EVOLUTION OF SUBSYSTEMS DURING COLLAPSE OF A CLUSTER

TOSHIO TSUCHIYA
Department of Astronomy, Kyoto University
Kyoto 606-01, Japan

Motivation: In the hierarchical clustering scenario, objects with smaller masses collapse and virialize earlier. I am interested in the effects of the existence of virialized subsystems on the structures of a collapsing larger mass object, and the fate of subsystems.
Comparison to previous works: Most work, both analytic and numerical, is concerned with the evolution of subsystems in a virialized cluster. Some numerical works have investigated dynamical effects in collapsing clusters, but these are usually not quite systematic.
Aim of this work: We try to study numerically the evolution of collapsing clusters with clumpy initial conditions. We make a systematic survey of two dimensional parameters: the number and the relative size of the subsystems.
Simulations: Numerical N-body simulations are made with the GRAPE-3A supercomputer. No cosmological expansion is included. Each subsystem is an equilibrium Plummer sphere. The initial radius of the cluster of the Plummer sphere is given by

$$R_0 \equiv 2r_{\rm v}\left(\frac{M_{\rm total}}{m}\right)^{(n_{\rm k}+5)/6} = N_{\rm c}^{(n_{\rm k}+5)/6}, \qquad (1)$$

where $r_{\rm v}$ is the initial radius of the cluster and the subsystems; $M_{\rm total}$ and m are the masses of the cluster and the subsystems and $N_{\rm c}$ is the number of the subsystems.
Results: We obtained a condition for the subsystems to survive the first violent phase of a collapsing cluster;

$$n_{\rm k} \geq -1, \qquad \text{and} \qquad N_{\rm c} \gg 1. \qquad (2)$$

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