

Explanetary Ecosystems: what do we know and what do we need to know?

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Exoplanets may provide the ultimate test of our understanding of biogeochemical cycles. Planets around other stars may very well be habitable, but the challenge for detecting life on these planets will be to distinguish the BIOgeochemical rates and fluxes of a living planet, from the strictly geochemical and physical processes of an abiotic planet. Ecosystem stoichiometry is a powerful theory based on the conservation of matter and energy that provides insight into interactions between organisms and environments at both the individual and the ecosystem scale. However, our knowledge of the ratios of biogeochemically relevant elements available on exoplanets is extremely limited, and hinders our ability to predict planetary-scale biogeochemical processes. The data for bioessential elements in nearby stars is somewhat limited, but suggests there could be a range of exoplanet compositions and thus, a range in conditions for life on exoplanets. A biogeosciences perspective provides a important framework for the exploration of exoplanets, establishing planetary-scale patterns and processes that will help us to understand the chemistry of exoplanets and whether they might host life.