

How Planet Nine could change the fate of the Solar system



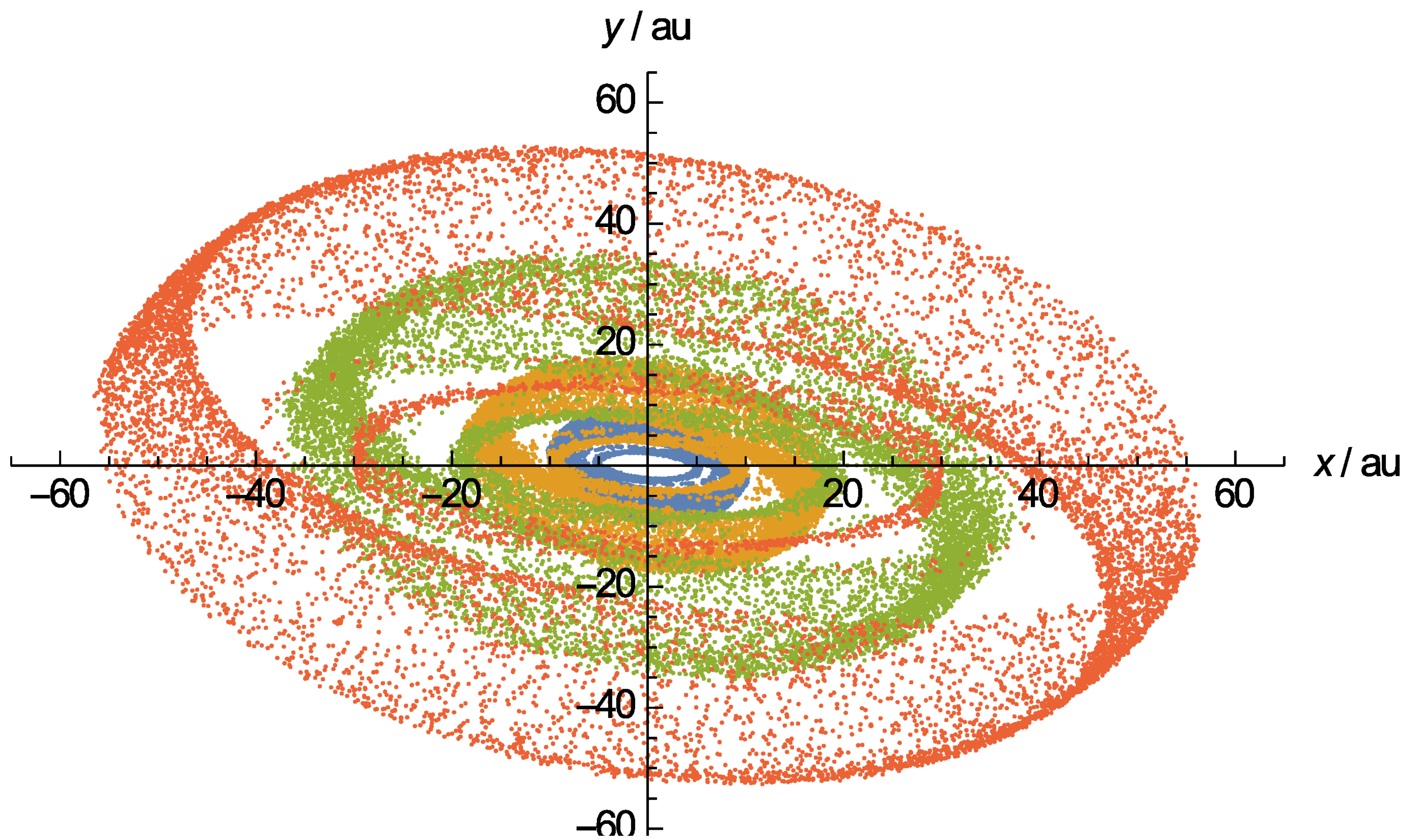
