The halo-to-stellar mass ratio in the S⁴G

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Abstract. We use 3.6 μm photometry for 1154 disk galaxies ($i < 65°$) in the S⁴G (Sheth *et al.* 2010). We obtain the average stellar component of the circular velocity ($V_{\rm disk}$) and the mean (dark matter) halo-to-stellar mass ratio ($M_{\rm halo}/M_*$) inside the optical radius ($R_{\rm opt}$) in bins of total stellar mass (M_*, from Muñoz-Mateos *et al.* 2015), providing observational constraints for galaxy formation models to be tested against. We find the $M_{\rm halo}/M_* - M_*$ relation in good agreement with the best-fit model at z≈0 in ΛCDM cosmological simulations (e.g. Moster 2010), assuming that the dark matter halo within $R_{\rm opt}$ comprises a constant fraction ($\sim 4\%$) of its total mass.

Keywords. galaxies: structure - galaxies: dark matter - galaxies: statistics

We obtain the mean $V_{\rm disk}$ and $M_{\rm halo}/M_*(< R_{\rm opt})$ in bins of M_* (Fig. 1) using the gravitational potentials (Φ) of S⁴G disk galaxies (Díaz-García *et al.* 2016):

$$V_{\rm disk}(r) = \sqrt{\Upsilon_{3.6\mu m} \left\langle \frac{\partial \Phi}{\partial r}(r) \right\rangle r} \qquad \& \qquad M_{\rm halo}/M_*(< R_{\rm opt}) \approx 1.34 \cdot \left(\frac{(V_{\rm HI}^{\rm max})^2}{V_{\rm disk}^2(R_{\rm opt})} - 1 \right),$$

where $\Upsilon_{3.6\mu m} = 0.53$ is the mass-to-light ratio at 3.6 μm (Eskew *et al.* 2012), $R_{\rm opt} \approx 3.2 \cdot \langle h_{\rm R} \rangle$ ($h_{\rm R}$ being the disk scalelength from Salo *et al.* 2015) and $V_{\rm HI}^{\rm max}$ is the mean inclination-corrected H I line width from the literature (e.g. Courtois *et al.* 2011).

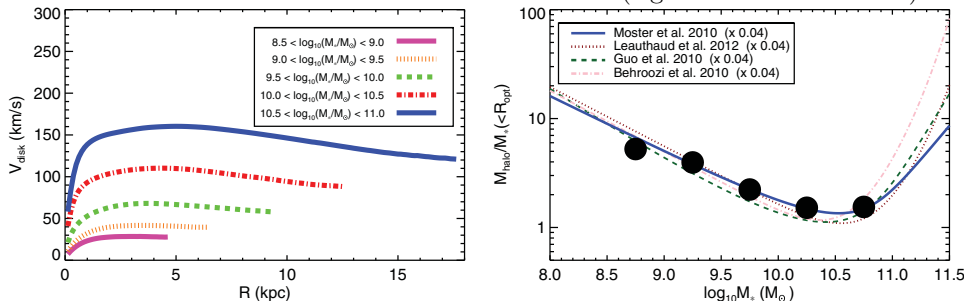**Figure 1.** *Left panel:* Mean $V_{\rm disk}$ for the different M_*-bins. *Right panel:* The central value of the M_*-bins vs. the mean $M_{\rm halo}/M_*(< R_{\rm opt})$ (filled circles). The dashed lines correspond to estimates in the literature for the total halo-to-stellar mass ratio vs. M_*, scaled down by a factor 0.04, showing good agreement with our estimate (Díaz-García *et al.* 2016).

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