Exoplanet Habitability

The search for exoplanets is a relatively new research field. Astronomers have been trying to find metrics of habitability that allow us to predict which exoplanets can harbor life. There are two overarching goals with this research, finding extraterrestrial life, and finding a planet that can one day be colonized by humans. Traditionally the habitable zone; the range of distance away from a planet's host star that can sustain liquid water on its surface, was the main metric used. In this project, I would like to explore other habitability metrics, and then combine the metrics to create an overall habitability metric. The metrics are: ESI, Earth similarity index. It inputs physical parameters, and uses Earth as a metric for habitability. PHI: Planetary habitability index, which considers biological factors such as water or having substrates. HITE: Habitability index for transiting exoplanets, based on the certain limit of planetary insolation at the surface. CD-HPF: Cobb-Douglas habitability score, based on the Cobb-Douglas habitability production function. I am also considering using the AHI, Aquatic habitability index, which is specific to water worlds, and THI, terrestrial habitability index which is specific to terrestrial planets. After taking the dataset and applying the following metrics, I would like to combine all of the metrics to give a single habitability score for the dataset of exoplanets. From there, I'd like to do something similar to project idea 12, and see if there is a correlation between, mass, semi-major axis, or other parameters, and the overall habitability. I would also like to create an 'ideal planet' based on the findings of overall habitability. This would depend on physical parameters such as mass and ellipticity that gives the highest overall habitability score.