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The emergence of angular momentum in globular clusters: insights from large N-body simulations

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The majority of Milky Way globular clusters (GCs) display a small, yet significant, amount of angular momentum, clearly detectable from line-of-sight and proper motion data sets. The origin of this angular momentum is still unknown, but its emergence may be linked to the primordial formation of GCs in the high-redshift universe.
In this talk, I will present 2 sets of direct N-body simulations run with NBODY6+++GPU:
1) ~25 large simulations with number of stars ranging from 250k to 1.5M, evolved in a tidal field and with stellar evolution, where different amounts of internal rotation are included in the initial conditions;
2) ~20 simulations with 250k stars, with idealized clumped initial conditions, where no internal rotation is initialized.
The first set of simulations allows us to study the evolution of angular momentum through >10 Gyr time and constrain the typical amount of angular momentum needed at the formation stage to reproduce current observations. On the other hand, the set of initially non-rotating clumped simulations allow us to study the conditions under which rotation can naturally emerge in the early assembly stage of GCs. The ongoing analysis shows that >50% of these simulations acquire a significant amount of angular momentum in the first <100 Myr, as a result of the assembly and mergers of the clumps. These results are important in the perspective of linking the properties of the gas-dominated early phase of GC formation to the subsequent N-body dominated evolution.

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