CHARACTERIZATION OF 3C RADIO-GALAXIES ENVIRONMENT

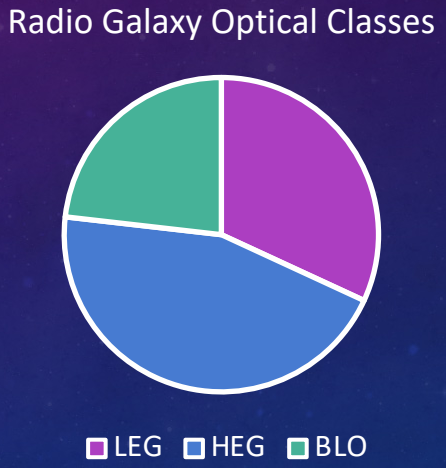
Samantha Casadei

SCIENTIFIC BACKGROUND

- Radio Galaxies (RGs) preferentially inhabit galaxy-rich large-scale environments (e.g., Tasse et al. 2008)
- Ideal laboratories to investigate formation and evolution of cosmological structures (e.g., Ineson et al. 2013, 2015)
- Previous work by Massaro et al., 2020 at $z < 0.15$ showed that independently of their radio (FR I vs FR II) classification RGs tend to inhabit galaxy-rich large-scale environments with similar richness
- Same results are obtained for optical (HEG vs LEG) classification, even though less statistically significant

