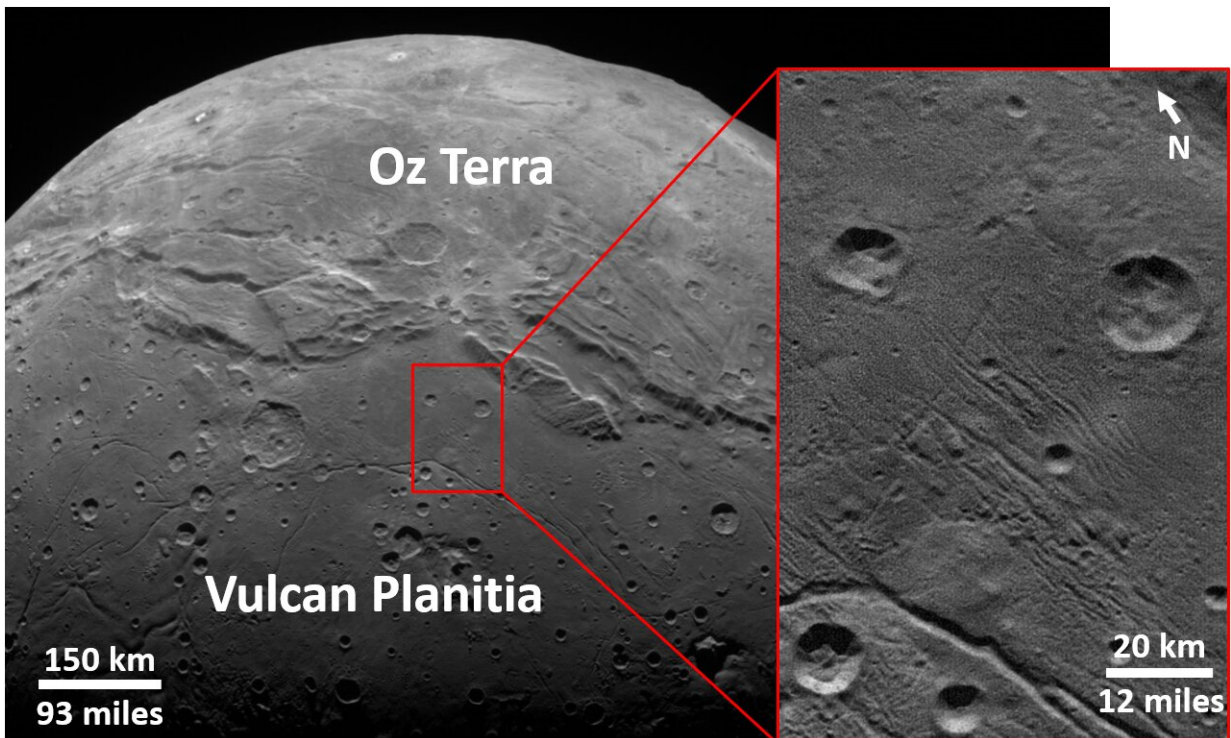


New Horizons research indicates small Kuiper Belt objects are surprisingly rare

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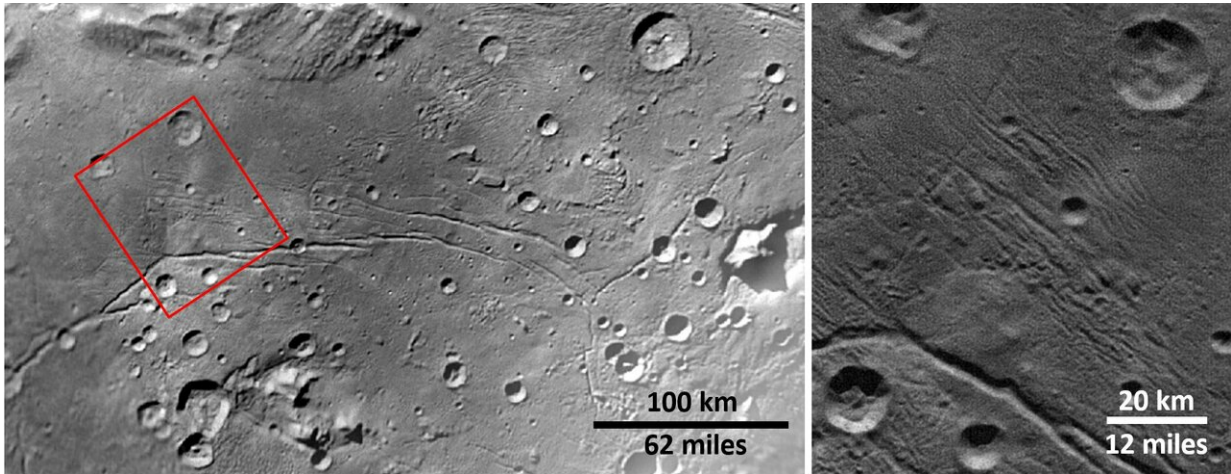
An SwRI-led team studied the craters and geology on Pluto and Charon and found there were fewer small craters than expected. This implies that the Kuiper Belt contains relatively small numbers of objects less than 1 mile in diameter. Imaged by New Horizon's LORRI camera, the smooth, geologically stable 'Vulcan Planitia' on Charon illustrates these findings. Credit: NASA/JHUAPL/LORRI/SwRI

Using New Horizons data from the Pluto-Charon flyby in 2015, a Southwest Research Institute-led team of scientists have indirectly discovered a distinct and surprising lack of very small objects in the Kuiper Belt. The evidence for the paucity of small Kuiper Belt objects (KBOs) comes from New Horizons imaging that revealed a dearth of small craters on Pluto's largest satellite, Charon, indicating that impactors from 300 feet to 1 mile (91 meters to 1.6 km) in diameter must also be rare.

The Kuiper Belt is a donut-shaped region of icy bodies beyond the orbit of Neptune. Because small Kuiper Belt objects were some of the "feedstock" from which planets formed, this research provides new insights into how the solar system originated. This research was published in the March 1 issue of the prestigious journal *Science*.

"These smaller Kuiper Belt objects are much too small to really see with any telescopes at such a great distance," said SwRI's Dr. Kelsi Singer, the paper's lead author and a co-investigator of NASA's New Horizons mission. "New Horizons flying directly through the Kuiper Belt and collecting data there was key to learning about both large and small bodies of the Belt."

"This breakthrough discovery by New Horizons has deep implications," added the mission's principal investigator, Dr. Alan Stern, also of SwRI. "Just as New Horizons revealed Pluto, its moons, and more recently, the KBO nicknamed Ultima Thule in exquisite detail, Dr. Singer's team revealed key details about the population of KBOs at scales we cannot come close to directly seeing from Earth."



