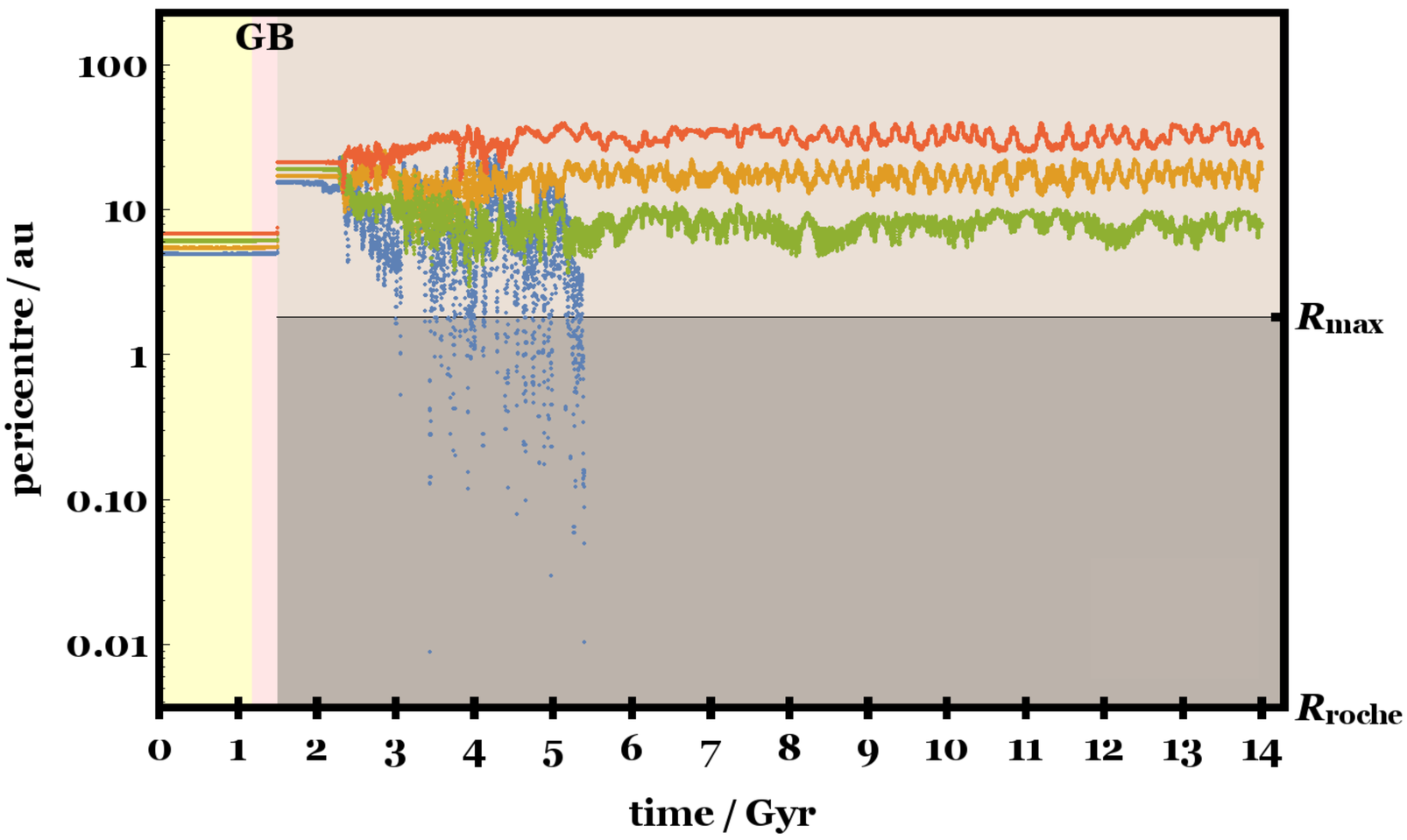
Full-lifetime simulations of multiple planets across all phases of stellar evolution

Dimitri Veras[1], Alexander J. Mustill[2], Boris T. Gänsicke[1], Seth Redfield[3], Nikolaos Georgakarakos[4], Alex B. Bowler[1], Maximillian J.S. Lloyd[1]