SAMPLE OF 3C GALAXIES

- 69 radio-galaxies with $0.05 < z < 0.3$
- 22 LEG
- 31 HEG
- 16 BLO



- 33 radio-galaxies with $0.02 < z < 0.1$
- 12 FR I
- 21 FR II

RADIO-GALAXY DISTRIBUTION WITH REDSHIFT

- Kolmogorov-Smirnov tests

  $P_{(HEG\ vs.\ BLO)} \sim 0.32$

  $P_{(HEG\ vs.\ LEG)} \sim 0.96$

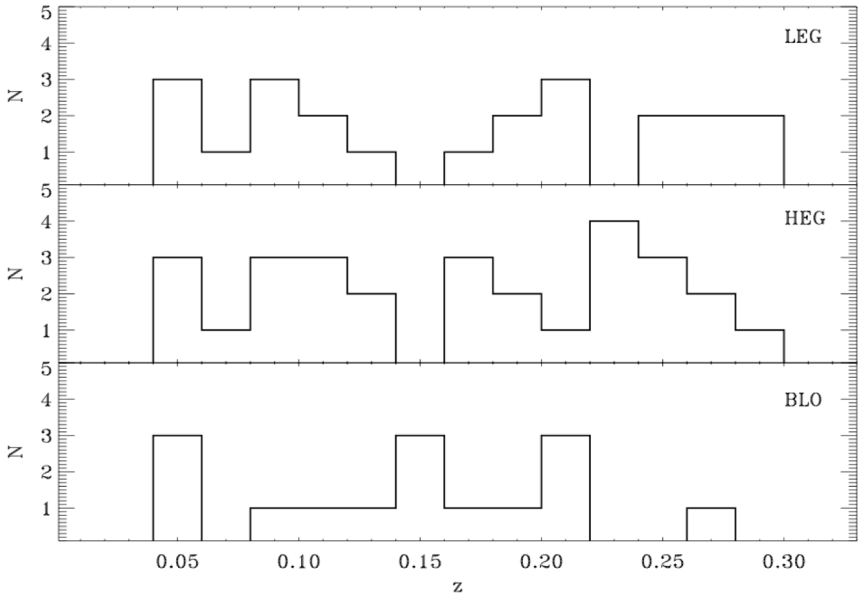
  $P_{(HEG+BLO\ vs.\ LEG)} \sim 0.86$

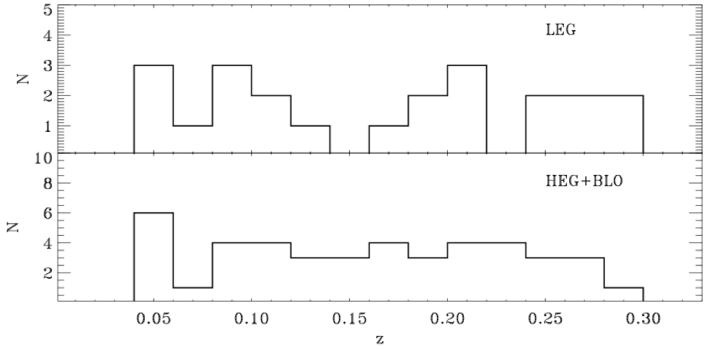
- Median Values

  $N_{LEG} = 0.19 \pm 0.02$

  $N_{HEG} = 0.18 \pm 0.02$

  $N_{BLO} = 0.15 \pm 0.02$





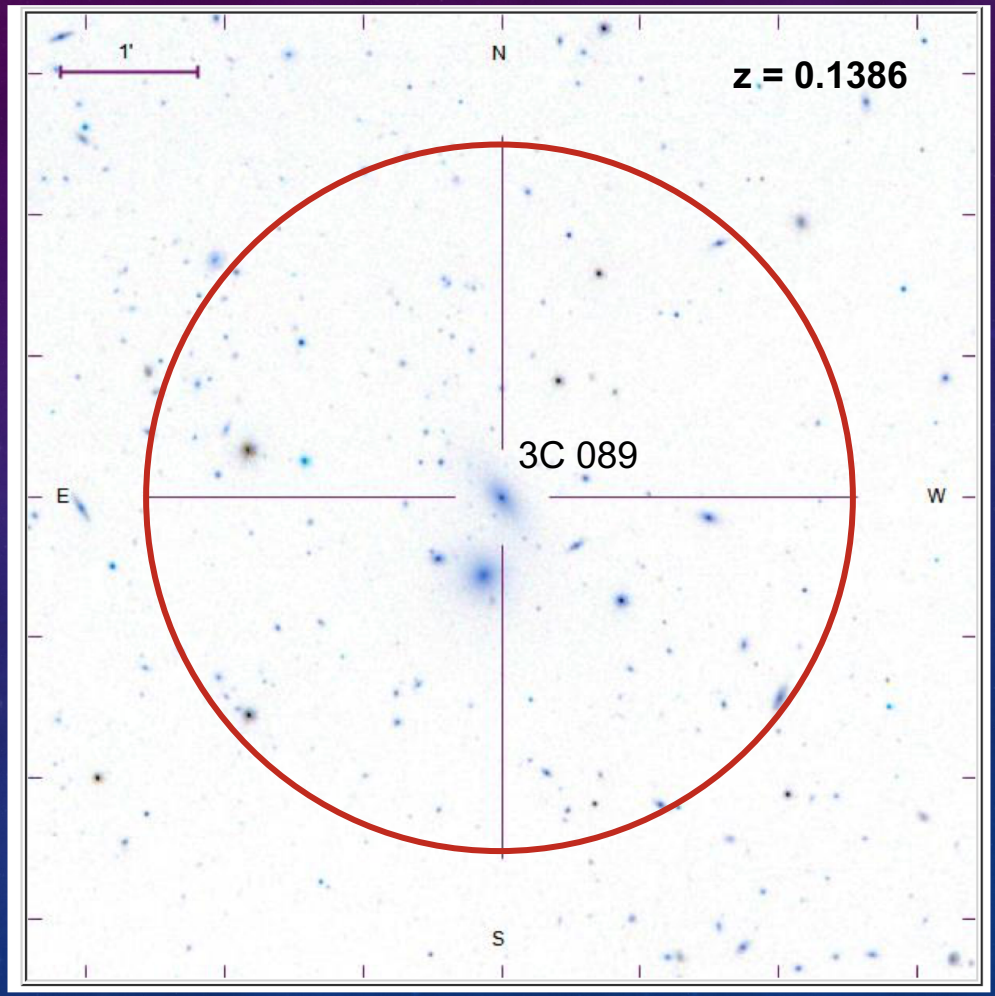
PAN-STARRS SURVEY

- Photometric survey
- Five filters (g, r, i, z and y)
- Apparent magnitude limit in g ~ 23.3 (Chambers et al., 2016)

