Passing NASA's Planet Quest Baton from Kepler to TESS

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Abstract

Kepler vaulted into the heavens on March 7, 2009, initiating NASAs search for Earth-size planets orbiting Sun-like stars in the habitable zone, where liquid water could exist on a rocky planetary surface. In the 4 years since Kepler began science operations, a flood of photometric data on upwards of 190,000 stars of unprecedented precision and continuity has provoked a watershed of 134+ confirmed or validated planets, 3200+ planetary candidates (most sub-Neptune in size and many comparable to or smaller than Earth), and a resounding revolution in asteroseismology and astrophysics. The most recent discoveries include Kepler-62 with 5 planets total of which 2 are in the habitable zone with radii of 1.4 and 1.7 $R_{\rm e}$. The focus of the mission is shifting towards how to rapidly vet the 18,000+ threshold crossing events produced with each transiting planet search, and towards those studies that will allow us to understand what the data are saying about the prevalence of planets in the solar neighborhood and throughout the galaxy. This talk will provide an overview of the science results from the Kepler Mission and the work ahead to derive the frequency of Earth-size planets in the habitable zone of solar-like stars from the treasure trove of Kepler data.

NASAs quest for exoplanets continues with the Transiting Exoplanet Survey Satellite (TESS) mission, slated for launch in May 2017 by NASAs Explorer Program. TESS will conduct an all-sky transit survey to identify the 1000 best small exoplanets in the solar neighborhood for follow up observations and characterization. TESSs targets will include all F, G, K dwarfs from +4 to +12 magnitude and all M dwarfs known within ∼200 light-years. 500,000 target stars will be observed over two years with ∼500 square degrees observed continuously for a year in each hemisphere in the James Webb Space Telescopes continuously viewable zones. Since the typical TESS target star is 5 magnitudes brighter than Kepler's and 10 times closer, TESS discoveries will afford significant opportunities to measure the masses of the exoplanets and to characterize their atmospheres with JWST, ELTs and other exoplanet explorers.