Summer vacation?
Scientists disagree over the habitability of a planet orbiting a distant red dwarf.

Credit: ESO

New Earth or Planetary Hothouse?

By Phil Berardelli
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Two months after astronomers discovered an extrasolar planet capable of supporting life, another team has questioned that finding and forwarded its own candidate for a second Earth--although neither world figures to become a prime vacation destination.

Last April, a Swiss team announced that it had found a rocky planet about five times as massive as and 1.5 times larger in diameter than Earth (*Science*, 27 April, p. 528:). The object, named Gliese 581c, orbits a red dwarf star in the constellation Libra about 20 light-years away. Based on their calculations, the scientists found that the planet rests near the inner edge of the habitable zone--the range of distances from a star in which water can exist as a liquid--and therefore could support at least simple life forms. That conclusion, the team said, made Gliese 581c the first potential Earth-like destination outside our solar system for future human explorers.

But astronauts shouldn't pack their bags just yet. When an international team of physicists led by Werner von Bloh of the Potsdam Institute for Climate Impact Research in Potsdam, Germany, applied computer climate models to Gliese 581c, it found that even if the planet contained life-giving carbon dioxide, Gliese 581c's close proximity to its parent star would cause high levels of the greenhouse gas to build up in the atmosphere. That would likely warm the planet above 100°C, boiling off any water.

A better prospect might be Gliese 581d, an even heavier world weighing about eight times more than Earth. Also discovered by the Swiss team in April, Gliese 581d is farther away from its star than 581c is--about the same distance as Mercury is from the sun--although its star is 100 times dimmer. As a result, the greenhouse effect would not cause runaway warming on 581d as it does on 581c, von Bloh and colleagues conclude in a letter that will be published in an upcoming issue of *Astronomy & Astrophysics*. The planet's "surface temperature ... might be above the freezing point of water," von Bloh says, but that can only be confirmed by further observations.

Even though the conclusions are from models and not direct observations, the new findings appear reasonable, says physicist Joseph Harrington of the University of Central Florida in Orlando. Whether a planet orbits within the habitability zone also depends on atmospheric dynamics, he says, which is why Venus is hotter than Mercury even though it's farther from the sun. "Gliese 581c is now out of the habitability club," says Harrington, "but its planetary sibling Gliese 581d has managed to squeak in."

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