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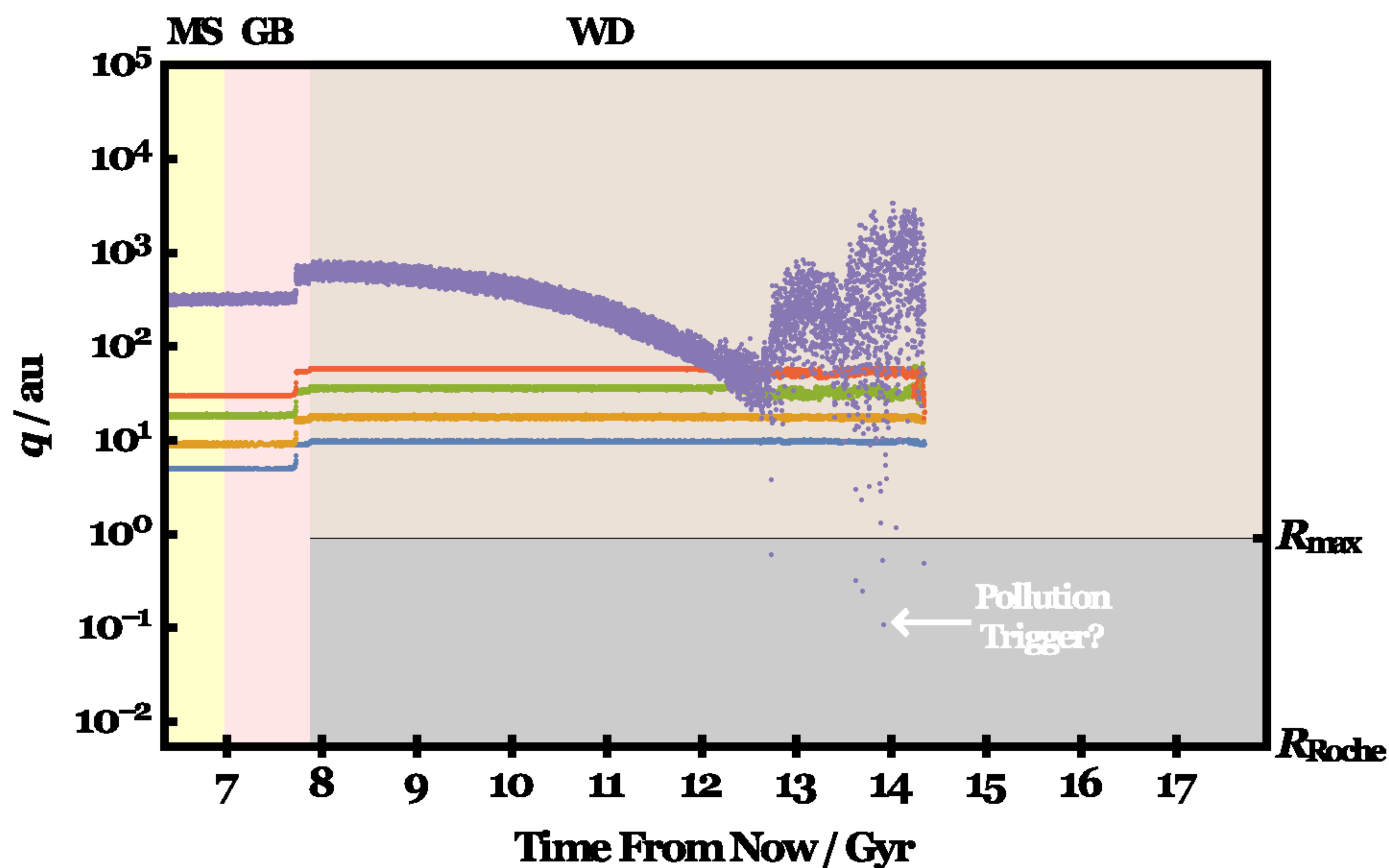