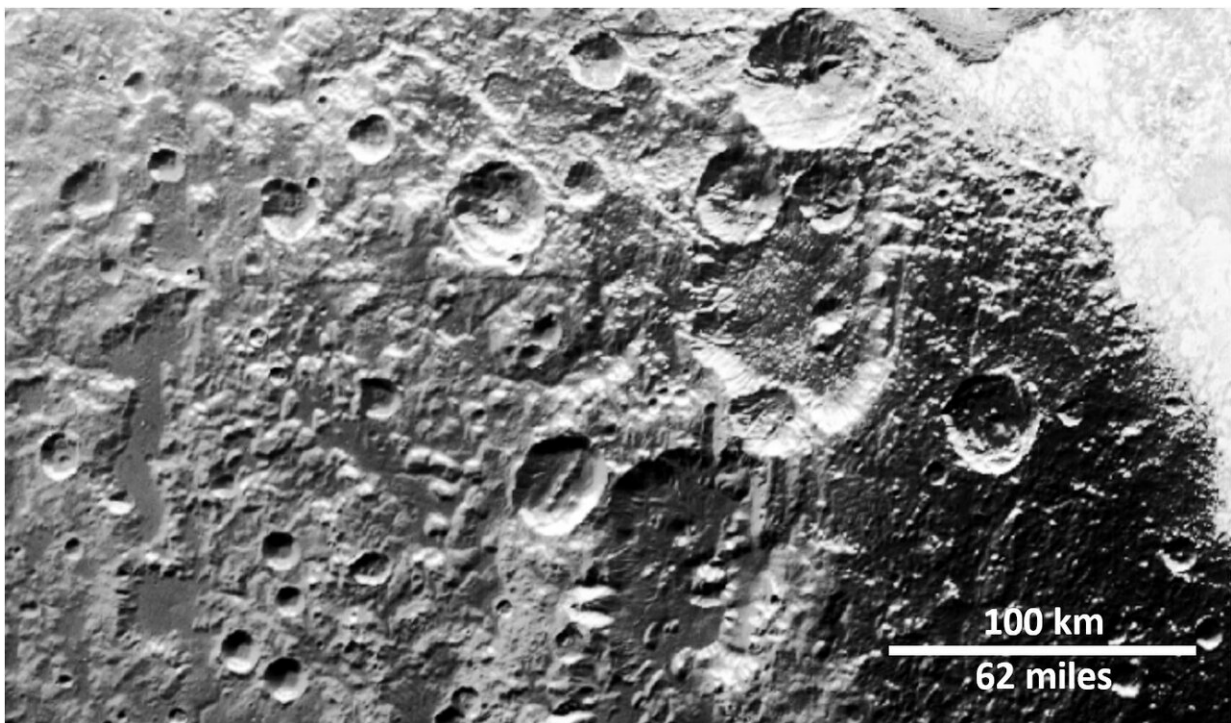
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Craters on solar system objects record the impacts of smaller bodies, providing hints about the history of the object and its place in the solar system. Because Pluto is so far from Earth, little was known about the dwarf planet's surface until the epic 2015 flyby. Observations of the surfaces of Pluto and Charon revealed a variety of features, including mountains that reach as high as 13,000 feet (4 km) and vast glaciers of nitrogen ice. Geologic processes on Pluto have erased or altered some of the evidence of its impact history, but Charon's relative geologic stasis has provided a more stable record of impacts.

"A major part of the mission of New Horizons is to better understand the Kuiper Belt," said Singer, whose research background studying the geology of the icy moons of Saturn and Jupiter positions her to

understand the surface processes seen on KBOs. "With the successful flyby of Ultima Thule early this year, we now have three distinct planetary surfaces to study. This paper uses the data from the Pluto-Charon flyby, which indicate fewer small impact craters than expected. And preliminary results from Ultima Thule support this finding."

Typical planetary models show that 4.6 billion years ago, the solar system formed from the gravitational collapse of a giant molecular cloud. The Sun, the planets and other objects formed as materials within the collapsing cloud clumped together in a process known as accretion. Different models result in [different populations](#) and locations of objects in the solar system.



Credit: NASA/Johns Hopkins University Applied Physics Laboratory/Southwest Research Institute/K. Singer

"This surprising lack of small KBOs changes our view of the Kuiper Belt and shows that either its formation or evolution, or both, were somewhat different than those of the asteroid belt between Mars and Jupiter," said Singer. "Perhaps the asteroid belt has more small bodies than the Kuiper Belt because its population experiences more collisions that break up larger objects into smaller ones."

The paper published in *Science* is titled "Impact craters on Pluto and Charon indicate a deficit of small Kuiper Belt objects."

More information: K.N. Singer et al., "Impact craters on Pluto and Charon indicate a deficit of small Kuiper belt objects," *Science* (2019). [science.sciencemag.org/cgi/doi ... 1126/science.aap8628](https://science.sciencemag.org/cgi/doi/10.1126/science.aap8628)

Provided by Southwest Research Institute

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