Galaxy Evolution and Feedback across Different Environments
Proceedings IAU Symposium No. 359, 2020
T. Storchi-Bergmann, W. Forman, R. Overzier & R. Riffel, eds.
doi:10.1017/S1743921320001830

Isolated groups of extremely blue dwarf galaxies

Vitor Bootz[1], Marina Trevisan[1], Trinh Thuan[2], Yuri Izotov[3], Angela Krabbe[4] and Oli Dors Jr.[4]

[1]Federal University of Rio Grande do Sul, Porto Alegre, RS, Brazil
emails: vitor.bootz@ufrgs.br, marina.trevisan@ufrgs.br

[2]University of Virginia, Charlottesville, VA, United States
email: txt@virginia.edu

[3]Bogolyubov Institute for Theoretical Physics, Kyiv, Ukraine
email: yizotov@bitp.kiev.ua

[4]Vale do Paraiba University, São José dos Campos, SP, Brazil
emails: angela.krabbe@gmail.com, olidors@univap.br

Abstract. Interactions and mergers between dwarf galaxies are mostly gas-rich and should be marked by an intense star formation activity. But these processes, which are expected to be common at earlier times, are very difficult to observe at low redshifts. To investigate that, we look in the *Sloan Digital Sky Survey* (SDSS) for compact groups that contain one luminous compact galaxy (LCG) with very high specific star formation rate (sSFR) and at least two other blue galaxies. We found 24 groups that satisfy these criteria, among which 12 groups have SDSS spectroscopic data for at least 2 member galaxies. Here we want to investigate, using the tidal strength estimator Q, how interactions between neighbouring galaxies affect the sSFR and concentration of each LCG. Statistical tests reveal a correlation between Q and their sSFR, indicating that tidal forces between neighbouring galaxies might be inducing bursts of star formation in the LCGs.

Keywords. Galaxies: dwarf, Galaxies: evolution, Galaxies: interactions

1. Introduction

Pairs and groups of interacting dwarf galaxies provide a unique window to address the hierarchical, gas-dominated assembly and the buildup of stellar mass in low-mass galaxies. However, fewer than 5% of dwarf galaxies are observed to have close companions, and most galaxy surveys are not deep enough to detect the companions even when they are present. Besides that, the existence of these dwarf groups at low redshifts is not expected and, to understand their nature and possible fate, a more detailed study of their properties is needed.

To investigate that, we look in the *Sloan Digital Sky Survey* (SDSS) for compact groups ($R_{\rm group} < 80\,$kpc) that contain only galaxies with $g-i$ colours far below the red sequence ($> 4\sigma$), one luminous compact galaxy (LCG) with very high specific star formation rate (sSFR, $-9.5 < \log(\mathrm{sSFR/yr}) < -7.6$) and at least two other blue galaxies. We found 24 groups that satisfy these criteria. In this paper, however, we present the properties of 12 groups that have SDSS spectroscopic data for at least 2 member galaxies. Group candidates that are not complete were or will be observed with GMOS@Gemini: 6 groups were observed during 2018A and 2019B (the data are currently being reduced), and 5 will be observed during 2020A (time already granted).

© The Author(s), 2021. Published by Cambridge University Press on behalf of International Astronomical Union

https://doi.org/10.1017/S1743921320001830 Published online by Cambridge University Press

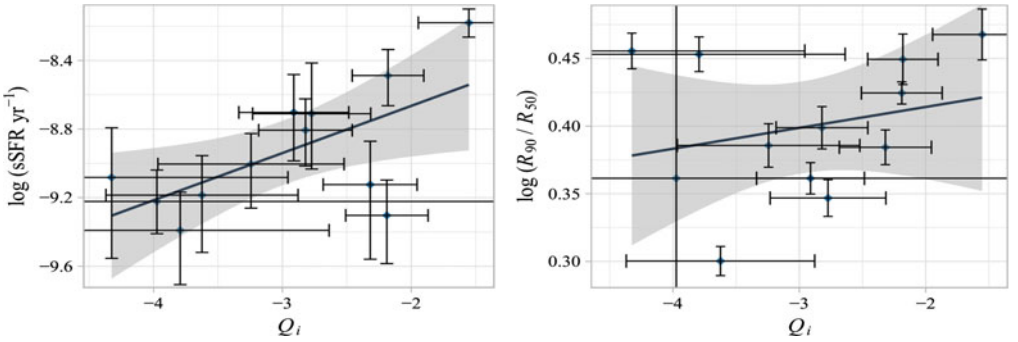

Figure 1. Specific star formation rate (left) and concentration (right) as a function of the tidal strength estimator Q. The plot shows only the groups for which we have at least two galaxies with SDSS spectroscopic observations. The black line represents a linear regression of the data and the shaded region represents the 95% confidence interval. The Kendall and Spearman correlation coefficients are $\tau = 0.42$ (p-value $= 0.06$) and $\rho = 0.54$ (p-value $= 0.07$) for the left image and $\tau = 0.18$ (p-value $= 0.46$) and $\rho = 0.19$ (p-value $= 0.56$) for the right image.

2. How the interactions affect the LCG sSFR and morphology?

To investigate how tidal interactions affect the properties of the LCGs residing in each of the 12 groups, we computed the tidal strength estimator, Q, from the relation (Goddard 2016):

$$Q_i = \frac{F_{tidal}}{F_{binding}} \propto \frac{M_i}{M_{LCG}} \left(\frac{D_{LCG}}{R_{i,LCG}} \right)^3 \tag{2.1}$$

where M_i is the stellar mass of the neighbour galaxy, $M_{\rm LCG}$ is the stellar mass of the LCG, $D_{\rm LCG}$ is the LCG diameter of the region containing 90% of the Petrosian flux in the r-band and $R_{i,\rm LCG}$ is the projected distance between the neighbour galaxy and the LCG. The galaxy stellar masses and radii were retrieved from the SDSS database.

In Fig. 1 left, we show how the LCG sSFR correlates with Q. The sSFRs are corrected for the age of the burst (sSFR$_0$, Izotov 2011). A Kendall and Spearman correlation tests indicate a strong correlation between these quantities, with coefficients $\tau = 0.42$ (p-value $= 0.06$) and $\rho = 0.54$ (p-value $= 0.07$). On the other hand, the LCG concentration is weakly correlated to Q. This is shown in Fig. 1 right, where we plot the ratio $\log R_{90}/R_{50}$ (radius containing 90% and 50% of the Petrosian flux of the LCG) versus the parameter Q. The weak correlation is evidenced by the Kendall and Spearman correlation tests, with coefficients $\tau = 0.18$ (p-value $= 0.46$) and $\rho = 0.19$ (p-value $= 0.56$), respectively.

The correlation between Q and sSFR indicates that tidal forces between neighbouring galaxies might be inducing bursts of star formation in the LCGs. The fact that we are not computing the total tidal forces acting on the LCG (i.e., we include only the spectroscopically confirmed group members) might be washing out the correlation between Q parameter and the concentration of the LCGs. Therefore, the observations that are being carried out using GMOS@Gemini are important to correctly estimate both relations.

References

Goddard, *et al.* 2016, *MNRAS*, 465, 688
Izotov, *et al.* 2011, *ApJ*, 728, 161

https://doi.org/10.1017/S1743921320001830 Published online by Cambridge University Press