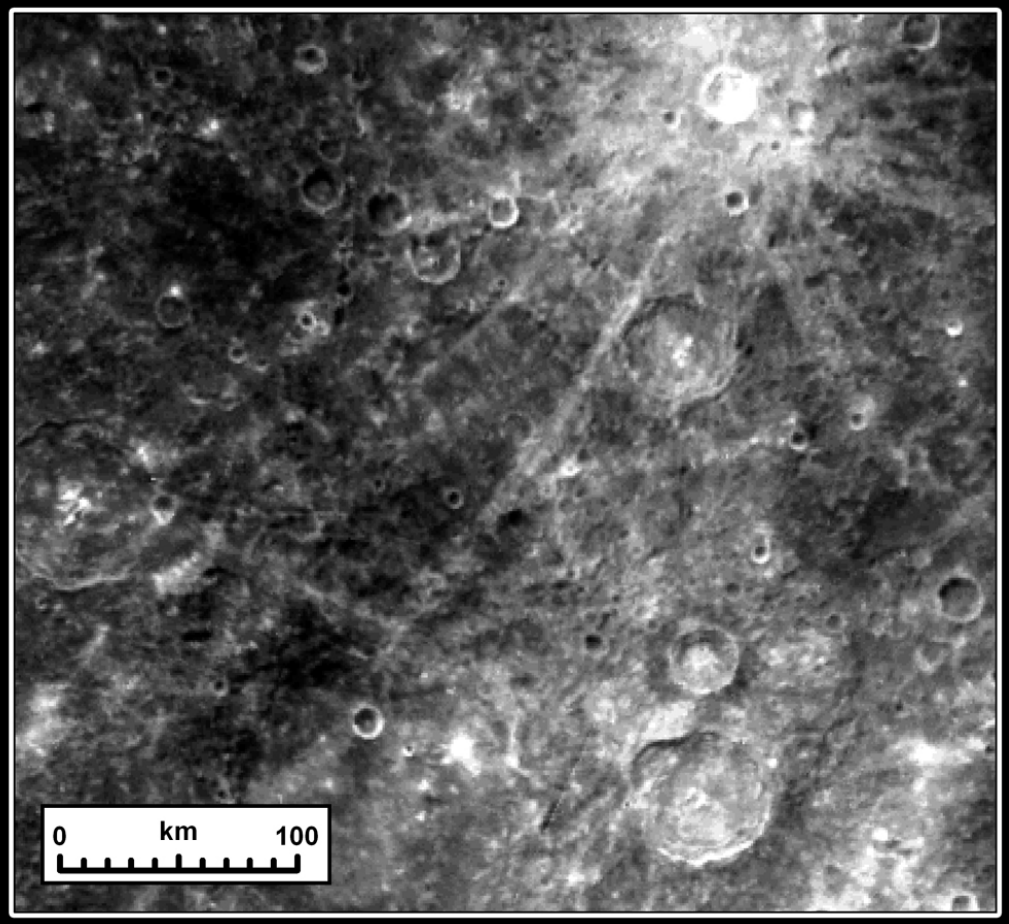


MESSENGER

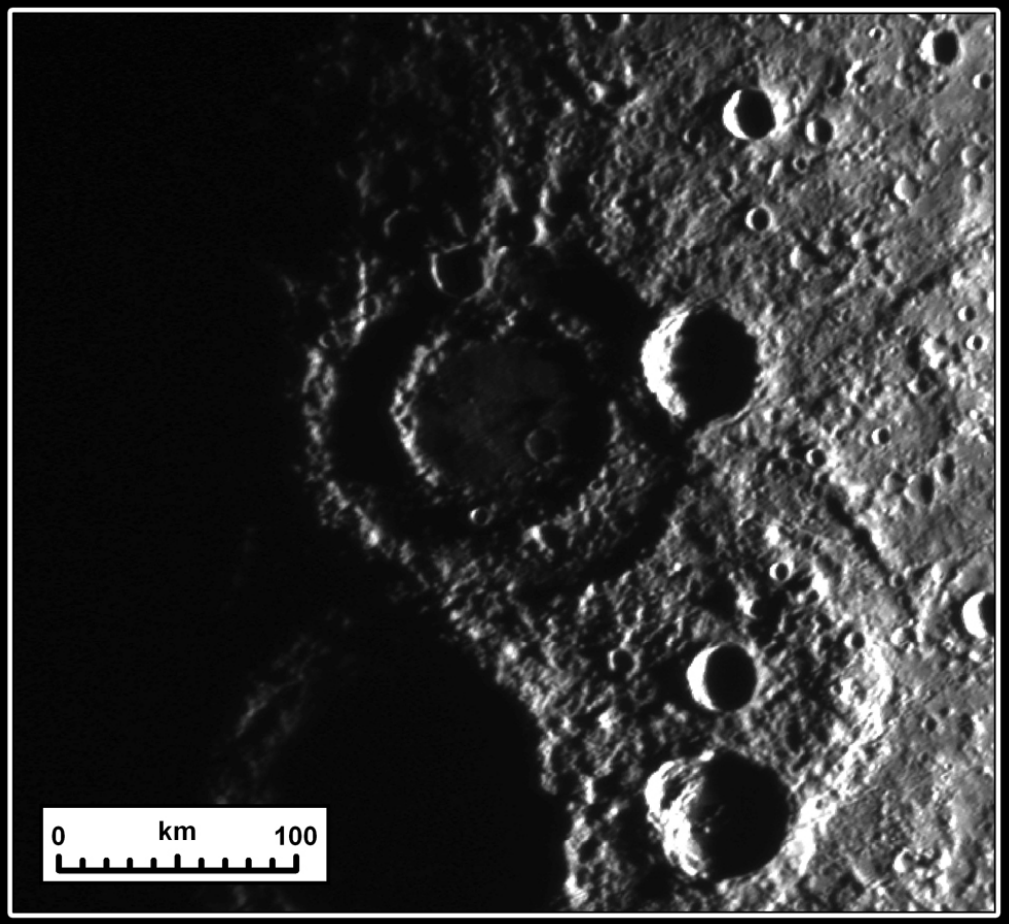
MErcury Surface, Space ENvironment, GEochemistry, and Ranging

Lighting conditions matter!

Need to image the surface with a range of lighting conditions to reveal Mercury's geologic history.



