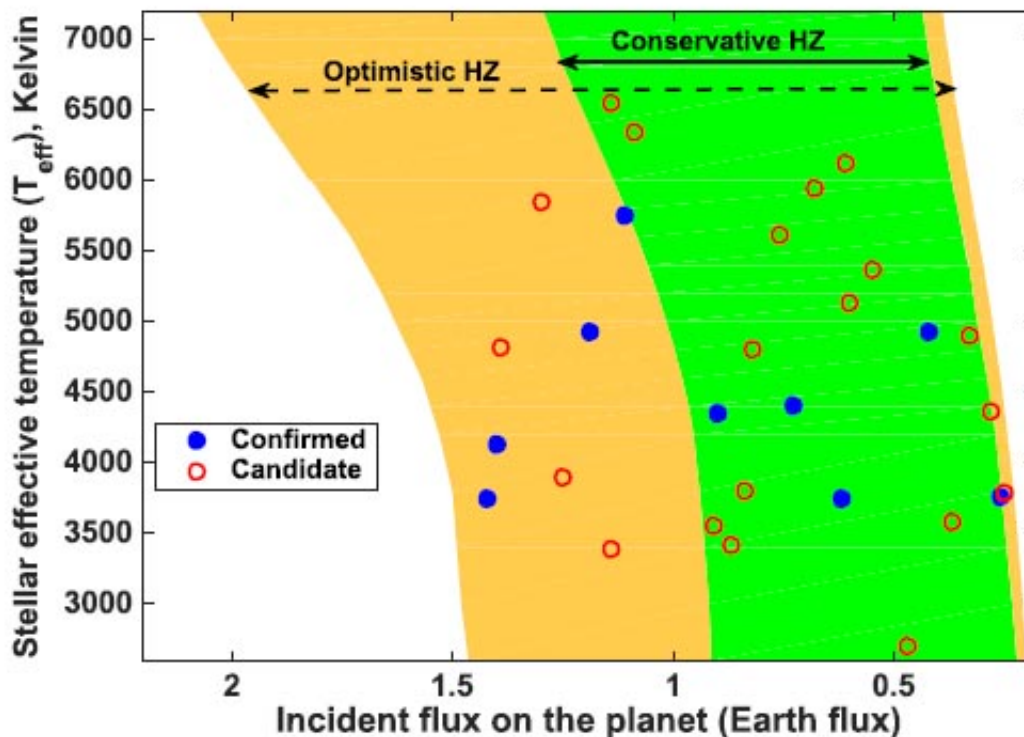


A catalog of habitable zone exoplanets

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A plot of the flux incident on an exoplanet (in units of the amount on Earth) versus the host star's temperature. The plot shows two ranges for the habitable zone, conservative green area) and optimistic (yellow area); it also shows where confirmed (blue dots) and unconfirmed (red circles) exoplanets lie in the plot. There are currently twenty known exoplanet candidates smaller than two Earth-radii that fall in their optimistically-defined habitable zones. Credit: Kane et al. 2016

The last two decades have seen an explosion of detections of exoplanets,

as the sensitivity to smaller planets has dramatically improved thanks especially to the Kepler mission. These discoveries have found that the frequency of planets increases to smaller sizes: terrestrial planets are more common than gas giants. The significance of a universe rich in terrestrial sized planets naturally leads to the question about the "habitable zone (HZ)" – the region around a star where a suitable planet could sustain the conditions necessary for life. In this zone, the balance between stellar radiation onto the planet and radiative cooling from the planet allows water on the surface to be a liquid. (The definition also includes consideration of the planet's atmosphere and solid surface.)

In our solar system, the Earth is cozily situated in the middle of the [habitable zone](#) which, depending on the model, extends roughly from Venus to Mars. The Kepler mission has as one of its primary goals the determination of the frequency of [terrestrial planets](#) in their habitable [zones](#). CfA astronomer Guillermo Torres and his colleagues have now produced a complete catalog of Kepler exoplanet candidates in their habitable zones from the Kepler data releases to date. After reviewing the various criteria for determining the boundaries of the HZ, they report there are 104 candidates within an optimistic (larger) HZ definition, and twenty within a more conservative (smaller) definition of the HZ and which also have radii less than two Earth-radii, making this group in particular potential "Earth-like" candidates.

The scientists also refine the definitions for the HZ for the purpose of more useful statistical diagnostics. They define four overlapping subgroups: candidates in the conservatively defined zone with a radius less than 2 Earth-radii; those in the larger, optimistic zone with this radius; those in the conservative zone with any radius; and those in the optimistic zone with any radius. The current catalog statistics for these four groups are 20, 29, 63, and 104 respectively. They note that these subgroups are useful when conducting specific followup studies; for example, searches for exomoons in the HZ is best done on the fourth

group and its giant exoplanets.

More information: Stephen R. Kane et al. A CATALOG OF HABITABLE ZONE EXOPLANET CANDIDATES, *The Astrophysical Journal* (2016). [DOI: 10.3847/0004-637X/830/1/1](https://doi.org/10.3847/0004-637X/830/1/1)

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