Veras (MNRAS, 2016, 463, 2958)

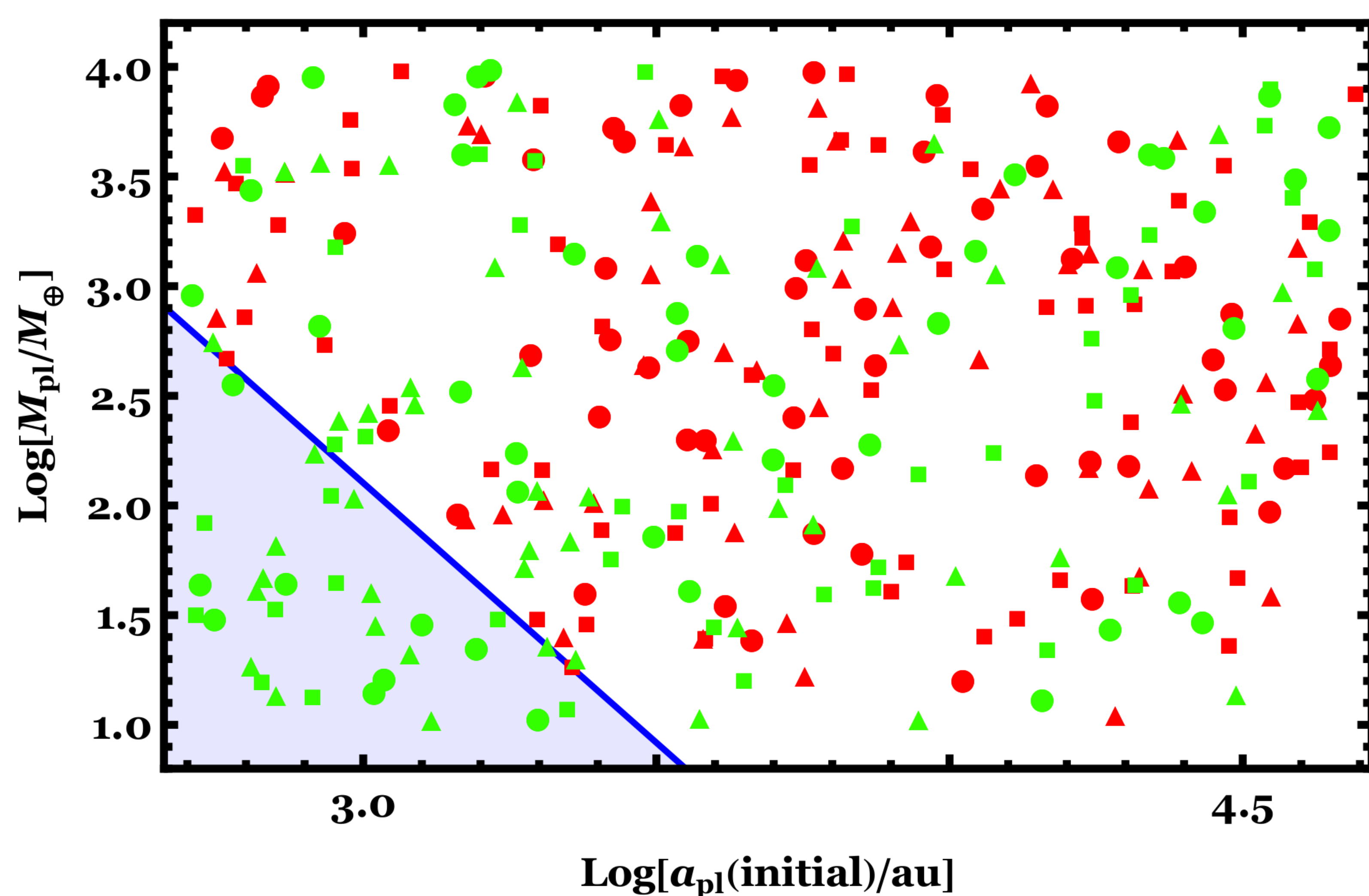
Jupiter, Saturn, Uranus and Neptune will survive the Sun's post-main-sequence evolution. However, if Planet Nine exists, I show that the above statement may no longer be true.



Orbital expansion of Jupiter (blue), Saturn (orange), Uranus (green) and Neptune (red) due to the Sun's post-main-sequence evolution. Without a Planet Nine, all four known giants are sure to remain on stable orbits.



The combined effects of Galactic tides and Solar mass loss can perturb a Planet Nine (purple) into the existing giants, scattering them. Plotted is the orbital pericentre versus time.



Stable (green) and unstable (red) outcomes depending on the mass (y -axis) and initial semimajor axis (x -axis) of Planet Nine. All of the systems within the blue triangle remain stable.