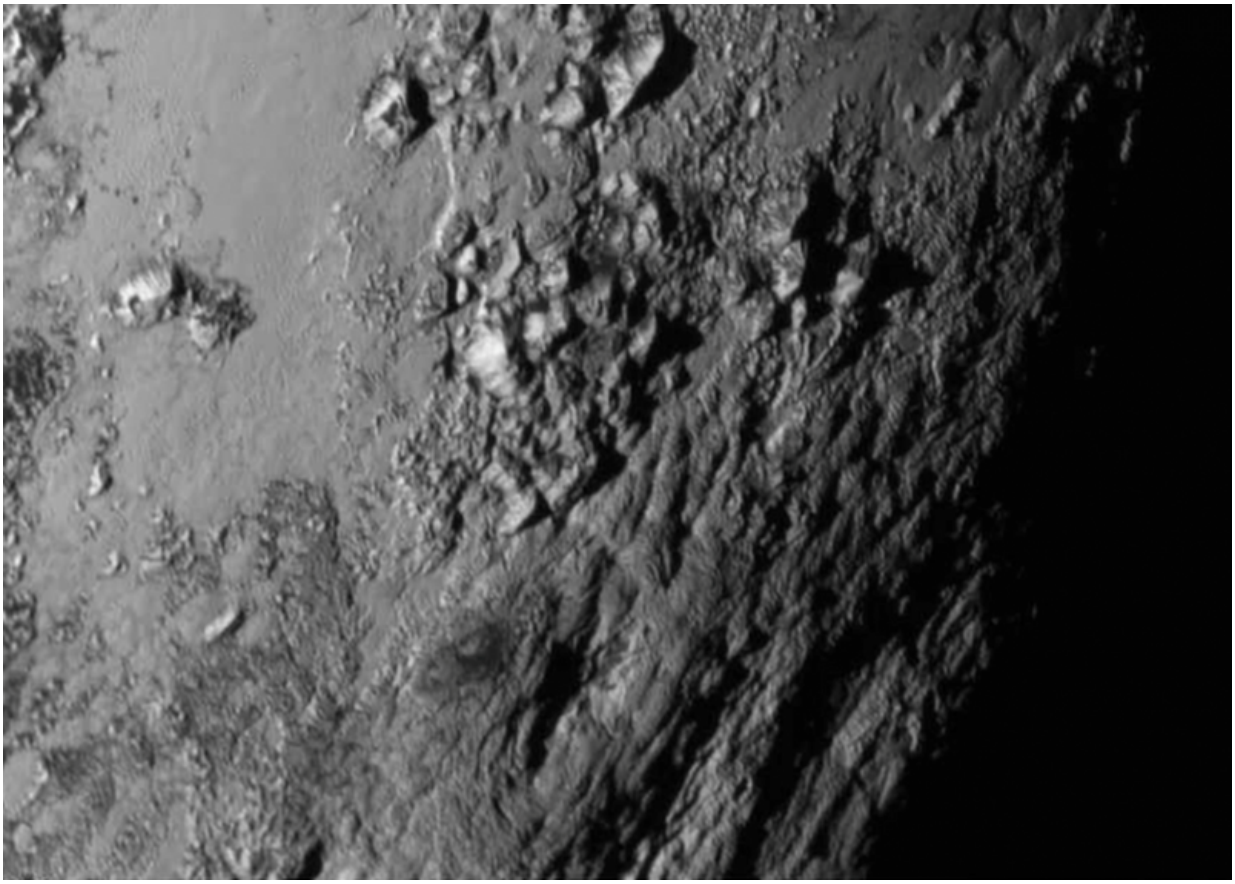
From mountains to moons—multiple discoveries from New Horizons Pluto mission

July 16 2015, by Dwayne Brown / Laurie Cantillo



New close-up images of a region near Pluto's equator reveal a giant surprise -- a range of youthful mountains rising as high as 11,000 feet (3,500 meters) above the surface of the icy body. Credit: NASA/JHU APL/SwRI

Icy mountains on Pluto and a new, crisp view of its largest moon, Charon, are among the several discoveries announced Wednesday by NASA's New Horizons team, just one day after the spacecraft's first ever Pluto flyby.

"Pluto New Horizons is a true mission of exploration showing us why basic scientific research is so important," said John Grunsfeld, associate administrator for NASA's Science Mission Directorate in Washington. "The mission has had nine years to build expectations about what we would see during closest approach to Pluto and Charon. Today, we get the first sampling of the scientific treasure collected during those critical moments, and I can tell you it dramatically surpasses those high expectations."