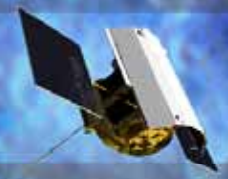
MARINER 10



MESSENGER

MESSENGER

MErcury Surface, Space ENvironment, GEochemistry, and Ranging



One Year of Orbital Operations (*well, almost!*)

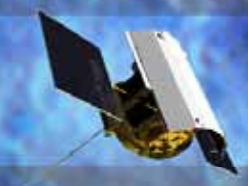
March 18, 2012, will mark one year of orbital operations and the end of the primary mission. MESSENGER has been funded for a one year "extended mission."

Insert movie: Orbital_Ops.mp4 here

NASA APL

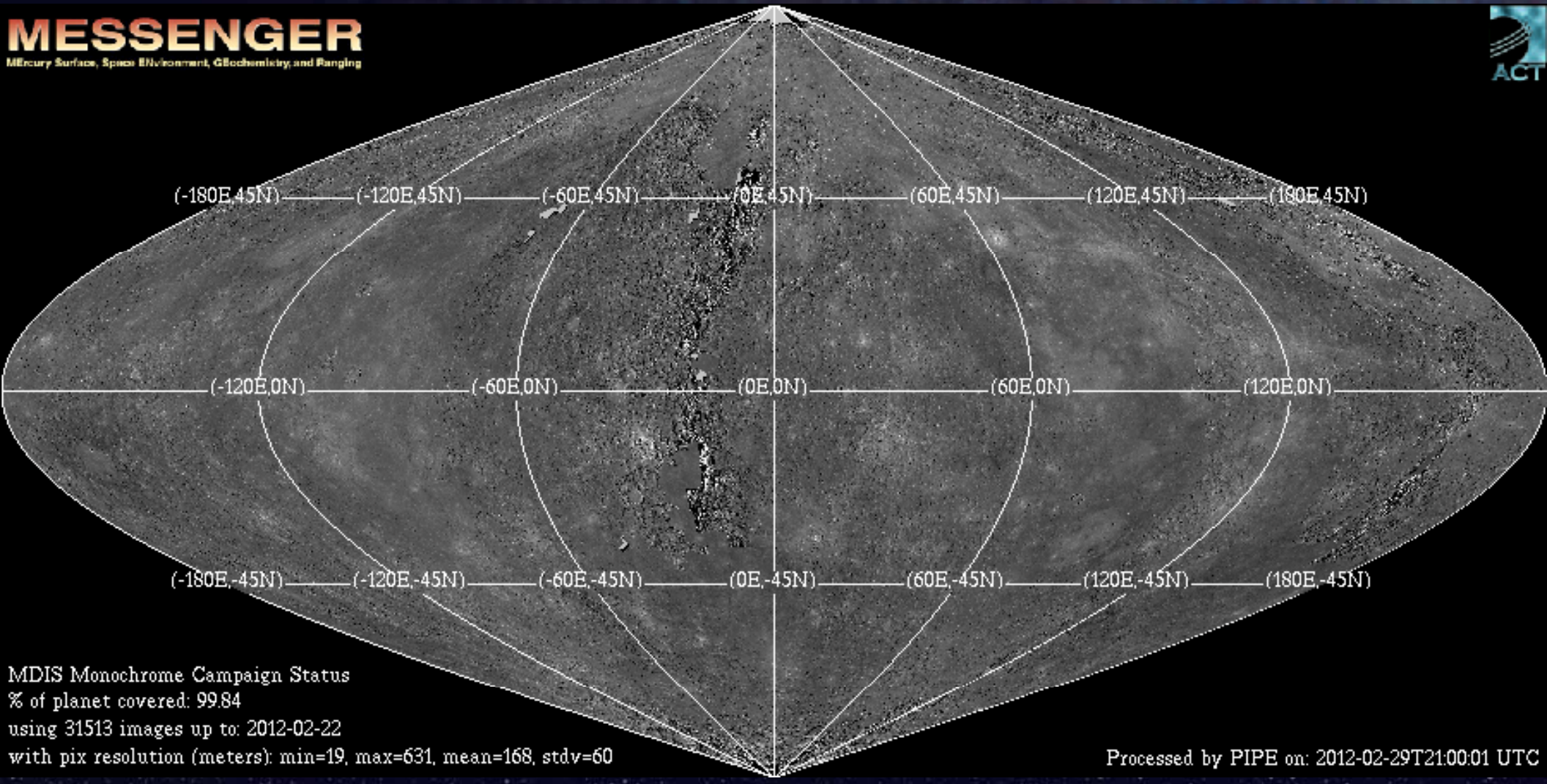
MESSENGER

MErcury Surface, Space ENvironment, GEochemistry, and Ranging



Global Morphology Base Map:

>99% of Mercury covered!



