UC Irvine astronomers discover scores of exoplanets may be larger than realized

The finding could impact search for extraterrestrial life.

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An exoplanet host with several background stars. If left uncorrected, the additional light from the background stars can lead to underestimated exoplanet size measurements. The square grid represents individual pixels from NASA’s TESS

satellite.

Picture Credit:
Nikolai Berman / UC Irvine

Irvine, Calif., July 14, 2025 — In new research, University of California, Irvine astronomers describe how more than 200 known exoplanets are likely much larger than previously thought. It's a finding that could change which distant worlds researchers consider potential harbors for extraterrestrial life.

"We found that hundreds of exoplanets are larger than they appear, and that shifts our understanding of exoplanets on a large scale," said Te Han, a doctoral student at UC Irvine and lead author of the new *Astrophysical Journal Letters* study. "This means we may have actually found fewer Earth-like planets so far than we thought."

Astronomers can't observe exoplanets directly. They have to wait for a planet to pass in front of its host star, and then they measure the very subtle drop in light emanating from a star. "We're basically measuring the shadow of the planet," said Paul Robertson, UC Irvine professor of astronomy and study co-author.

Han's team studied observations of hundreds of exoplanets observed by NASA's Transiting Exoplanet Survey Satellite, and they found that light from neighboring stars can "contaminate" the light of a star an astronomer is studying. This can make any planet that's passing in front of a star appear smaller than it truly is, because smaller planets block less light than bigger planets.

Han assembled hundreds of studies describing exoplanets discovered by the TESS mission, and he sorted the planets according to how various research teams measured the radii of exoplanets so he could estimate with the help of a computer model the degree to which those measurements were biased because of light contamination from neighboring stars. The team used observations from another satellite mission called Gaia to help them estimate just how much light contamination is affecting TESS' observations.

"TESS data are contaminated, which Te's custom model corrects better than anyone else in the field," said Robertson. "What we find in this study is that these planets may systematically be larger than we initially thought. It raises the question: Just how common are Earth-sized planets?"

The number of exoplanets thought to be similar in size to Earth was already small. “Of the single-planet systems discovered by TESS so far, only three were thought to be similar to Earth in their composition,” said Han. “With this new finding, all of them are actually bigger than we thought.”

That means that, rather than being rocky planets like Earth, the planets are more likely so-called “water worlds,” planets covered by one giant ocean that tend to be larger than Earth – or even larger, gaseous planets like Uranus or Neptune. This could impact the search for life on distant planets, because while water worlds may harbor life, they may also lack the same kinds of features that help life flourish on planets like Earth.

“This has important implications for our understanding of exoplanets, including among other things prioritization for follow-up observations with the James Webb Space Telescope, and the controversial existence of a galactic population of water worlds,” said Roberston.

Next, Han and his team plan to use the new data to start reexamining planets previously thought uninhabitable due to their size and to also let other researchers know to exercise caution when interpreting data from satellites like TESS.

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