"Home run!" said Alan Stern, principal investigator for New Horizons at the Southwest Research Institute (SwRI) in Boulder, Colorado. "New Horizons is returning amazing results already. The data look absolutely gorgeous, and Pluto and Charon are just mind blowing."

A new close-up image of an equatorial region near the base of Pluto's bright heart-shaped feature shows a mountain range with peaks jutting as high as 11,000 feet (3,500 meters) above the surface of the icy body.

The mountains on Pluto likely formed no more than 100 million years ago—mere youngsters in a 4.56-billion-year-old solar system. This suggests the close-up region, which covers about one percent of Pluto's surface, may still be geologically active today.

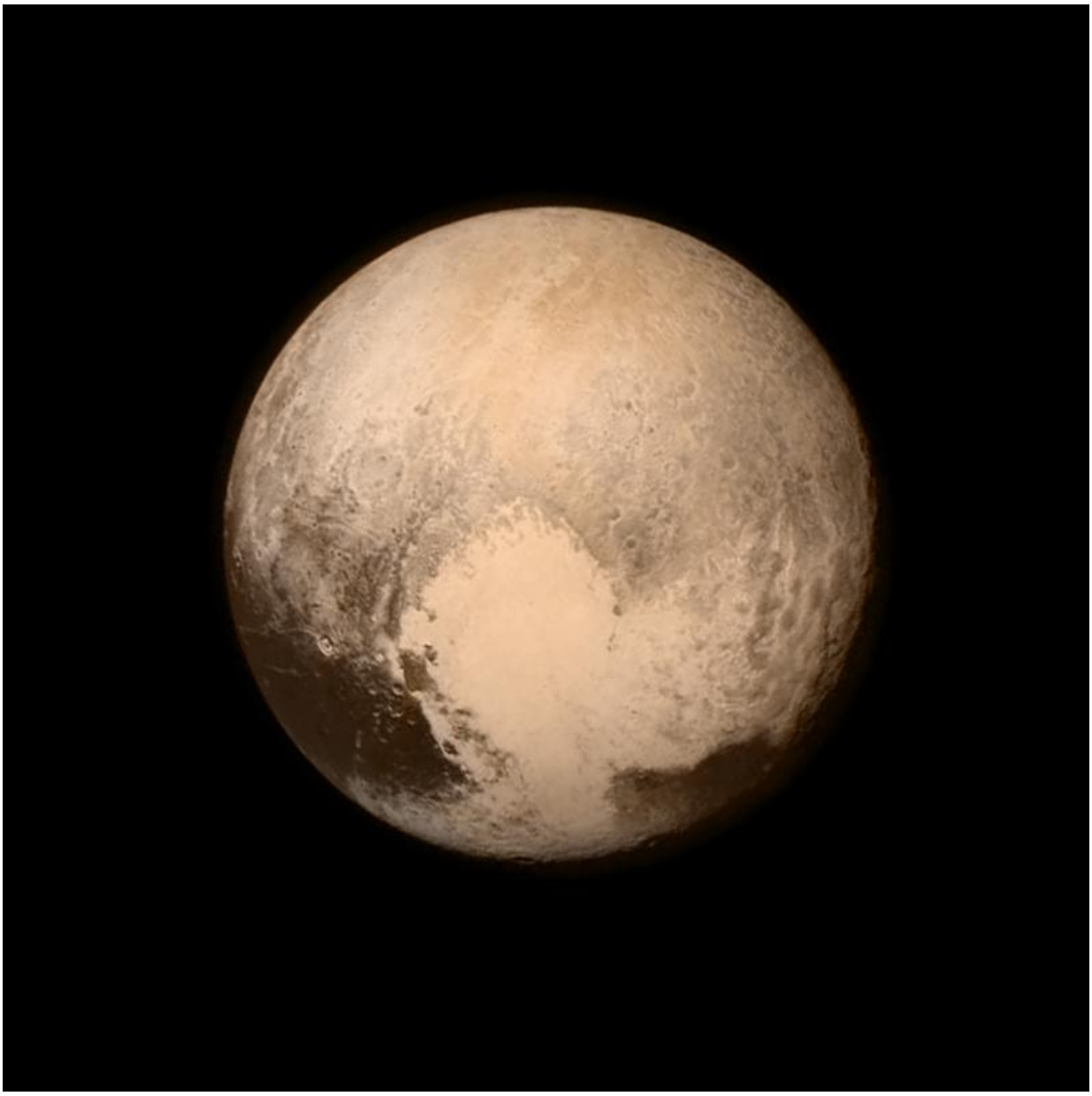
"This is one of the youngest surfaces we've ever seen in the solar system," said Jeff Moore of the New Horizons Geology, Geophysics and Imaging Team (GGI) at NASA's Ames Research Center in Moffett Field, California.

