Astronomy & Astrophysics manuscript no. paper
October 21, 2025
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Are galaxies in compact groups special?

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Received XXX; accepted YYY

ABSTRACT

We investigate the properties of galaxies in compact groups (CGs) and compare them to a control sample of galaxies.

Key words. galaxies: clusters: general – catalogs

1. Introduction

2. Data

2.1. Samples

We use the compact groups and control samples we built in our previous article Tricottet et al. (2025). We nevertheless briefly recall here how they were built. Explain. Contrarily to our previous article, though, we remove CGs that we classified as *split* following Zheng & Shen (2021). In this process, our initial compact group sample of 78 groups reduced to 62.

We use the SDSS DR 16 to retrieve masses, star formation rates (SFRs) and morphologies of galaxies assessed in Galaxy Zoo Lintott et al. (2011). We specifically extracted fields `sfr_tot_p50`, `specsfr_tot_p50` and `lgm_tot_p50` from the `galSpecExtra` table, and `p_el_debiased` and `p_cs_debiased` from the `zooSpec` table.

2.2. sSFR

To build a general star formation classification that could be uniformly applied to all our samples, we extracted galaxies from the SDSS DR 16 through the query displayed in listing 1.

```
SELECT
    s.specObjID,
    s.z,
    p.petroMag_r,
    p.objID,
    g.sfr_tot_p50, g.specsfr_tot_p50, g.lgm_tot_p50,
    l.h_alpha_eqw, l.h_beta_eqw, l.oiii_5007_eqw, l.nii_6584_eqw,
    l.h_alpha_flux, l.h_beta_flux, l.oiii_5007_flux, l.nii_6584_flux,
    z. p_el_debiased AS p_E,
    z. p_cs_debiased AS p_S
FROM SpecObj AS s
    JOIN PhotoObj AS p ON s.bestObjID = p.objID
    JOIN galSpecExtra as g ON s.specObjID = g.specObjID
    JOIN galSpecLine as l ON s.specObjID = l.specObjID
    JOIN zooSpec AS z ON s.specObjID = z.specObjID
WHERE s.z BETWEEN 0.005 AND 0.0452
    AND (p.petroMag_r - p.extinction_r <= 17.77)
    AND s.class = 'GALAXY'
    AND g.lgm_tot_p50 > -1000
```

Listing 1. Query used for selecting spectral & photometric data from the SDSS

We select non-AGN galaxies by first placing them on the classical BPT diagnostic of Veilleux & Osterbrock (1987) :contentReference[oaicite:0]index=0 and requiring measured values of both emission-line ratios

$$\log_{10}([\mathrm{N\,II}]\lambda6584/\mathrm{H}\alpha) \quad \text{and} \quad \log_{10}([\mathrm{O\,III}]\lambda5007/\mathrm{H}\beta).$$

A galaxy is flagged as an AGN if it satisfies either

$$\log_{10}\frac{[\mathrm{N\,II}]}{\mathrm{H}\alpha} > 0,$$

or if it lies above the empirical demarcation of Kauffmann et al. (2003):

$$\log_{10}\frac{[\mathrm{O\,III}]}{\mathrm{H}\beta} > \frac{0.61}{\log_{10}([\mathrm{N\,II}]/\mathrm{H}\alpha) - 0.05} + 1.3,$$

in which case it is removed from the non-AGN sample :contentReference[oaicite:1]index=1. All remaining galaxies—including those with missing line ratios—are retained as non-AGN :contentReference[oaicite:2]index=2. The non-AGN selection process is shown on figure **??**.

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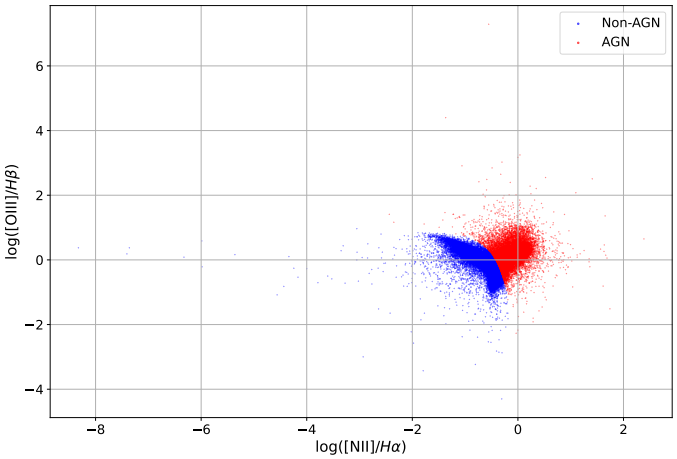

Fig. 1. BPT diagram showing our separation of ordinary and AGN galaxies.

