[P03-10] N-body Simulations of the Dynamical Evolution of Rotating Stellar Systems

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We present N-body simulations that represent both rotating and non-rotating star clusters with mass spectrum in orbits around galactic center, investigating quantitatively and geometrically the influence of internal rotation and the tidal effects caused by the galactic gravitational field. We used NBODY6, N-body code based on the direct force integration by Aarseth and modified it to take into account the external gravitational field. In our simulations, star clusters evolve dynamically almost up to the time they have lost half of initial mass. We confirmed that rotating clusters evolve significantly faster than non-rotating ones. The clusters are found to achieve synchronous rotations with the orbital angular speed after several revolutions around the Galactic center. However, the rotation curve induced by the tidal torque has the tendency of increasing rapidly toward the outer parts as the tidal torque becomes negligible in the inner parts of the clusters.

[P03-11] Special Relativistic Radiation Hydrodynamics for Cylindrical Coordinates

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Many astrophysical systems, such as accretion disks and jets, in which radiation interacts with relativistically moving matter possess cylindrical symmetry or are conveniently described by cylindrical coordinates. With applications to such systems in mind, I use the covariant tensor conservation laws to derive special relativistic, time-dependent energy and momentum equations separately for matter and radiation in cylindrical coordinates. The equations can be conveniently applied to various three-dimensional radiation hydrodynamic processes with or without cylindrical symmetry. Radiation moments like radiation energy density, flux, and pressure are defined in the comoving (with the flow) frame first and then transformed to the corresponding covariant quantities. The interaction between matter and radiation is also described in the comoving frame while the equations are represented in the coordinates that are fixed with respect to the central object. As a concrete example, the relativistic equations of motion for a cylindrical accretion flow interacting with a spherically symmetric radiation field are presented.