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REASSESSMENT OF HABITABILITY AND POTENTIALLY HABITABLE PLANETS THROUGH COMPARTMENTALIZED HABITABLE ZONES (CHZ'S) USING PLANETARY MODELLING AND SIMULATION SOFTWARE

Abstract

The paper re-defines the notion of goldilocks zones within planetary systems. As we broaden the definition of "Habitability," A set of challenges arise that question the nature of what is regarded as life-supporting/giving. Observing physical conditions on the Earth, a key focus is placed on specific regions on the Earth's surface that are considered habitable with ideal conditions (Keeping aside extremophiles). To analyze and study these scrutinized zones on other planets within the system and exoplanets, Vplanet and ROCKE 3D are used to model and identify ideal habitable/goldilocks zones. Within these nonpareil zones, obliquity and inclination angles are used as significant parameters to narrow down to distinct localities called- "Compartmentalized habitable zones" (CHZ) on a planet's surface. To identify the boundary parameters of compartmentalized habitable zones, physical and biological constraints are used to define the surface temperature ranges for various life forms. The paper looks keenly at orbital mechanics of early stellar systems to understand the influence of planet formations on physical, chemical and biological factors (and vice versa) of the bodies within the system and intern define habitable zones for the same. Keeping in mind the Earth Similarity index, the paper stresses upon Obliquity and inclination angles as major factors that play a vital role in defining the ESI factors. To comprehend the extent of influence, these factors have on habitable zones, we build a comparative study between Earth and Earth-like planets that points towards their influence on the time take for the evolution of life. Extrapolating this idea, a small theoretical and computational study is conducted to look for Compartmentalized Habitable Zones near the Corrotation belt of different galaxies with different geometries. The belt's defining parameters are studied individually to draw results leading towards the nature of planetary bodies that lie on these belts. Earth and Mars are also studied to comprehend the habitability factors within our solar system, and conclusions are drawn to look at new factors that need to be considered to define habitable zones.