

How common are earths around small stars?

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An artist's conception of a cool M-dwarf star seen with a transiting planet. A new Kepler study of 64 small stars with 95 candidate exoplanets estimates that the closest Earth-sized exoplanet probably orbits an M-dwarf less than 15 light-years away. Credit: MEarth Project, D. Charbonneau

(Phys.org) —The Kepler mission has revolutionized the study of exoplanet statistics by increasing the number of known extrasolar planets and planet candidates by a factor of five, and by discovering systems with longer orbital periods and smaller planet radii than any of the prior exoplanet surveys. There is of course considerable interest in locating Earth-sized planets residing in the habitable zones of their stars, that is, having orbits producing surface temperatures that allow water to remain liquid - a prerequisite for the development of life.

It turns out that small stars, so-called M-dwarfs whose masses are about

half a solar-mass and whose [surface temperatures](#) are less than about 4000K, are much more numerous than solar-type stars - about twelve times as common. Hunting for Earth-sized planets around M-dwarfs, therefore, is of particular interest. Although the idea of finding [habitable planets](#) around M-dwarfs had been discussed as early as fifty years ago, the possibilities were considered slight because of two concerns about these smaller stars. The first is that because the star is cooler and less luminous than the Sun, the planet needs to be closer for its surface temperature to be suitable, but then gravity will tidally lock it facing the star (much as the Moon is tidally locked facing the Earth). With one face perpetually toward (and one away from) the star, the planet's surface might be either too hot or too cold. The second difficulty was that small stars tend to flare, perhaps affecting a planet's atmosphere.

New research, however, suggests that suitable habitable regions might develop on a planet in either of these cases. Since there are so many more small stars, and since it is so much easier to study their transiting planets because they are closer in and so have shorter orbital periods, a team of Kepler scientists began a focussed study of exoplanets around small stars. CfA astronomers Courtney Dressing and David Charbonneau report their conclusions in this month's *Astrophysical Journal*. Using Kepler, they identify 64 dwarf stars with 95 candidate (still awaiting confirmation) planets. This sample is large enough to reach some impressive statistical conclusions: on average every six small stars should host an Earth-sized planet in its habitable zone; and to 95% confidence, because small stars are so common, the nearest planet in a habitable zone probably lies within fifteen light-years of Earth.

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