Hydra cluster galaxies: bulge-disc decomposition in 12 S-PLUS bands

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S-PLUS
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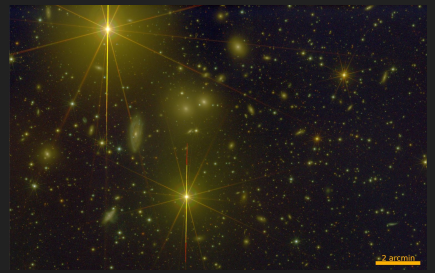

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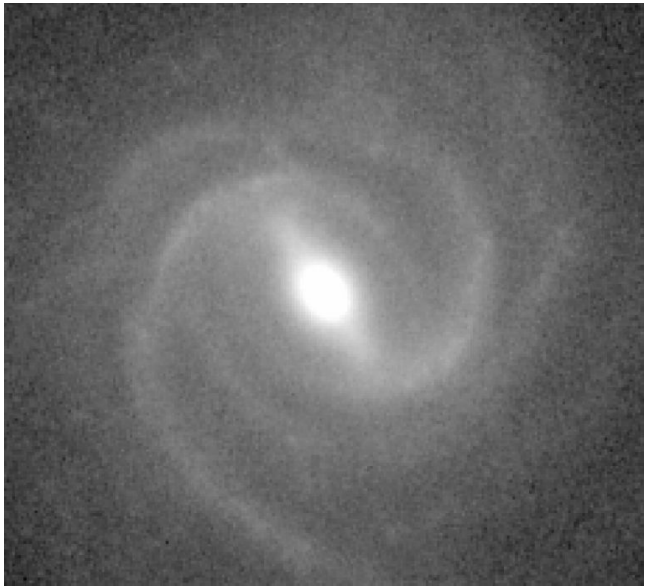
Formation and Evolution of galaxies

- The disc suffer more the influencer of the environment than the bulge.
- Differences between the bulge and disc properties of cluster and field galaxies may indicate different formation scenarios.
- Colour gradients (inside-out formation)

