

Probing the Environments of Giant Radio Galaxies

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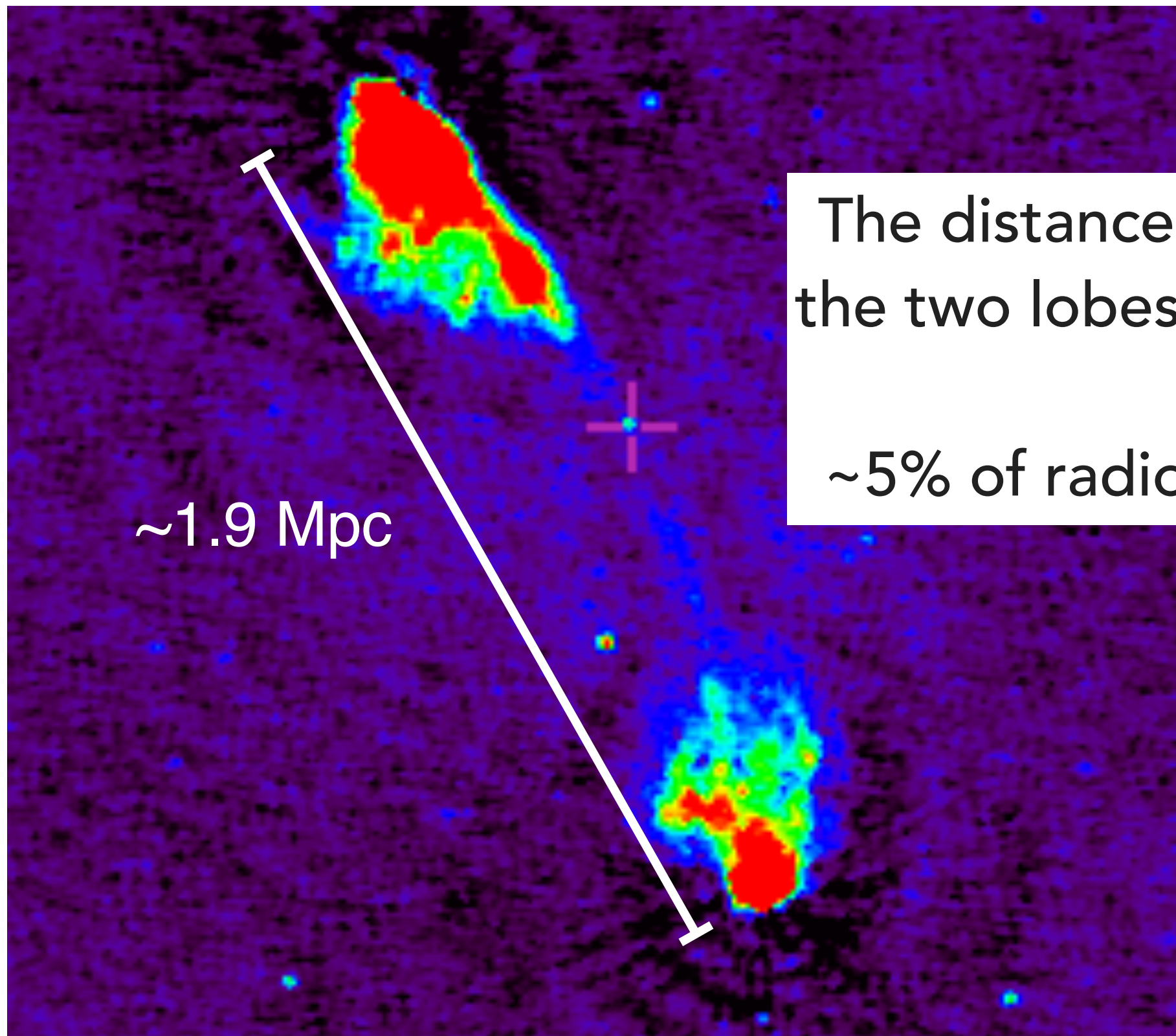
In collaboration with
J. Xavier Prochaska (UCSC)



UNIVERSITY OF CALIFORNIA
SANTA CRUZ



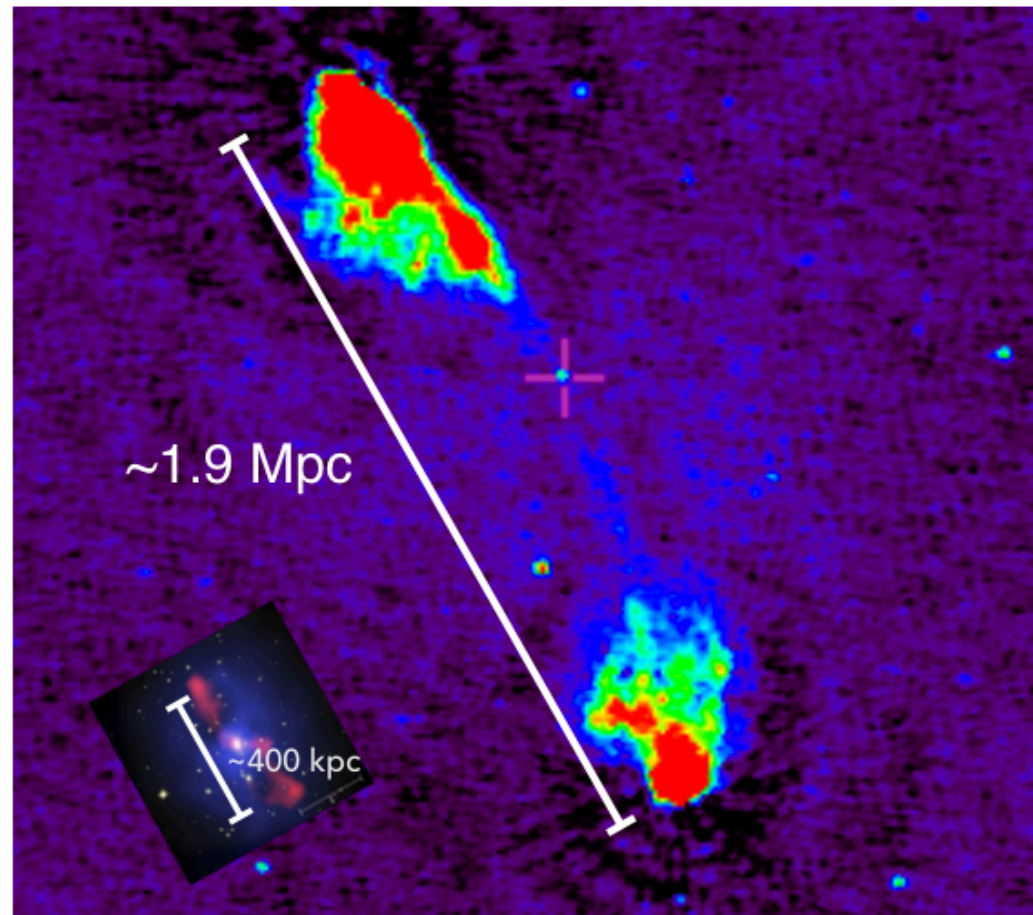
An extreme rare population - giant radio galaxies