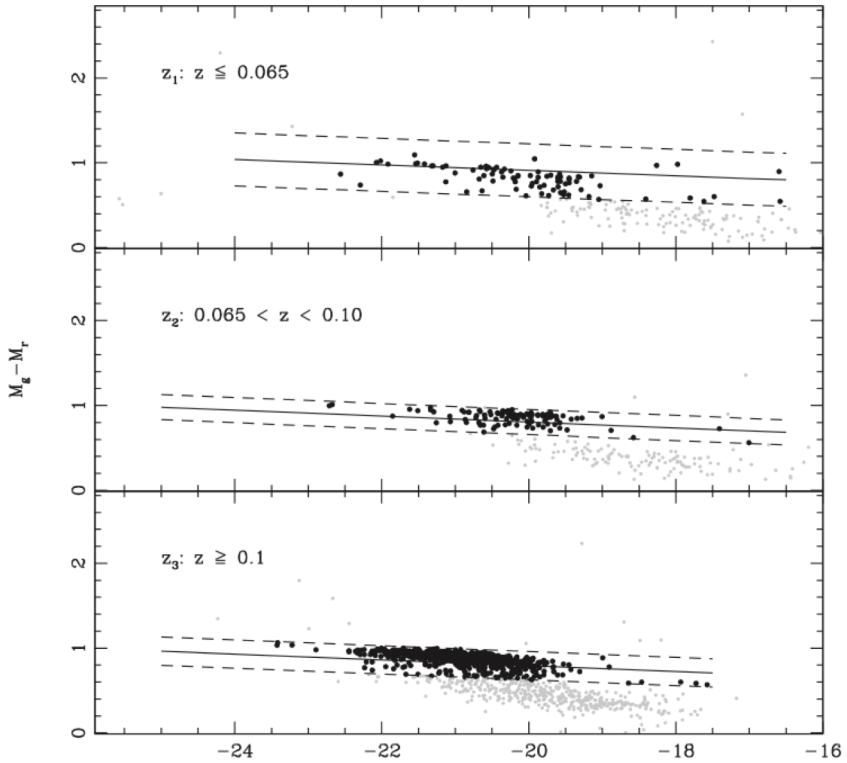
EXTRACTION REGION

- r = 500 kpc

- Background regions at 5 Mpc distance from the source

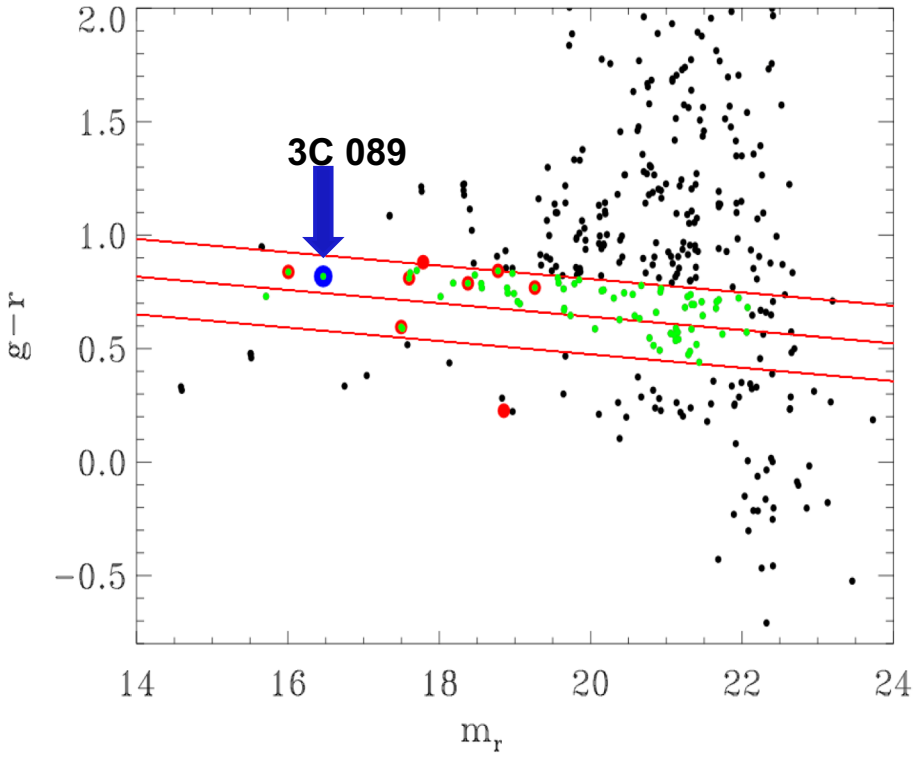


METHOD – RED SEQUENCE



