COMPACT MASSIVE GALAXIES IN THE NEARBY UNIVERSE: A TRULY UNIQUE OBJECTS

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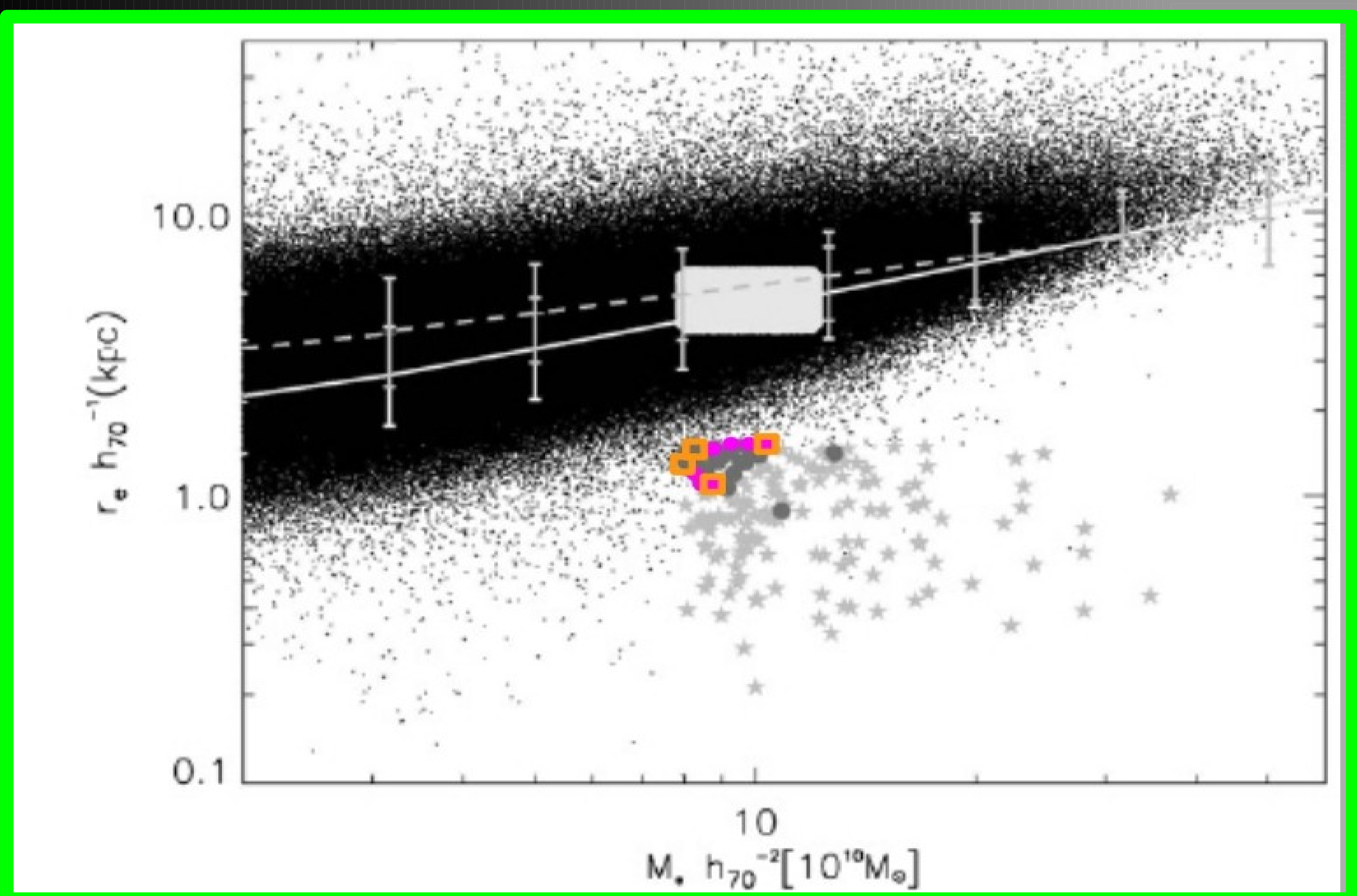
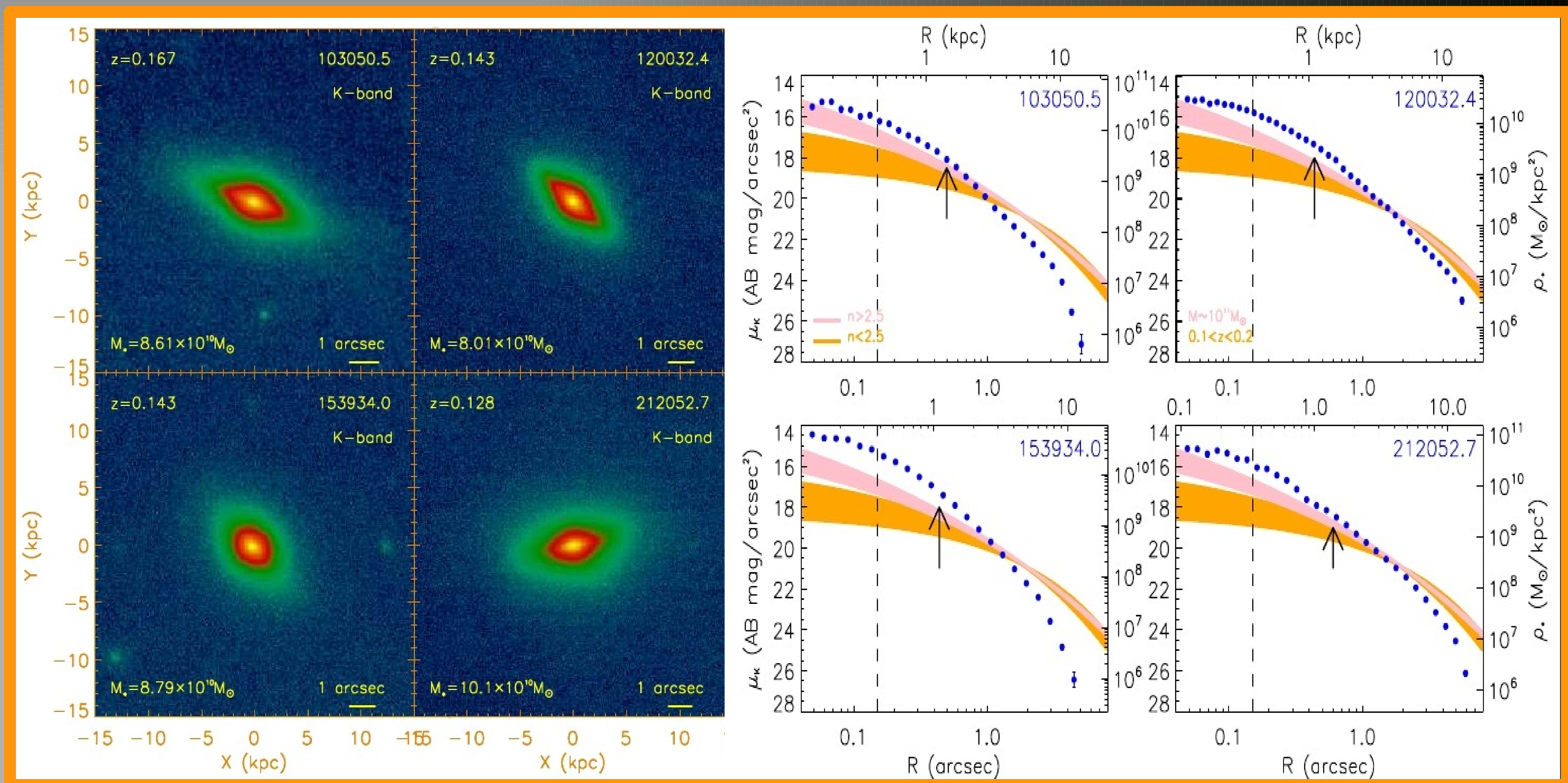
In this work we present new high-quality data for several compact massive galaxies in the nearby Universe from the Trujillo et al (2009) (T09) sample: a) high-quality long slit *WHT/ISIS* spectra: Ferré-Mateu et al, in prep.; b) high-resolution imaging *GEMINI/NIRI* data: Trujillo, Carrasco & Ferré-Mateu, in prep.

