Every day we are faced with threats ranging from the increasing rate of climate change to a global pandemic, each of which threatens the survivability of Earth. Hollywood movies such as Christopher Nolan’s Interstellar raise the possibility that we may have to leave Earth one day in search of other planets that are capable of sustaining life. While leaving Earth does sound intriguing, how do we know if a distant planet can sustain human life?

The Habitable Zone

NASA defines an exoplanet as ‘any planet beyond our solar system.’ [1] The best example we have of a planet capable of sustaining life is Earth, so we want to find an exoplanet with similar conditions to Earth.

One of the important conditions for life to exist is the presence of water. “Around any star we can draw a band that represents the distance from the star to a planet for liquid water to exist, this is known as the habitable zone.” [2] If a planet is too close to the parent star, its surface temperature will be too hot, and the water would have evaporated. On the other hand, if it is too far it will be too cold, and the water would be frozen.

Figure 1 is a visualization of the habitable zone. The red represents a region that is too warm, blue represents a region that is too cold, and green is one that is just right. [3]

Exoplanets found in the green region are known as ‘Goldilocks’ planets, with the region known as the ‘Goldilocks’ zone. [4]

The Transit Method

If we look up at the night sky, we see a multitude of sparkling dots we call stars. They appear as dots because they are hundreds of light years away from us. The planets orbiting these stars are even more difficult to see so “astronomers focus on the stars themselves for signs about the planets orbiting them” [5]
The transit method is one of the popular methods for detecting exoplanets. A transit is the “moment a planet passes between a star and an observer.” [6] The moment this occurs there is a dip in brightness, which provides an abundance of information for astronomers. The small dip in brightness can tell us a great deal about the characteristics of the exoplanet. For starters, the magnitude of the dip in brightness can tell us about the size of the exoplanet. The length of time the dip lasts can tell us about the period (i.e. the time it takes the planet to orbit the star. [6] In addition to these two characteristics, we can also learn more about the exoplanet’s atmosphere. During transit, “some of the light that passes through the planet’s atmosphere can be analyzed to determine the different levels of atmospheric elements present.” [6]

The transit method might sound perfect for observing distant exoplanets, but it does have its disadvantages. There is the possibility that a “planet’s transit might only be a fraction of its orbital period.” [7] This means that an exoplanet’s transit might last hours while its orbit will take years. Astronomers need to observe these transits repeatedly to ensure an exoplanet is present, but this can be difficult for exoplanets that have longer periods. Thus, the transit method might be biased towards only observing short period planets. [7]

In the future, we might have to leave Earth someday and it is exciting to hear that humanity has already begun the search for other potentially habitable planets. Maybe one day our future generations will be studying what life was like back on Earth. Wouldn’t that be exciting?

**Sources Cited**


