Prospects for detecting decreasing exoplanet frequency with main-sequence age using PLATO

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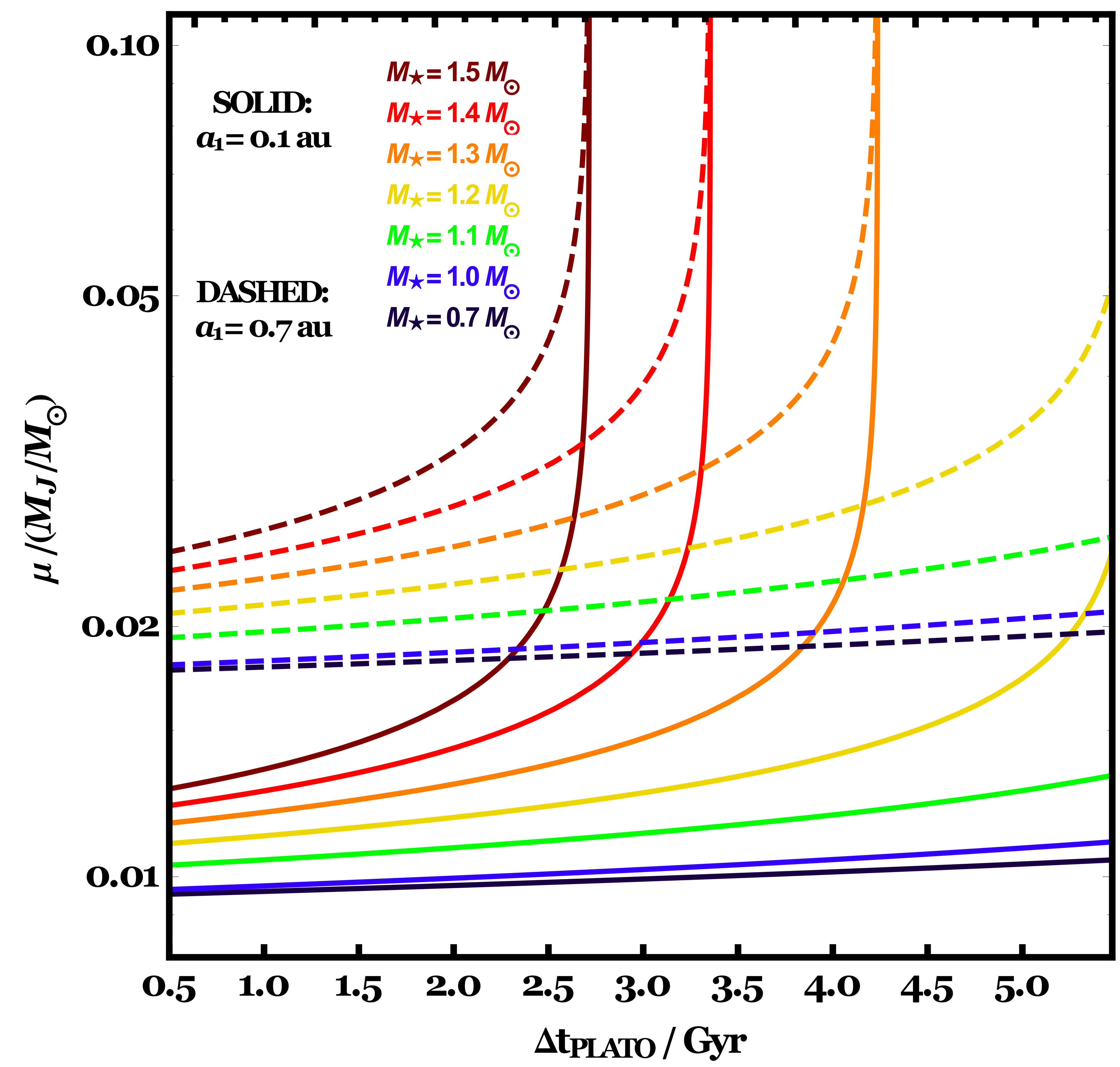
Veras et al. (MNRAS, 2015, 453, 67)