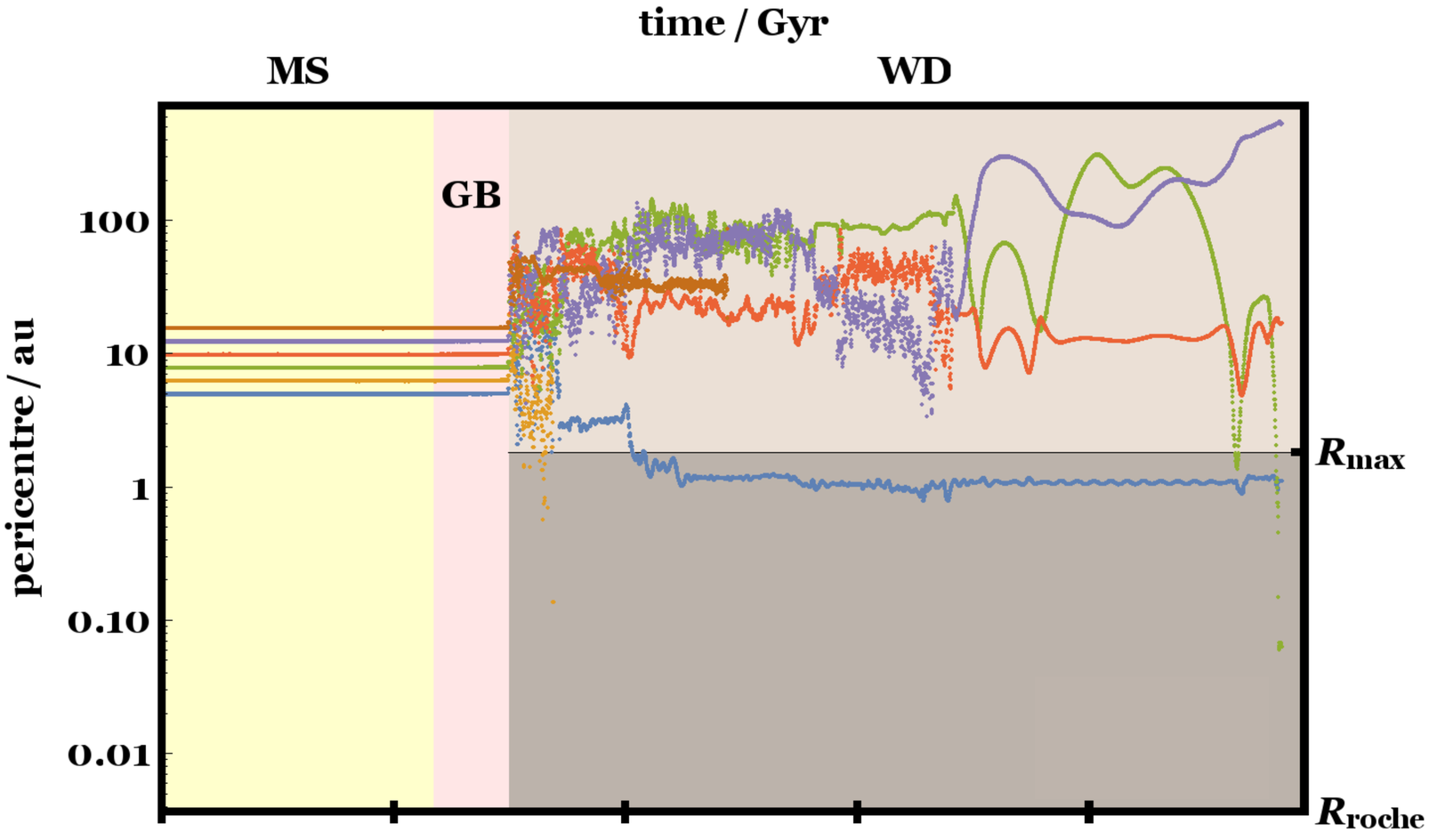
[1]University of Warwick, [2]Lund Observatory, [3]Wesleyan University, [4]New York University Abu Dhabi

Veras et al. (MNRAS, 2016, 458, 3942)

We perform the first full-lifetime simulations of unequal mass planets across all phases of stellar evolution. We also include a simulation property database, including if and when instability occurs, and whether the eventual white dwarf could contain planetary remnants.



The full-lifetime evolution of four terrestrial planets such that the innermost one is about 5% of the mass of the outer three. The least massive planet is eventually scattered towards the white dwarf.



Evolution over 5 Gyr of six planets, three of which are Uranus-mass and three of which are Neptune-mass. Unpacking of the system occurs almost immediately after the giant branch phase.

The white dwarf cooling age (time since becoming a white dwarf) at which test particles across all simulations entered the white dwarf Roche, or disruption, radius. The histograms illustrate the pollution decay rate obtained from the simulations.