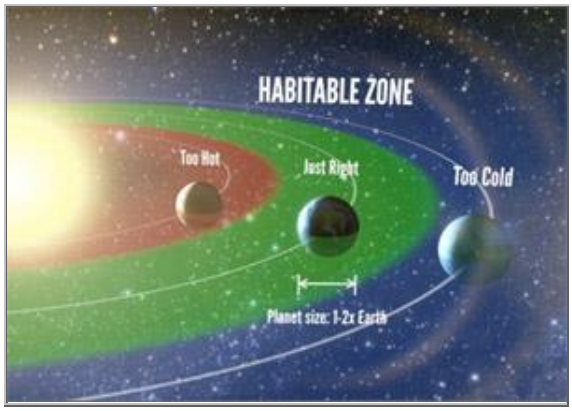
One in five Sun-like stars may host habitable world

Nov. 5, 2013
Courtesy of the W.M. Keck Observatory
and World Science staff

One in five Sun-like stars in our galaxy have Earth-sized planets that could host life, according to a new study.

The figure is an estimate of how many planets are likely to be circling their stars at suitable distances for liquid water to stay on the planet surface.



Artist's representa of the "habitable zone," the range of orbits where liquid water is permitted on the surface of a planet. The authors find that 22±8 percent of Sun-like stars harbor a planet between one and two times the size of Earth in the habitable zone. (Courtesy of Keck Observatory)

The findings, by scientists at the University of California, Berkeley, and the University of Hawaii, Manoa, appear Nov. 4 in the journal *Proceedings of the National Academy of Sciences*.

"What this means is, when you look up at the thousands of stars in the night sky, the nearest sun-like star with an Earth-size planet in its habitable zone is probably only 12 light years away and can be seen with the naked eye. That is amazing," said UC Berkeley graduate student Erik Petigura, who led the analysis of the data. A light-year is the distance light travels in a year.

The scientists used data from NASA's Kepler spacecraft and the W. M. Keck Observatory on the summit of Mauna Kea, Hawaii.

For NASA, the estimate "is really important, because successor missions to Kepler will try to take an actual picture of a planet, and the size of the telescope they have to build depends on how close the nearest Earth-size planets are," said Andrew Howard, astronomer with the Institute for Astronomy at the University of Hawaii. "An abundance of planets orbiting nearby stars simplifies such follow-up missions."

The team, which also included UC Berkeley astronomer and planet-hunter Geoffrey Marcy, cautioned that Earth-size planets in Earth-size orbits are not necessarily hospitable to life, even if they orbit in the "habitable zone" of a star, where the temperatures are suitable for liquid water.

"Some may have thick atmospheres, making it so hot at the surface that DNA-like molecules would not survive. Others may have rocky surfaces that could harbor liquid water suitable for living organisms," Marcy said. "We don't know what range of planet types and their environments are suitable for life."

Just last week, Howard, Marcy and their colleagues provided hope that many such planets actually are rocky. They reported that one Earth-sized planet discovered – albeit, one far too hot for life as we know it – is about as heavy as Earth and most likely made of rock and iron, like Earth.

"This gives us some confidence that when we look out into the habitable zone, the planets Erik is describing may be Earth-size, rocky planets," Howard said.

All of the potentially habitable planets found in their survey are around "K" stars, which are cooler and slightly smaller than the sun, Petigura said. But the analysis indicated that the result is also applicable to "G" stars like the sun. The two star types together account, themselves, for an estimated one in five stars.

NASA launched the now crippled Kepler space telescope in 2009 to look for planets that cross in front of their stars, which causes a tiny reduction in the star's brightness. From among the 150,000 stars photographed, NASA's Kepler team reported more than 3,000 planet candidates. Many of these are much larger than Earth – ranging from large planets with thick atmospheres, like Neptune, to gas giants like Jupiter – or in orbits so close to their stars that they are roasted.

To sort them out, Petigura and his colleagues are using the twin telescopes of the Keck Observatory to analyze light from as many stars as possible. This will help them determine each star's true brightness and calculate the width of each transiting planet, with an emphasis on Earth-width planets.

Although the Kepler instrument is no longer working, the new findings satisfy its main mission: to determine how many of the 100 billion stars in our galaxy have potentially habitable planets, the scientists said.