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# ISOLATED GROUPS OF EXTREMELY BLUE DWARF GALAXIES


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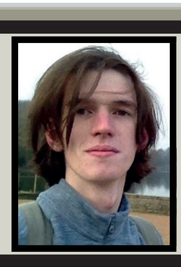


## INTRODUCTION

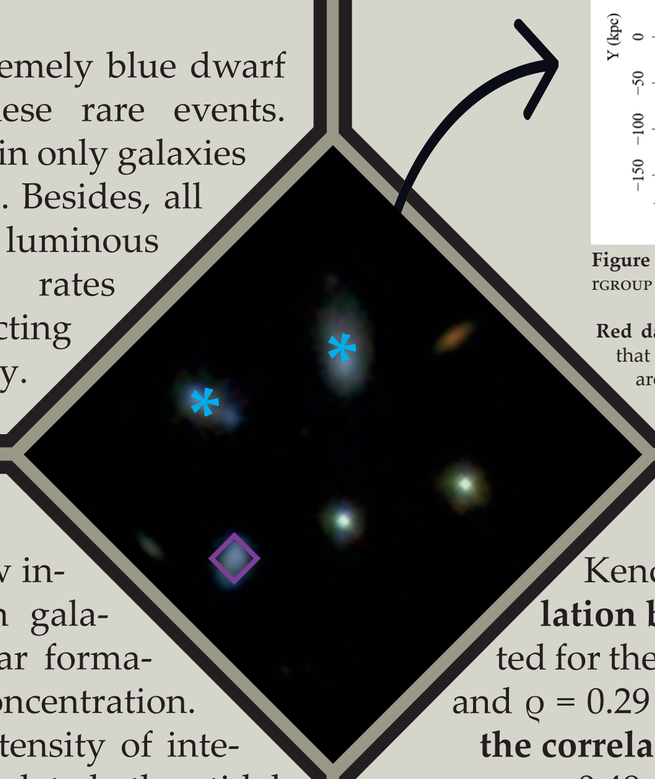
**Interactions and mergers between dwarf galaxies are mostly gas-rich and should be marked by an intense star formation (SF) activity. But these processes, which are expected to be common at earlier times, are very difficult to observe at low redshifts.**

These interactions are very well studied in high mass regimes, specially at low redshifts [1][2]. On the other hand, intermediate and low-mass galaxies ($M_{STAR} < 10^{11}$ $M_{SM}$) appear to grow mainly through gas accretion, what makes merger events among these systems rare. Nevertheless, the few that occur are mostly minor and gas-rich, i.e., drastically different from mergers between massive galaxies.

## GOALS

In this study, we analyse a sample of groups of extremely blue dwarf galaxies, which might provide a window into these rare events.

Our groups are compact ($R_{GROUP} < 100$ kpc) and contain only galaxies with g-i colours far below the red sequence (> 4 sigma). Besides, all groups have at least one spectroscopically-confirmed luminous compact galaxy with very high specific SF rates ($9.5 < \log[sSFR/yr] < -7.6$), suggesting that they are interacting systems with strong ongoing star formation activity.



## DATA AND SAMPLE SELECTION

**Using the SDSS photometric catalog we selected groups that have:**

**1.** One luminous compact galaxy (LCG) with very high sSFR;

**2.** At least 3 blue (i.e., g-i colors σ>4 below the red sequence) galaxies (including the LCG) that are brighter than $r \leq r_{LCG} + 1 \leq 19$, where $r_{LCG}$ is the extinction-corrected apparent magnitude of the LCG;

**3.** Radius of the smallest circle that contains all member galaxies $R_{GROUP} \leq 100$ kpc;

**4.** No galaxies in the red sequence within $R < R_{GROUP} + 50$ kpc.

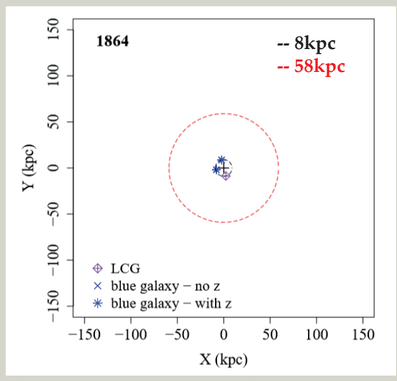



**Figure 1. Black dashed line:** circle with $r_{GROUP}$ = 8 kpc that contains all the member galaxies. **Red dashed line:** circle with r = 8+50 kpc that illustrates the isolation criteria: there are no "red" galaxies within the region delimited by the red circle.