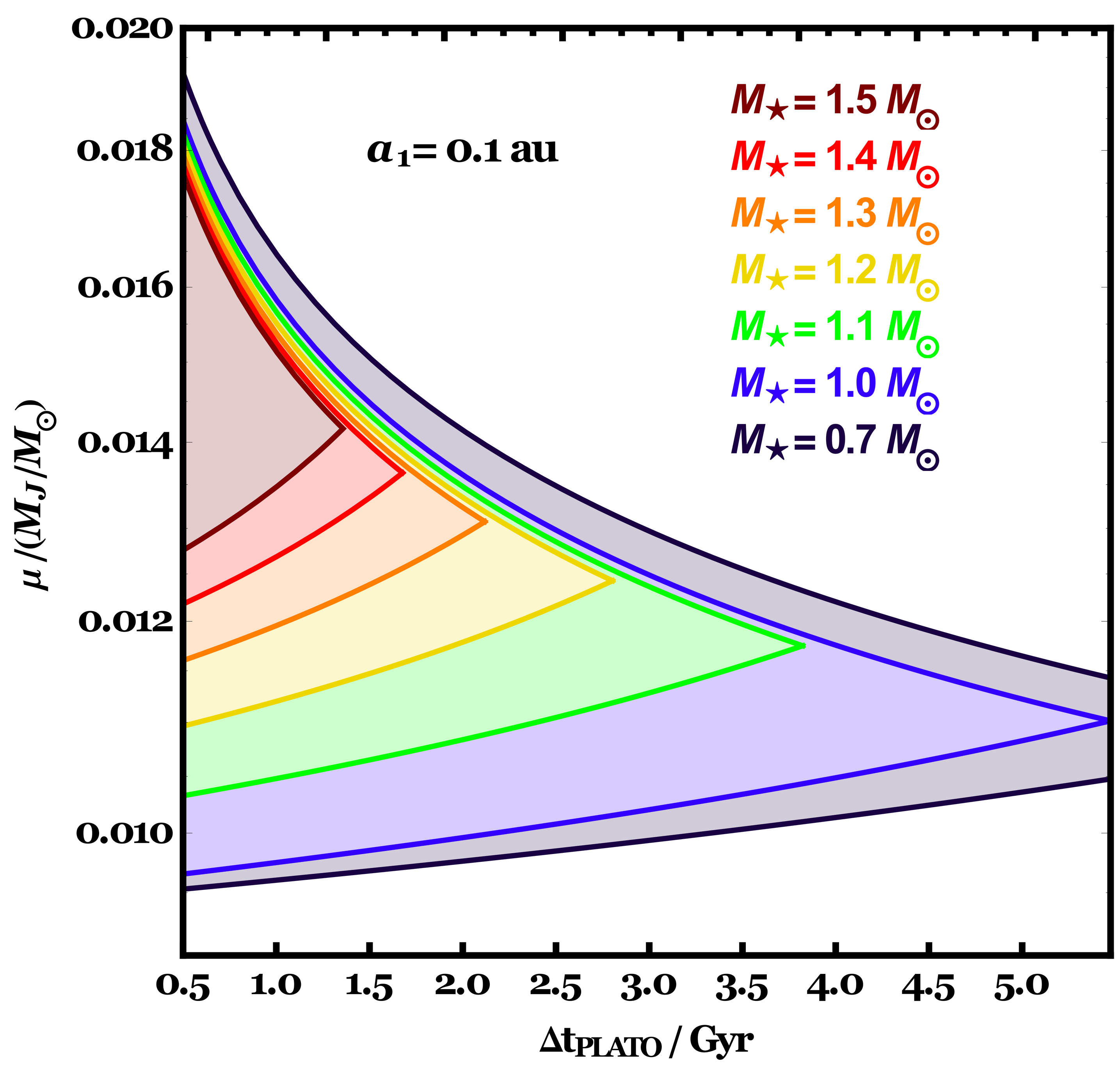
The space mission PLATO will usher in a new era of exoplanetary science by expanding our current inventory of transiting systems and constraining host star ages, which are currently highly uncertain. This capability might allow PLATO to detect changes in planetary system architecture with time as systems instigate scattering and become unstable.

Here, we determine PLATO's capability to detect a trend of decreasing planet frequency with age. We find that this trend should be detectable for planetary masses which are at least as massive as Neptune.

