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REDEFINED APPROACH TO HABITABILITY ASSESSMENT OF EXOPLANETS.

Abstract

The study of classifying planets in and beyond our solar system on whether they can accommodate life is very crucial for humanity to become multi-planetary species. Through years after constant efforts of astronomers and scientists, we were able to categorize a list of criteria to test planets on which they can be classified whether they are habitable. It later became the study of circumstellar habitable zones. This research work presents a new method to classify previously detected exoplanets candidates under known orbital parameters. The acquired set of planet candidates is arranged based on the luminosity and size of the star. The star plays a very crucial role in deciding habitability. We classify the exoplanets based on the luminosity and subsequently the radius of the habitable zone. We also consider the variability in luminosity which directly correlates with the habitable zone for the star system. Apart from previously considered habitable zone orbital parameters, we also propose consideration of additional parameters crucial for supporting earth-like life namely Earth Similarity Index (ESI) and Planetary Habitability Index (PHI). We use the ESI ranging from 0.0-least habitable to 1.0-most suitable for sustaining life. The score includes the Mean Radius of the Planet, as a reference value the earth radius is taken, the Bulk density of the planet, with a reference value of the earth bulk density, the escape velocity of the planet, with a reference value of earth escapes value. The surface temperature of the planet, with a reference value of 288K. ESI helps to take into account the physical factors of the planet. We filter the candidates based on which exoplanets can sustain the biological phenomenon. The PHI levels provide necessary information such as substrate, energy, and chemistry of the planet helping us consider the chemical process. The process of understanding biological occurrence is a major need that has to be filled while qualifying exoplanets as they play a key role in the survival of life. In this paper, we present a catalog-wide study of exoplanets detected by Kepler and TESS missions by our novel scoring system which combines all these factors into an index. Our method improves upon the techniques in studying habitable zones by considering parameters that were previously ignored. The research would help enhance our understanding of exoplanets that can sustain earth-like life and continue further investigation of candidate planets.