Remarkable new details of Pluto's largest moon Charon are revealed in this image from New Horizons' Long Range Reconnaissance Imager (LORRI), taken late on July 13, 2015 from a distance of 289,000 miles (466,000 kilometers). A swath of cliffs and troughs stretches about 600 miles (1,000 kilometers) from left to right, suggesting widespread fracturing of Charon's crust, likely a result of internal processes. At upper right, along the moon's curving edge, is a canyon estimated to be 4 to 6 miles (7 to 9 kilometers) deep. Mission scientists are surprised by the apparent lack of craters on Charon. South of the moon's equator, at the bottom of this image, terrain is lit by the slanting rays of the sun, creating shadows that make it easier to distinguish topography. Even here, however, relatively few craters are visible, indicating a relatively young surface that has been reshaped by geologic activity. In Charon's north polar region, a dark marking prominent in New Horizons' approach images is now seen to have a diffuse boundary, suggesting it is a thin deposit of dark material. Underlying it

is a distinct, sharply bounded, angular feature; higher resolution images still to come are expected to shed more light on this enigmatic region. The image has been compressed to reduce its file size for transmission to Earth. In high-contrast areas of the image, features as small as 3 miles (5 kilometers) across can be seen. Some lower-contrast detail is obscured by the compression of the image, which may make some areas appear smoother than they really are. The uncompressed version still resides in New Horizons' computer memory and is scheduled to be transmitted at a later date. The image has been combined with color information obtained by New Horizons' Ralph instrument on July 13. Credit: NASA-JHUAPL-SwRI

Unlike the icy moons of giant planets, Pluto cannot be heated by gravitational interactions with a much larger planetary body. Some other process must be generating the mountainous landscape.

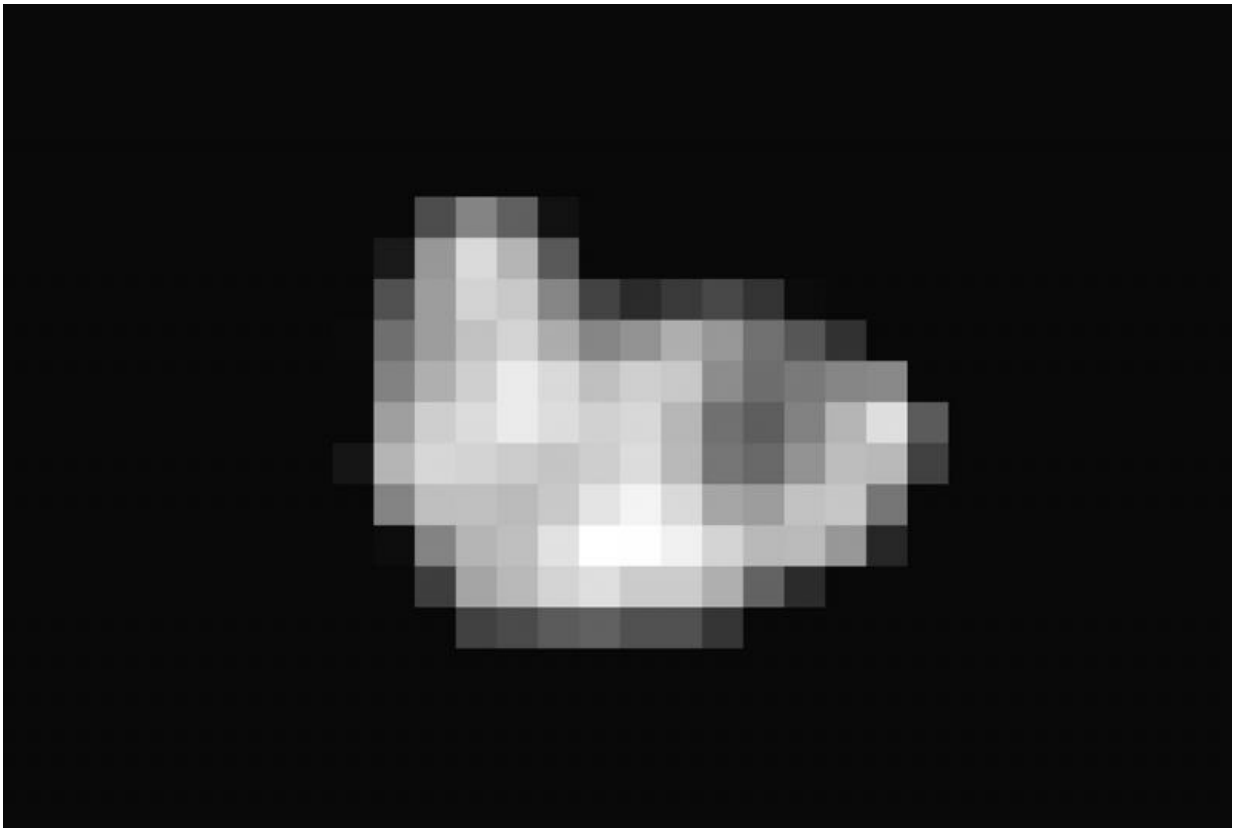
"This may cause us to rethink what powers geological activity on many other icy worlds," says GGI deputy team leader John Spencer at SwRI.