We have performed a detailed morphological, kinematical and stellar populations analysis to fully characterize these intriguing objects. This work was initially aimed to test the hypothesis whether these objects were the relics from the high-z compact massive galaxies. Our results tend to contradict this view. We find that these local massive ($M^* \approx 1.2 \times 10^{11} M_{sun}$) objects are very compact (Re ≈ 1.3 kpc), with disky morphologies but high Sérsic indices (n ≥ 2.5). Most of the analyzed objects are fast rotators with rotational velocities as high as Vr = 200 km/s and velocity dispersions around σ ≈ 200 km/s. A very detailed analysis of their stellar populations reveals young mean SSP-equivalent ages ≤ 2Gyr and metallicities around solar ([Z/H] ≈ 0). The Star Formation Histories (SFH) derived from STARLIGHT full spectrum-fitting approach (Cid Fernandes et al. 05) show surprisingly high mass-weighted contributions from young stellar populations, which in some cases represent about 50% of the total mass. We also obtained the surface brightness profiles from adaptive optics imaging, confirming the compactness of these objects (re ≈ 1.2 kpc) and, more important, we find that they do not follow the local, normally-sized stellar surface brightness profiles. To summarize, these objects are unique and rare and deviate from standard galaxy scaling relations .



Stellar mass–size distribution of the NYU Value-Added Galaxy Catalog (DR6) galaxies. The position of T09 sample of compact galaxies is shown with gray circles. The local compact galaxies for the spectroscopic study are overplotted with solid magenta circles. In orange open squares those observed with adaptive optics. The stars are sources classified as QSOs. Overplotted on the observed distribution are the mean and dispersion of the distribution of the Sérsic half-light radius of the SDSS early-type (n > 2.5; solid line) and late-type (n < 2.5; dashed line) galaxies as a function of the stellar mass. The gray rectangular area shows the region used to extract the control sample galaxies in T09. (Figure from T09)

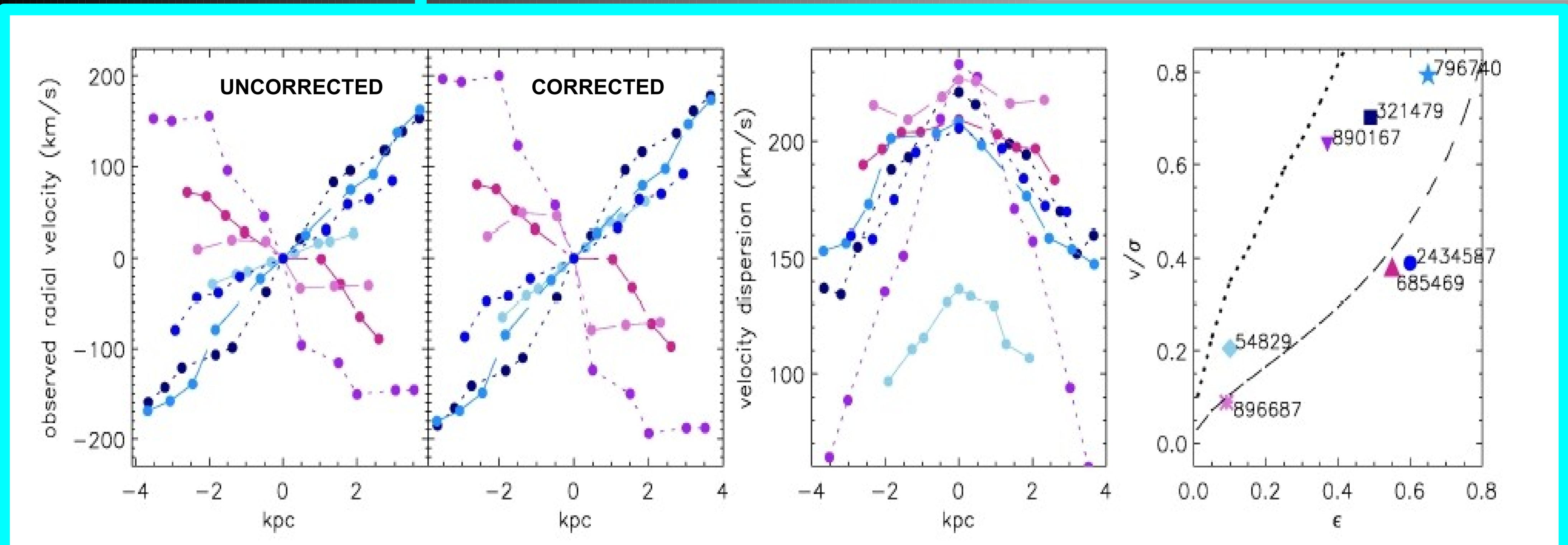


a) Thumbnails showing the compactness of our objects.