The distance between
the two lobes >700 kpc

~5% of radio galaxies

An extreme rare population - giant radio galaxies

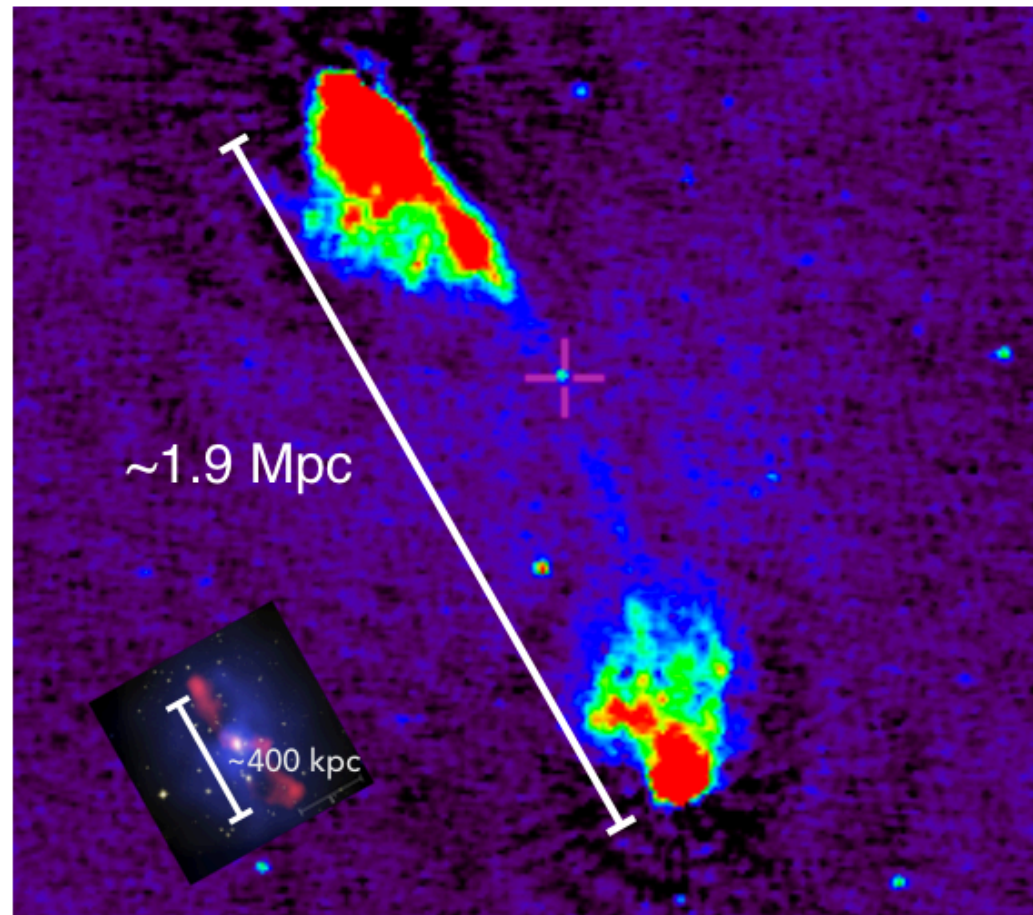


Dabhade et al. (2020) / Lan & Prochaska (2021)

What drives such extended radio structures?

1. GRGs tend to live in low density environments.
(e.g., Mack et al. 1998; Malarecki et al. 2015)
2. GRGs tend to have long activity time or powerful engines.
(e.g. Subrahmanyan et al. 1996; Hardcastle et al. 2019; Bruni et al. 2020)

An extreme rare population - giant radio galaxies



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What drives such extended radio structures?

Is the environment the main cause of the enormous radio structures?

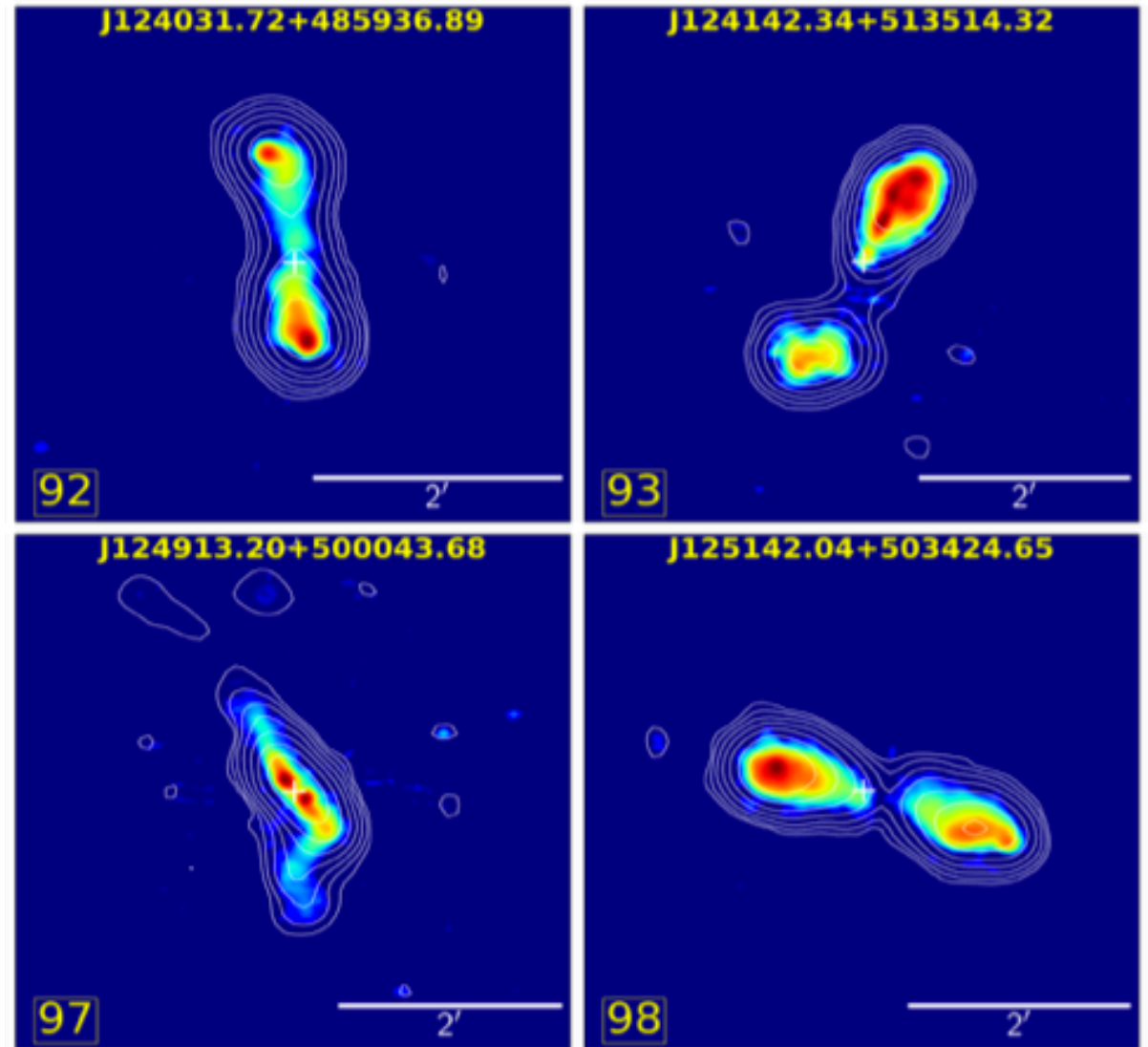
The LOFAR Two-metre Sky Survey



~100 MHz / ~6" resolution

DR1
~400 deg²
~300,000 radio objects

Shimwell et al. (2019)

