Characterizing Host Star Composition for Prioritizing Our Search for Habitable Planets C.T. Unterborn[1], S. D. Hull[2], J. A. Johnson[3], W. R. Panero[2], L. P. Stixrude[4], J. K. Teske[5], [1]School of Earth and Space Exploration, Arizona State University, PO Box 876004, Tempe, AZ 85287 (cayman.unterborn@asu.edu), [2]School of Earth Sciences, The Ohio State University, [3]Department of Astronomy, The Ohio State University, [4]Deparment of Earth Sciences, University College London, [5]The Carnegie Observatories, Carnegie Institution of Science.

Abstract: The Earth is unique in our Solar System. It is the only planet known to undergo plate tectonics. It has a magnetic field as result of an outer liquid iron core that protects the surface from Solar radiation. What is not known, however, is whether the Earth is unique among all terrestrial planets *outside* our Solar System. The population of potentially Earth-like planets will only continue to grow. The TESS mission, launching in 2017, is designed to identify rocky planets around bright, nearby stars across the whole sky. Of the 5,000 potential transit-like signals detected, only ~100 will be selected for follow-up spectroscopy. From this subsample, only ~50 planets are expected to have both mass and radius measurements, thus allowing for detailed modeling of the planetary interior and potential surface processes. As we search for habitable worlds within this sample, then, understanding which TESS objects of interest (TOI) warrant detailed and time-intensive follow-up observations is of paramount importance.

Recent surveys of dwarf planetary host and non-host stars find variations in the major terrestrial planet element abundances (Mg, Fe, Si) of between 10% and 400% of Solar. Additionally, the terrestrial exoplanet record shows planets ranging in size from sub-Mercury to super-Earth. How this stellar compositional diversity is translated into resultant exoplanet physical properties including its mineralogy, structure and potential for tectonics is not known. Here, we present results of models blending equilibrium condensation sequence computations with geophysical interior calculations adopting the inputs of multiple stellar abundance catalogues. This benchmarked and generalized approach allows us to predict the mineralogy and structure of an "average" exoplanet in these planetary systems, thus informing their likelihood to be "Earth-like" and potentially habitable. This combination of astro- and geophysical modeling provides us with a self-consistent method with which to compare planetary systems, thus improving our ability to prioritize "Earth-like" targets for follow-up observations within the TOI dataset. Furthermore, the methods described herein afford us an opportunity to explore rocky planet diversity as a whole and truly begin to answer the question, "Is the Earth special?"