Pluto nearly fills the frame in this image from the Long Range Reconnaissance Imager (LORRI) aboard NASA's New Horizons spacecraft, taken on July 13, 2015 when the spacecraft was 476,000 miles (768,000 kilometers) from the surface. This is the last and most detailed image sent to Earth before the spacecraft's closest approach to Pluto on July 14. The color image has been combined with lower-resolution color information from the Ralph instrument that was acquired earlier on July 13. This view is dominated by the large, bright feature informally named the "heart," which measures approximately 1,000 miles (1,600 kilometers) across. The heart borders darker equatorial terrains, and

the mottled terrain to its east (right) are complex. However, even at this resolution, much of the heart's interior appears remarkably featureless—possibly a sign of ongoing geologic processes. Credit: NASA/APL/SwRI

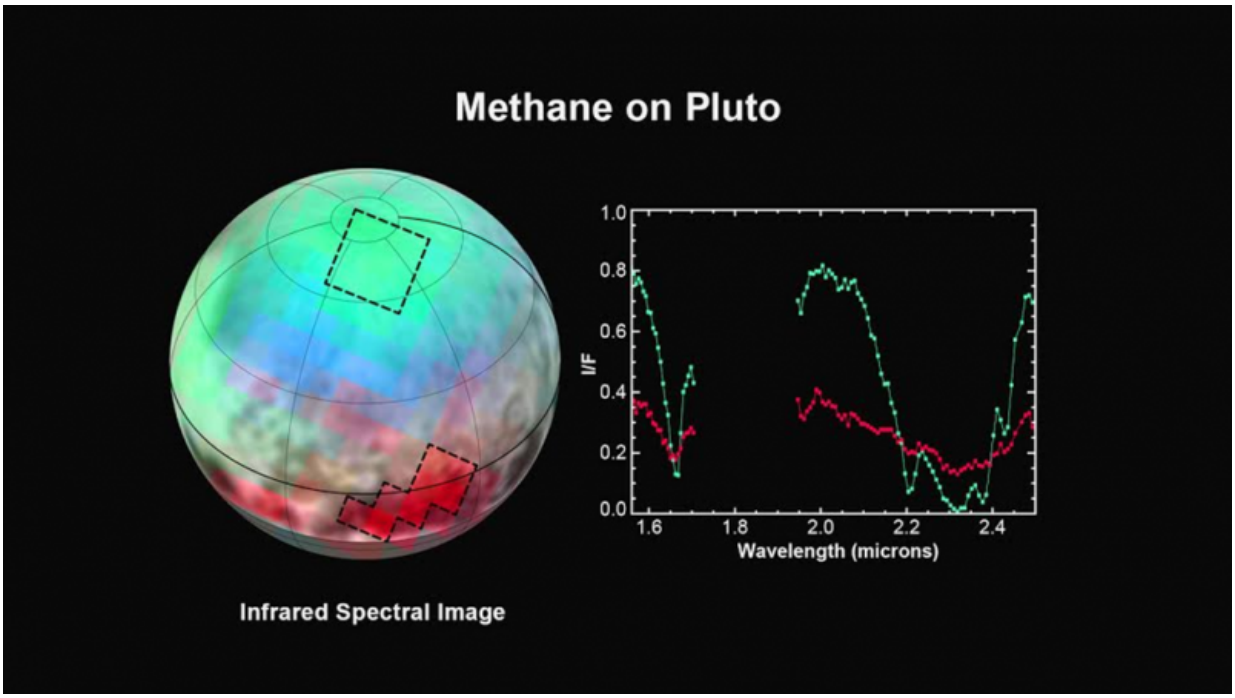
The new view of Charon reveals a youthful and varied terrain. Scientists are surprised by the apparent lack of craters. A swath of cliffs and troughs stretching about 600 miles (1,000 kilometers) suggests widespread fracturing of Charon's crust, likely the result of internal geological processes. The image also shows a canyon estimated to be 4 to 6 miles (7 to 9 kilometers) deep. In Charon's north polar region, the dark surface markings have a diffuse boundary, suggesting a thin deposit or stain on the surface.