O'Mill et al. 2019

COLOR MAGNITUDE DIAGRAM FOR OPTICAL CLASSES

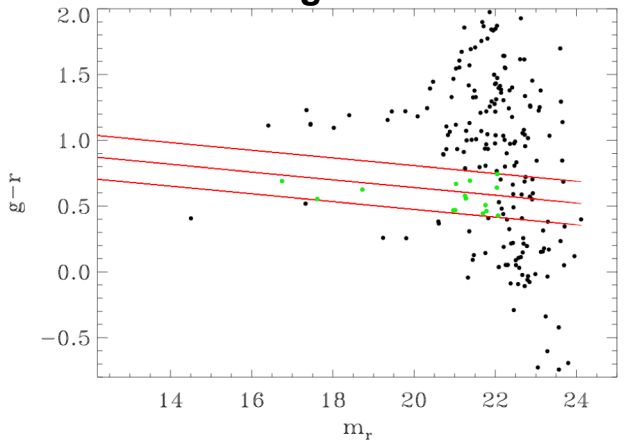


3C Source

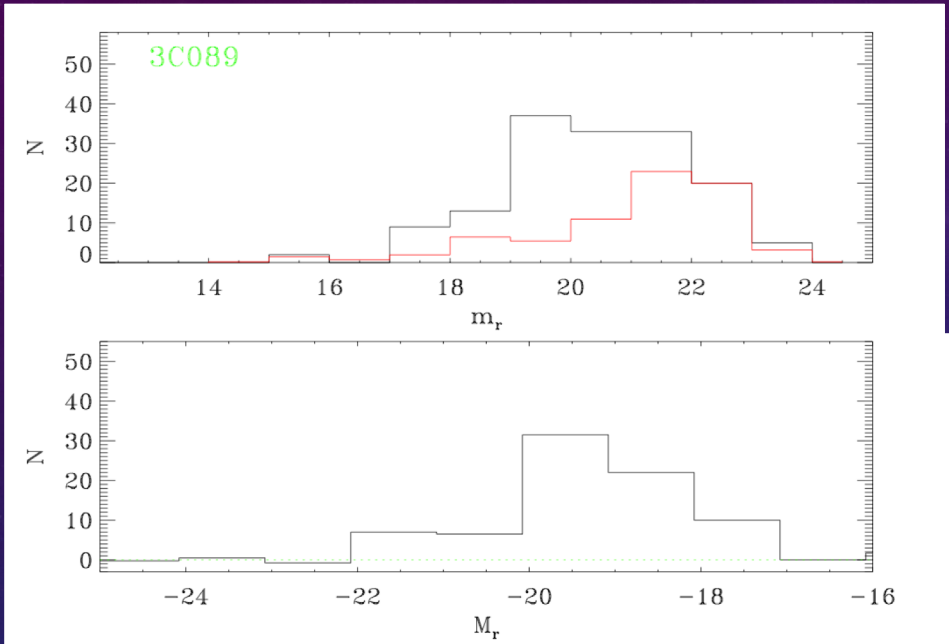
SDSS Spectroscopic Companions

Red Sequence Sources