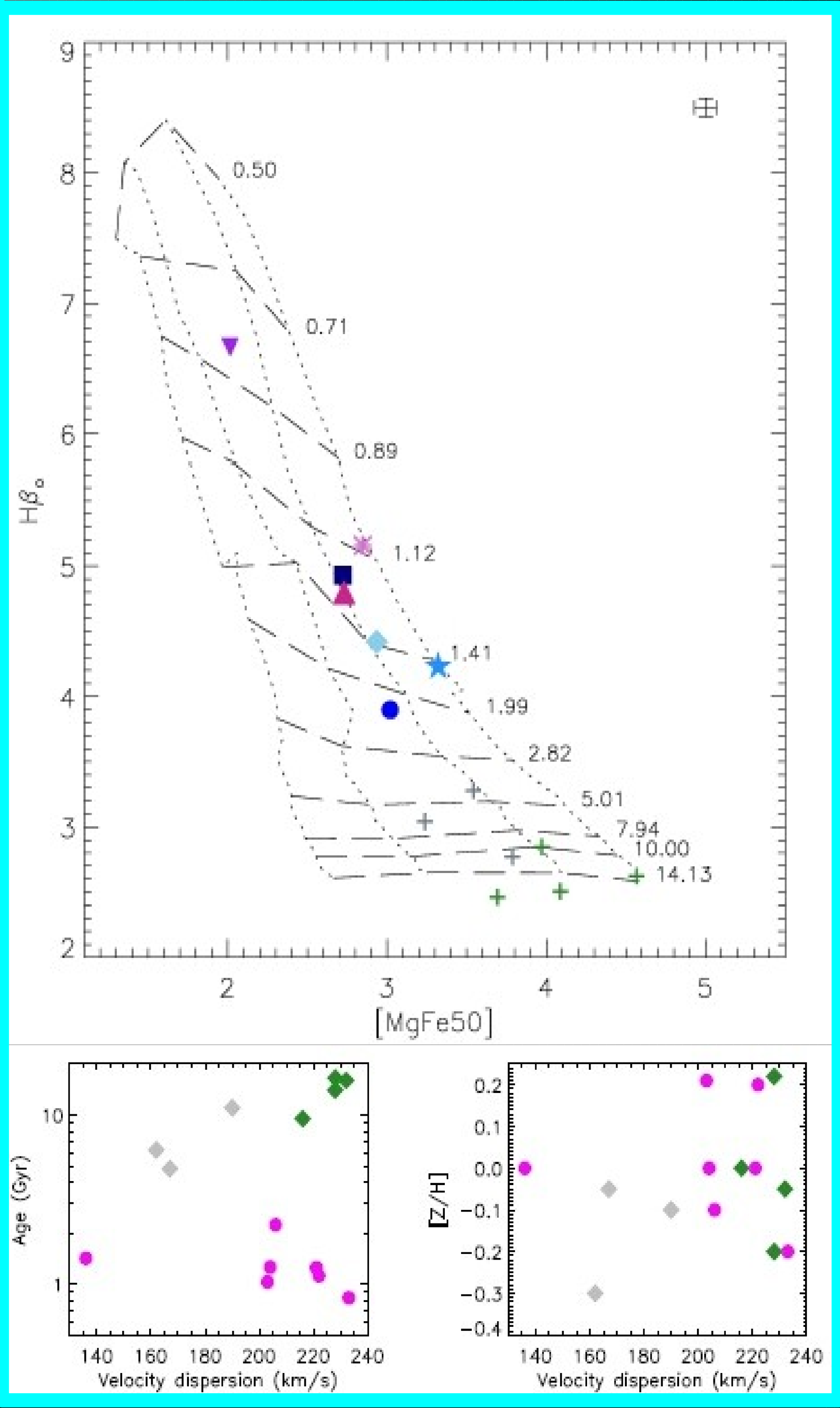
b) Surface brightness profiles for 4 compact galaxies (blue dotted line). The relation for early-type galaxies (pink) and late-type galaxies (orange) of similar mass but normally-sized is overplotted. Arrows mark the position of the Re for each galaxy. It is clear that the local compact galaxies do not follow any of the local relations. Figure from Trujillo, Carrasco & Ferré-Mateu, (in prep).

NYU ID	z	R_e (kpc)	σ (km/s)	n	b/a
54829	0.085	1.12	137	4.60	0.90
321479	0.128	1.20	221	5.80	0.51
685469	0.149	1.48	204	3.03	0.45
796740	0.182	1.24	203	2.40	0.35
890167	0.143	0.83	233	3.72	0.63
896687	0.130	1.63	223	5.44	0.95
2434587	0.172	1.13	206	5.45	0.40

TABLE: Compact galaxy structural parameters. The effective radii (Re), the Sérsic index (n) and the axis ratio (b/a) where derived with GALFIT. (Table and figures from Ferré-Mateu et al, in prep).



a) Radial velocities (Vr) derived with PpxF (Cappellari & Emsellem,04) using the SSP models of V10 as templates. First panel, observed Vr; second panel, Vr corrected from inclination effects. b) Velocity dispersions from PPxF; c) Anisotropy diagram, showing that our objects are mainly fast rotators. Note that this condition cannot be discarded for the remaining galaxies lying in the slow rotators regime as we were unable to reach the maximum rotational velocity for these objects.



a) Age-sensitive indicator $H\beta_o$ (Cervantes & Vazdekis 09) *vs* the total metallicity indicator [MgFe50] in the LIS8.4 Å system from V10. Age increases from top to bottom as pointed out in the panel (in Gyr) and metallicity from left to right ([Fe/H]= -0.71, -0.40, 0.00, +0.22). Our compact galaxies are represented in filled symbols (also in the figure with the kinematical properties). Green and grey crosses represent a control sample of nearby elliptical (Sánchez-Blázquez et al. 06) and spiral (Falcón-Barroso et al., submitted) galaxies of similar velocity dispersion but normally-sized. b) Derived ages and total metallicities derived from the upper panel plotted *vs* galaxy velocity dispersion. In this case, the magenta sollid circles represent the sample of local compact galaxies

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