The Main Broad Peak: Characterizations and Features

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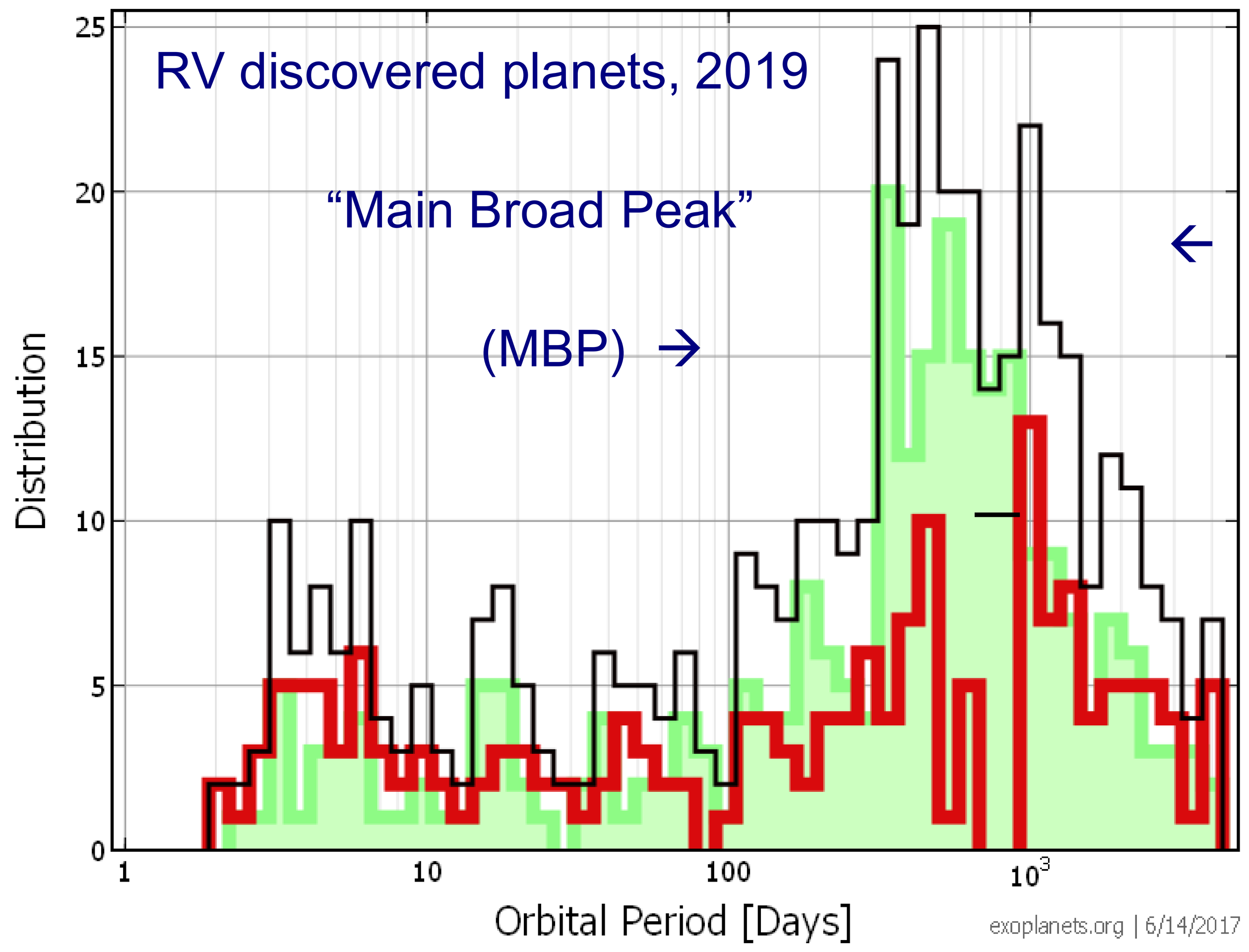
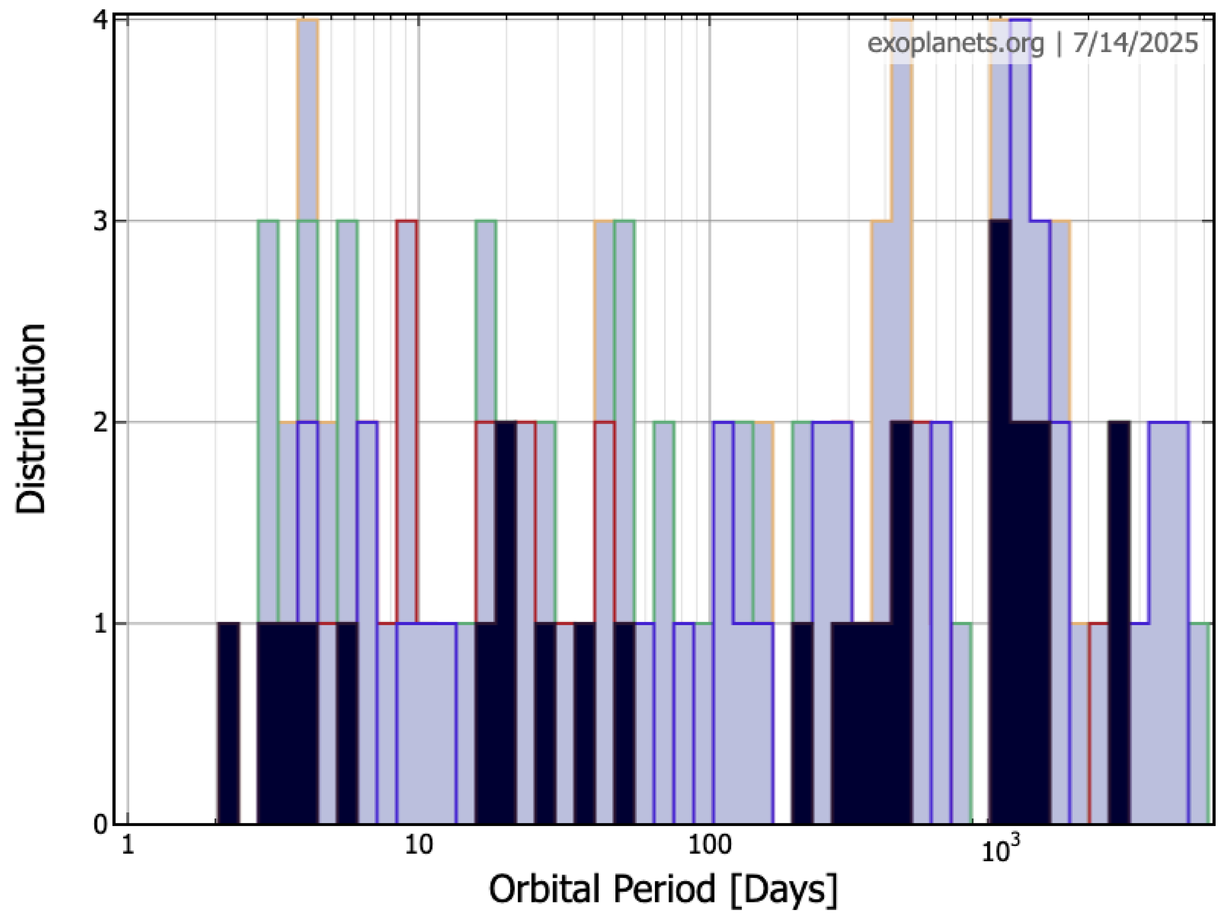
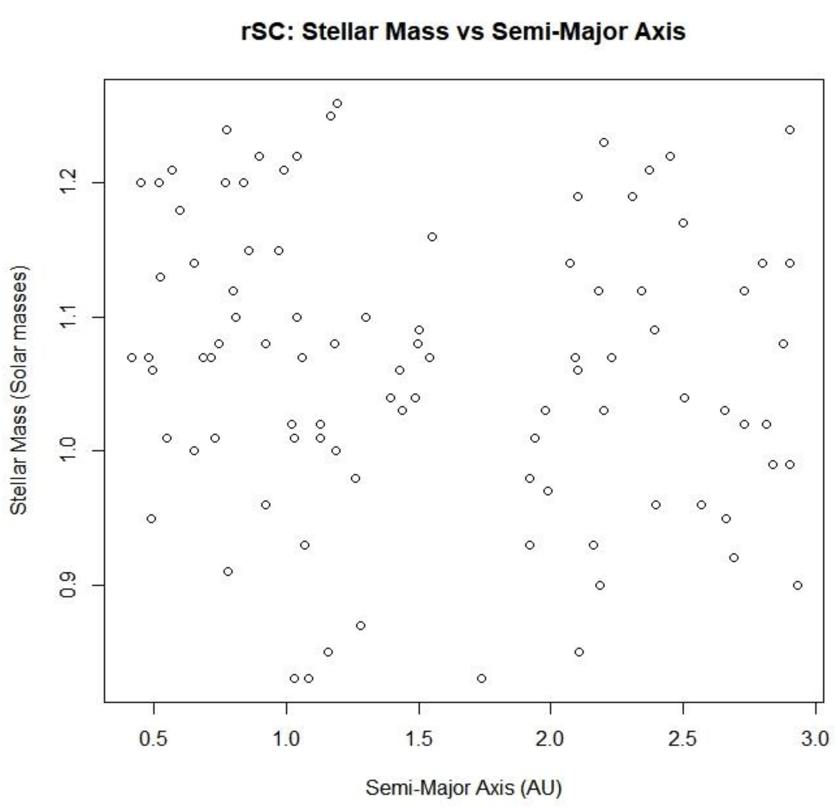
Abstract

