Researchers find tidally distorted exoplanets may have unique signatures

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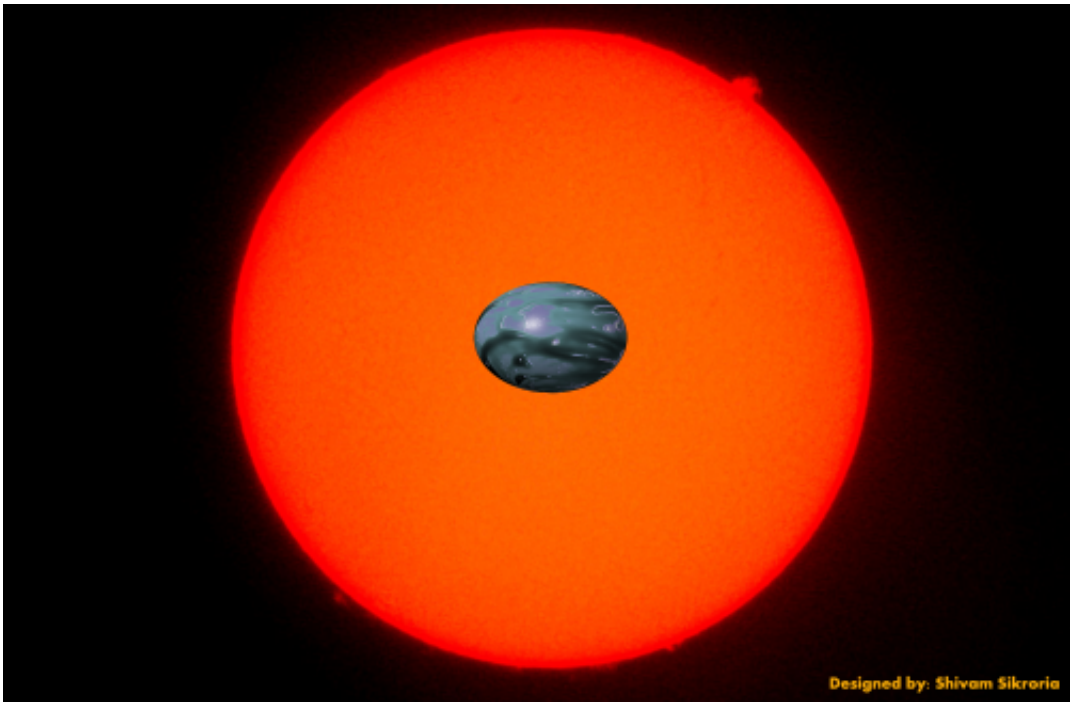

An artist's impression of a stretched rocky planet in orbit around a red dwarf star. So close to the star, there is a difference in the strength of the gravitational field on each side of the planet, stretching it significantly. Credit: Shivam Sikroria

Astronomers could soon be able to find rocky planets stretched out by the gravity of the stars they orbit, according to a group of researchers in the United States. The team, led by Prabal Saxena of George Mason University, describe how to detect these exotic worlds in a paper in the

journal *Monthly Notices of the Royal Astronomical Society*.

Since the first discovery in 1993, more than 1800 planets have been found in orbit around stars other than our Sun. These 'exoplanets' are incredibly diverse, with some gaseous like Jupiter and some mostly rocky like the Earth. The worlds also orbit their stars at very different distances, from less than a million km to nearly 100 billion km away. Planets that are very close to their stars experience harsh conditions, often with very high temperatures (>1000 degrees Celsius) and significant stretching from the tidal forces resulting from the stellar gravitational field. This is most obvious with planets with a large atmosphere (so-called 'hot Jupiters') but harder to see with the rockier objects.

Prabal and his team modelled cases where the planets are in orbit close to small red dwarf stars, much fainter than our Sun, but by far the most common type of star in the Galaxy. The planets' rotation is locked, so the worlds keep the same face towards the stars they orbit, much like the Moon does as it moves around the Earth. According to the scientists, in these circumstances the distortion of the planets should be detectable in transit events, where the planets moves in front of their stars and blocks out some of their light.

If astronomers are able to find these extreme exoplanets, it could give them new insights into the properties of Earth-like planets as a whole. Prabal comments, "Imagine taking a planet like the Earth or Mars, placing it near a cool red star and stretching it out. Analysing the new shape alone will tell us a lot about the otherwise impossible to see internal structure of the planet and how it changes over time."

The subtle signals from stretched rocky planets could be found by some current telescopes, and certainly by much more powerful observatories like the James Webb Space Telescope (JWST) and the European

Extremely Large Telescope (E-ELT) that are due to enter service in the next few years.

More information: "The observational effects and signatures of tidally distorted solid exoplanets." *MNRAS* (February 2015) Vol. 446 4271-4277 DOI: 10.1093/mnras/stu2111 First published online December 14, 2014

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