MESSENGER

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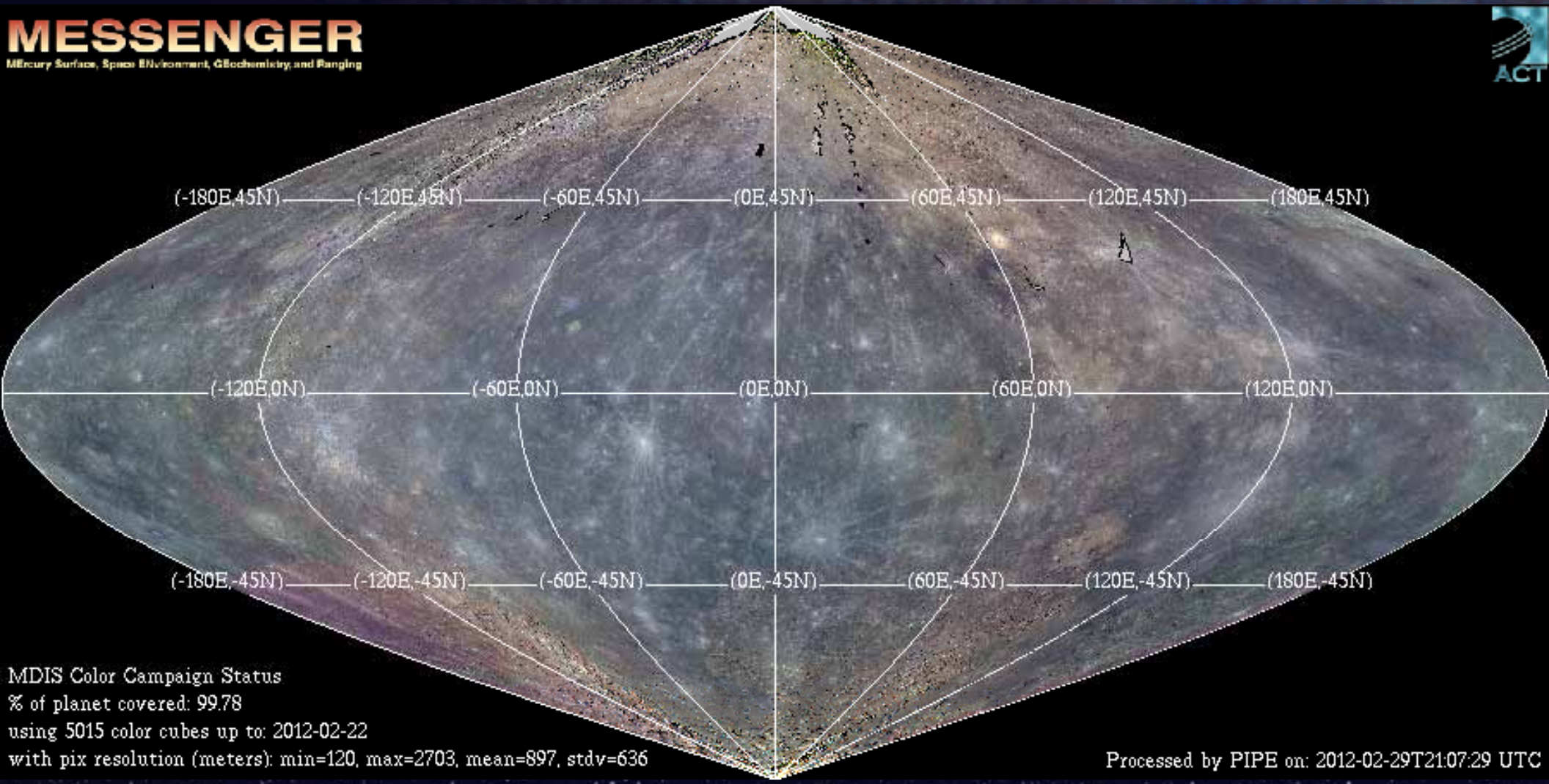
Global Color Base Map:

>99% of Mercury covered!



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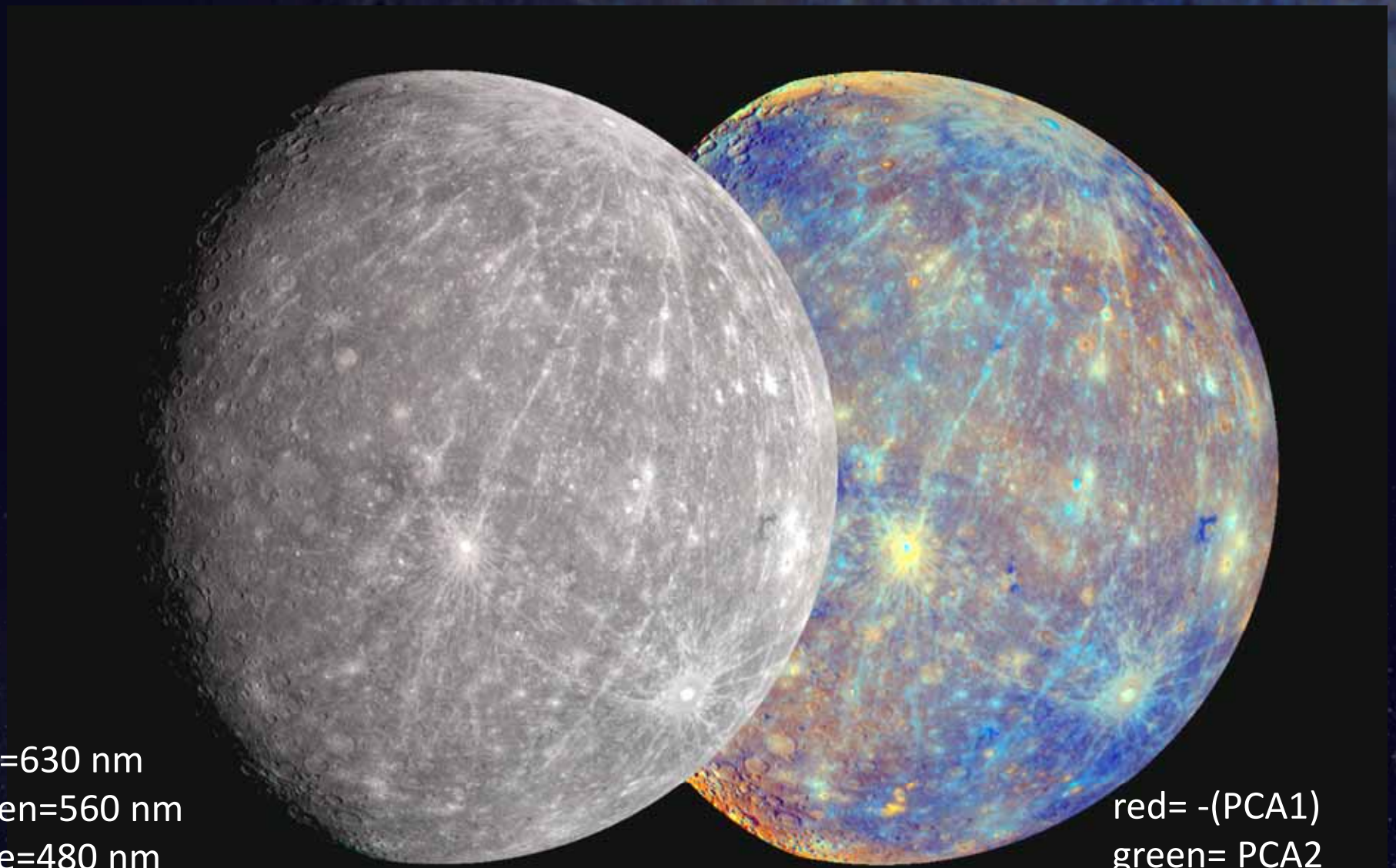
Mercury's "True" Color & Enhanced Color



