Dark Matter in Galaxies
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The $\sigma_c - V_{circ}$ correlation in high and low surface brightness galaxies

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Abstract. We investigate the relation between the central velocity dispersion, σ_c, and the circular velocity, V_{circ}, in galaxies. In addition to previously obtained data, we consider an observationally homogeneus sample of 52 high surface brightness and 11 low surface brightness spiral galaxies. We performed a straight line regression analysis in a linear scale, finding a good fit, also for low σ_c galaxies, always rejected in the previous studies. Low surface brightness galaxies seem to behave differently, showing either higher values of V_{circ} or lower values of σ_c with respect to their high surface brightness counterparts.

Studying the interplay between ionized-gas and stellar kinematics allows us to address different issues concerning the dynamical structure of disk galaxies, and to constrain the processes leading to their formation and evolution. All these issues will greatly benefit from a survey devoted to the comparative measurement of ionized-gas and stellar kinematics in disk galaxies. This is particularly true for the relationships involving the measurement of σ_c, such as the $M_\bullet$–σ_c relation (Ferrarese & Merritt 2000; Gebhardt et al. 2000) and the σ_c–V_{circ} relation (Ferrarese 2002; Baes et al. 2003). To this aim we obtained the stellar and gaseous kinematics for 52 lenticular (Bertola et al. 1995) and spiral galaxies (Corsini et al. 1999, 2003; Vega Beltrán et al. 2001; Pizzella et al. 2003) of high surface brightness (HSB hereafter). Recently, we considered a sample of 11 low surface brightness spirals (LSB herafter). We obtained long-slit spectra along their major axes at the Very Large Telescope with a resolution of about 45 km s^{-1} × 1″. The ionized-gas kinematics were measured from the Hβ and [O III]λ5007 emission lines. The stellar kinematics were measured in the region of the Mg triplet at 5200 Angstroms with the Fourier Correlation Quotient method (Pizzella et al., these proceedings).

For 42 sample galaxies we derived σ_c from the radial profile of the stellar velocity dispersion and V_{circ} from the flat portion of the ionized-gas rotation curve (Fig. 1, left panel). Finally, we selected the 6 HSBs with data extending at radii larger than R_{25} (and therefore ensuring a most reliable value of V_{circ}) and all the 11 LSBs. We built the final data set including the 24 HSBs studied by Ferrarese (2002) and Baes et al. (2003) and 20 ellipticals studied by Kronawitter et al. (2000). We performed a straight line regression analysis in a linear scale, finding a good fit, also for galaxies with $\sigma_c < 70$ km s^{-1}, always rejected in the previous studies (Fig. 1, right panel). Although our LSBs were not entirely representative of the LSBs population, the comparison with the HSB sample seems to indicate that LSBs follow a different relation, having a smaller σ_c for a

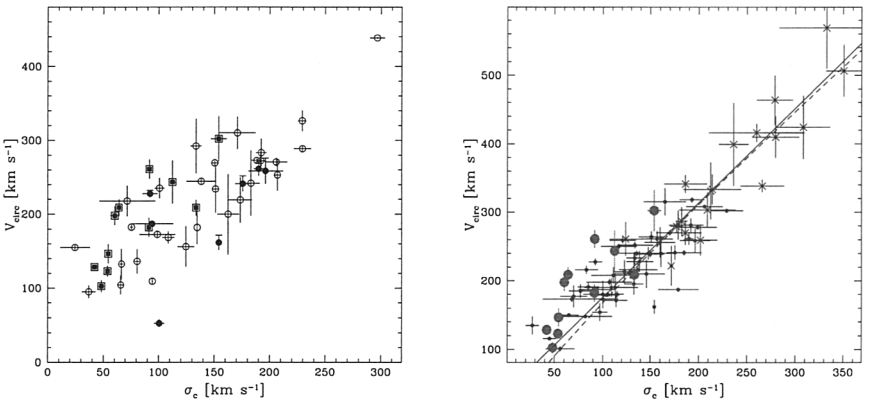

Figure 1. *Left panel:* Values of σ_c and V_{circ} for the 42 galaxies of our sample. *Open* and *filled circles* correspond to HSBs for which $R(V_{circ}) < R_{25}$ and $R(V_{circ}) > R_{25}$, respectively. LSBs are marked with *squares*. *Right panel:* σ_c–V_{circ} relation for our LSBs (*circles*), the HSBs with $R(V_{circ}) > R_{25}$ taken from Ferrarese (2002), Baes et al. (2003) and this paper (*dots*) and the ellipticals of Kronawitter et al. (2000, *crosses*). *Continuous* and *dashed lines* correspond to our linear fit and power-law fit by Ferrarese (2002), respectively.

given V_{circ}, or a higher V_{circ} for a given σ_c. The collapse of baryonic matter has been claimed to induce a further concentration in the dark matter distribution, and a deepening of the overall gravitational well in the central regions. If this is the case, the finding that at a given V_{circ} (which corresponds to a given M_{DM}, Bullock et al. 2001) the central σ_c of LSBs is smaller than in their HSB counterparts, would argue against the relevance of baryon collapse in the radial density profile of dark matter in LSBs.

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