

How Host Stellar Mass Shapes Planet-Planet Scattering Outcomes: N -body Simulations around M Dwarfs

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Although high-eccentricity planets and free-floating planets are now commonly observed, the dynamical processes that produce them are not yet fully understood. Gravitational scattering between planets is widely considered a key mechanism. M dwarfs are the most common stars in the Galaxy and frequently host planetary systems, yet most existing scattering studies focus on Sun-like host stars. In M dwarf systems, the planet-to-star mass ratio is higher than in Sun-like systems, and based on the Safronov number argument, this is expected to favor ejection over collision. How scattering outcomes depend on host stellar mass in a systematic way remains unclear. In this work, N -body simulations are used to study planet-planet scattering around M dwarfs. The host stellar mass and initial orbital separation are varied to explore how these parameters influence the relative rates of collision, ejection, and orbital rearrangement. Ejection is expected to become increasingly dominant over collision as host stellar mass decreases. Preliminary simulation results are consistent with this expectation, suggesting fewer surviving planets with higher eccentricities around lower-mass stars. The dependence of scattering outcomes on host stellar mass is discussed, along with implications for the observed architectures of planetary systems around M dwarfs and the population of free-floating planets detected by microlensing surveys.