New Icy 'Super-Earth' Planet Found

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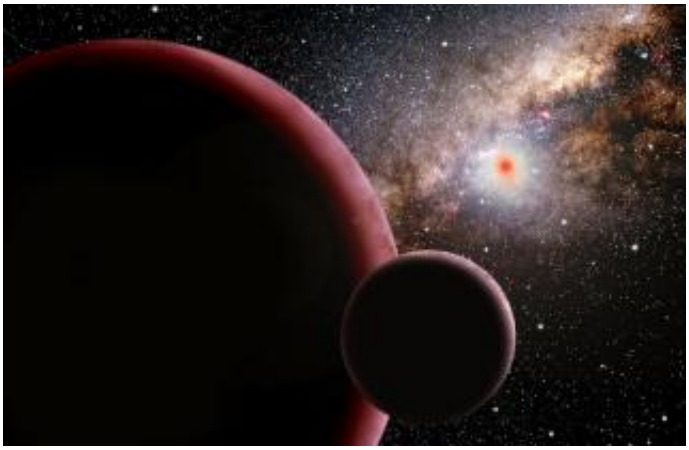

The discovery of a "super-Earth" orbiting a red dwarf star 9,000 light-years away suggests that such worlds are three times more common than Jupiter-sized planets. The 13-Earth-mass planet (shown in this artist's conception with a hypothetical moon) was detected by a search for microlensing events, in which the gravity of a foreground star distorts the light of a more distant background star. Microlensing is the only way to detect Earth-mass planets from the ground with current technology. Credit: David A. Aguilar (CfA)

An international collaboration of astronomers has discovered a "super-Earth" orbiting in the cold outer regions of a distant solar system about 9,000 light-years away. The planet weighs 13 times as much as Earth, and at -330 degrees Fahrenheit, it's one of the coldest planets ever discovered outside our solar system.

Andrew Gould, leader of the MicroFUN collaboration and professor of

astronomy at Ohio State University , pointed to two key implications of the discovery. "First," Gould said, "this icy super-Earth dominates the region around its star that in our solar system is populated by the gas-giant planets, Jupiter and Saturn. We've never seen a system like this before, because we've never had the means to find them."

"And second," he added, "these icy super-Earths are pretty common. Roughly 35 percent of all stars have them."

The astronomers have submitted a paper on the planet to Astrophysical Journal Letters, and posted a copy on the Internet preprint server arXiv.org.

MicroFUN searches for planets using a phenomenon called gravitational microlensing, which occurs when a massive object such as a star crosses in front of another star shining in the background. The object's strong gravity bends the light rays from the more distant star and magnifies them like a lens. Here on Earth, we see the magnified star get brighter as the lens star crosses in front of it, and then fade as the lens gets farther away.

The OGLE (Optical Gravitational Lensing Experiment) collaboration initially discovered the microlensed star in April 2005. Piecing together their observations, Gould and OGLE leader Andrzej Udalski of Warsaw University Observatory suddenly realized on May 1 that the star was brightening extremely quickly, meaning that it would be exceptionally fertile ground for planet hunting. "It was 4:00 a.m.," Gould said. "I was very excited and frantic to get someone to observe that star."

So Gould called the MDM Observatory in Arizona, where the astronomer on duty happened to be Ohio State graduate student Deokkeun An.

Gould asked An to spare a few minutes during his night's work to occasionally measure the star's brightness. But when An and his co-observer Ai-ying Zhou of Missouri State University heard how intense the signal was, they decided to put aside their own project to take more than 1,000 measurements of the event.

"It's a good thing that they did -- their observations turned out to be critical to our determination that there was a planet," Gould said.

"I thought this was a good chance to take many images of the event, to erase any doubt as to whether this was a planet signal," An remembered. "Since the target could only be seen through the telescope during a short time window, we did not hesitate to follow it."

The event was also observed by astronomers in New Zealand and Hawaii.

But after the astronomers gathered all the data, they faced more difficulties. There remained a chance that the tiny warping they saw in the signal wasn't caused by a planet, and Ohio State graduate student Subo Dong had to write special software to speed their computer models to weed out the other possibilities.

Finally, the models confirmed the presence of a Neptune-mass planet, 13 times heavier than Earth, orbiting a star about half as big as our sun.

Gould suspects that the planet is a bare, icy terrestrial one -- a cold super-Earth. Judging from the absence of Jupiter-like planets in its vicinity, that solar system may lack the gas necessary to make gas planets, he said.

"We can't really tell for sure," he admitted. "If we start getting more statistics on this type of planet, we could piece together a better story."

Until a decade ago, scientists had no evidence of what other solar systems were like. Since then, some 170 planets have been discovered, and most of them have been gas giants similar to Jupiter.

Only a handful of Neptune-mass planets have ever been detected, and only two in the cold outer regions of their solar systems. "The next step is to push the sensitivity of our detection methods down to reach Earth-mass planets," Gould said, "and microlensing is the best way to get there."

The technique is the only one sensitive enough to detect these types of planets, he added. To increase the chance of finding planets like Earth, he would like to see a new generation of telescopes dedicated to microlensing planet searches.

Source: Ohio State University