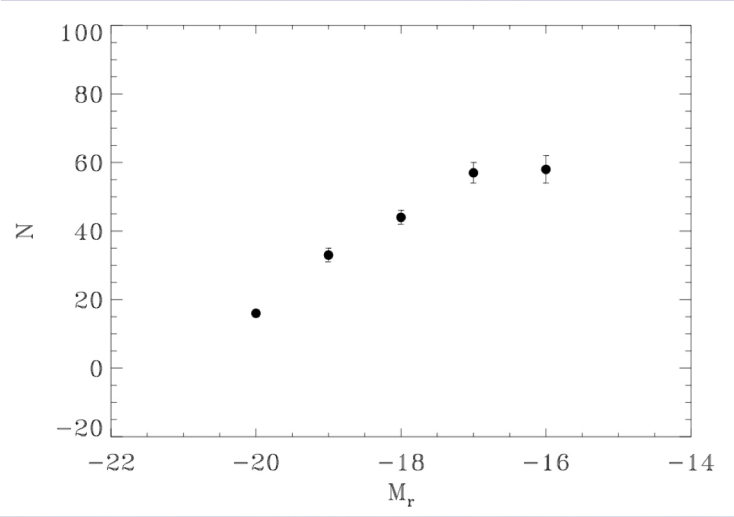
Background



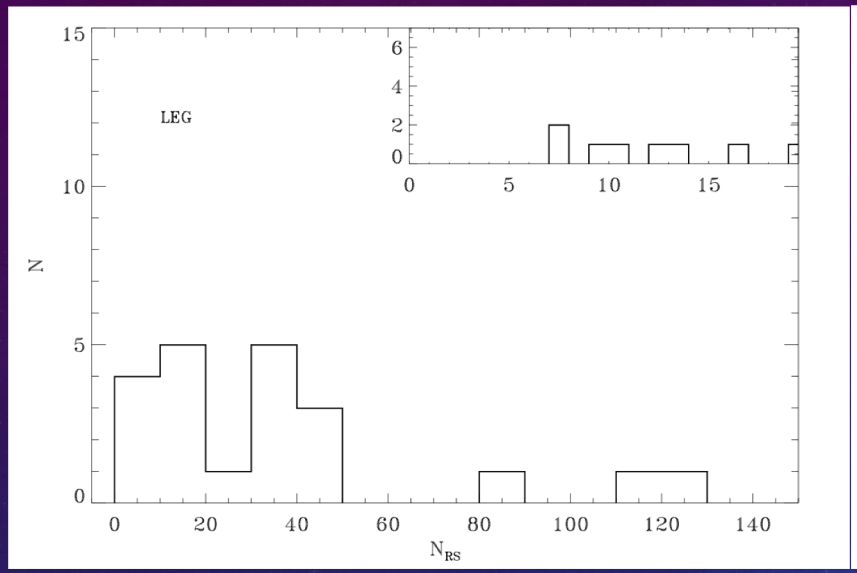
COUNTING RED SEQUENCE SOURCES

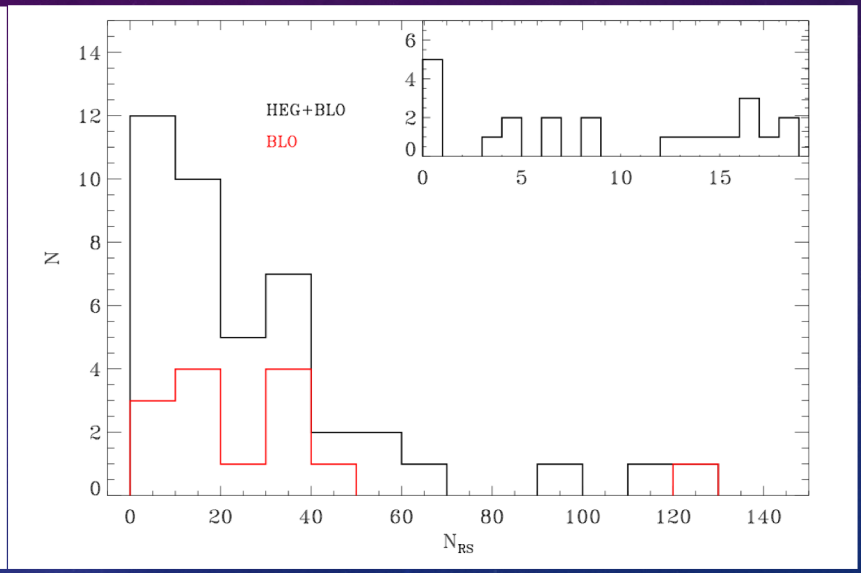


Same absolute magnitude limit for every source



