Evolution of Galactic Density Peaks in Constrained Random Field

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To study the effect of primordial large-scale density fluctuations on the formation of clusters of galaxies and their physical properties, a set of controlled numerical simulations has been performed under the standard cosmology. The initial conditions were designed to have a 3σ perturbation in the background when the density field is smoothed with a Gaussian filter with radius of one-tenth of the length of simulation box. local densities at the final positions of CDM particles have been calculated to located "clesters of galaxies".

The physical properties of clusters such as the distribution of mass and the line-of-sight velocity dispersions have been studied. Clusters were classified into groups according ti their LOS velocity dispersions representing the richness. The number density of rich clusters found in the simulations is consistent with the observation.

We have found that regions of high backround density form more rich clusters. On the other hand, low density regions tend to form poor ones. Only the regions with initial backround density fluctuations exceeding 2σ produce rich clusters with $<\sigma^2_{LOS}>^{1/2} \geq 500 km\ s^{-1}$ irrespective of local density fluctuations. But in the regions where the smoothed backround density has a value near the mean, the local density fluctuation is more important to the formation of clusters.

The power spectrum and the auto-correlation function analysis shows a "richness bias" in the spatial distribution of clusters in the sense that rich object cluster more strongly. The strength of clustering bias consistent with the results of earlier works although only the qualitative comparison is available.

Effects of Gravitational Radiation on Three-Body Interactions of 10 $M_\odot$ Black Holes

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The formation of binaries and subsequent merging by gravitational radiation emission is important in the evoution of dense clusters of compact stars. If there exist 10 $M_\odot$ black holes in nuclei of galaxies, thsy form a subsystem with very small size within the "flat core" of the backround stars. If the core density is sufficiently via three-body processes. The inter actions between binaries and a single star are well studied subject. However, the effect of gravitational radiation could be important for the case