Two-Component Decomposition

Sérsic profile + Exponential Profile

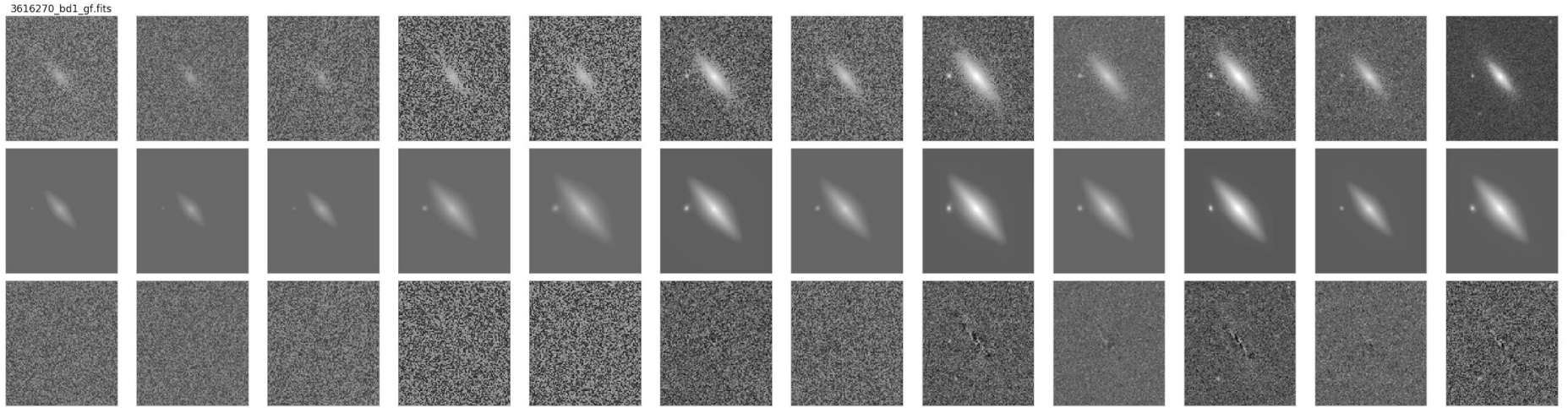
n (free) **n = 1**



$$\ln I(R) = \ln I_0 - kR^{\frac{-1}{n}}$$

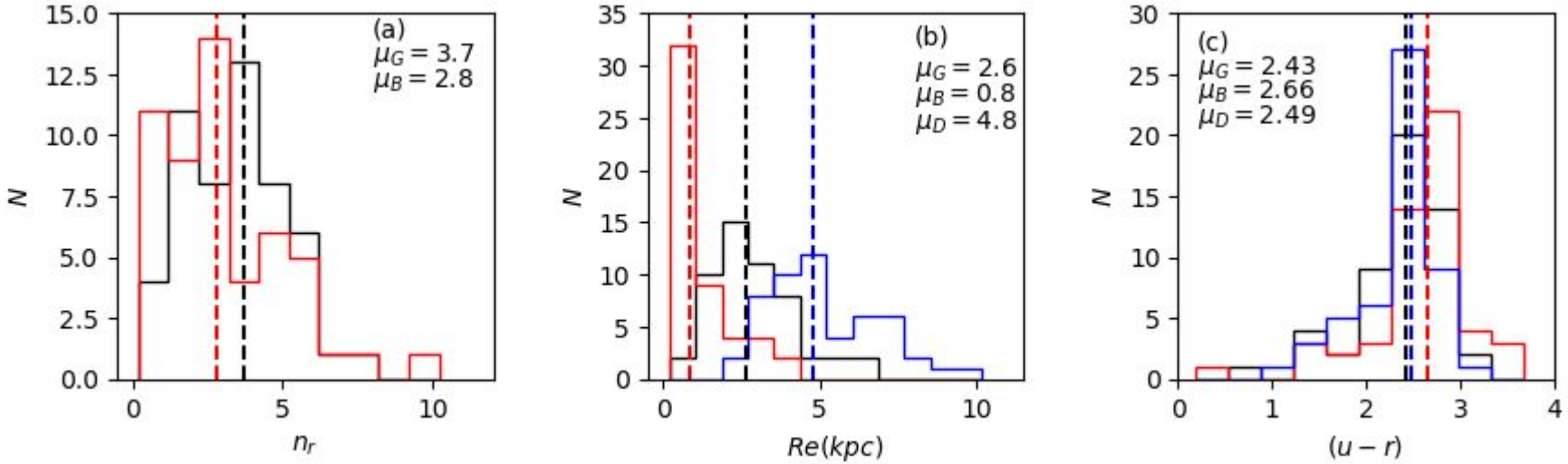
MegaMorph project (two-component)

The MegaMorph project uses **GALAPAGOS-2 (Galaxy Analysis over Large Areas**, Barden et al. 2012) with **GALFITM** (Peng et al. 2002; Peng et al. 2010)