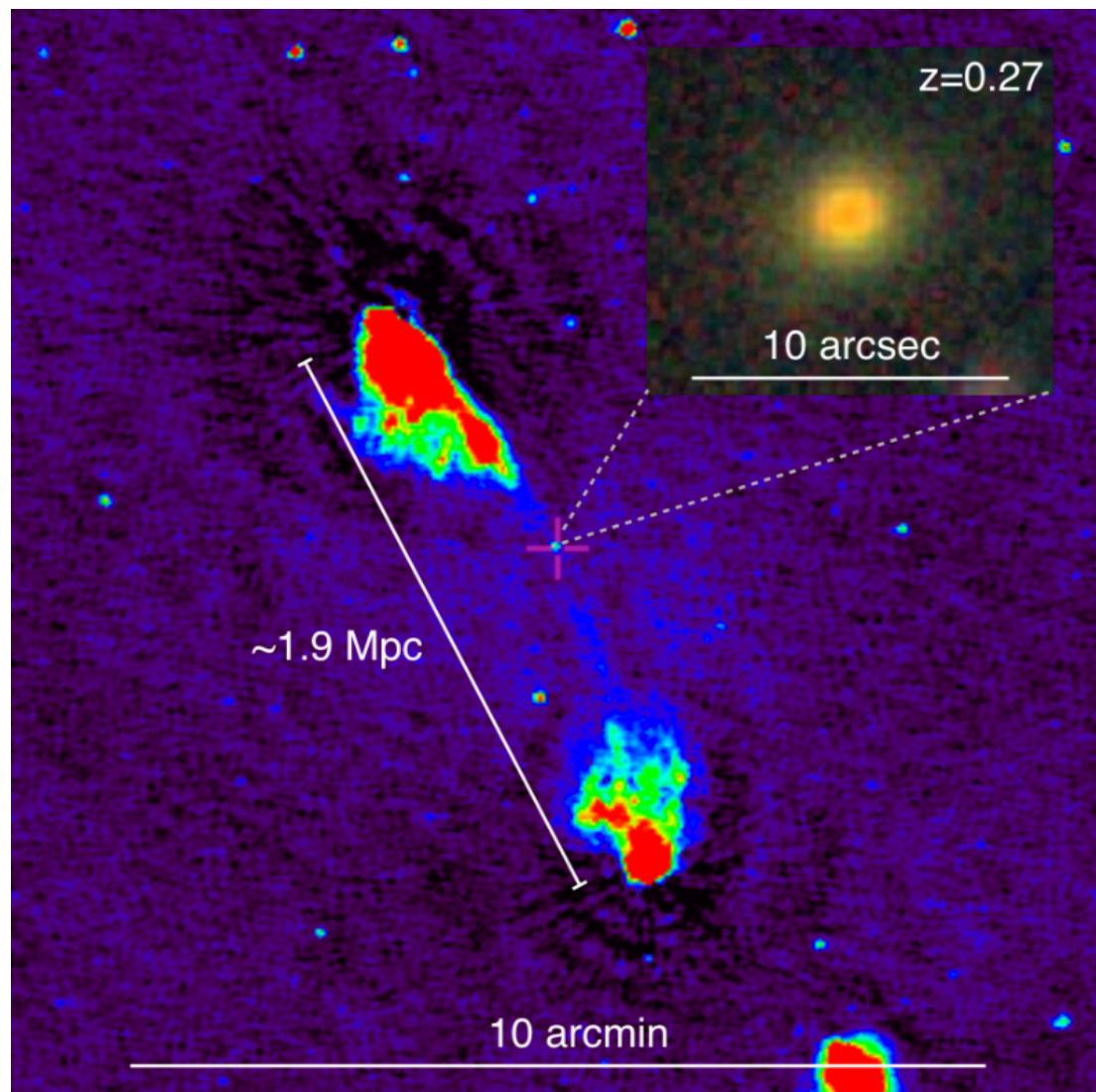


~200 GRGs

Dabhade et al. (2020)