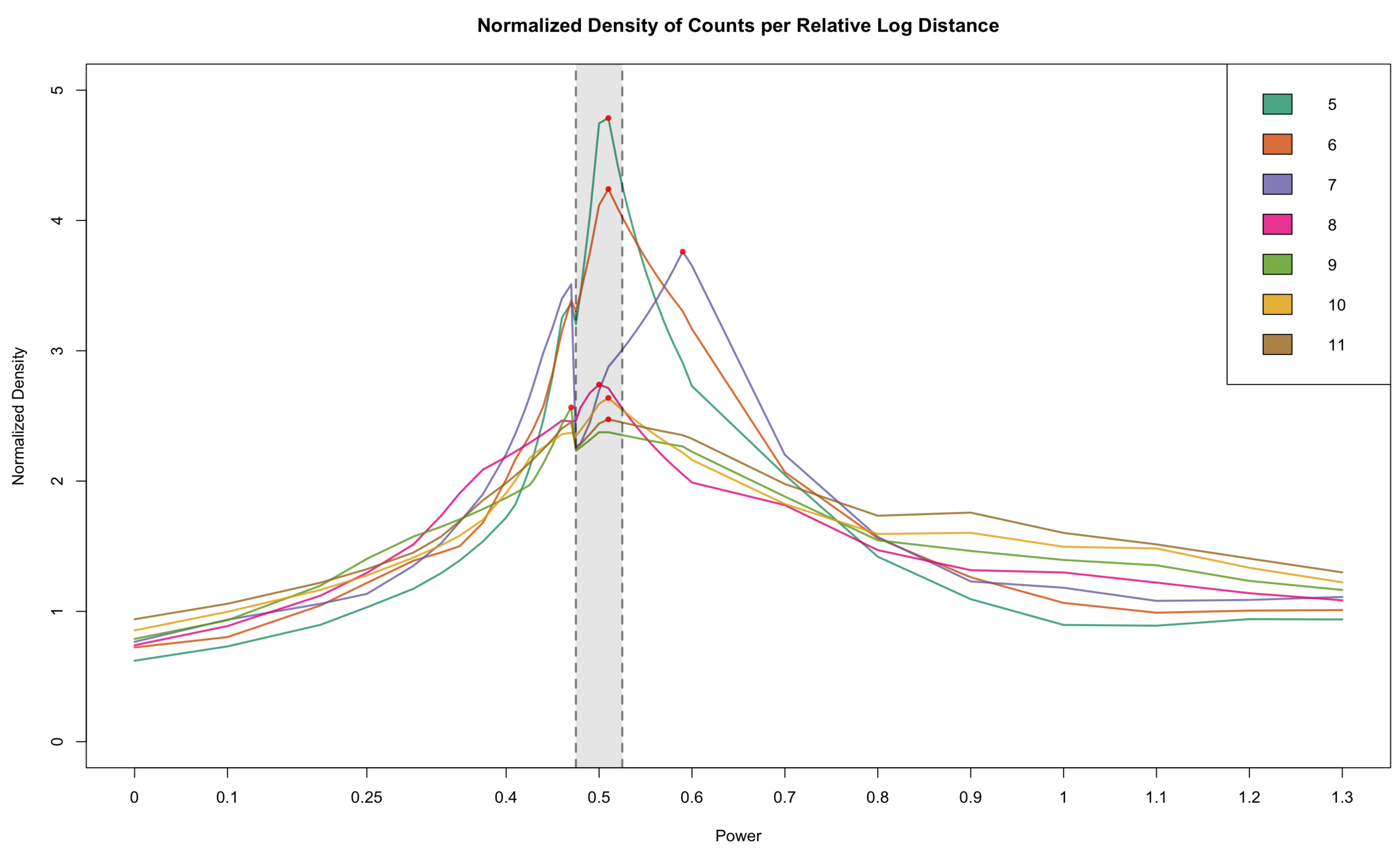
The largest number of exoplanets reside in a “Main Broad Peak” (MBP) that is farther from the star than the “planet desert”, as seen in the view of planets of detectable mass in systems found by radial velocity (RV).