FINAL RESULTS – OPTICAL CLASSES





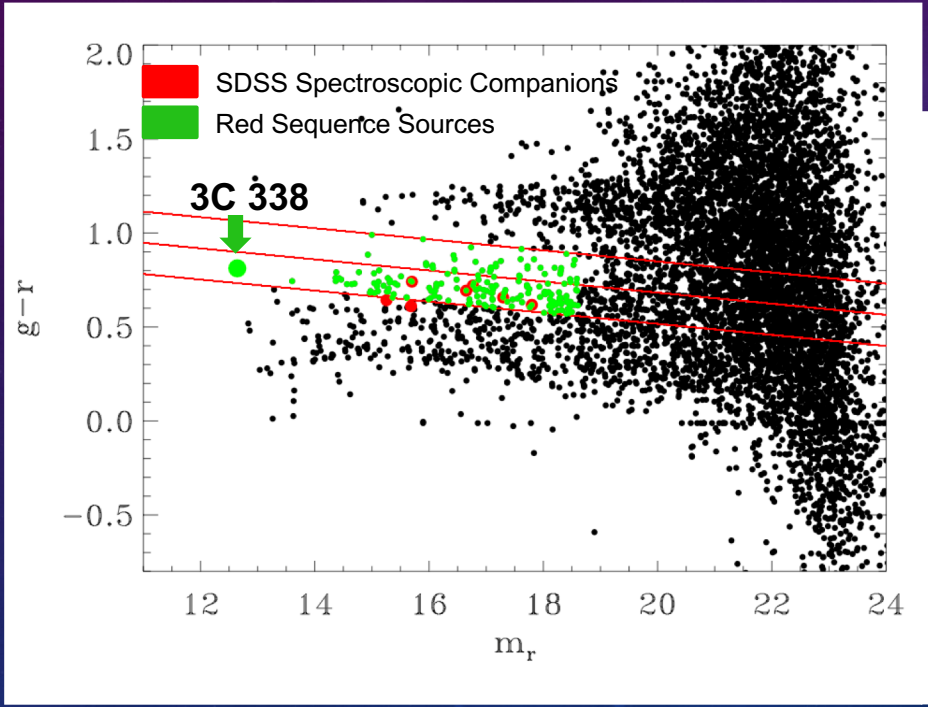
Median LEG 33 $\pm$ 12

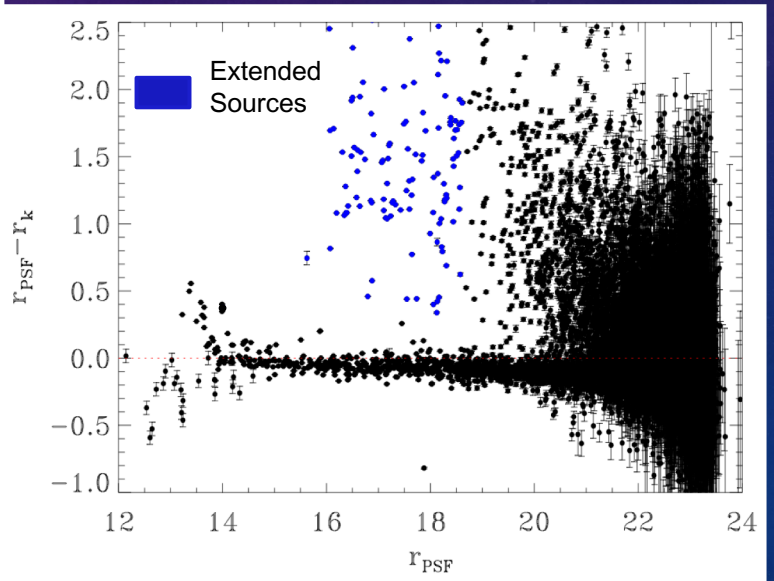
Median HEG+BLO = 18 $\pm$ 7