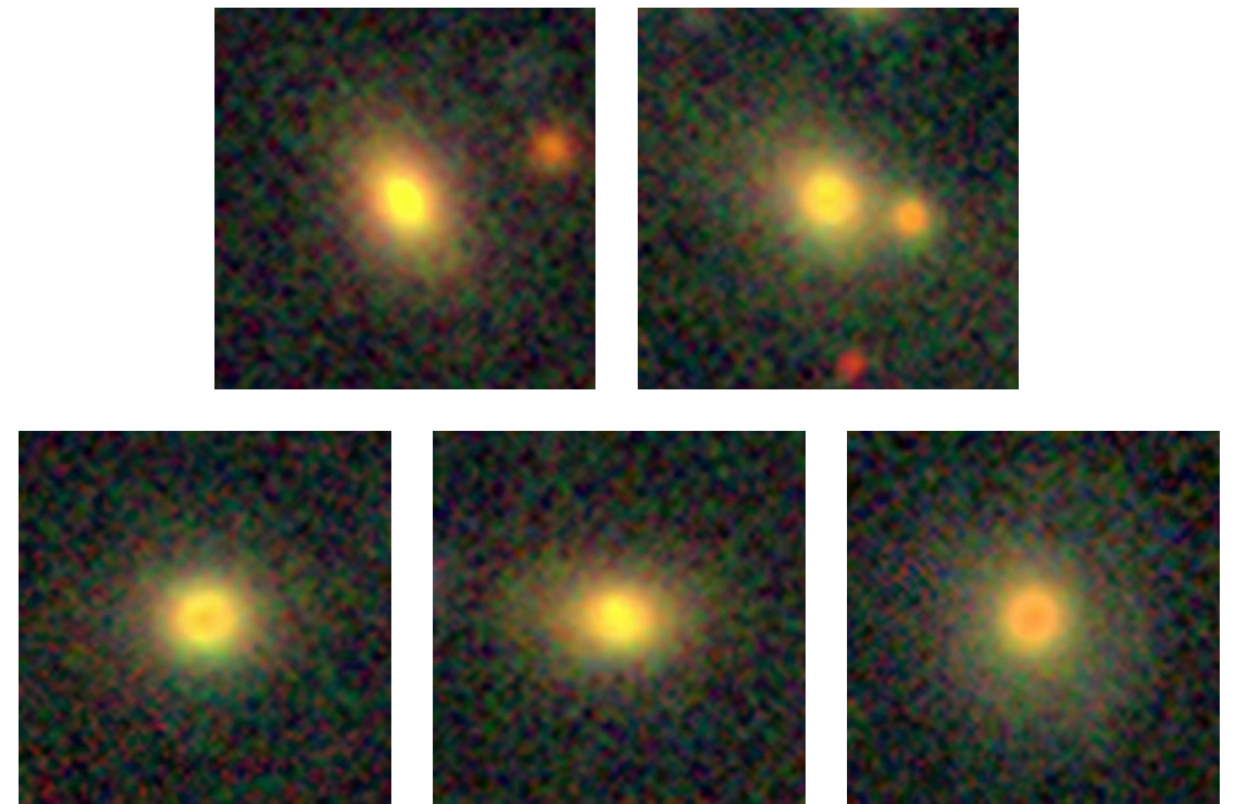
GRG sample and the control sample

GRG sample



110 GRGs with
SDSS spectroscopic redshifts

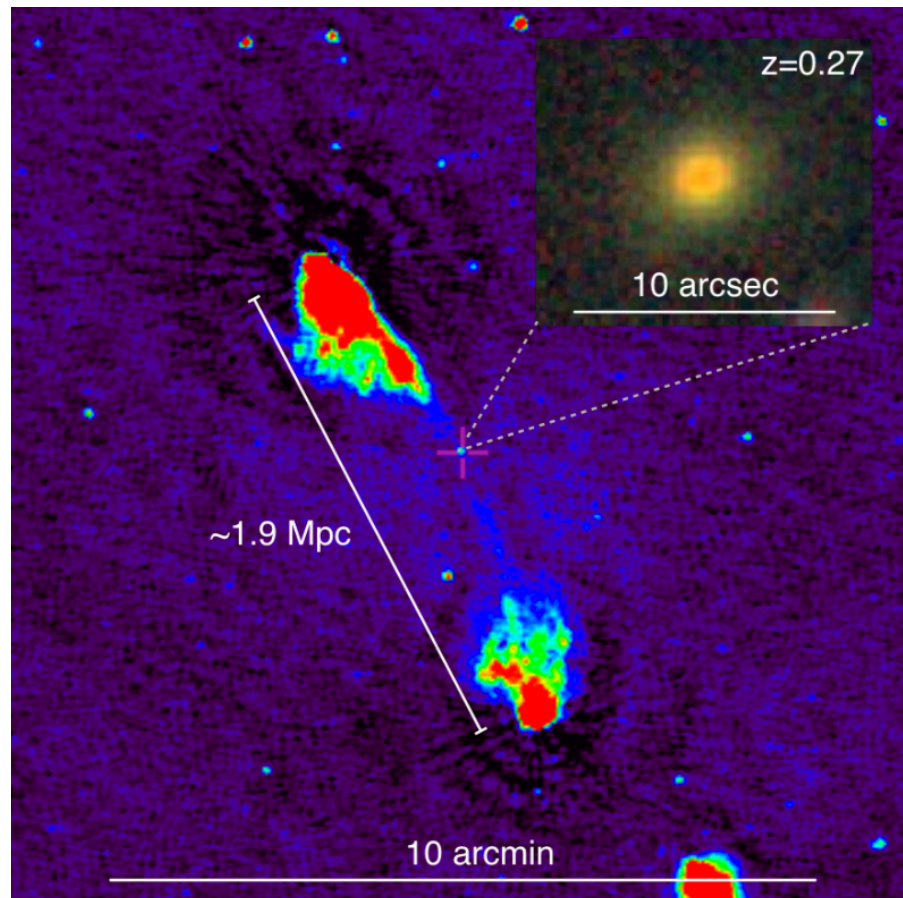
The control sample (no radio emission)



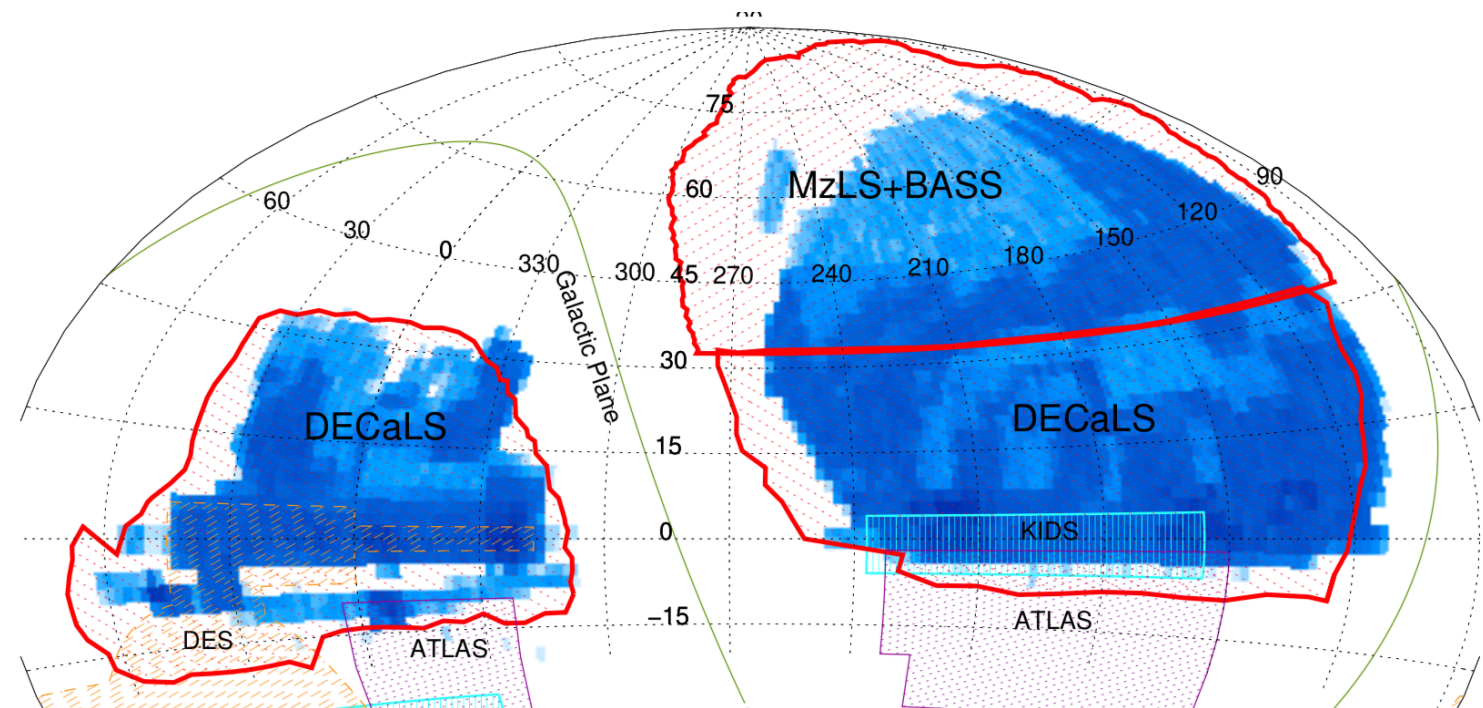
5 optical selected control galaxies
without radio emission for each GRG

Statistically probing the satellite abundances

GRG sample



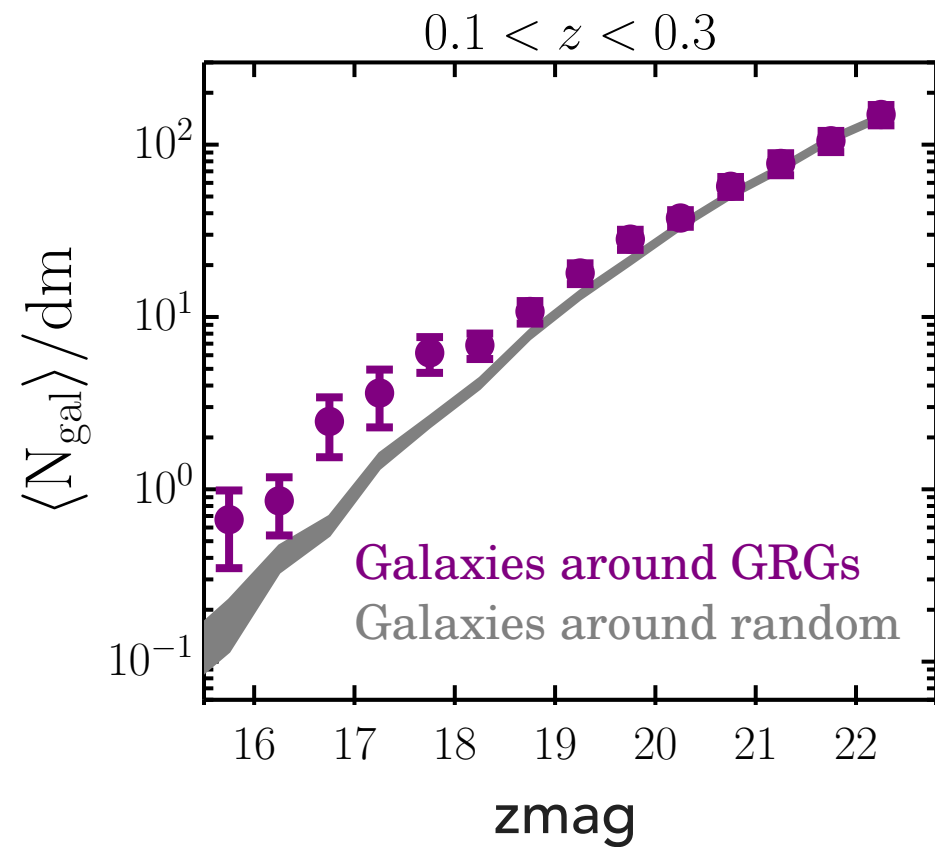
DESI Legacy Imaging Surveys



Dey...Lan et al. (2019)

