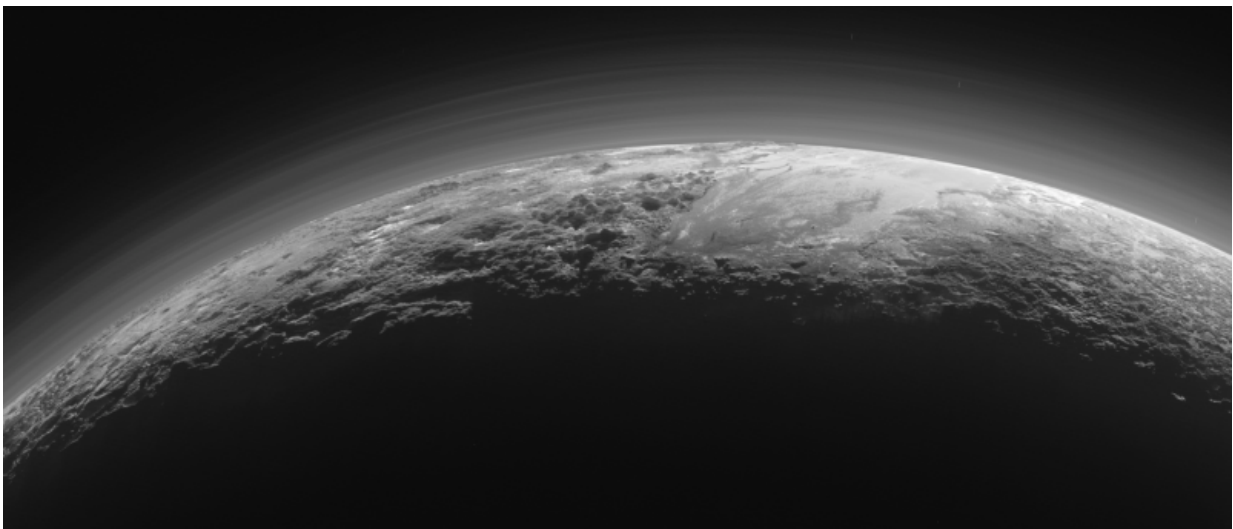


Ice volcanoes, twirling moons: Four months after Pluto flyby, New Horizons yields wealth of discovery

November 9 2015, by Dwayne Brown



Credit: NASA

From possible ice volcanoes to twirling moons, NASA's New Horizons science team is discussing more than 50 exciting discoveries about Pluto at this week's 47th Annual Meeting of the American Astronomical Society's Division for Planetary Sciences in National Harbor, Maryland.

"The New Horizons mission has taken what we thought we knew about Pluto and turned it upside down," said Jim Green, director of planetary

science at NASA Headquarters in Washington. "It's why we explore—to satisfy our innate curiosity and answer deeper questions about how we got here and what lies beyond the next horizon."

For one such discovery, New Horizons geologists combined images of Pluto's surface to make 3-D maps that indicate two of Pluto's most distinctive mountains could be cryovolcanoes—ice volcanoes that may have been active in the recent geological past.

"It's hard to imagine how rapidly our view of Pluto and its moons are evolving as new data stream in each week. As the discoveries pour in from those data, Pluto is becoming a star of the [solar system](#)," said mission Principal Investigator Alan Stern of the Southwest Research Institute in Boulder, Colorado. "Moreover, I'd wager that for most planetary scientists, any one or two of our latest major findings on one world would be considered astounding. To have them all is simply incredible."

The two cryovolcano candidates are large features measuring tens of miles or kilometers across and several miles or kilometers high.

"These are big mountains with a large hole in their summit, and on Earth that generally means one thing—a volcano," said Oliver White, New Horizons postdoctoral researcher at NASA's Ames Research Center in Moffett Field, California. "If they are volcanic, then the summit depression would likely have formed via collapse as material is erupted from underneath. The strange hummocky texture of the mountain flanks may represent volcanic flows of some sort that have traveled down from the summit region and onto the plains beyond, but why they are hummocky, and what they are made of, we don't yet know."