Since its discovery in 2005, Pluto's moon Hydra has been known only as a fuzzy dot of uncertain shape, size, and reflectivity. Imaging obtained during New Horizons' historic transit of the Pluto-Charon system and transmitted to Earth early this morning has definitively resolved these fundamental properties of Pluto's outermost moon. Long Range Reconnaissance Imager (LORRI) observations revealed an irregularly shaped body characterized by significant brightness variations over the surface. With a resolution of 2 miles (3 kilometers) per pixel, the LORRI image shows the tiny potato-shaped moon measures 27 miles (43 kilometers) by 20 miles (33 kilometers). Like that of Charon, Hydra's surface is probably covered with water ice, the most abundant ice in the universe. Observed within Hydra's bright regions is a darker circular structure with a diameter of approximately 6 miles (10 kilometers). Hydra's reflectivity (the percentage of incident light reflected from the surface) is intermediate between that of Pluto and Charon. "New Horizons has finally nailed the basic physical properties of Hydra," says Hal Weaver, New Horizons Project Scientist and LORRI science operations lead. "We're going to see Hydra even better in the images yet to come." Hydra was approximately 400,000 miles away from New Horizons when the image was acquired. Credit: NASA-JHUAPL-SwRI

New Horizons also observed the smaller members of the Pluto system, which includes four other moons: Nix, Hydra, Styx and Kerberos. A new sneak-peak image of Hydra is the first to reveal its apparent irregular shape and its size, estimated to be about 27 by 20 miles (43 by 33 kilometers).

The observations also indicate Hydra's surface is probably coated with water ice. Future images will reveal more clues about the formation of this and the other moon billions of years ago. Spectroscopic data from New Horizons' Ralph instruments reveal an abundance of methane ice, but with striking differences among regions across the frozen surface of Pluto.



The latest spectra from New Horizons Ralph instrument reveal an abundance of methane ice, but with striking differences from place to place across the frozen surface of Pluto. “We just learned that in the north polar cap, methane ice is diluted in a thick, transparent slab of nitrogen ice resulting in strong absorption of infrared light,” said New Horizons co-investigator Will Grundy, Lowell Observatory, Flagstaff, Arizona. In one of the visually dark equatorial patches, the methane ice has shallower infrared absorptions indicative of a very different texture. “The spectrum appears as if the ice is less diluted in nitrogen,” Grundy speculated “or that it has a different texture in that area.” An Earthly example of different textures of a frozen substance: a fluffy bank of clean snow is bright white, but compacted polar ice looks blue. New Horizons’ surface composition team, led by Grundy, has begun the intricate process of analyzing Ralph data to determine the detailed compositions of the distinct regions on Pluto. This is the first detailed image of Pluto from the Linear Etalon Imaging Spectral Array, part of the Ralph instrument on New Horizons. The observations were made at three wavelengths of infrared light, which are invisible to the human eye. In this picture, blue corresponds to light of wavelengths 1.62 to 1.70 micrometers, a channel covering a medium-strong absorption band of methane ice, green (1.97 to 2.05 micrometers) represents a channel where methane ice does not absorb light, and red (2.30 to 2.33 micrometers) is a channel where the light is very

heavily absorbed by methane ice. The two areas outlined on Pluto show where Ralph observations obtained the spectral traces at the right. Note that the methane absorptions (notable dips) in the spectrum from the northern region are much deeper than the dips in the spectrum from the dark patch. The Ralph data were obtained by New Horizons on July 12, 2015. Credit: NASA-JHUAPL-SwRI

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