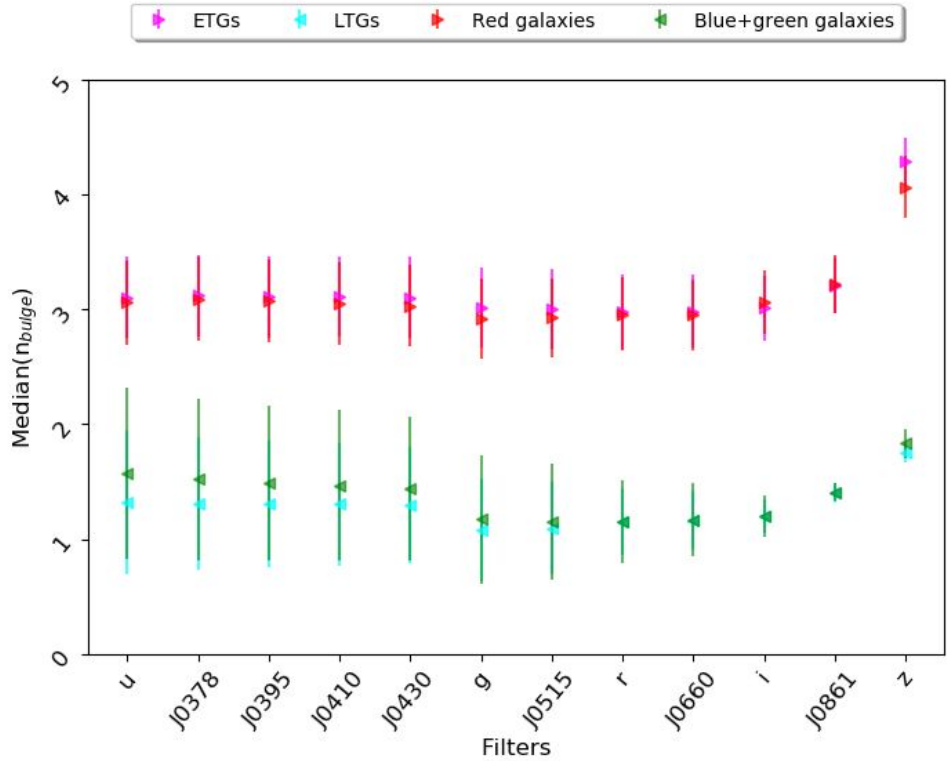


Galaxy properties

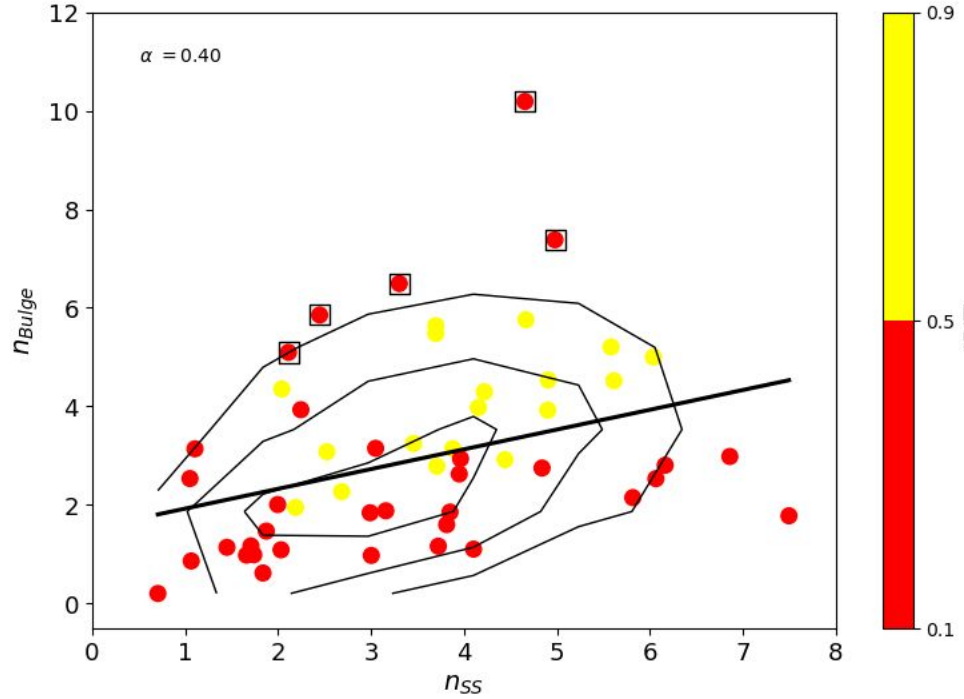
- 52 galaxies
- 0.1 < (B/T) < 0.9

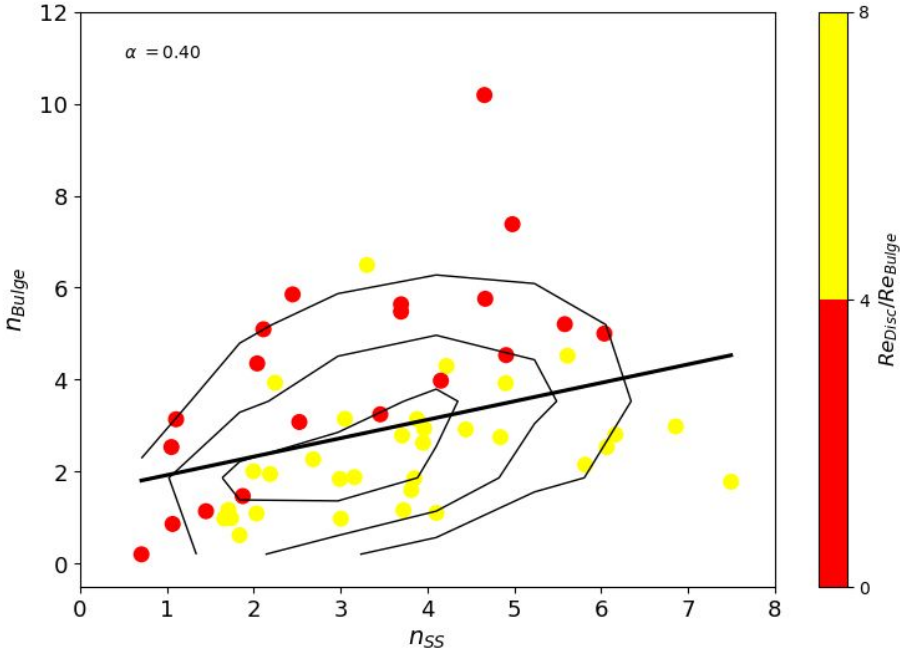


Bulge’s Sérsic indexes

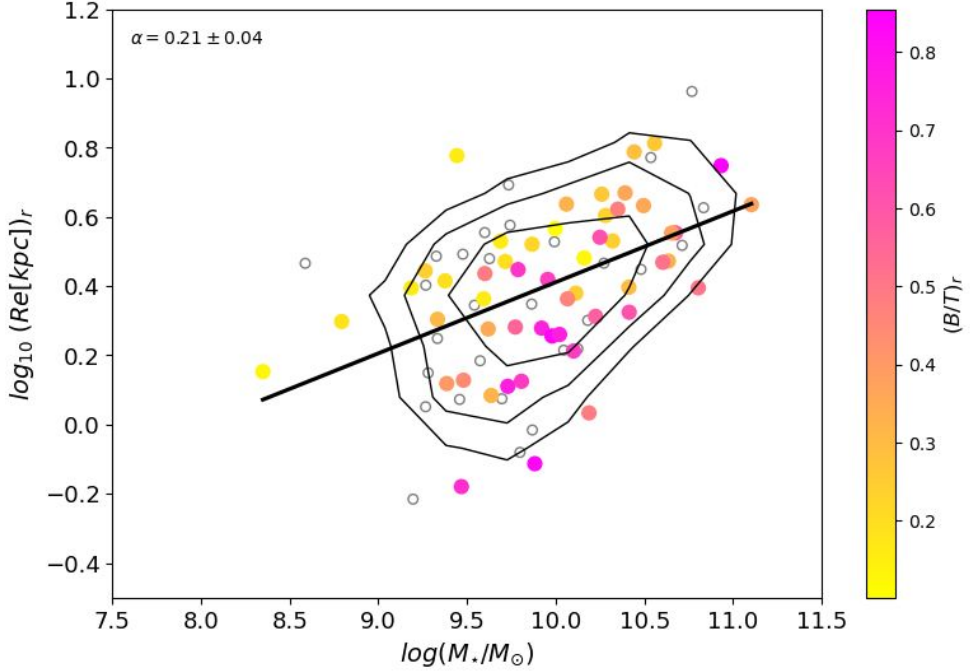


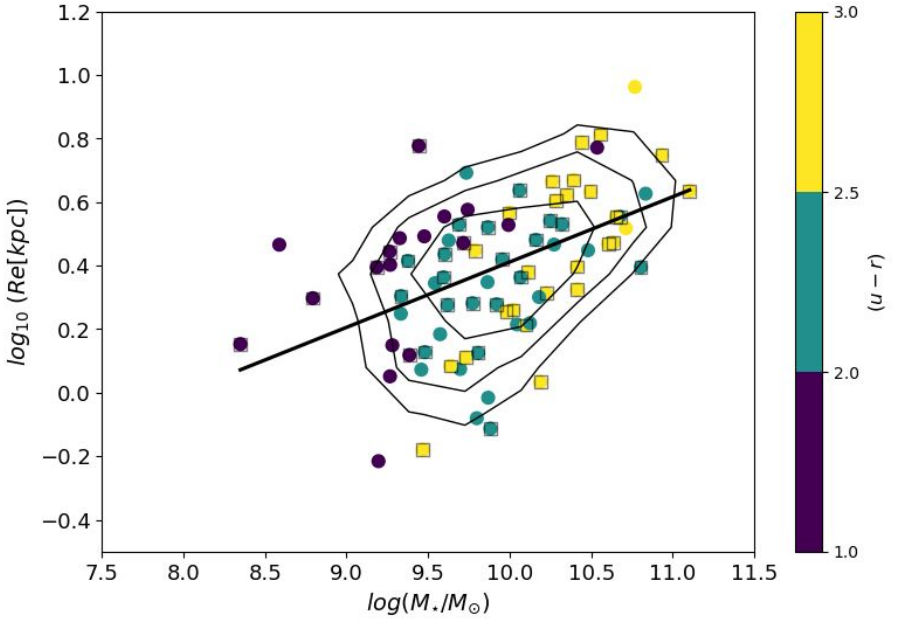
Galaxy's *n* vs. Bulge's *n*



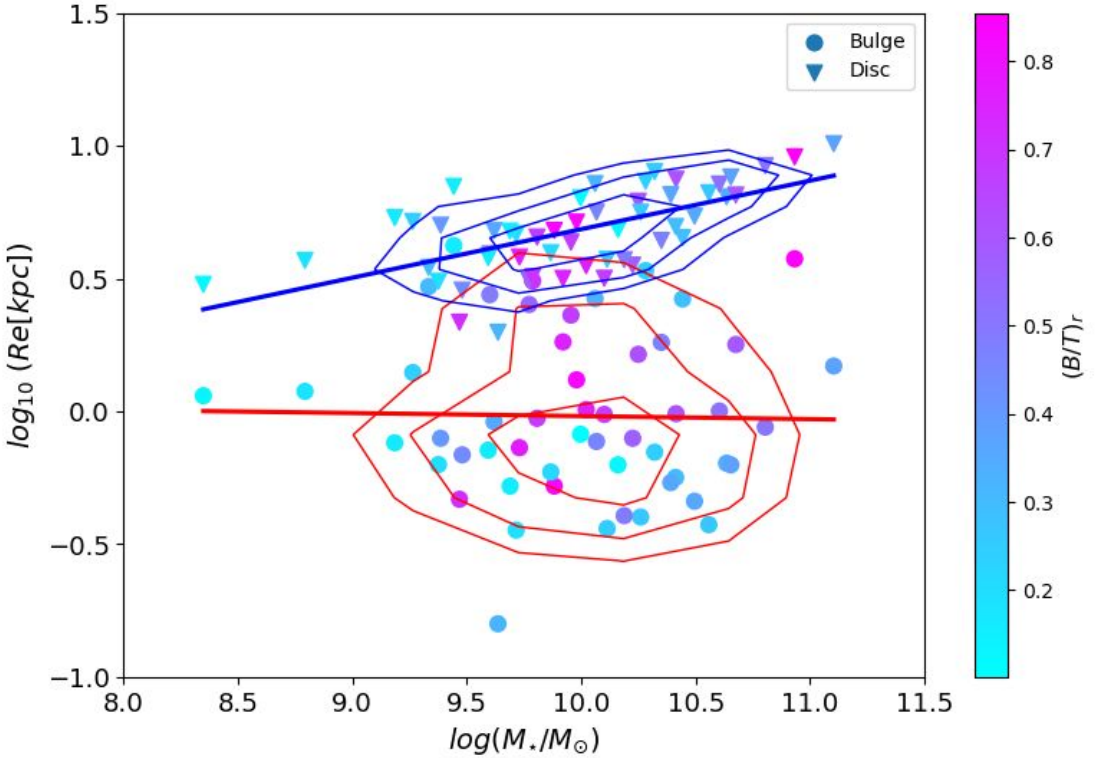


Mass-size relation

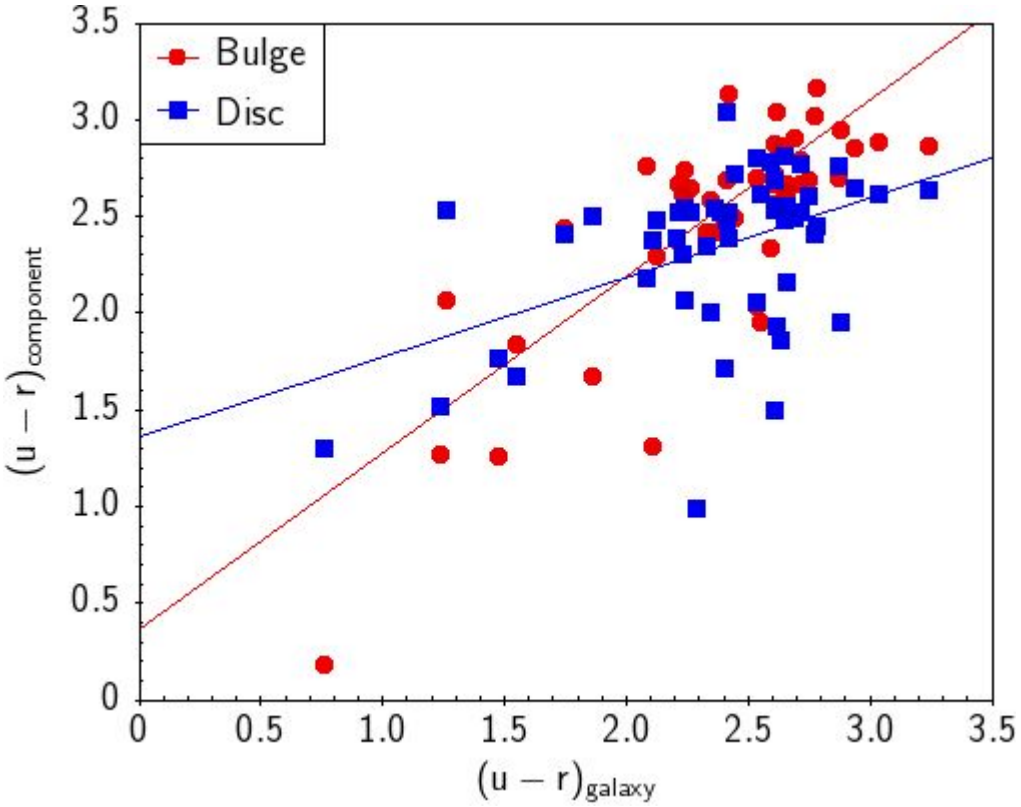




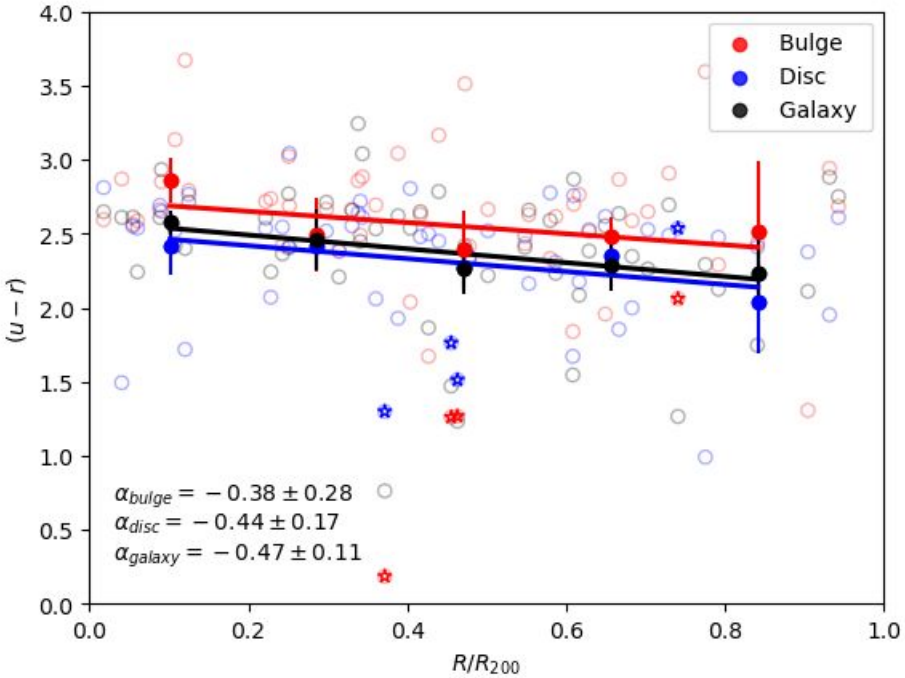
