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Dynamical origin of wide-orbit planets

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There is strong evidence from the broad eccentricity distribution of giant exoplanets that dynamical instabilities are ubiquitous. During the ejection of a planet, it may spend time on a wide enough orbit to be subject to external torques, from both passing stars (in particular, for early instabilities while the Sun was in its birth cluster) and the Galactic tidal field (for later dynamical instabilities). These external torques can trap a fraction of planets that would otherwise have been ejected as free-floating planets. The orbits of trapped planets depend on the strength of external torques – during the stellar cluster phase, planets can be trapped with semimajor axes of a few hundred au, on orbits similar to the proposed Planet 9. At later times, the Galactic tide can strand planets in the Oort cloud. I will discuss the dynamics of trapping planets on wide orbits, as well as the occurrence rate from simulations and how it compares with that of free-floating planets.

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