Dynamics of Galaxies: from the Early Universe to the Present
ASP Conference Series, Vol. 197, 2000
F. Combes, G. A. Mamon, and V. Charmandaris, eds.

Formation of cD Galaxies Within Dark Matter Distributions

Carlos García Gómez and Antonio Garijo

Universitat Rovira i Virgili, Carretera Salou s/n 43006 Tarragona, Spain

E. Athanassoula

Observatoire de Marseille, 2 Place Le Verrier F-13248 Marseille, France

Abstract. Recent observations from gravitational lenses show that the dark matter in clusters of galaxies must have a cusped distribution. This fact is also supported by numerical simulations which give universal cusped distributions for the dark matter halos. Our N-body simulations show that brightest cluster members with properties similar to giant ellipticals or cD galaxies can form only within cusped dark matter distributions. The galaxies formed within distributions with a flat core (in our simulations Plummer spheres) have mass distributions which are not in agreement with observations.

1. Simulations

Our N-body simulations consist of 100 000 equal mass particles. A fraction of these are distributed in a common background and the rest within 50 equal mass galaxies. For the dark matter distributions we used either cusped Hernquist distributions or non-singular Plummer distributions. The galaxies were distributed initially following the density distribution of the background and with virialised initial conditions. So, initially "light follows mass". We used different initial conditions changing alternatively the core radius of the background distribution, the fraction of the half mass radius containing the galaxies and the ratio of mass in the background over the mass in galaxies.

2. Formation of cD galaxies

The mass of the central galaxy grows in time by means of two mechanisms. By merging with the satellite galaxies and by accreting material stripped from the the galaxies that have not yet merged into the giant one. The relative contribution of these two mechanisms depends strongly on the properties of the background profile. In profiles with flat cores (Plummer) the stripping is dominant while in cusped distributions the merging with satellite galaxies dominates the formation process, specially in the initial steps.