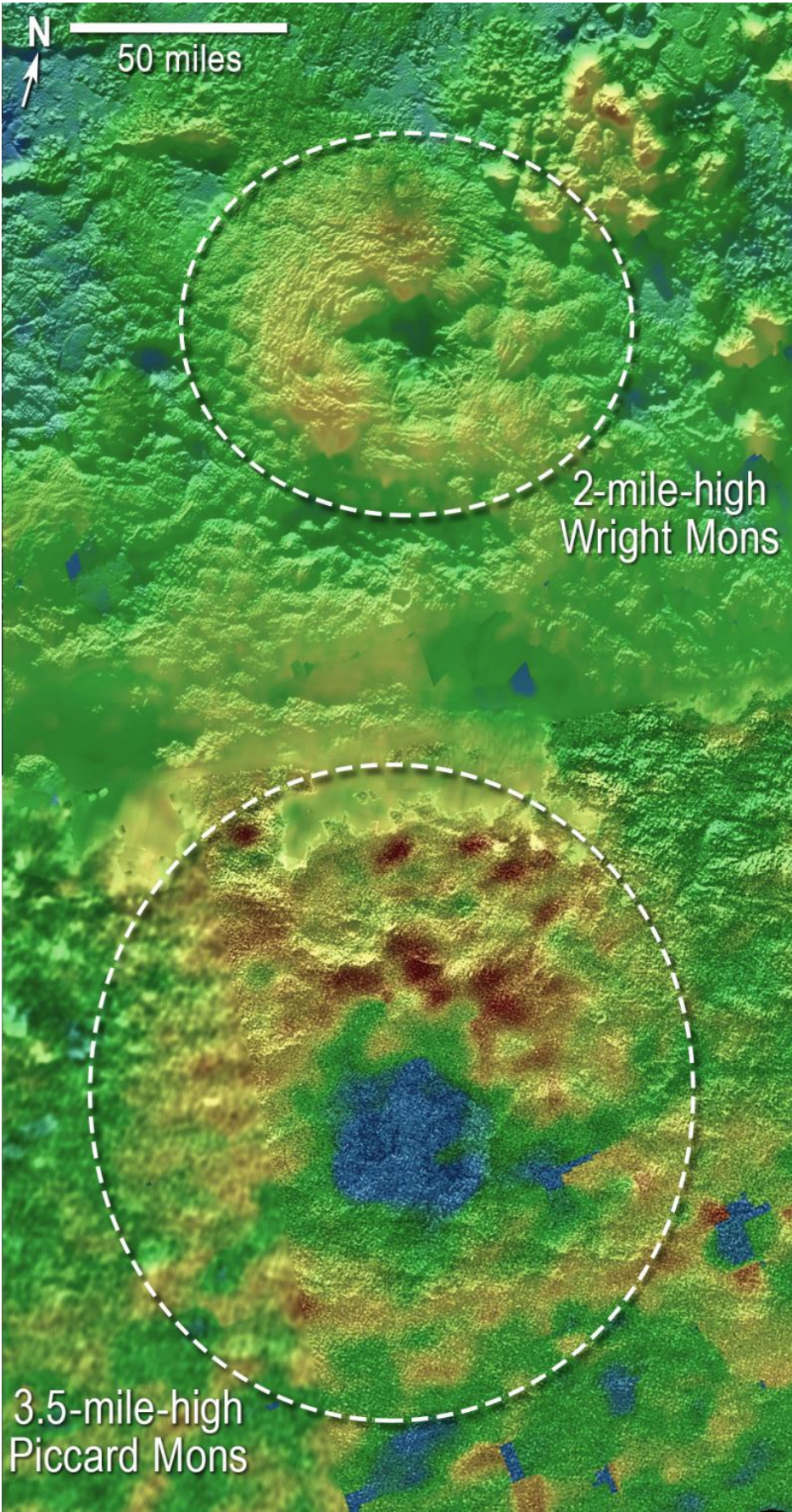
While their appearance is similar to volcanoes on Earth that spew molten rock, ice volcanoes on Pluto are expected to emit a somewhat melted

slurry of substances such as water ice, nitrogen, ammonia, or methane. If Pluto proves to have volcanoes, it will provide an important new clue to its geologic and atmospheric evolution.

"After all, nothing like this has been seen in the deep outer solar system," said Jeffrey Moore, New Horizons Geology, Geophysics and Imaging team leader, at Ames.

Pluto's Long History of Geologic Activity

Pluto's surface varies in age—from ancient, to intermediate, to relatively young —according to another new finding from New Horizons.



