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Strongly Interacting Planetary Systems

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Both ground-based Doppler surveys and NASA's Kepler mission have discovered a diversity of planetary system architectures that challenge theories of planet formation. Systems of tightly-packed or near-resonant planets are particularly useful for constraining theories of orbital migration and the excitation of orbital eccentricities and inclinations. In particular, transit timing variations (TTVs) provide a powerful tool to characterize the masses and orbits of dozens of small planets, including many planets at orbital periods beyond the reach of both current Doppler surveys and photoevaporation-induced atmospheric loss. Dynamical modeling of these systems has identified some "supper-puffy" planets, i.e., low mass planets with surprisingly large radii and low densities. I will describe a few particularly interesting planetary systems and discuss the implications for the formation of planets ranging from gaseous super-Earth-size planets to rocky planets the size of Mars.