The Dynamical Response to a Bar Potential in a Gaseous Disk

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We have studied the response of a gaseous dosk to a rotating bar potential through two-dimensional simulations using the SPH(smoothed particle hydrodynamics) method. We have employed fixed external potentials, which are constant in time in a frame rotating with the bar, representing the following three components: a bar, a halo and an exponential stellar dosk.

The mass of the bar modelled here is a tenth of that of the stellar disk and the axial ratio(b/a) is 0.25. The halo mass is assumed to be comparable to the stellar disk mass, while the gaseous disk the same mass as the bar. Simulations show that spiral arms are induced by the bar and large non-circular motions are clearly present, which are consistent with the previously reported studies. We have also found shocks form along the spiral arms and transfer outwards the angular momentum of the gas flow. This causes the inflow of the gas which results in the gas density enhancement in the central region. It turns out that this process does not depend upon the self-gravity of the gaseous disk. we suggest the shock formation along the spiral arms plays an important role in fueling the gas into the nuclei of starburst galaxies.

The Effect of the Field Galaxies and the Clusters of Galaxies on the Gravitational Lens Statistics

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We numerically simulate gravitational lensing by a galaxy surrounded by field galaxies or a galaxy within a cluster. With the simulations, th probability of multiple image lensing and the distribution of image separations are statistically estimated and compared with single galaxy lensing case.

Cluster like coma do not produce any noticeable differences, compared to lensing by a single galaxy unless galaxies in the cluster are much heavier than we usually expect. However, if 100% of all matter in $\Omega=1.0$ universe reside in galaxies, nearby field galaxies affect lensing signofocantly. If 10%, there are small yet noticeable differences in image separation statistics. In general, the distribution of image separations is bimodal with small fraction of cases producing separations a few times larger than the Einstein radii.