Disk Galaxy Mergers and the Fundamental Plane

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Abstract.
We report on an ongoing study of disk galaxy merger simulations and their implications for the Fundamental Plane (FP) of elliptical galaxies.

1. Introduction

It is widely believed that mergers of disk galaxies can give rise to elliptical galaxies. Is the merger origin consistent with the existence of the FP of ellipticals? The FP can be derived using the Virial Theorem and homology, if a Mass-Luminosity relation is in place. Our idea is that the FP of merger ellipticals might be related to the existence of the TF scaling between disk galaxies.

Bekki (1998) argues that non-homology, i.e. a systematic change in the structural and kinematic properties of elliptical galaxies with luminosity is responsible for the FP’s tilt.

We tackle this problem via N-body simulations, assuming that there is an existing mass-luminosity relation between the initial systems, i.e. the disks. Such a relation is actually implied by the Tully-Fisher (TF) relation, $L \propto V_{\text{max}}^\alpha$.

Several models of collisionless mergers between disk galaxies have been run. Galaxies were scaled initially to lay on top of the TF relation, with varying values of $\alpha$. Our results show a preference for an exponent $\alpha \sim 3.5$, while other exponents place remnants away from the FP. More detailed account will be given in a forthcoming paper (González-García et al. 2002).

References