EVOLUTION OF GALAXIES THROUGH THEIR INTERACTIONS

Y. FUNATO AND J. MAKINO
University of Tokyo, 3-8-1, Komaba, Meguro-ku, Tokyo, 153, Japan

We investigated how the encounters between galaxies change their mass M and velocity dispersion σ. We carried out a series of direct N-body simulation of encounters of two spherical galaxies. In Figure 1, the relative change of energy $\Delta E/E$ are plotted against that of mass $\Delta M/M$ for various initial conditions. The filled and open symbols correspond to the cases of Plummer model and relaxed Hernquist model, respectively. Here $\beta \equiv (\Delta E/E)/(\Delta M/M)$.

We found a simple theory which explains the result. If the galaxies have halos with density $\rho \sim r^{-\alpha}$, the relation is expressed as $\Delta\sigma/\sigma = 0.25(\alpha - 3)\Delta M/M$ independendly of the collisoin parameters.

For the real galaxies, α is believed to be 4. Therefore the ratio β is 0.25. This implies that galaxies will assymptotically become to the state which is expressed as $\sigma \sim M^{0.25}$ through interactions. Assuming that M/L is constant, this relation is equivalent to the Faber–Jackson relation $\sigma \sim L^{0.25}$.

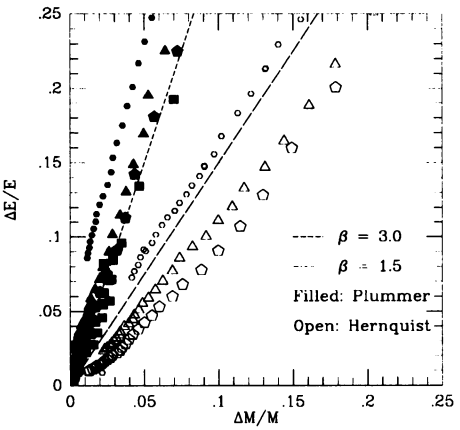

Figure 1. $\Delta E/E$ vs $\Delta M/M$

https://doi.org/10.1017/S007418090023297X Published online by Cambridge University Press