Kolmogorov-Smirnov P ~ 0.21

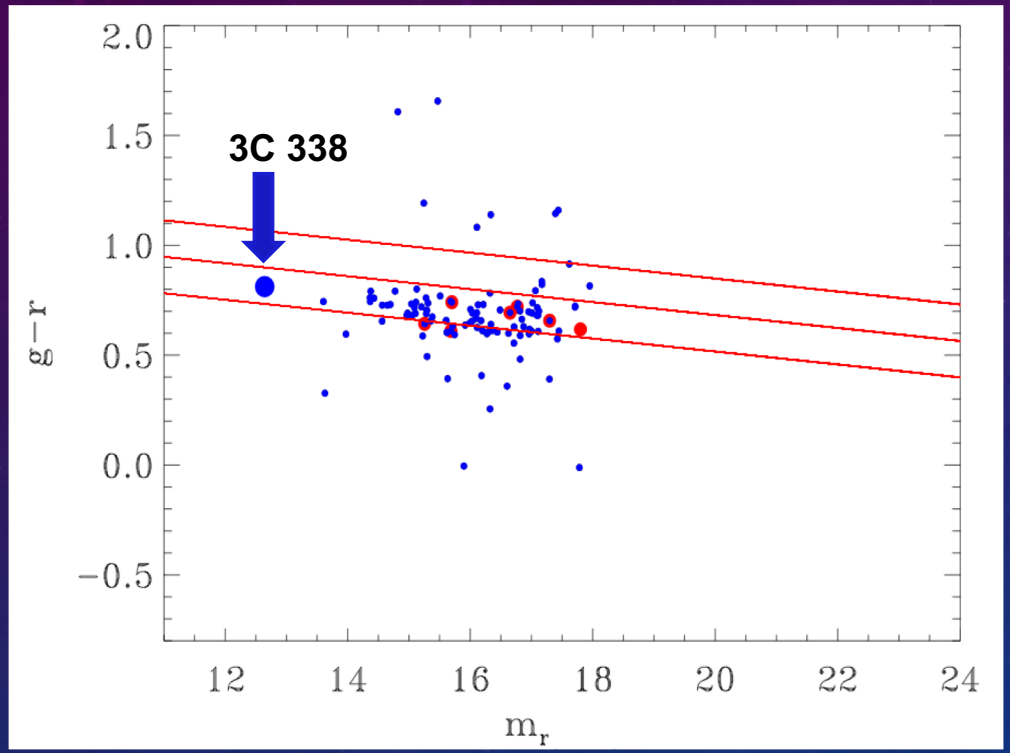
COLOR MAGNITUDE DIAGRAM FOR LOW REDSHIFT FR I AND FR II

Stellar contamination and low signal to noise ratio
Selection of extended sources