Using New Horizons images of Pluto's surface to make 3-D topographic maps, scientists discovered that two of Pluto's mountains, informally named Wright Mons and Piccard Mons, could be ice volcanoes. The color depicts changes in elevation, blue indicating lower terrain and brown showing higher elevation. Green terrains are at intermediate heights. Credit: NASA/JHUAPL/SwRI

To determine the age of a surface area of the planet, scientists count crater impacts. The more crater impacts, the older the region likely is. Crater counts of surface areas on Pluto indicate that it has surface regions dating to just after the formation of the planets of our solar system, about four billion years ago.

But there also is a vast area that was, in geological terms, born yesterday—meaning it may have formed within the past 10 million years. This area, informally named Sputnik Planum, appears on the left side of Pluto's "heart" and is completely crater-free in all images received, so far.

New data from crater counts reveal the presence of intermediate, or "middle-aged," terrains on Pluto, as well. This suggests Sputnik Planum is not an anomaly—that Pluto has been geologically active throughout much of its more than 4-billion-year history.

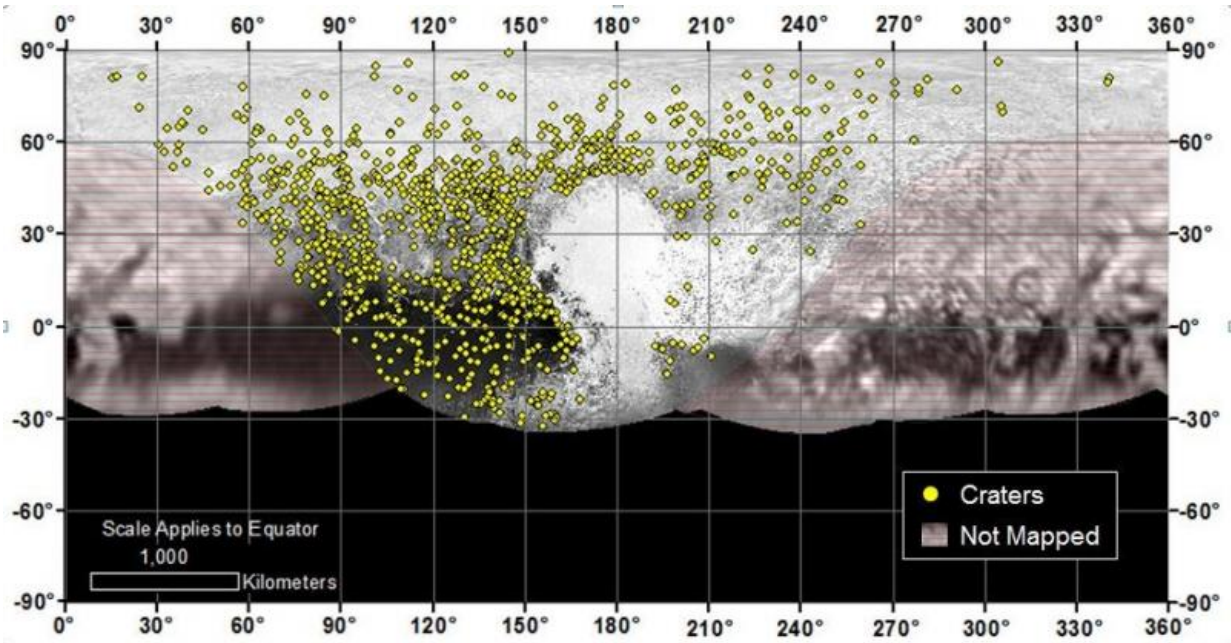
"We've mapped more than a thousand craters on Pluto, which vary greatly in size and appearance," said postdoctoral researcher Kelsi Singer, of the Southwest Research Institute (SwRI) in Boulder, Colorado. "Among other things, I expect cratering studies like these to give us important new insights into how this part of the solar system formed."

Building Blocks of the Solar System

Crater counts are giving the New Horizons team insight into the structure of the Kuiper Belt itself. The dearth of smaller craters across Pluto and its large moon Charon indicate the Kuiper Belt, which is an unexplored outer region of our solar system, likely had fewer smaller objects than some models had predicted.

This leads New Horizons scientists to doubt a longstanding model that all Kuiper Belt objects formed by accumulating much smaller objects—less than a mile wide. The absence of small craters on Pluto and Charon support other models theorizing that Kuiper Belt objects tens of miles across may have formed directly, at their current—or close to current—size.

