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Simulating the Milky Way and Everything In It

Wednesday, May 29, 2024 4:00 PM (30 minutes)

Our Galaxy is filled with complex astronomical phenomena, ranging from star formation, planet formation, stellar interactions and mergers, accretion discs, tidal disruption events and more. Many of these systems and objects involve a diverse array of physics, such as magnetic fields, dust, or general relativity. This can make numerical simulations difficult to perform, as it means creating multi-physics solvers that work together to produce accurate solutions. The range of spatial and temporal scales also makes it challenging to maintain computational efficiency, for example, following the formation of a protostar from a molecular cloud core involves nearly 20 orders of magnitude change in density. I will discuss our efforts to build smoothed particle hydrodynamics (SPH) methods for the general study of astrophysics within the Milky Way, focusing on the multi-physics solvers we have built into the Phantom SPH code and our efforts to scale up parallel performance.

Keyword-1

Numerical simulations

Keyword-2

SPH

Keyword-3

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