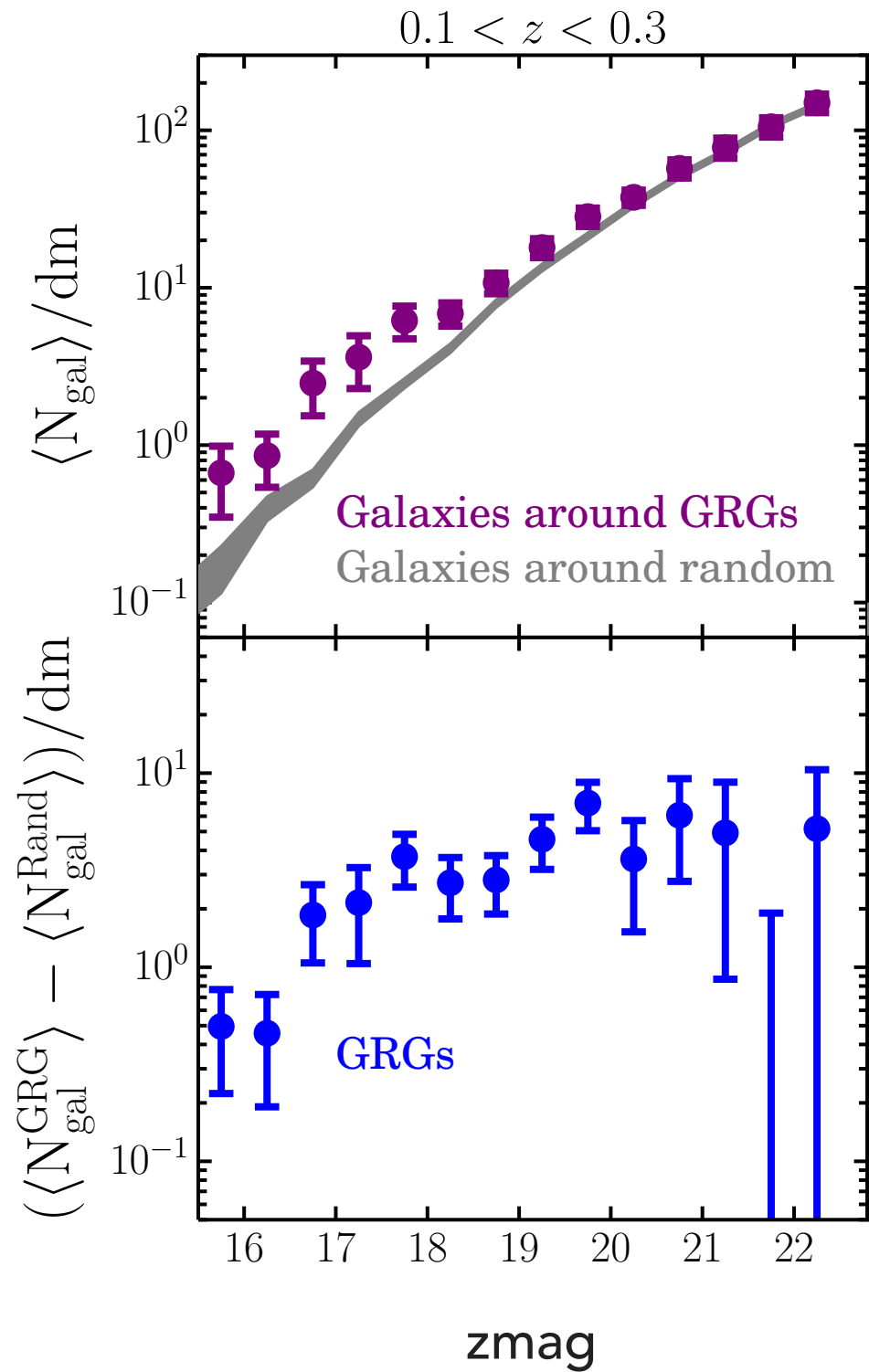
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Statistically probing the satellite abundances



