Super-Earth unlikely able to transfer life to other planets

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While scientists believe conditions suitable for life might exist on the so-called "super-Earth" in the Gliese 581 system, it's unlikely to be transferred to other planets within that solar system.

"One of the big scientific questions is how did life get started and how did it spread through the universe," said Jay Melosh, distinguished professor of earth and atmospheric sciences. "That question used to be limited to just the Earth, but we now know in our solar system there is a lot of exchange that takes place, and it's quite possible life started on Mars and came to Earth. There's also been a great deal of discussion about the possible spread of life in the universe from star to star."

Moon rocks and Mars meteorites have been found on Earth, which led Melosh to previously suggest living microbes could be exchanged among planets in a similar manner.

A Purdue research team has found that, in contrast to our own solar system, the exchange of living microbes between "super-Earth" and planets in that solar system is not likely to occur.

Laci Brock, a student studying interdisciplinary physics and planetary science, and Melosh will present those findings Tuesday (March 20) at the 43rd Lunar and Planetary Science Conference in The Woodlands, Texas.

Brock examined the Gliese 581 planetary system because Planet d,

known as super-Earth, falls in a "habitable zone" where liquid water could possibly exist.

"Laci has found the somewhat surprising result that it is very difficult for materials to spread throughout that system in the same way it could take place in our solar system," Melosh said.

All four planets found in Gliese 581 are within close proximity to their central star, which results in large orbital velocities, Brock said. However, the initial velocity of material leaving Planet d is not enough to allow exchanges among planets.

"Planet d would have a very small chance of transferring material to the other planets in the Gliese system and, thus, is far more isolated, biologically, than the inner planets of our own solar system," Brock said. "It really shows us how unique our solar system is."

Melosh said a more extended solar system would be needed for exchange of materials among planets.

"None of the solar systems that have been found so far would have opportunities for exchange of life among the different planets like what our own solar system offers," he said.

The Opik-Arnold method was used to simulate 10,000 particles being ejected from Planet e and super-Earth. The velocity ranges of the particles were scaled from each of the planet's orbital velocities, which is very high by solar system standards due to the close proximity to their central star.

"Ejections from Planet d have a low probability of impact on any other planet than itself, and most ejected particles would enter an initial hyperbolic orbit and be ejected from the planetary system," Brock said.

Several members of Purdue's planetary sciences department are attending the 43rd Lunar and Planetary Science Conference, presenting research on possible biologic contamination of Mars' moon Phobos by microbes from the surface of Mars; the formation of jets on comets; and gravity anomalies around large lunar craters.

"Purdue has quite a showing of different people at this conference to showcase their work," Melosh said.

More information: 43rd Lunar and Planetary Science Conference: www.lpi.usra.edu/meetings/lpsc2012/

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