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Surprise during the Search for a Second Earth

A team of scientists led by the Potsdam Institute for Climate Impact Research (PIK) investigated the habitability of the planetary system Gliese 581 in the constellation of Libra, 20 light-years away.

The planetary system Gliese 581 contains probably three planets orbiting a Red Dwarf. The central star has 100 times less luminosity than our Sun. Both planets investigated are so-called Super-Earths, i.e. planets with a mass up to 10 times higher than that of the Earth.

With the help of a model for the evolution of Earth-like planets coupled with a climate model they were able to demonstrate habitable conditions on the planet Gl 581d, while its smaller brother, Gl 581c, has to be classified uninhabitable.

This contradicts the findings of another research team in April of this year that announced Gl 581c to be the first habitable planet outside our solar system.

The new investigations of the Potsdam scientists Werner von Bloh, Christine Bounama and Siegfried Franck together with Manfred Cuntz from the Texas University at Arlington incorporate the thermal evolution of planets, i.e. the cooling of the planetary body from its formation and the connected geodynamic parameters.

Because of its heavy mass the Potsdam scientists consider it likely that Gl 581c has a dense atmosphere.

Previous calculations derived the habitability of the planet only from temperatures calculated for the radiation balance of the planetary surface without an atmosphere.

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Among the extra solar planets detected so far, the planet Gl 581c, already acclaimed by the media as a"second Earth", has the most similar dimensions compared to Earth, because it has"only" five times its mass.

But according to the new calculations the orbit is too close to the central star so that the surface is too hot for the evolution of life.

In contrast to previous assumptions, the environmental conditions on the planet Gl 581d with an eight times higher mass than Earth and a more distant orbit could allow the evolution of primitive life forms.

Because the planet always has the same side turned towards its central star - as the Moon does to the Earth - the emergence of higher life forms is very unlikely.

On the day side it is probably warm, while on the night side severe cold dominates. Nor could Gliese 581d become a second home planet for mankind because even on its sunlit side, red twilight prevails and wild storms blow.

The search for a "second Earth" able to harbour higher life forms is therefore still far from over.

Nevertheless, a more detailed investigation of Gl 581d would be exciting because it orbits in the habitable zone, where the emergence of life might be possible.

This planet and its neighbours are within the range of detection of the Darwin satellite mission planned by the Europeans for 2015, a mission designed for the observation of extra solar planets and the detection of life.

The Super-Earth Gl 581d should be explicitly observed as part of this endeavour.