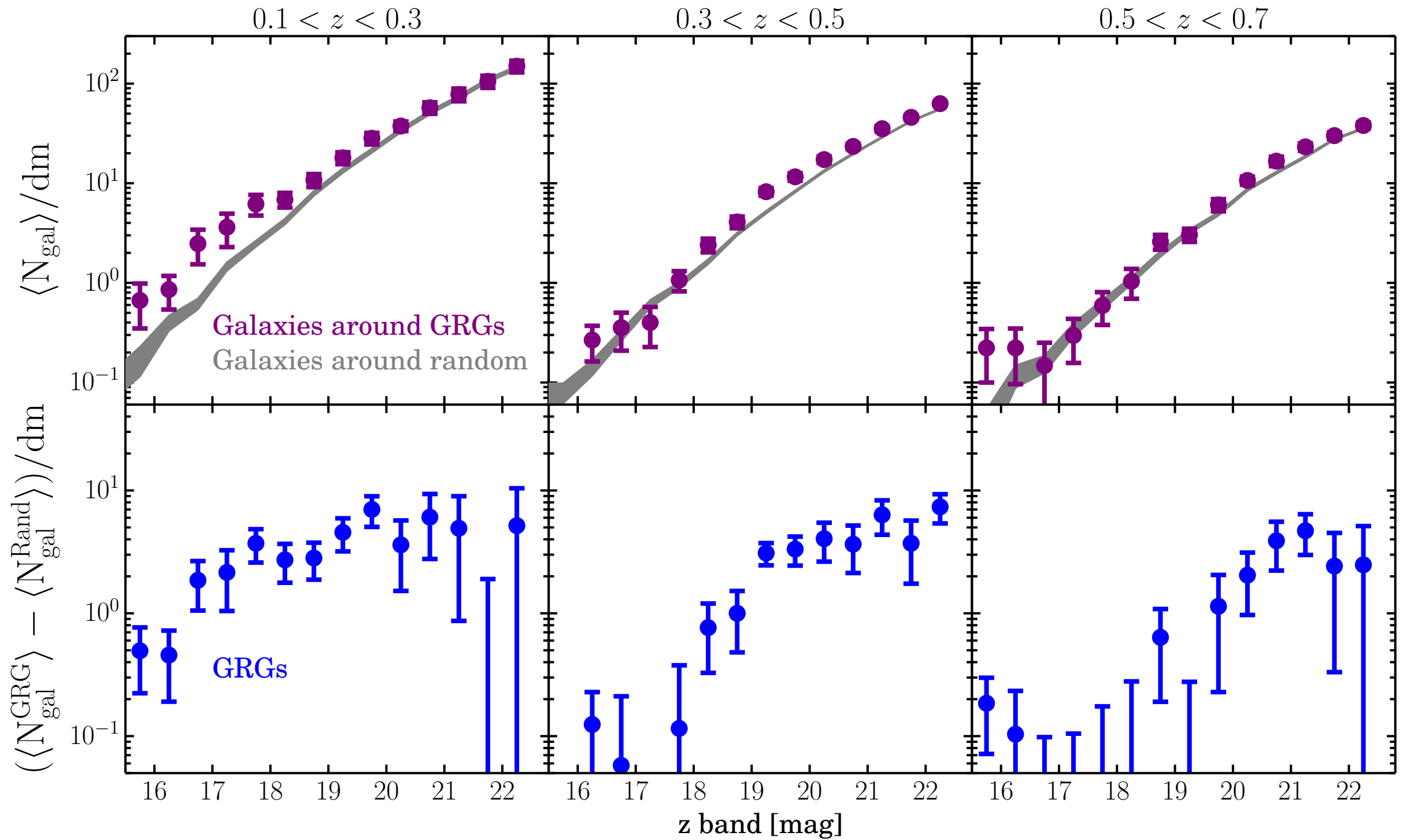
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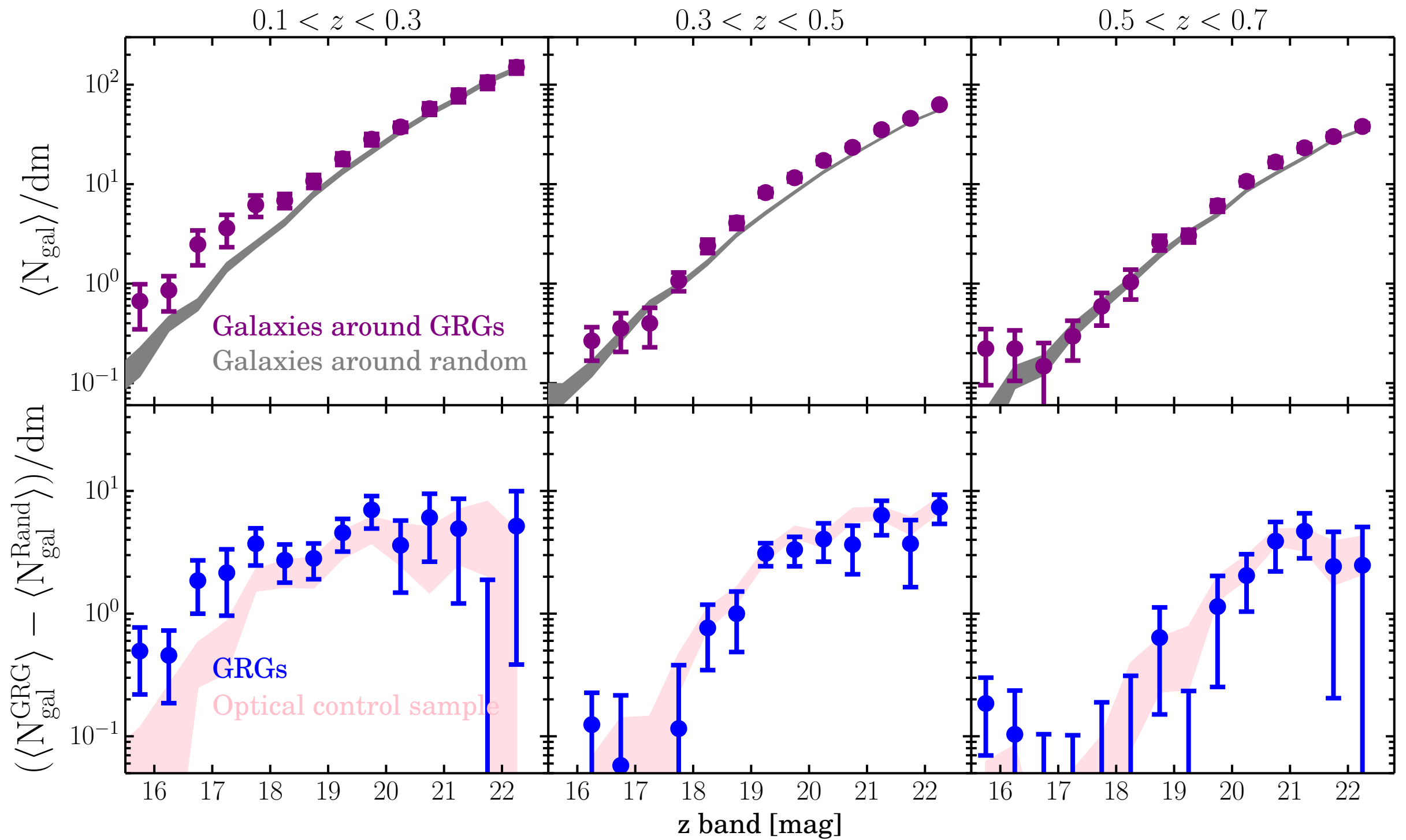


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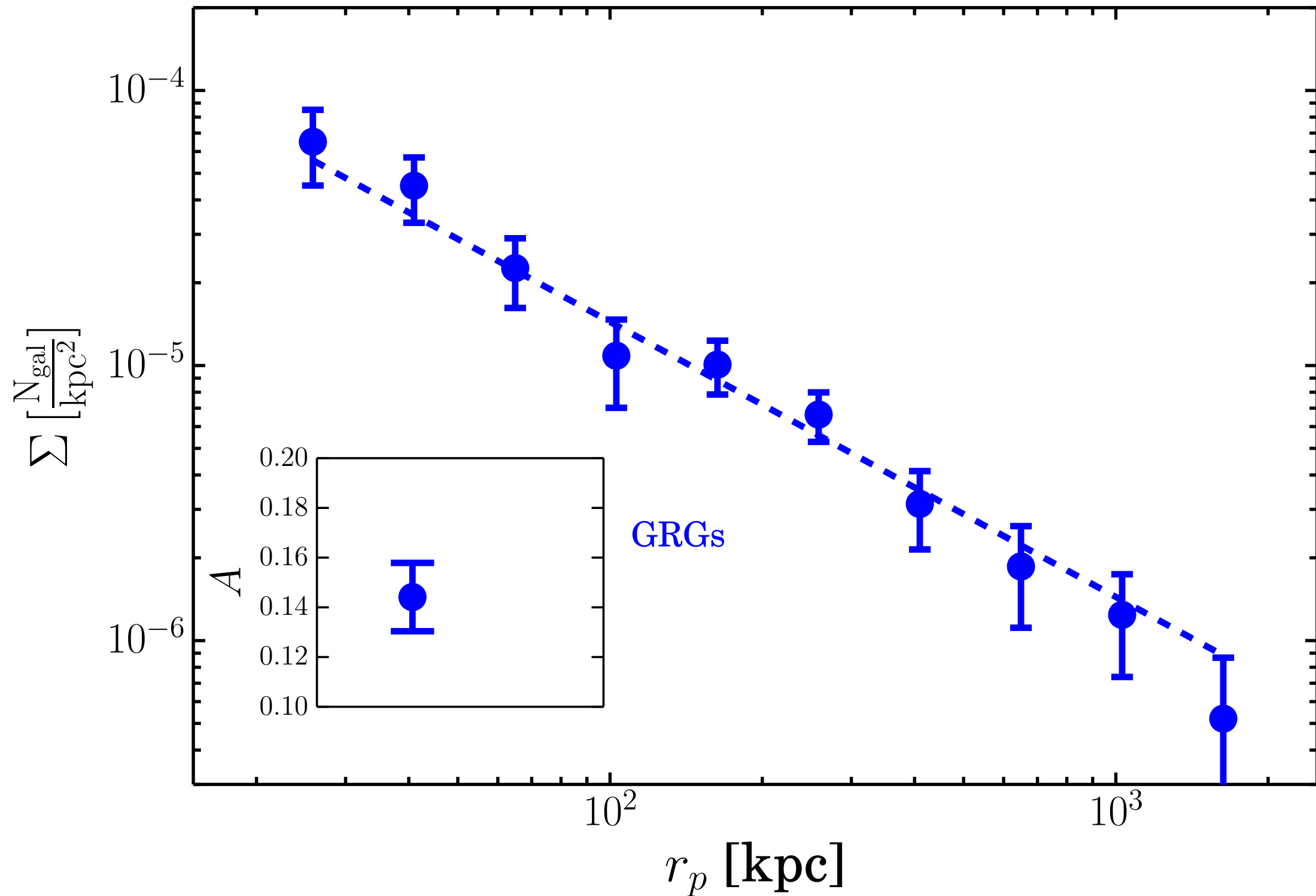
Statistically probing the satellite abundances