red=630 nm
green=560 nm
blue=480 nm

red= -(PCA1)
green= PCA2
blue=430nm/560 nm

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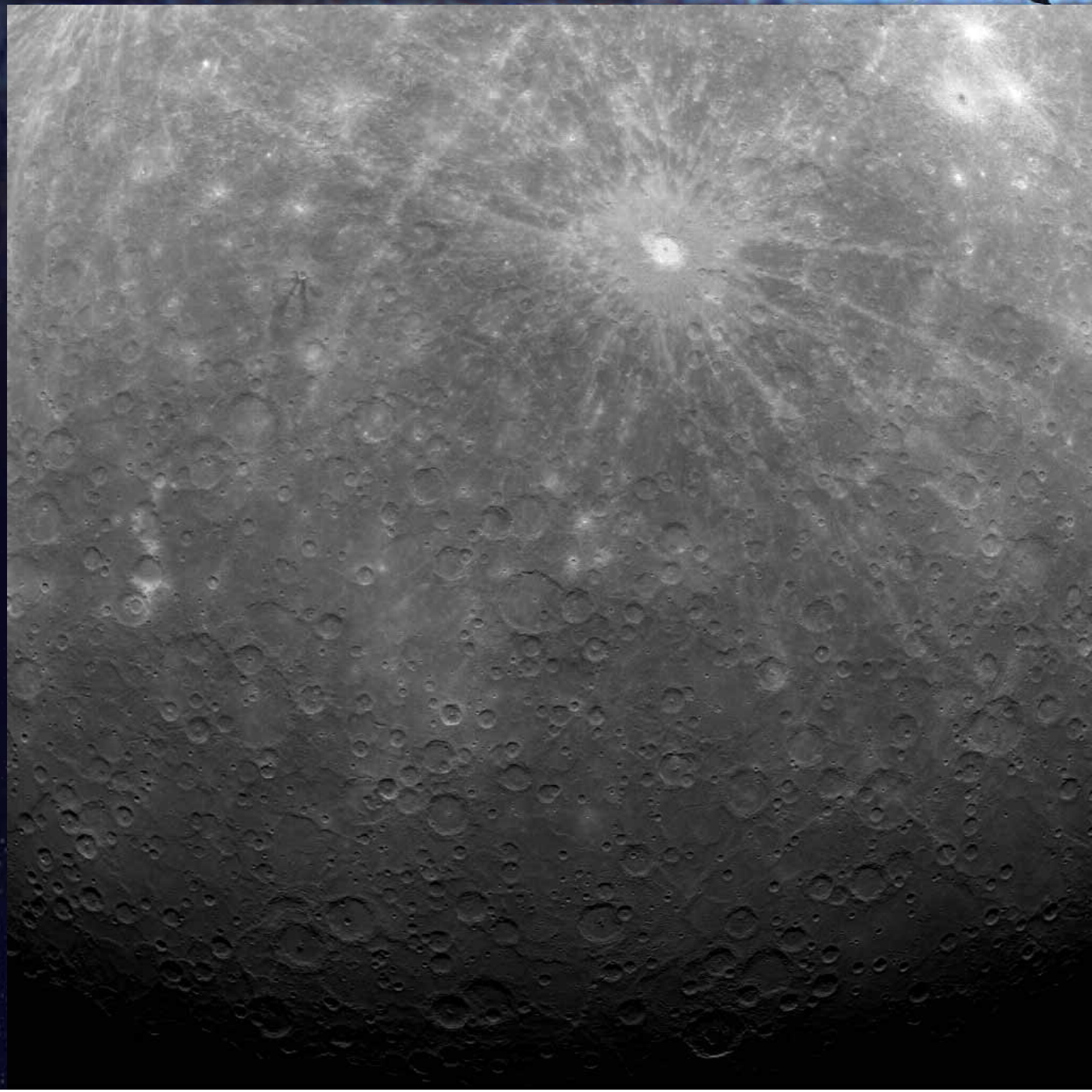
To date, MESSENGER has acquired >86,000 images from orbit!

Some Personal Favorites

First image ever obtained from Mercury orbit!
March 29, 2011

(Rayed crater Debussy has a diameter of 80 km)



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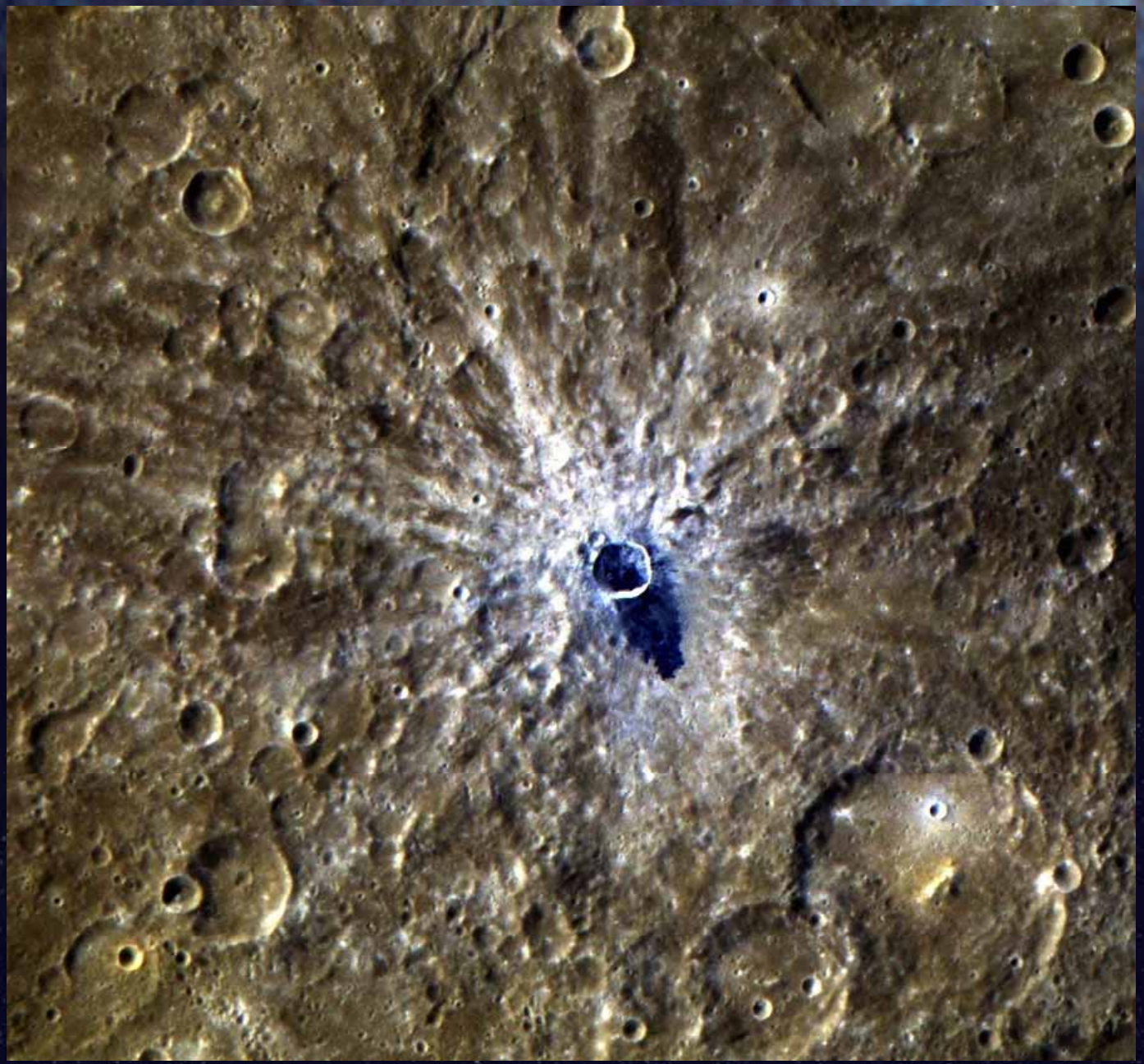
Some Personal Favorites