The largest number of giant planets occur in a “Main Broad Peak” (MBP, above left), at least for planets sufficiently large (“giant”) to have been found by radial velocity (RV).
We find the MBP changes with parameters of the star, planet, and orbit.
We highlight the change in distance from the star and width with stellar mass (above right).





Conclusion: Planet distributions details can guide understanding

We show unexpected new features found in the distribution of the semi-major axes (“a”) show a dependence on stellar mass that adds to the already strong statistical case that among a large fraction of exoplanets, there is significant structure in the distribution of “a”. If PLATO finds enough planets with periods up to 1000 days, it could help validate and characterize or refute these features.
The findings of these features are presented as a major result, because to understand the locations of these features and to explain how these features survive will inevitably make a major impact on exoplanet theory.
Planet distributions are starting to show details that must be explained either observationally or in terms of planet formation and evolution .There is a correlation between eccentricity and stellar [Fe/H] (Taylor, 2012,2013; Dawson & Murray-Clay 2013) The population and eccentricity distribution of iron-rich versus iron-poor planets likely result from higher rates of scattering in systems more crowded with planets (DM13). Alternatively, scattering could also result in iron being delivered to the star’s outer layer. It is puzzling that scattering could lead to a period range with (almost) no planets! An alternative explanation might be: Is this a range that planet scattering fails to deliver iron to the star?