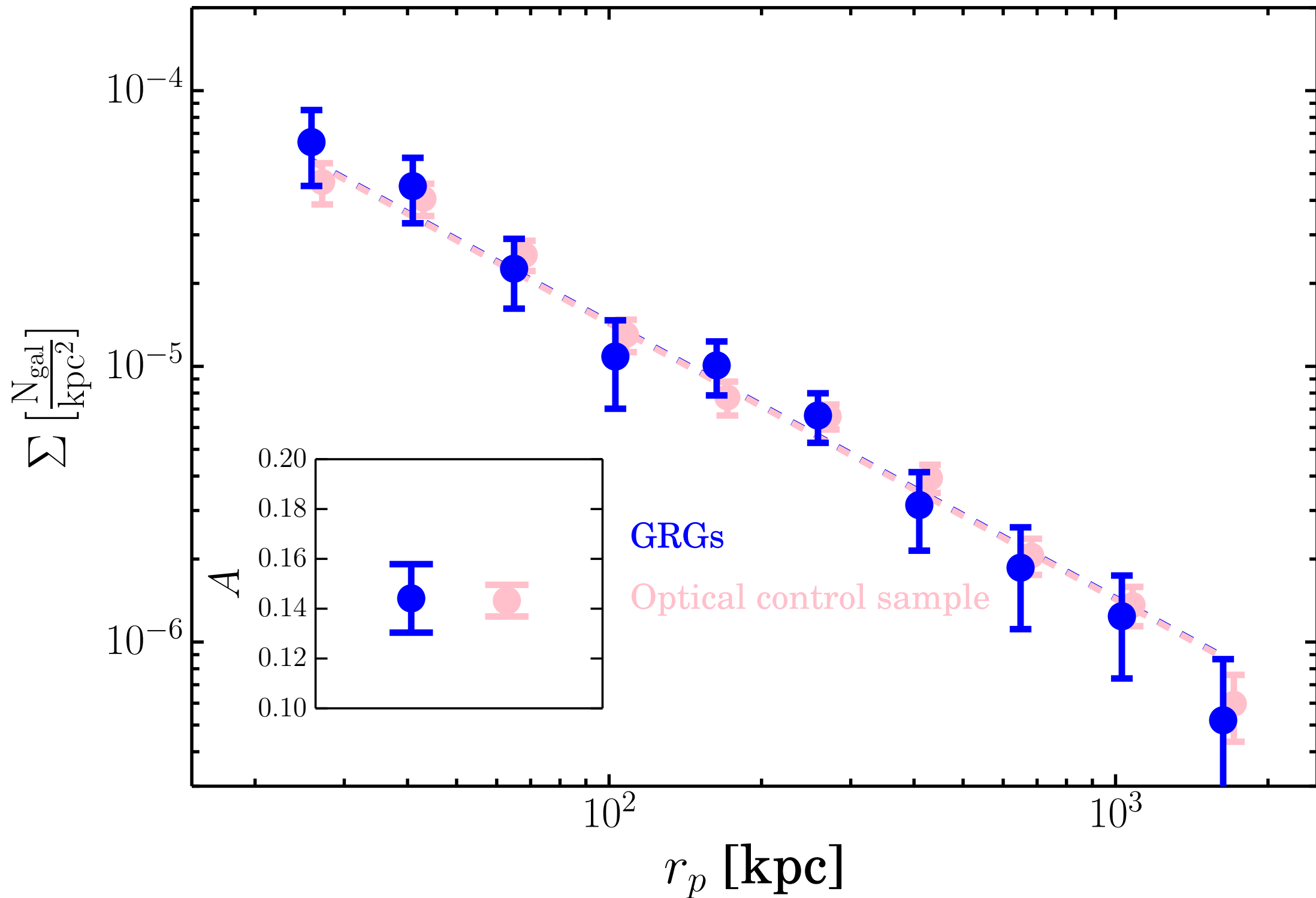
Statistically probing the satellite abundances



Statistically probing the satellite abundances

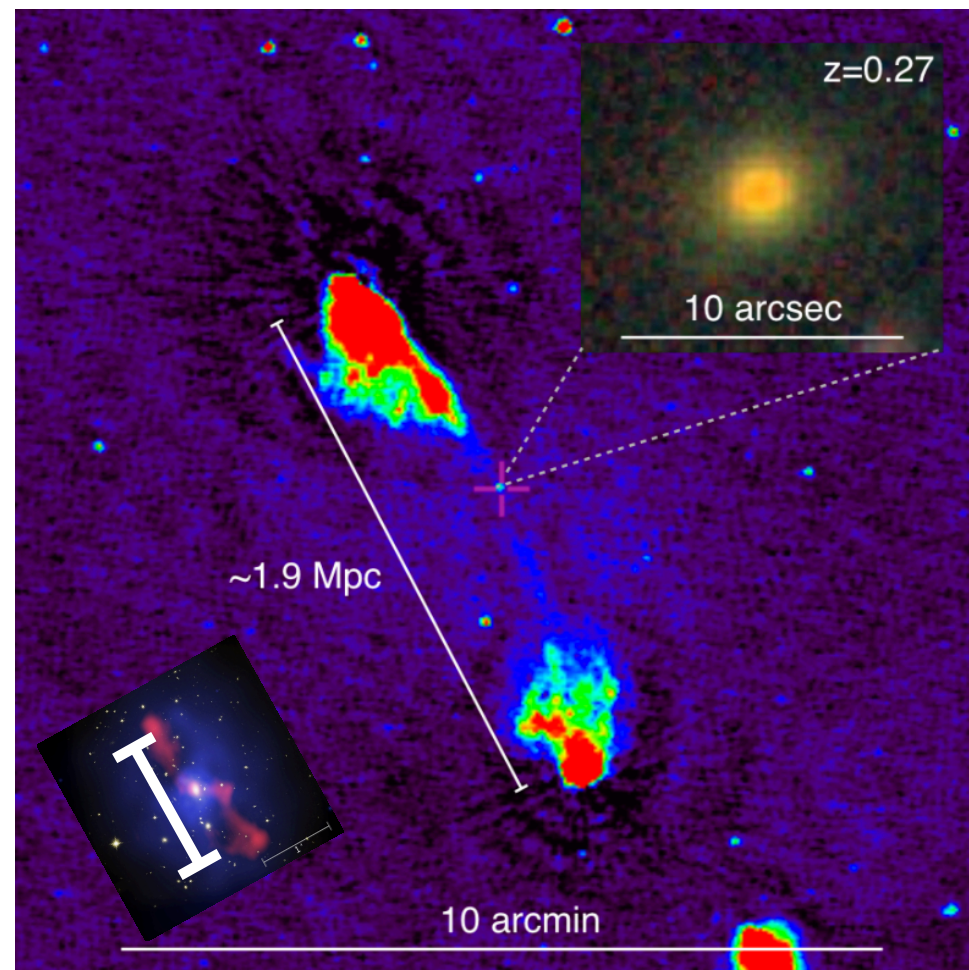


Statistically probing the satellite abundances



GRGs do not preferentially live in low density environments.