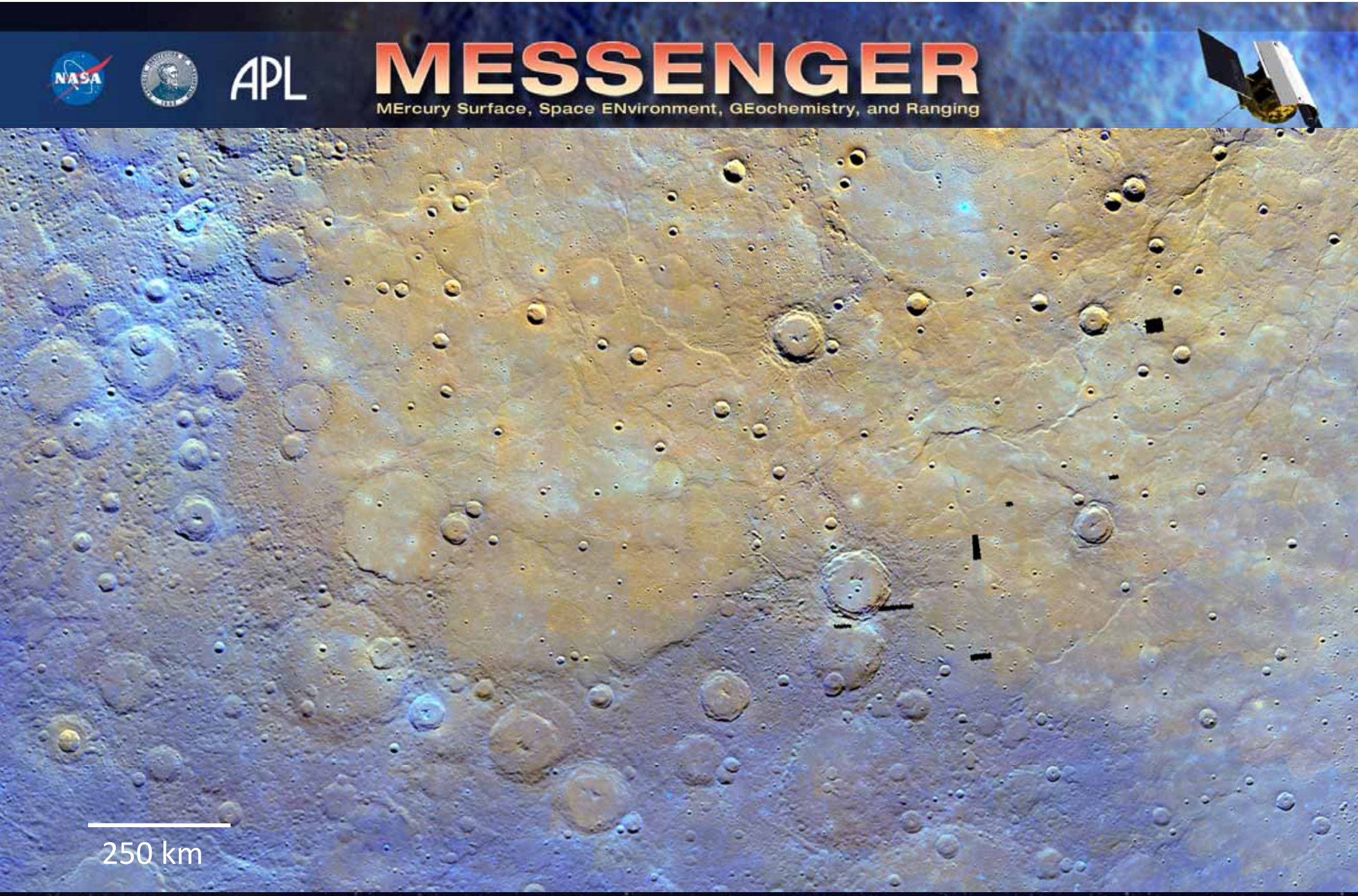
"Blue tongue" crater!

Dark impact melt that has flowed out of a young rayed crater



(The center crater has a diameter of 14 km)

The central wavelengths of 1000, 750, and 430 nm displayed in red, green, and blue, respectively



An edge of Mercury's <u>immense</u> (~5 million km² !) northern volcanic plains

Principle component analysis and color ratio used in red, green, and blue channels

