

Geologic Factors Influencing Long-term Habitability on M-Dwarf Exoplanets

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With JWST and future telescopes' potential to characterize M-dwarf exoplanets, we must identify the geologic properties that determine habitability and their resulting observable signatures. Our current knowledge of the geologic processes, particularly silicate weathering, and their potential effects on habitability on a M-dwarf rocky exoplanet is limited. The silicate weathering cycle is a fundamental process that stabilizes Earth's climate over geologic timescales by modulating atmospheric $p\text{CO}_2$. However, it is unclear whether this process will have the same effect on M-dwarf planets. We aim to investigate the influence of continental weathering on the climate and habitability of synchronously rotating M-dwarf planets. We use ExoPlaSim, a 3D global circulation model, to explore how the distribution and size of landmasses affect the long-term climate of TRAPPIST-1e. Preliminary data suggests that a continent centered on the nightside of an ocean-dominated planet does not have a significant impact on the overall climate state. We predict that land-dominated planets with an inland sea may be more habitable than ocean-dominated planets. Understanding the processes that affect habitability and climate is crucial for accurately predicting the characteristics of observed exoplanets with next-generation telescopes.