In fact, the evidence that many Kuiper Belt objects could have been "born large" has scientists excited that New Horizons' next potential target—the 30-mile-wide (40-50 kilometer wide) KBO named 2014 MU69—which may offer the first detailed look at just such a pristine, ancient building block of the solar system.



Locations of more than 1,000 craters mapped on Pluto by NASA's New Horizons mission indicate a wide range of surface ages, which likely means Pluto has been geologically active throughout its history. Credit: NASA/JHUAPL/SwRI

Pluto's Spinning, Merged Moons

The New Horizons mission also is shedding new light on Pluto's fascinating system of moons, and their unusual properties. For example, nearly every other moon in the solar system—including Earth's moon—is in synchronous rotation, keeping one face toward the planet. This is not the case for Pluto's small moons.

Pluto's small lunar satellites are spinning much faster, with Hydra—its most distant moon—rotating an unprecedented 89 times during a single lap around the planet. Scientists believe these spin rates may be variable because Charon exerts a strong torque that prevents each small moon

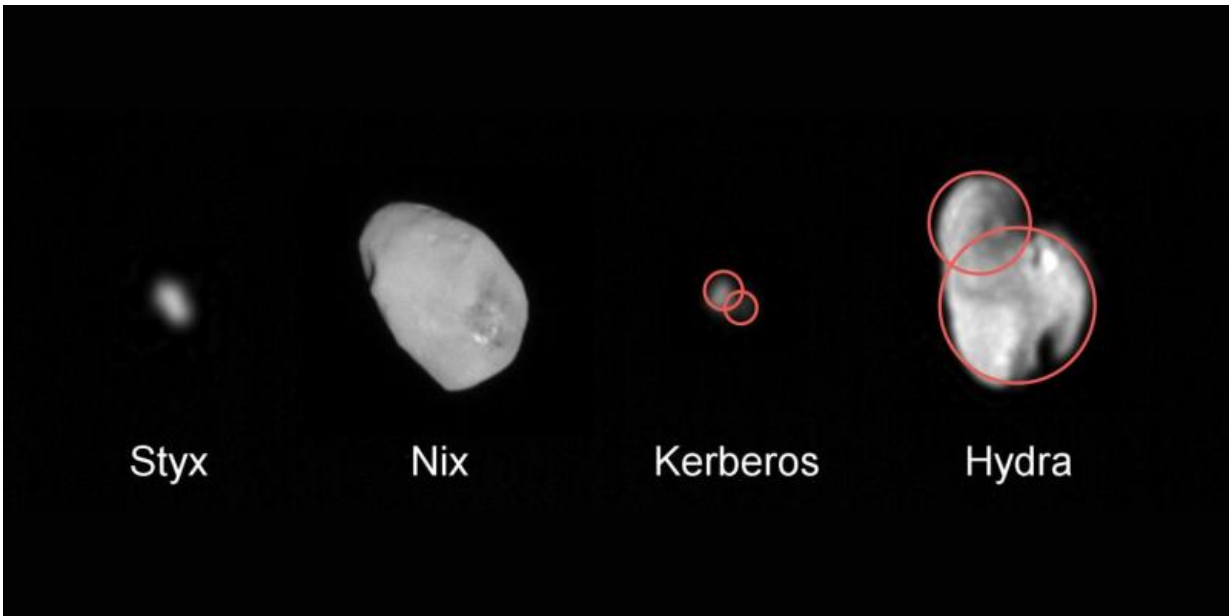
from settling down into synchronous rotation.

Another oddity of Pluto's moons: scientists expected the satellites would wobble, but not to such a degree.

"Pluto's moons behave like spinning tops," said co-investigator Mark Showalter of the SETI Institute in Mountain View, California.

Images of Pluto's four smallest satellites also indicate several of them could be the results of mergers of two or more moons.

"We suspect from this that Pluto had more moons in the past, in the aftermath of the big impact that also created Charon," said Showalter.



Data from NASA's New Horizons mission indicates that at least two -- and possibly all four -- of Pluto's small moons may be the result of mergers between still smaller moons. If this discovery is borne out with further analysis, it could provide important new clues to the formation of the Pluto system. Credit: NASA/JHUAPL/SwRI

Provided by NASA

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