On TESS Demographics and Data Mining of Prospect Earth-Twins via Habitability Constraints

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Considering the increasing amounts of planetary data available, this investigation aimed to automate the process of identifying likely habitable exoplanet candidates within big datasets-based on planetary radii, ESI, and HZ location. The researcher developed a computational model in Python to digest TESS data, survey selected because of short orbital period candidates suitable for atmospheric characterization. The model-was proven to be successful for (1) mining prospective rocky exoplanets within the HZ, (2) analyzing demographic tendencies-throughout filtering stages, and (3) incorporating post-processing visualization. TESS data tends towards those candidates likely incapable of harboring water due to bias in detection method by instrument sensitivity. The researcher hypothesized that likely habitable exoplanets share constant qualities that may influence radii, stellar flux, and HZ. Large-exoplanets tend to be detected orbiting around K, G, F, A-stars, while Earth-twins and Super-Earth's are detected orbiting M, K, G stars. Luminosity and stellar flux within the HZ remain within constant ranges of .004-4.441 and .213-1.758, respectively. These values coincide with the luminosity and stellar flux ranges of M, K, G stars, spectral types hosting majority of exoplanets which survived all constraints, thus supporting my hypothesis. The-researcher created a TESS Habitable Exoplanet Catalog (THEC) to narrow the candidates for spectroscopy and follow-up confirmation. A THEC candidate was referred to the list of ACWG priorities of the TESS Follow-Up Program (TFOP).

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