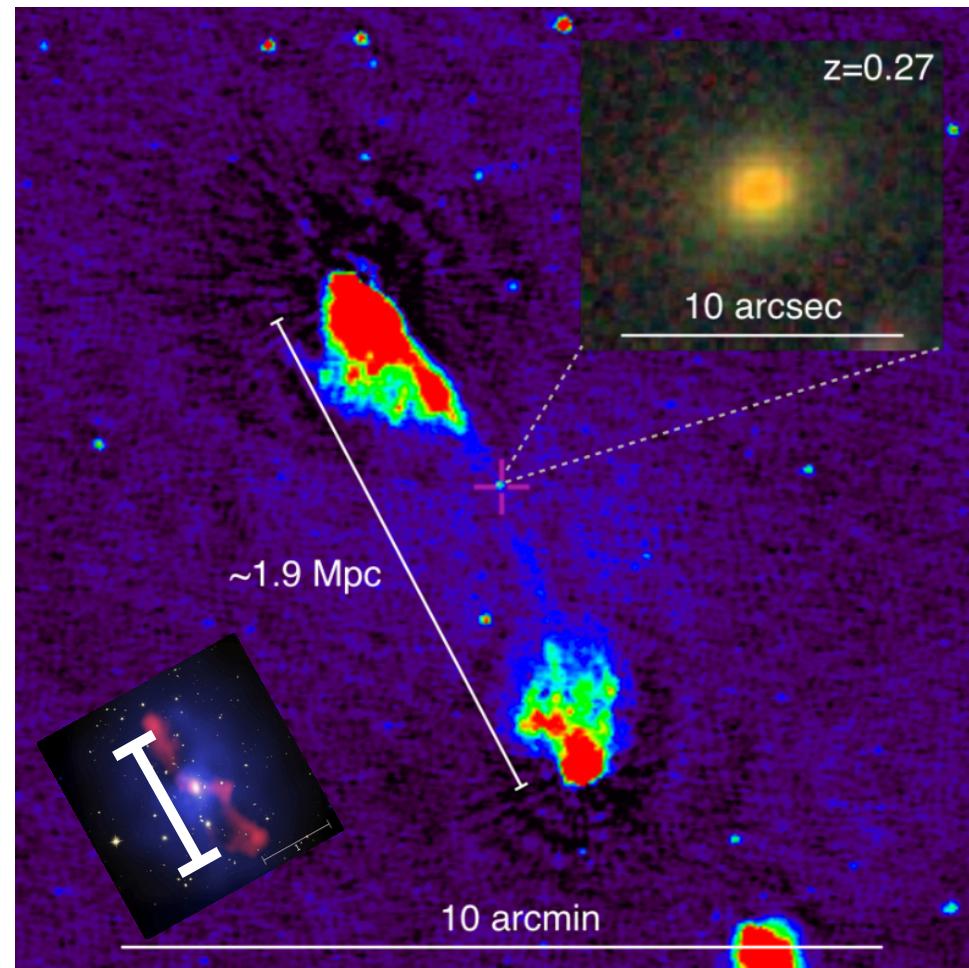
An extreme rare population - giant radio galaxies



What drives such extended radio structures?

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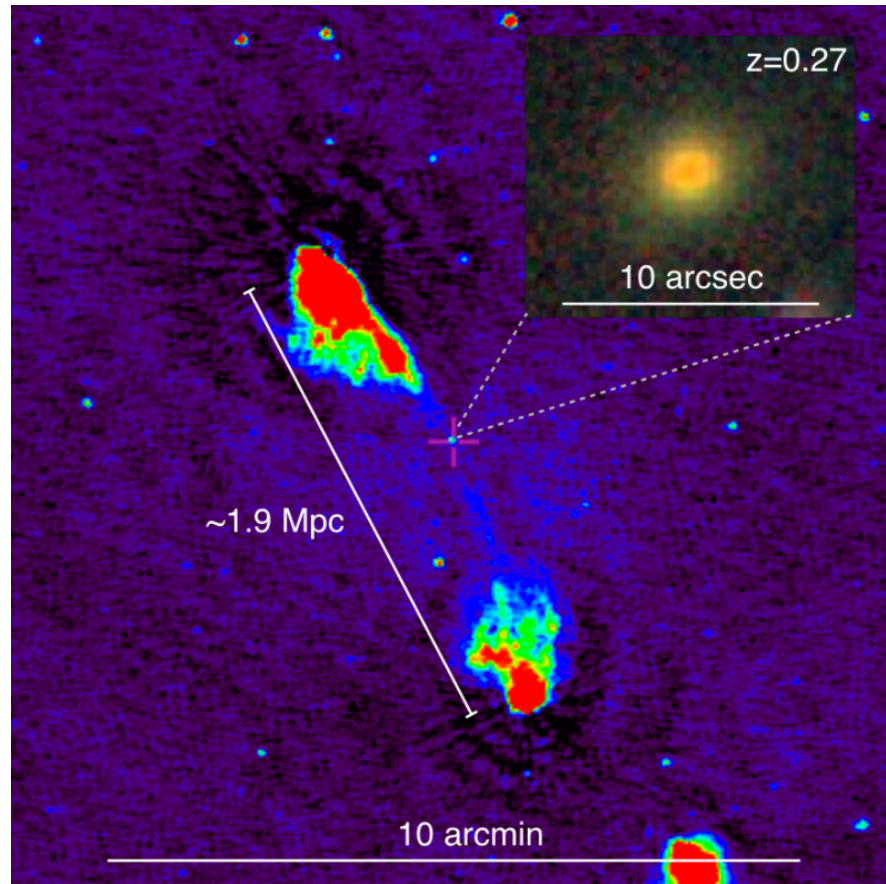
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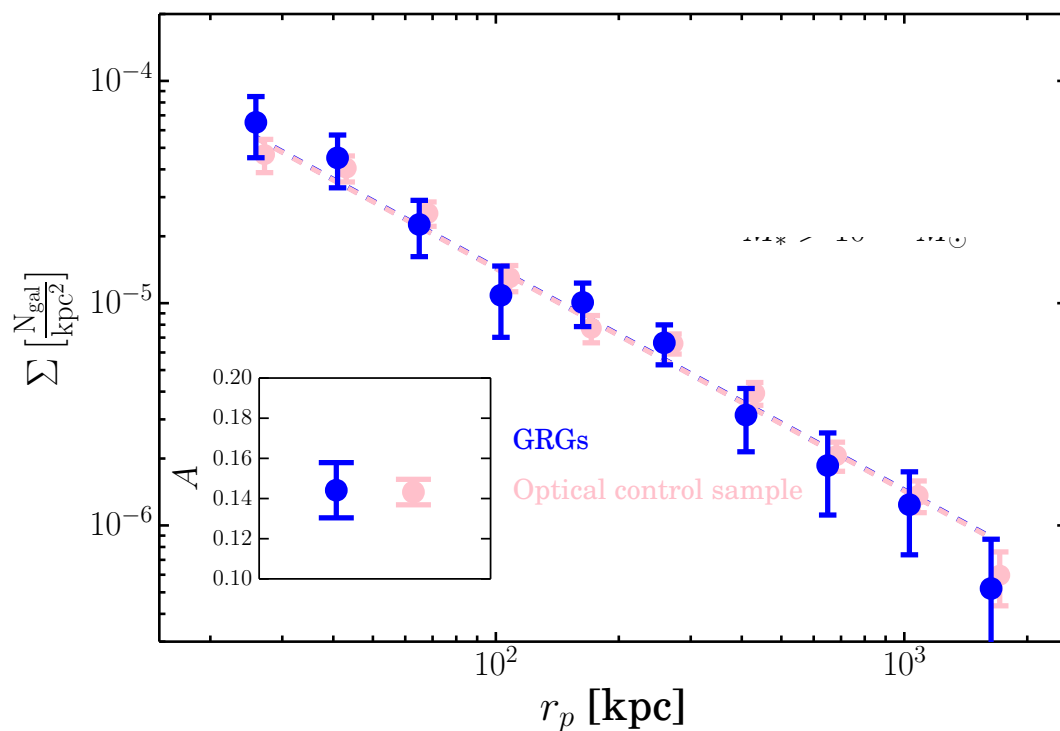
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Summary



Is the environment the main cause of the enormous radio structures?



No. Our measurements show that the GRGs tend to live in the similar environments as their optical counterparts.