

Formation of disks with persistent spiral arms from the gravitational collapse of out-of-equilibrium dissipative systems

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An out-of-equilibrium, isolated and uniform over-density of massive particles relax towards a quasi-stationary state close to virial equilibrium through a monolithic collapse driven by its own mean gravitational field. If the system initially breaks spherical symmetry and has some angular momentum such a dissipationless dynamics may give rise to a disk with persistent far out-of-equilibrium structures like spiral arms, bars and/or rings. By considering several numerical experiments of a simple toy model, we also discuss the combined effect of gravitational and gas dynamics in such an out-of-equilibrium framework.

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