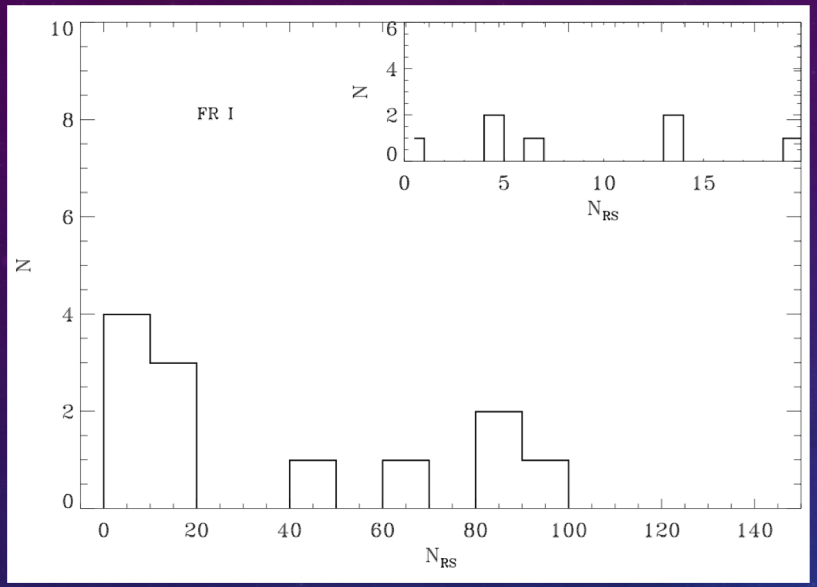
COLOR MAGNITUDE DIAGRAM FOR LOW REDSHIFT FR I AND FR II

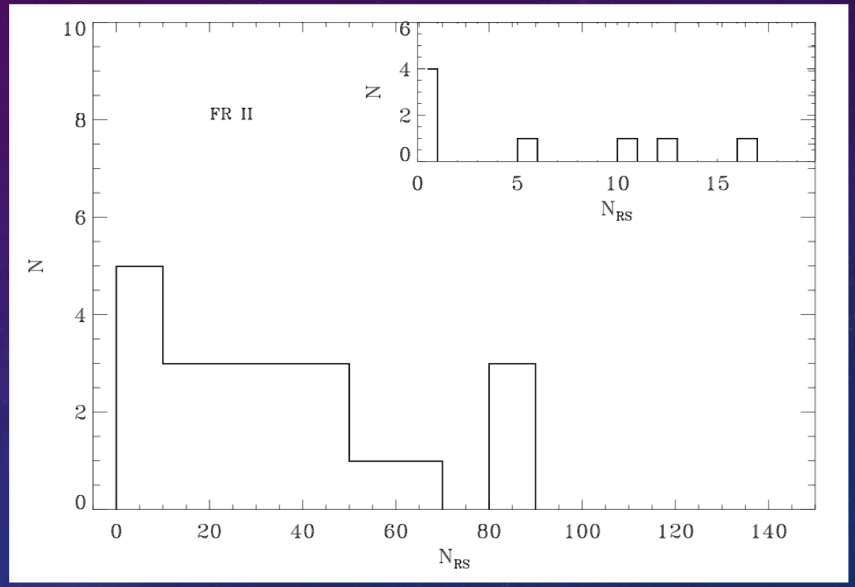


The extended sources (in blue) are just a small fraction of the objects in the CMD.

Stellar contamination is avoided and errors associated to measurements decreased.

FINAL RESULTS – MORPHOLOGICAL CLASSES (0.002 < Z < 0.1)





Median FR I = 19 ± 13

Median FR II = 32 ± 7

Kolmogorov-Smirnov P ~ 0.8

CONCLUSIONS

- Radio-galaxies inhabit different environments
- The optical classes are not statistically different
- No LEGs in poor environments

- The morphological classes FR-I and FR-II are also not statistically different

There is no connection between environment and nuclear activity!