MESSENGER

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Some Personal Favorites

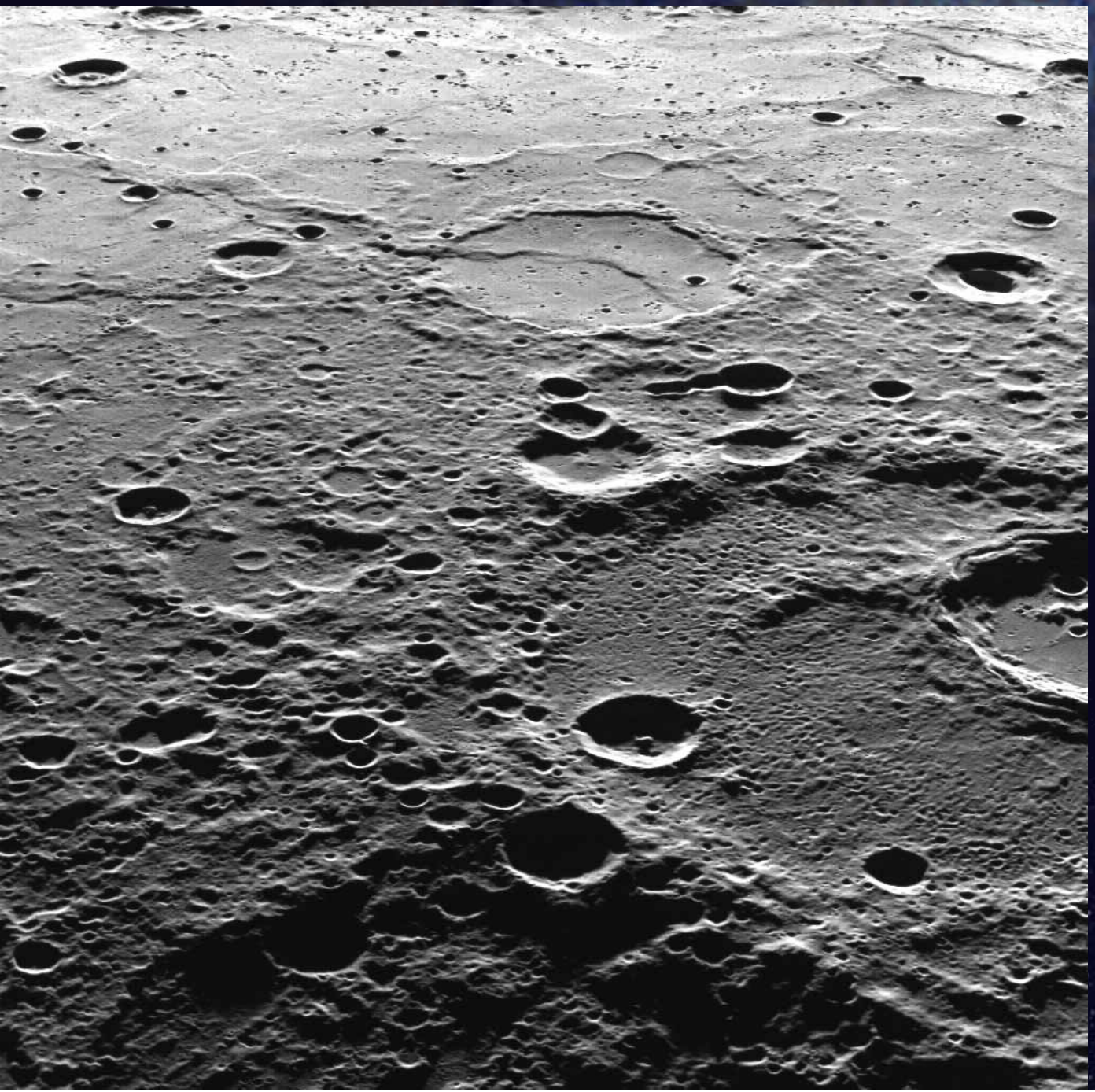
Colorful view of Mercury against the blackness of space

The central wavelengths of 1000, 750, and 430 nm displayed in red, green, and blue, respectively

MESSENGER

MErcury Surface, Space ENvironment, GEochemistry, and Ranging

APL



To date, MESSENGER has acquired >86,000 images from orbit!

Some Personal Favorites

Looking from older towards younger, rougher to smoother

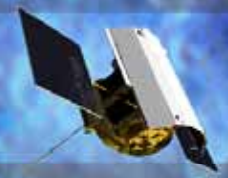
A more cratered surface is older than a less cratered one

(The bottom of this scene is 220 km across)

MESSENGER

MErcury Surface, Space ENvironment, GEochemistry, and Ranging

APL



To date, MESSENGER has acquired >86,000 images from orbit!

Some Personal Favorites

Degas crater!

As never seen before
at 90 meters/pixel

from Mariner 10

from MESSENGER!

(Degas crater has a diameter of 52 km)

The central wavelengths of 1000, 750, and 430 nm displayed in red, green, and blue, respectively

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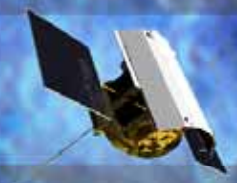
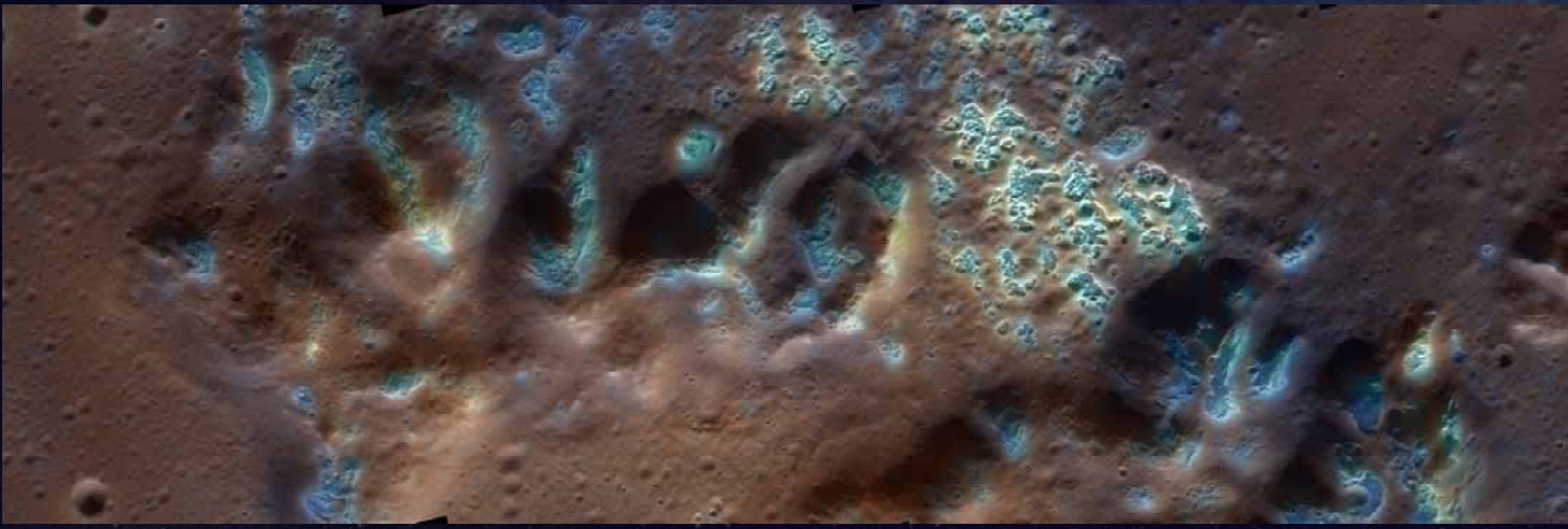


Some Personal Favorites

To date, MESSENGER has acquired >86,000 images from orbit!

