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A theoretical perspective on the ultra-compact systems of CoRoT and Kepler

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Abstract

CoRoT and Kepler discovered closely spaced short period planetary systems. We investigate into the physics of these systems by combining an approach that was developed for the CoRoT mission to determine the distributions of planetary masses and radii based on a minimum number of basic physical principles with the classical approach of Hill-exclusion volumes to estimate dynamical stability. We discuss to what extent the discovered systems can be understood as a random draw from the theoretical mass and/or radius distributions with Hill-exclusion stability as a constraint. We point to the bi-modality of the theoretical planetary mass-function as a key factor in shaping the architecture of the presently known systems. Given the first-time availability of new high-resolution epoch-of observation theoretical radius distributions for the entire present period sensitivity of CoRoT and Kepler-releases, we take the opportunity to confront the various radius anomalies — 'styrofoam' planets, inflated Jupiters and Neptunes — to our statistical approach.

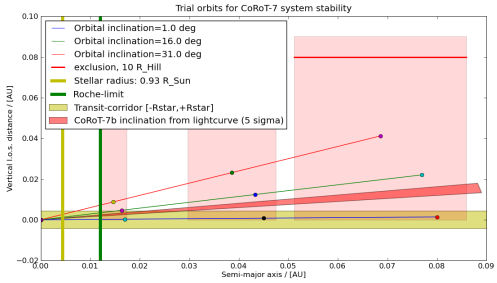

Figure 1: Geometry and dynamical architecture of the CoRoT-7 system. Key locations are plotted in a plane in the line of sight and vertical to the CoRoT-7b orbit. star. Shaded areas mark Hill-exclusion volumes for the dynamically 'most dense' of three cases investigated in the Hatzes et al. 2010 study.

0.1 Note

To be updated after the CoRoT-Symposium (June 17th).