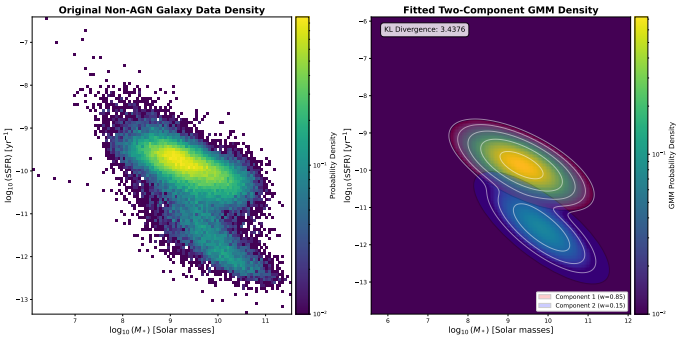

Fig. 2.

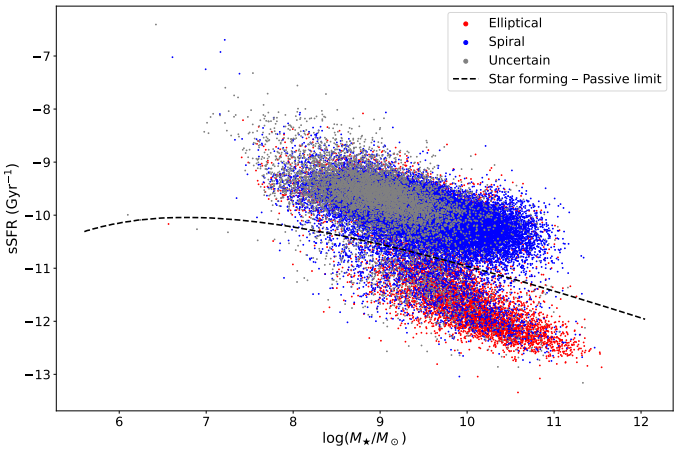

Fig. 3. sSFR vs mass, star-forming/passive limit and morphologies for the SDSS control sample.

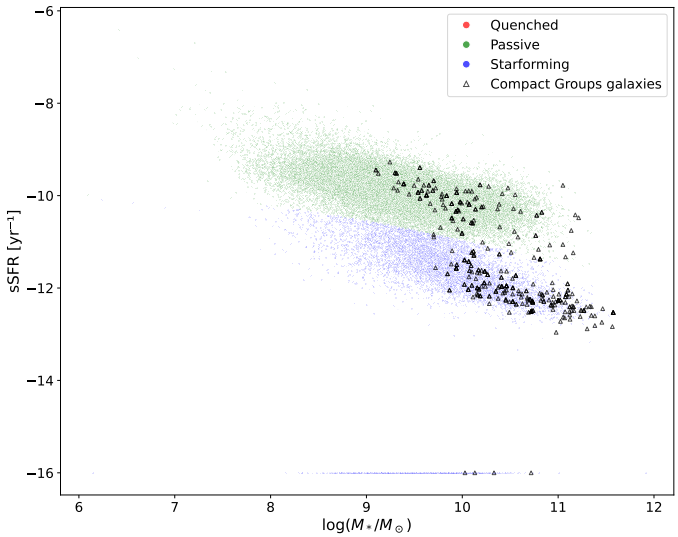

Fig. 4.

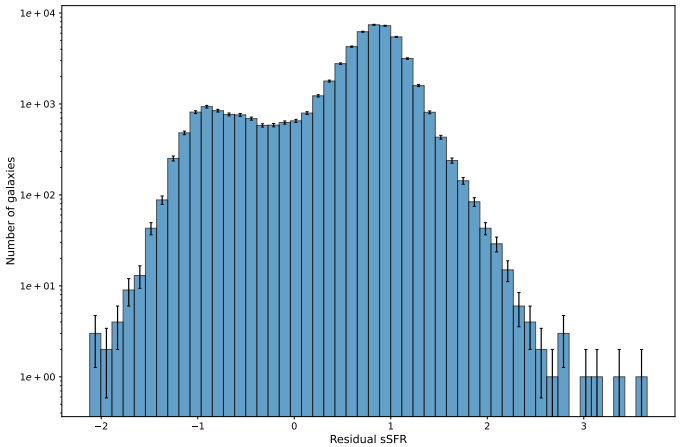

Fig. 5.

Interpolation points for sSFR classification

Acknowledgements. We thank ...

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