

Exoplanets lighten up

More Earth-like planets spotted outside our solar system.

Katharine Sanderson

A solar system more than six parsecs away from Earth may hold two planetary record-breakers: the lightest exoplanet ever spotted, and another planet just the right distance from its star to harbour liquid water.

Michel Mayor, from Switzerland's Geneva Observatory, announced the findings on 21 April at a meeting for the European Week of Astronomy and Space Science at the University of Hertfordshire, UK. Both discoveries boost the spirits of astronomers seeking Earth-like planets outside our Solar System.

The new lightest exoplanet, called Gliese 581e, is the fourth to be detected in the Gliese 581 star system. It is probably a rocky planet with a mass just 1.9 times that of Earth, Mayor says, although is too hot and too close to its parent star to harbour life.

Mayor and his colleagues also announced a refinement in the orbit of a planet they discovered in 2007, Gliese 581d, which they thought at the time hovered on the 'habitable' zone of its star, where liquid water could exist. We now know "this planet is exactly inside the habitable zone", Mayor says.

Light spot

Mayor's team made observations with the HARPS (High Accuracy Radial velocity Planetary Search project) instrument at the European Organisation for Astronomical Research in the Southern Hemisphere in La Silla, Chile. HARPS measures the wobble in a star's orbit caused by the pull of its orbiting planets. These fluctuations are tiny, but show up as changes in the star's spectrum.

"It is very exciting that they are able to find such a light planet using the radial-velocity method," says Jim Kasting, an expert on habitable zones from the Pennsylvania State University in University Park.

In February, the planet with the smallest radius yet seen, about 1.7 times that of Earth's, was unveiled by the CoRoT (Convection, Rotation and Planetary Transits) mission at France's National Centre for Space Studies (CNES).

CoRoT looks for planets that are transiting in front of their star, which can give a measure of radius, but not mass. Mayor has measured a mass, but not the radius. "It will be better to have both," he says. But "unhappily we haven't been able to do that for this system". He hopes he will be able to get a radius estimate for Gliese 581e, if it is caught transiting its star.

Oceans afar

HARPS observations also allowed Mayor's team to refine the orbit of Gliese 581d, which has a mass about 7 times that of Earth. Previously, Gliese 581d was thought to orbit its star once every 60–80 days. Now Mayor says he has pinned it down to 66.8 days.

When this orbital period is plugged into theoretical models of regions around the star that might harbour life, the answer is encouraging. "Gliese 581d is now well in the habitable zone," agrees Werner von Bloh, an exoplanet scientist at the Potsdam Institute for Climate Impact Research in Germany who has performed his own Gliese 581 calculations.

Gliese 581d is too far from its star, which is dim compared with our Sun, to be composed entirely of rock: the dust that accumulated around the star when it was born was unlikely to be sufficient to form a rocky planet of that size so far out. But it probably has oceans on its surface, says Mayor, and this is the first such planet to be detected.

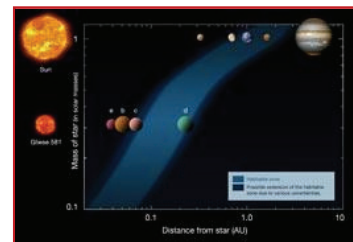
"This planet is probably the best candidate for harbouring life, but it is still a long shot because its mass could be significantly larger than the 7 Earth mass minimum that they get from radial-velocity measurements. If it's bigger than about 10 Earth masses, then it is probably an ice giant like Neptune or Uranus and, as such, would lack a solid (or liquid) surface," cautions Kasting.

Mayor is using HARPS to focus on a small selection of bright stars, and thinks that the observations announced so far are promising for future exoplanet discoveries. He has a swathe of unpublished data from which he hopes 80 low-mass planets may be teased out.



Gliese 581e is only about twice the mass of Earth.

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"Maybe the first twin of the Earth will come out of this type of experiment," he says, adding that such a planet could be found within four or five years.



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