Application of Luminosity Modulus in Exoplanet Transits

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Exoplanet study has evolved into a methodical science capable of discovering physical characteristics. However, limitations exist in ascertaining exoplanet composition in practice and on a large scale. Determining exoplanet composition is critical for assessing habitability and thus the search for life—requiring the creation of other ways to analyze composition. To this end, I developed a novel, versatile model to ascertain exoplanet makeup, allowing for mass classification and offering clues as to which foster life. Initially, I recognized that exoplanet Blackbody Radiation emissions could create error in transit method calculations of physical characteristics. I then refined this into a model accounting for Blackbody error in exoplanet transits, revealing a plethora of information about composition through the Stefan-Boltzman Law. When applied to exoplanet datasets, the model yielded temperature and albedo, which provided insight on composition. I then evaluated the model's effectiveness by comparing its results to NASA Exoplanet Archive data, revealing that one albedo I calculated was very close to that of NASA's. Also, two of the exoplanets studied had no previously identified albedos, so, if confirmed, my measurements could be the first. Overall, my model was highly accurate in predicting the albedo of at least one of the exoplanets studied, and otherwise produced tangible results. In sum, my model demonstrated that it could greatly impact the study of exoplanet composition. Moreover, because the model has the potential to be applied en masse---needing only a single transit to identify the albedo---it can be used widely by professional and amateur astronomers alike, thereby increasing the depth and breadth of our knowledge and benefiting the search for life.

Awards Won:

Patent and Trademark Office Society: Second Award of $500