(This scene is 20 km tall)

Principle component analysis and color ratio used in red, green, and blue channels



Mercury's "hollows"

MESSENGER images reveal a newly discovered landform on Mercury!

Hollows may have formed by Mercury's surface losing volatile materials; this is a surprise, as Mercury was thought be a volatile-poor planet.

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MESSENGER

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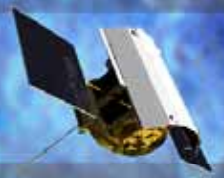
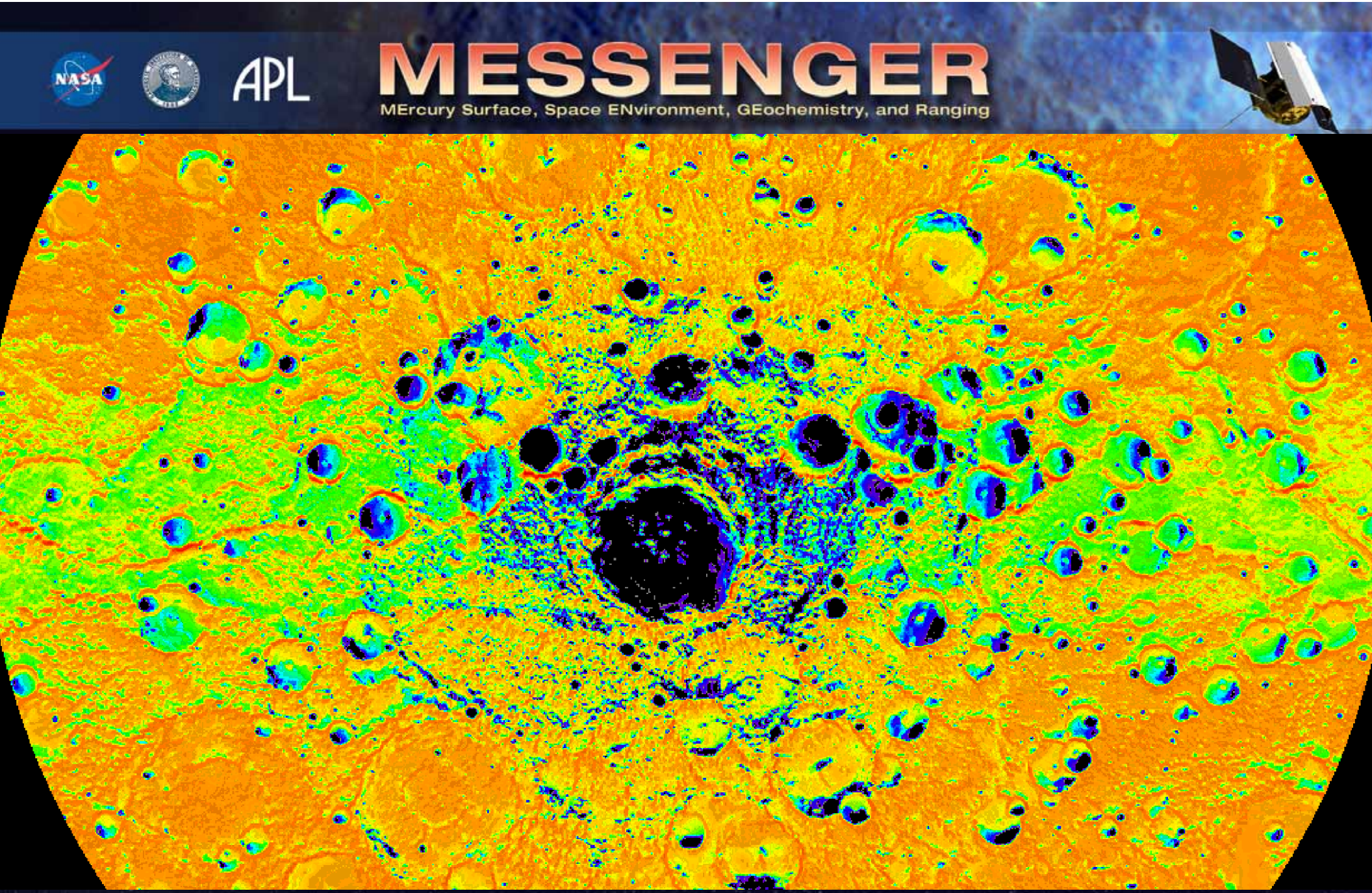


Terminator shot

Separating the sunlit dayside from the dark nightside

The central wavelengths of 1000, 750, and 430 nm displayed in red, green, and blue, respectively

(The scene is 1800 km wide)



Shadowed craters at Mercury's south pole

Colors indicate the percentage of time that an area receives sunlight

(Chao Meng-Fu crater near the center has a diameter of 180 km)