2 planets: Minimum mass ratio for detectable trend

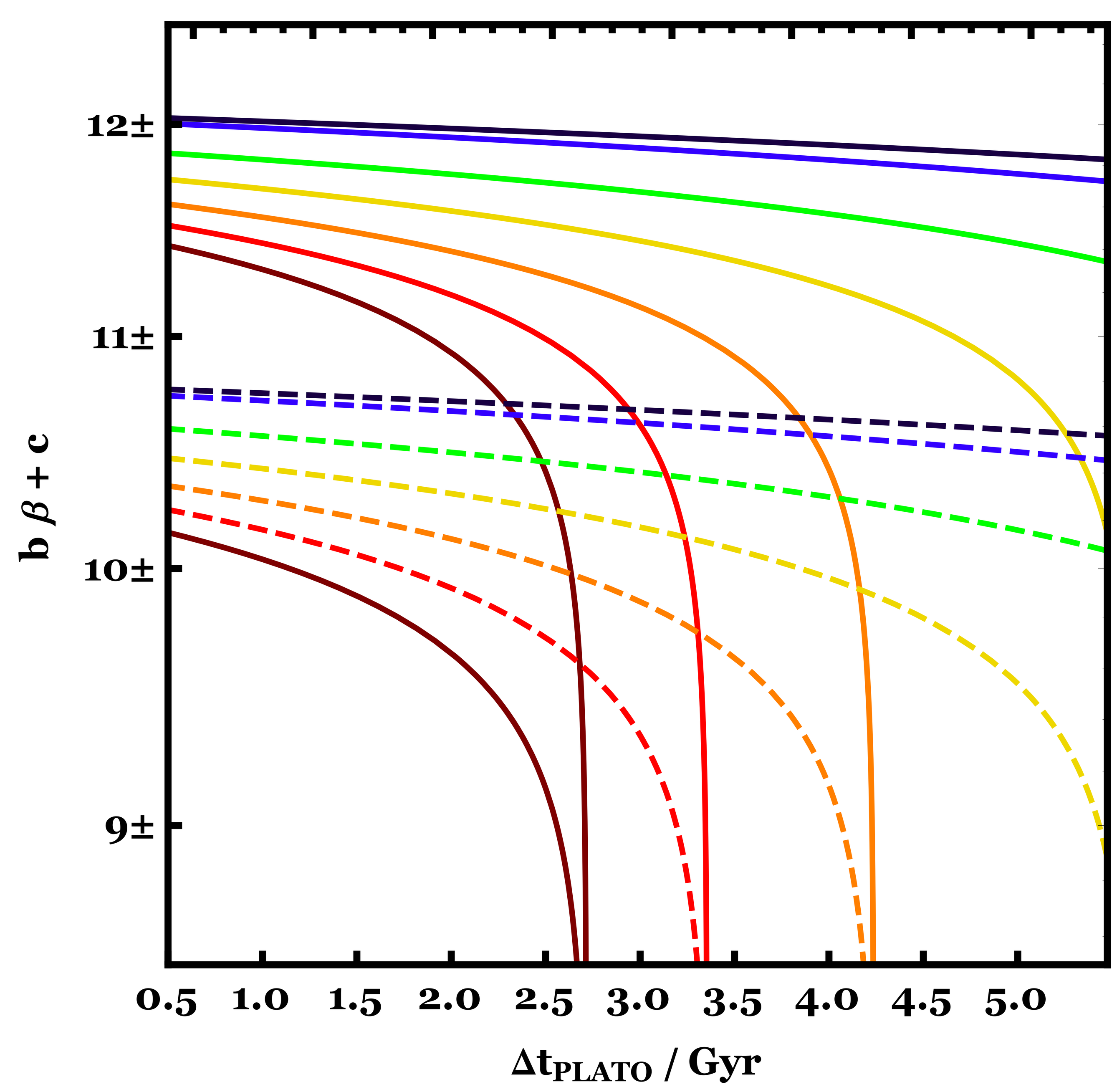


The minimum planet–star mass ratio μ for which PLATO can detect a decreasing trend of planet frequency versus time for packed, Hill-stable two-planet systems. The x-axis refers to the (variable) magnitude of the stellar age constraints PLATO may provide.



Same as the above figure, but with the important first time bin excluded. In this case, the range of masses for which there is a detectable trend decreases significantly.

≥3 planets: Necessary empirical relation for detectable trend



Same as the above figure, but for more than 2 planets. In this case, constraints are not provided directly on mass, but instead for mutual separation of the planets (y-axis).