Stellar Populations - Planning for the Next Decade
Proceedings IAU Symposium No. 262, 2009
Gustavo Bruzual & Stéphane Charlot, eds.

doi:10.1017/S1743921310003091

Superdense massive galaxies in the nearby universe

Anna Ferré-Mateu & Ignacio Trujillo

Instituo Astrofísica de Canarias, Tenerife
c/Via Láctea s/n E38205, Tenerife, Spain
email: aferre@iac.es

Abstract. At high-z the most superdense massive galaxies are supposed to be the result of gas-rich mergers resulting in compact remnant (Khochfar & Silk (2006); Naab *et al.*(2007)). After this, dry mergers are expected to be the mechanism that moves these very massive galaxies towards the current stellar mass size relation. Whitin these merging scenarios, a non-negligible fraction (1-10%) of these galaxies is expected to survive since that epoch retaining their compactness and presenting old stellar populations in the past universe.Using the NYU Value-Added Galaxy Catalog (DR6), we find only a tiny fraction of galaxies (∼0.03%) with $r_e \leqslant 1.5$ kpc and $M_* \geqslant 8x10^{10} M_\odot$ in the local Universe (z∼ 0.2). Surprisingly, they are relatively young (∼2Gyr) and metal rich ([Z/H]∼0.2) These results have been published in Trujillo *et al.*(2009)

Keywords. galaxies: evolution, formation, stellar content

To investigate whether the distinct structural properties of our sample and a control sample are linked to differences in their stellar population properties, their global spectra and their luminosity-weigthed ages and metallicities are analyzed on the basis of stellar population models.
With the global spectra it is found that the average compact galaxy looks clearly younger than the average control galaxy (Fig 1). Consequently, the metal lines of compact galaxies are weaker than those in the sample control. With the $H\beta_o$ vs [MgFe] grid, it is clear that compact galaxies are younger (∼2Gy) than the control ones (∼ 14Gy) as seen in Fig 2. SFHs of our objects have been probed by means of STARLIGHT and the preliminary results show that for an average compact galaxy, more than 64% of the luminosity comes from the stellar populations younger than 3 Gy, indicating that superdense massive galaxies are genuinally young objects.

Results

Superdense massive galaxies ($r_e \sim 1$ kpc, M∼ $10^{11} M_\odot$) were common in the early universe (z ∼ 1.5). Whitin this scheme a non-negligible fraction (1-10%) of superdense massive galaxies is expected to survive intact since that epoch (Hopkins *et al.*2009) and, consequently, they are supposed to have old stellar populations, which is at odds with our findings. Within the scheme of dry merging scenario, our result could highlight the importance of accounting for minor merging in order to make robust estimations in the number density of old superdense massive galaxies in the present Universe.

References

Hopkins, P. *et al.* 2009, *ApJ*, 691, 1424
Khochfar, S. & Silk, J. 2006, *ApJ*, 648, L21
Naab, T. *et al.* 2007, *ApJ*,658, 710
Trujillo, I. *et al.* 2009, *ApJ*,692, L118

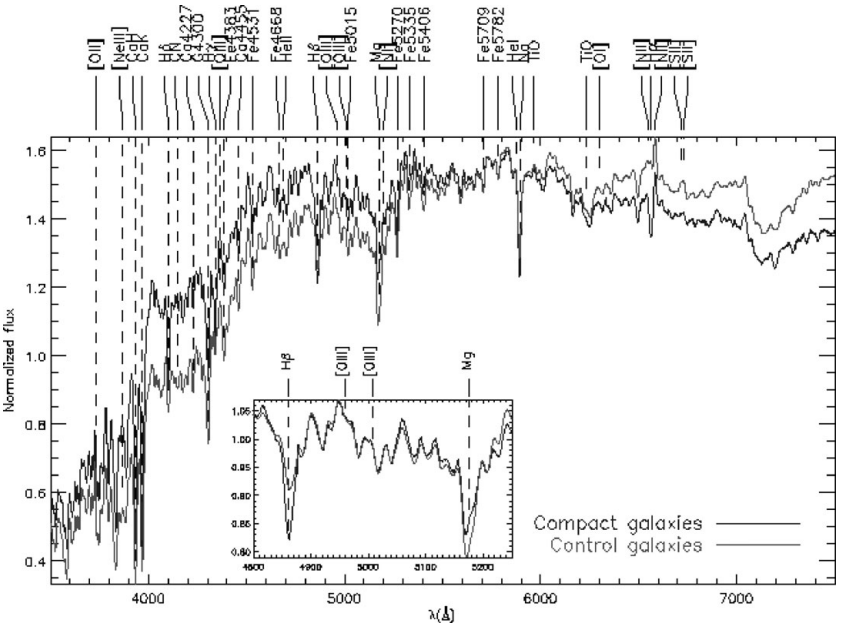

Figure 1. Mean spectra of the compact galaxies of our sample (black line) and the control galaxies (grey line). The inset shows the spectral region around H_β and Mg lines showing the great difference in age between the compact and control sample galaxies

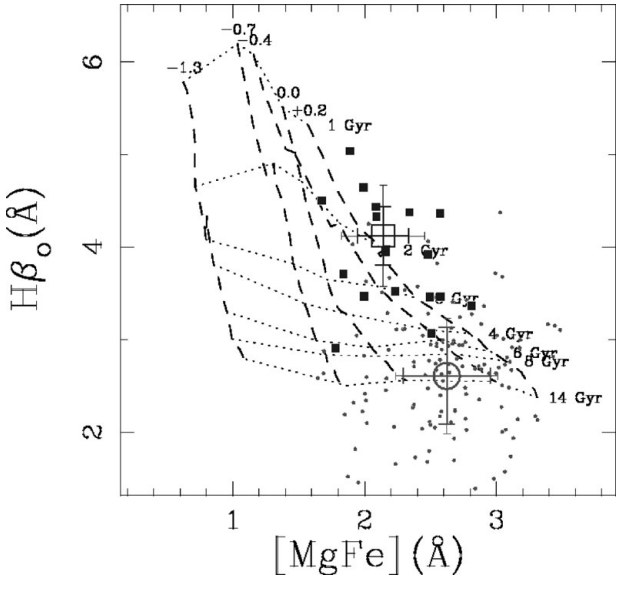

Figure 2. $H\beta_o$ vs [MgFe] diagram for 151 galaxies of a compact (filled squares, 18) and control samples (dots, 133) for which no $\lambda 5577$ $\AA$ [OI] skyline residuals affect the index measurements. Overplotted are V99+SSP model grids with different ages (dotted lines) and metallicities (dashed lines) as given in the labels. The open square and circle are error-weighted mean indices for the compact and control samples respectively. Thick error bars show the 1σ index uncertainties, whereas the thin error bars correspond to the dispersions of the sample.

https://doi.org/10.1017/S1743921310003091 Published online by Cambridge University Press