Abstract Submitted
for the OSF17 Meeting of
The American Physical Society

Extensive Excursion and Orbital Exchange in Few Body Planetary Systems STEFAN LESNANSKY, DONALD PRIOUR, Youngstown State University — The popular conception of planetary systems involves planets moving in discrete, well separated quasi-circular orbits, with at most slight variation in orbital radii. Using locally stable simulations adapted from molecular dynamics simulations used on a much smaller scale, we find stable planetary systems, made up of three or four similar sized planets, which behave very differently from this paradigm of well defined circular orbits. In fact, we find systems stable on a long term basis with surprising behaviors, including orbit swapping and fluctuations of orbital radii comparable in some cases to the mean orbital radius. An additional salient characteristic of these unique configurations is a further distinction among cases in which orbital radii are smoothly correlated, undergoing regular oscillations, and scenarios in which correlations are much less consistent with at least qualitatively chaotic variation in orbital radii with time. As a measure of astronomical abundance, we explore the extent to which these unique configurations persist when the planetary masses and initial conditions are manipulated. Broadly speaking, we find these configurations to be more abundant in this sense for high stellar to planetary mass ratios.

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Date submitted: 14 Sep 2017 Electronic form version 1.4