Componentes' Mass-size relation

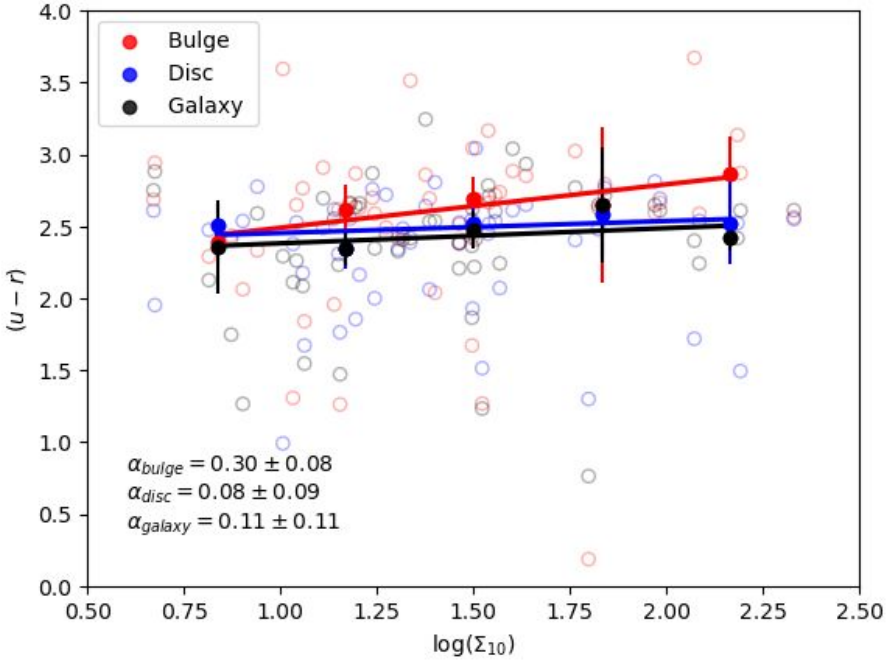


Galaxy's color vs. Componentes' color

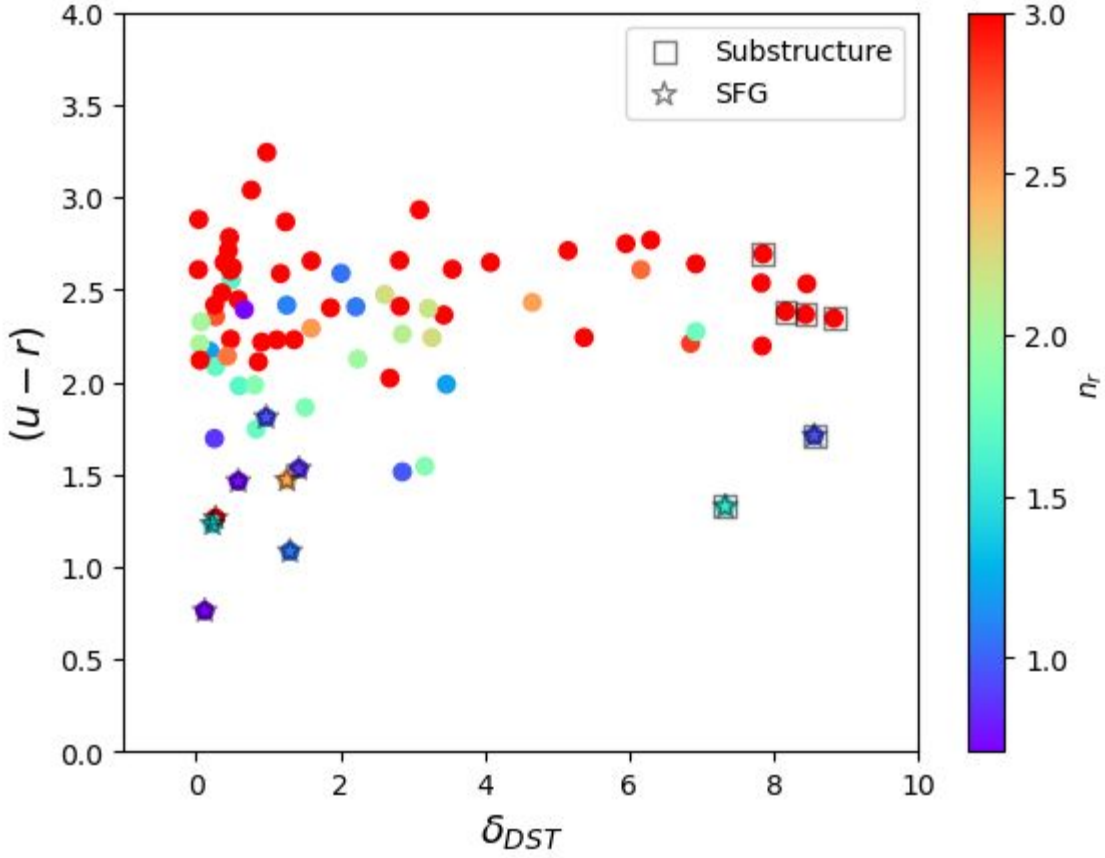


Galaxies and components colors





Galaxies and components colors



Summary and Conclusions

- The discs are generally bluer than the bulges. The median (u-r) offset separating the colour distributions of the bulges and discs is 0.17 mag. However, there are some galaxies (~36%) that have a bluer bulge than the disc.