MESSENGER

MErcury Surface, Space ENvironment, GEochemistry, and Ranging

Some Personal Favorites

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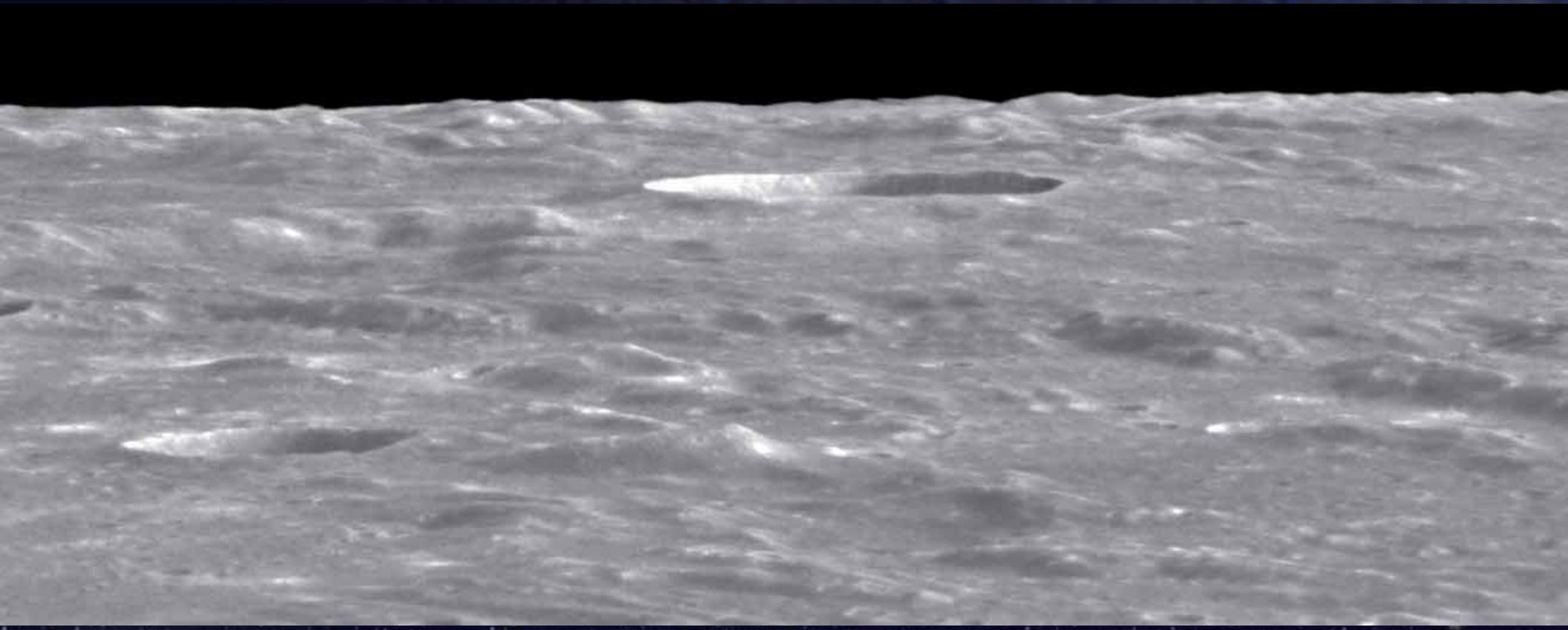
(The large crater near the center has a diameter of 17 km)



A spectacular view to Mercury's horizon!

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To date, MESSENGER has acquired >86,000 images from orbit!

Some Personal Favorites

Kuiper crater!

A bright rayed crater with reddish ejecta

(Kuiper crater has a diameter of 62 km)

The central wavelengths of 1000, 750, and 430 nm displayed in red, green, and blue, respectively

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To date, MESSENGER has acquired >86,000 images from orbit!

Some Personal Favorites

A stark and beautiful crescent Mercury in black and white

(Mercury's radius is 2440 km)

MESSENGER

MErcury Surface, Space ENvironment, GEochemistry, and Ranging

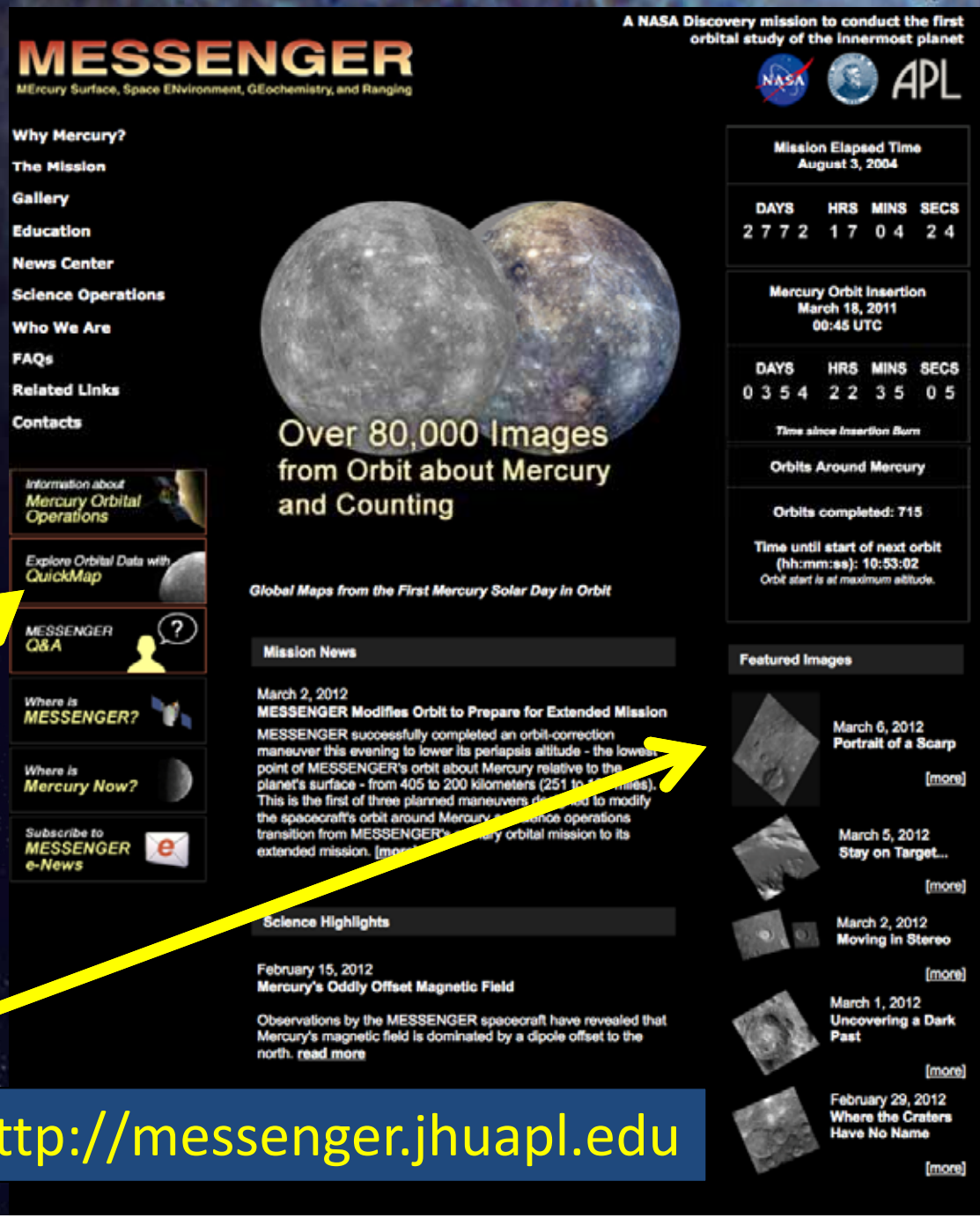
APL

To date, MESSENGER has acquired >86,000 images from orbit!

Visit the MESSENGER website and find your own personal favorites!

NEW global mosaic just released on March 8, 2012! Explore it in QuickMap!

A new image is posted every day!



http://messenger.jhuapl.edu