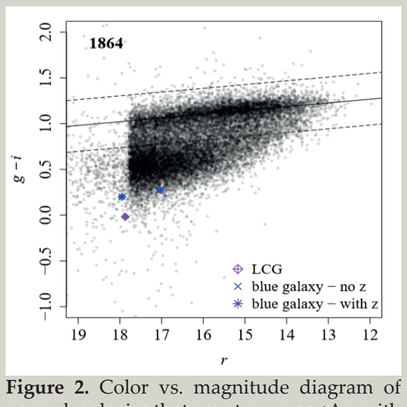



**Figure 2.** Color vs. magnitude diagram of normal galaxies that are at $z = z_{LCG} \pm \Delta z$, with $c\Delta z$ = 1000 km.s$^{-1}$ (black symbols). The solid and dashed lines show the best fit to the red sequence ±4σrs, where σrs is the scatter of the red sequence. The galaxies in our group are indicated by the purple (LCG) and blue (other member galaxies) symbols.

## DATA ANALYSIS

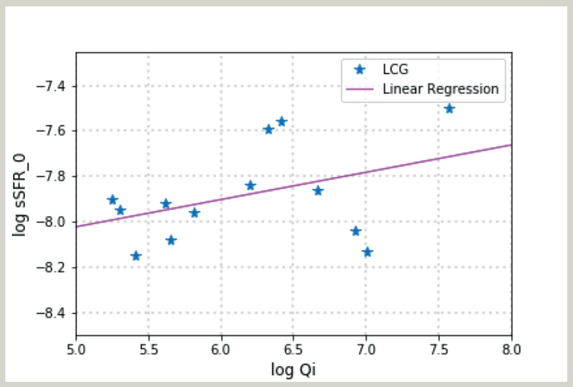



**Figure 3.** Specific star formation rate (corrected for the age of the burst) as a function of the tidal strength estimator. The plot shows only the groups for which we have at least two galaxies with SDSS spectroscopic observations. The pink line the best linear fit to the data. The Kendall and Spearman correlation coefficients are τ = 0.21 (p-value = 0.37) and ϱ = 0.29 (p-value = 0.34).

Figures 3 and 4 show how the sSFRs and the concentration vary with Q.

* Mi is the mass of the group galaxy; $M_{LCG}$ is the mass of the LCG; $D_{LCG}$ is the LCG diameter containing 90% of the Petrosian flux in the r-band and $R_{i,LCG}$ is the projected distance between the neighbour and the LCG.

We investigate how interactions between galaxies affect their star formation rates and concentration. To estimate the intensity of interactions, we calculated the tidal strength estimator Q for each LCG, given by the equation:

$$Q_i = \frac{F_{\rm tidal}}{F_{\rm binding}} \propto \frac{M_i}{M_{\rm LCG}} \left( \frac{D_{\rm LCG}}{R_{i,\rm LCG}} \right)^3 \quad *$$

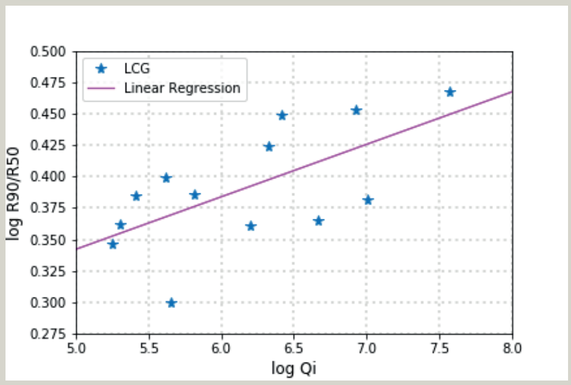



**Figure 4.** Concentration as a function of the tidal strength estimator. The notation is the same as in Fig. 3. The Kendall and Spearman correlation coefficients are τ = 0.49 (p-value = 0.02) and ϱ = 0.58 (p-value = 0.04), respectively.

## RESULTS

Kendall and Spearman tests in figure 3 indicate a **weak correlation between the tidal strength estimator Q and sSFR** (corrected for the age of the burst), with coefficients τ = 0.21 (p-value = 0.37) and ϱ = 0.29 (p-value = 0.34). **On the other hand, these tests confirm the correlation between Q and R90/R50** in figure 4, with coefficients τ = 0.49 (p-value = 0.02) and ϱ = 0.58 (p-value = 0.04), respectively.

**The correlation between the LCG concentration and the Q parameter indicates that the tidal interactions between the member galaxies might be driving gas to the LCG inner regions and making the LCG very compact.**

## PERSPECTIVES

We are currently reducing and analysing GMOS@GEMINI data of groups for which the SDSS spectroscopic observations are not complete (i.e., we do not have SDSS spectra for all member galaxies). Therefore, we will be able to compute the tidal strength estimator taking all member galaxies into account and study the properties of these groups in more detail.

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## REFERENCES


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[4] Izotov et al. 2011, ApJ, 728, 161
[5] Goddard et al. 2016, arXiv:1612.01545