A CATALOG OF KEPLER HABITABLE ZONE EXOPLANET CANDIDATES. S.R. Kane[1], M.L. Hill[1], J.F. Kasting[2], R.K. Kopparapu[3], E.V. Quintana[4], T. Barclay[4], N.M. Batalha[4], W.J. Borucki[4], D.R. Ciardi[5], N. Haghigipour[6], N.R. Hinkel[7], L. Kaltenegger[8], F. Selsis[9], G. Torres[10]
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Abstract: The NASA Kepler mission has discovered thousands of new planetary candidates, many of which have been confirmed through follow-up observations. A primary goal of the mission is to determine the occurrence rate of terrestrial-size planets within the Habitable Zone (HZ) of their host stars. The Habitable Zone Working Group (HZWG) was created to form a core group of Habitable Zone experts to properly vet and characterize the increasing number of Kepler exoplanet candidates whose orbital location and physical size make them prime candidates for habitability.

A major product of the HZWG is a list of HZ exoplanet candidates from the Kepler Data Release 24 Q1-Q17 data vetting process [1]. We use a variety of criteria regarding HZ boundaries and planetary sizes to produce complete lists of HZ candidates, including a catalog of 104 candidates within the optimistic HZ and 20 candidates with radii less than two Earth radii within the conservative HZ. We cross-match our HZ candidates with the Data Release 25 stellar properties and confirmed planet properties to provide robust stellar parameters and candidate dispositions. We also performed dynamical analysis simulations for multi-planet systems that contain candidates with radii less than two Earth radii as a step toward validation of those systems.

The four different categories of candidates allow the community to adopt the criteria that are most useful for a particular follow-up program. For example, giant planets in the optimistic HZ may be useful for those interesting in HZ exomoons where a wider range of incident flux can account for additional energy sources from tidal energy, etc. Our analysis of the radii distributions for candidates in the HZ compared with the general candidate population shows that the two are very similar within the constraints of selection effects and systematic noise that impacts longer-period terrestrial planets (see Figure 1). The implication is that the distribution of planets outside of the HZ is representative of the distribution of planets that exist within the HZ.

This presentation will describe the highlights of the HZ catalog and the plans for further validation of HZ candidates and follow-up studies.

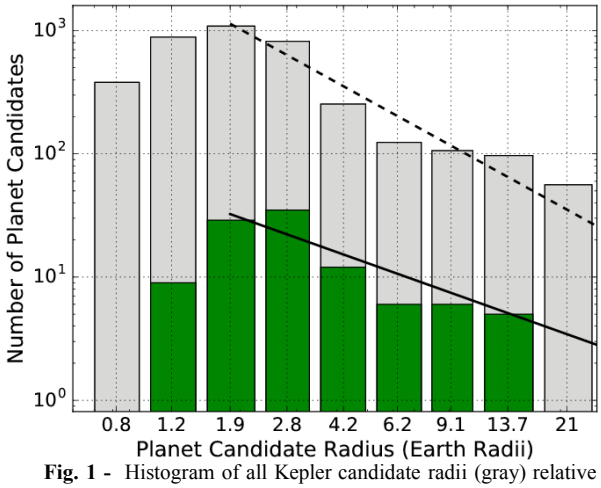

Fig. 1 - Histogram of all Kepler candidate radii (gray) relative to those candidates that are in the optimistic HZ of their host star (green). The solid lines are power law fits to the HZ candidates and the dashed lines are power law fits to the entire Kepler distribution. Statistical analysis of the distributions shows that there is little evidence of a significant difference in the populations.

References:

[1] Kane, S.R., Hill, M.L., Kasting, J.F., et al. 2016, ApJ, 830, 1