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Massive black hole growth by full and partial tidal disruption events

Tidal disruptions of stars by massive black holes (MBHs) in dense stellar clusters may be an important channel for MBH growth. While full tidal disruption events (FTDEs) have been studied extensively, recently the focus has shifted to understanding the impact of partial tidal disruption events (PTDEs). We study MBH growth in dense star clusters through full and partial tidal disruption events via direct N-body simulations using the novel hierarchical forth-order forward integrator code BIFROST. The code is GPU accelerated, making simulations of 10^6 stars feasible, and can simulate arbitrary binary fractions due to efficiently parallelized secular and regularized integration techniques for binaries, fly-bys, triples and multiple subsystems. Post-Newtonian (PN) terms are included in the equations of motion of subsystem particles up to order PN3.5. We present first results on the growth of $10^3 M_\odot$ MBHs in a suite of simulations of compact star clusters up to 10^6 stars. We compare MBH growth rates in models with FTDEs only and FTDEs+PTDEs and show how PTDEs influence massive BH growth. We compute FTDE and PTDE rates and compare our results to previous numerical predictions and current observational estimates. We also discuss how well the black hole growth can be represented by simple analytic fitting formulae which could have a wide range of applications for high-resolution cosmological simulations.

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