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## Lunar Craters May Be Chilliest Spots in Solar System

By KENNETH CHANG  
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The shadowy craters near the south pole of the [Moon](#) may be the coldest places in the solar system, colder than even Pluto, [NASA](#) scientists reported Thursday as they unveiled some of the first findings from the Lunar Reconnaissance Orbiter spacecraft.



“We’re looking at the Moon with new eyes,” said Richard Vondrak, the mission’s project scientist.

The orbiter, [launched in June](#), officially began its one-year mission to map the Moon’s surface this week. But during three months of turning on, testing and calibration of its seven instruments, it had already begun returning data. Notably, its camera captured pictures of the Apollo landing sites, including some of the tracks that the astronauts left on the surface.

In the newly released data, thermal measurements showed that daytime temperatures over much of the surface reached 220 degrees Fahrenheit — hotter than boiling water — before plummeting to frigidness at night.

But the bottoms of the craters, which lie in permanent darkness, never warm above minus 400. Those ultracold temperatures are cold enough to have trapped and held deposits of ice for several billion years. The ice could prove a valuable resource to future explorers, not only as drinking water but also, when the water molecules are broken apart, hydrogen and oxygen.

If it exists, the ice could also hold a detailed historical record of past comet impacts on the Moon, which would provide new hints of the early conditions in the solar system.

A second instrument detected slow-moving neutrons,

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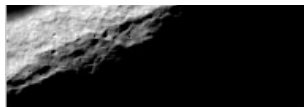

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A photograph from the Lunar Reconnaissance Orbiter showing the rim of Shackleton crater, near the Moon's south pole. [More Photos »](#)

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which indicate the presence of hydrogen in the polar regions. The hydrogen is most likely in the form of water, and that data support [the findings of the Lunar Prospector spacecraft](#) a decade ago.

In a twist, the reconnaissance orbiter found hydrogen not only in some craters but also in some areas outside of the craters. Also, some of the craters did not appear to have hydrogen.

That means the water — or some other hydrogen-containing molecule like methane — lies beneath the surface. “It would be very durable there,” Dr. Vondrak said. “What we don’t know is the abundance and how deep it is buried.”

Getting to the material at the bottom of the craters could be difficult. An instrument that maps the topography by bouncing a laser beam off the surface has found the sides of the craters to be steep and rough terrain.

The primary mission of the Lunar Reconnaissance Orbiter, gathering data on the Moon from an altitude of 31 miles to prepare for the return on astronauts, will continue for a year. After that, it will continue to operate to gather information for scientists.

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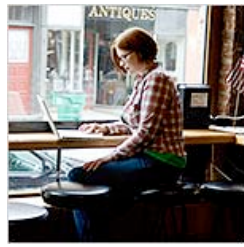


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