- Bulges, discs, and the whole galaxy become redder towards higher density and to the central part of the cluster. The colour of the bulge, disc, and the whole galaxies are more affected by the clustercentric distance than the local density.

- ETGs and red galaxies have similar median Sérsic index for the bulge, remaining approximately constant among the filters *u* to *i*, showing an increase in the filters *J0861* to *z*. The LTGs and blue + green galaxies have the same behaviour as the ETGs and red galaxies in the filters *J0861* to *z*.

- Analysing the plane $n_{SS,r}$ vs. $n_{bulge,r}$ we found that galaxies with higher values of $n_{bulge,r}$ have larger values of $(B/T)_r$, at a fixed $n_{SS,r}$. Also galaxies with larger values of $n_{bulge,r}$, at a fixed $n_{SS,r}$, are more compact.

- This mass-size relation shows that, at a fixed stellar mass, galaxies with higher values of $(B/T)_r$ are more compact. Additionally, at a fixed stellar mass, redder galaxies are more compact. Then, it is very likely that the same mechanism that is quenching the galaxies is also causing its compaction.

Summary and Conclusions

- The bulge's effective radius does not show a dependence on the galaxy stellar mass, however the disc shows an increase in size towards larger stellar masses. Thus, it is likely that, for cluster galaxies, the disc component is yielding the galaxy mass-size relation.

- The star formation, in the 4 star-forming galaxies, is probably concentrated in the centre of the galaxies. It is very likely that their star formation is being caused by tidal interaction. In addition, these galaxies are most likely suffering ram pressure stripping and/or harassment events, that could stop the galaxy star-formation from outside-in, known as outside-in quenching process, which will lead the galaxy to become quenched.


Thank
You!