
This Large Exoplanet Could Have Right Conditions For Life

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London: Research led by an Indian-origin astronomer has found an exoplanet more than twice the size of Earth that could have the right conditions to sustain alien life.

The team from the University of Cambridge used the mass, radius, and atmospheric data of the exoplanet K2-18b and determined that it is possible for the planet to host liquid water at habitable conditions beneath its hydrogen-rich atmosphere.

The results were published in The Astrophysical Journal Letters.

Located 124 light years away, the exoplanet K2-18b, is 2.6 times the radius and 8.6 times the mass of Earth, and orbits its star within the habitable zone, where temperatures could allow liquid water to exist.

The planet was the subject of significant media coverage in the autumn of 2019, as two different teams reported detection of water vapour in its hydrogen-rich atmosphere.

However, the extent of the atmosphere and the conditions of the interior underneath remained unknown.

"Water vapour has been detected in the atmospheres of a number of exoplanets but, even if the planet is in the habitable zone, that doesn't necessarily mean there are habitable conditions on the surface," said Nikku Madhusudhan from Cambridge's Institute of Astronomy, who led the new research.

"To establish the prospects for habitability, it is important to obtain a unified understanding of the interior and atmospheric conditions on the planet -- in particular, whether liquid water can exist beneath the atmosphere," Madhusudhan said.

Given the large size of K2-18b, it has been suggested that it would be more like a smaller version of Neptune than a larger version of Earth.

A 'mini-Neptune' is expected to have a significant hydrogen 'envelope' surrounding a layer of high-pressure water, with an inner core of rock and iron.

If the hydrogen envelope is too thick, the temperature and pressure at the surface of the water layer beneath would be far too great to support life.

Now, Madhusudhan and his team have shown that despite the size of K2-18b, its hydrogen envelope is not necessarily too thick and the water layer could have the right conditions to support life.

They used the existing observations of the atmosphere, as well as the mass and radius, to determine the composition and structure of both the atmosphere and interior using detailed numerical models and statistical methods to explain the data.

The researchers confirmed the atmosphere to be hydrogen-rich with a significant amount of water vapour.

They also found that levels of other chemicals such as methane and ammonia were lower than expected for such an atmosphere. Whether these levels can be attributed to biological processes remains to be seen.
