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Lenticular vs spiral galaxies: dark matter content and the Tully-Fisher relation

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We provide observational constraints on disk galaxy evolution for a sample of 28 local edge-on early-type (S0–Sb) disk galaxies. We do this in two ways: (i) we use simple dynamical modelling techniques to constrain their stellar and dark matter content (Williams *et al.* 2009) and (ii) we compare the zero points of the Tully-Fisher relations (TFRs; Tully & Fisher 1977) of the spirals and S0s.

For each galaxy, we model the stellar mass distribution under the assumptions of axisymmetry and a constant stellar mass-to-light ratio (M/L), and include a NFW halo. We then use an axisymmetric Jeans modelling technique assuming constant orbital anisotropy (Cappellari 2008). In this way we derive a model-dependent but purely dynamical estimate of the stellar (M/L), free from uncertainties due to the initial mass function and late phases of stellar evolution. We find a median K_S-band stellar (M/L) of 1.09 with a small rms scatter of 0.31. Dark matter typically comprises 15% of the mass within the effective radius $R_{\rm e}$ and 50% within the optical radius R_{25}.

There is a small but significant difference between the zero points of the spiral and S0 TFRs. For a given circular velocity, spirals are brighter than S0s by 0.5 mag at K_S-band, an offset smaller than previous results (e.g. Bedregal *et al.* 2006). We argue that our determination is to be preferred because it is free from the possible bias introduced by the comparison of rotational velocities derived from global emission line widths to stellar kinematics.

References

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