

NASA, using Kepler space telescope, finds smallest planet yet

By Eryn Brown

LOS ANGELES – NASA scientists have discovered a faraway planet that's smaller than Mercury – far tinier than they expected they could find when they launched the Kepler space telescope nearly four years ago.

The hot, rocky world orbits a sun-like star that's about 210 light-years from Earth. Astronomers are excited about it because it's smaller than any planet in our solar system, said astrophysicist Thomas Barclay of NASA's Ames Research Center in Mountain View, Calif.

"This is the smallest exoplanet that's ever been found," said Barclay, lead author of a report on the discovery published Wednesday in the journal *Nature*. "We're breaking new ground here."

From its perch in space, the Kepler telescope trains its lenses on more than 150,000 stars in the Milky Way and searches for the telltale fluctuations in a star's light caused by a planet's passing orbit. A primary goal of the mission is to look for Earth-like worlds that orbit within their stars' "habitable zones" – planets that might be able to maintain liquid water on their surfaces and, perhaps, sustain life.

Kepler has performed its job well, thus far detecting 2,740 possible planets in its designated patch of sky. Subsequent analysis has confirmed that 105 of those candidates were actual planets.

Most of those have been significantly larger than Earth, and are believed to be gassy or watery in composition. Small rocky planets are more difficult to spot, Barclay said, in part because they obscure such a tiny amount of light from the stars they orbit. Natural variability in a star's light can be confused with a planetary signal.

But Kepler-37, the star that hosts the small planet, made the detection work easier by being bright and "quiet," Barclay said. In fact, the scientists were able to see a clear-enough pattern of dips in its light to distinguish three separate planets orbiting the star.

Subsequent analysis – using images from ground-based telescopes and sophisticated computer modeling – helped Barclay's team confirm that the sightings were real, he added.

The smallest of the three planets, known as Kepler-37b, is about the same size as Earth's moon and takes just 13 days to complete an orbit. Its neighbor, Kepler-37c, is about three-quarters the size of Earth and completes an orbit in 21 days. Both are probably rocky planets, Barclay said.

The third planet in the system, called Kepler-37d, is about twice as big as Earth and orbits in 40 days. It is likely to be a gassy, Neptune-like planet – but very hot, Barclay said.

All three bodies are closer to their host star than Mercury is to the sun, and none of them would be suitable for supporting life as we know it, Barclay said.

But their discovery is still "really good news" for the search for habitable worlds, he added, because it demonstrates that the Kepler telescope is sensitive enough to find Earth-sized planets with longer orbits "in the not-too distant future."

Because the Kepler-37 planets are so close to their star and orbit it so quickly, scientists were able to observe dozens of light dips associated with their transits. Planets orbiting at greater distances don't pass in front of their star as frequently, so it takes

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longer for researchers to accumulate sufficient data to study.

Barclay said he doesn't expect the telescope to find many more planets as small as Kepler-37b, however. They're just too hard to see.

"There's a limit to how small a signal you can detect," he said.

California Institute of Technology astronomer John Johnson, who was not involved in the research, said that scientists planning the Kepler mission never thought they would find such tiny worlds. "I don't think anyone would have been taken seriously if they had said, before Kepler launched, that we'd find planets as small as Mercury," he said. Mercury is slightly larger than Earth's moon.

The telescope has revolutionized astronomers' notions of our galaxy as a place that must be "teeming with rocky planets" that seem to be "a natural outgrowth of star formation," he added.

Indeed, Kepler has been so prolific that many space enthusiasts have become blasé about exoplanet discoveries just as scientists are closing in on finding truly Earth-like worlds, Johnson said.

"Every one of these detections was unimaginable in 2008," he said. "Every one of these is super-important."

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