The Effect of Orbital Separation and Stellar Class Type on the Habitability of Circumbinary Planets in the Innermost Stable Orbit about a Binary Star System

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Since there are more binary star systems than single star systems that have been observed in the visible universe, the purpose of this experiment is to explore the implications of habitability of binary star systems by determining the effect of stellar class type and orbital separation between two binary stars on the climate and habitability of an earth-like, circumbinary planet in the innermost stable orbit about a binary star system. A simulation was done of each combination of star classes (M, K, G, F, and A) including binaries of the same class with a trial done at every distance from the smallest distance two binaries can be apart and still remain detached and up to 50 AU. It was hypothesized that the most habitable systems would be those composed of low mass stars of the same or similar star class type and with low orbital separations because those systems produce the most stable conditions for life to exist. The results showed that eight out of the fifteen combinations of stellar class types are potentially habitable, with the largest parameters for habitable zones occurring in combinations where the class type was the same, and more narrow parameters where the class type was similar. Future research could include focusing on the vague parameters given for this experiment and determining more exact parameters, then observing other variables for habitability, including how the chemical composition of the stars and stellar evolution affect the longevity of the system and the evolution of the habitable zone.

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