

The Kinematics of Bulges in Spiral and Lenticular Galaxies

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We investigate the role of secular and hierarchical processes in galaxy evolution and the relationships between spirals and S0s. We present results from a project that examines a sample of 30 edge-on spiral and S0 (lenticular) galaxies that have boxy and peanut-shaped bulges. We compute model kinematics for the sample by solving the Jeans equations for mass distributions which we derive from K -band images. These simple axisymmetric models have only one free parameter: the dynamical mass-to-light ratio, which we assume is independent of radius. When compared to the observed stellar kinematics, the models' second velocity moments are strikingly accurate within the extent of our kinematic data, which typically reach 0.5-1 R_{25} (where R_{25} is the optical radius), or equivalently 2-3 R_e (where R_e is the effective or half-light radius). We therefore find no evidence for dark matter within the optical disk of spiral galaxies, in agreement with previous studies. More importantly, our results extend the radius to which this assertion is valid for S0 galaxies. The predicted kinematics also deviate slightly but systematically from the observations in the bulge region of most galaxies, but we argue that this is consistent with the claim that boxy and peanut-shaped bulges are bars viewed edge-on. We further present a study of the Tully-Fisher relation for the galaxies in this sample, which tests the evolutionary link of spirals and S0s. Finally, we show preliminary findings of an observational study of the kinematics of boxy bulges as a function of vertical offset from the equatorial plane. This study investigates the cylindrical rotation of boxy bulges, a generic prediction of bar-driven secular evolution models.