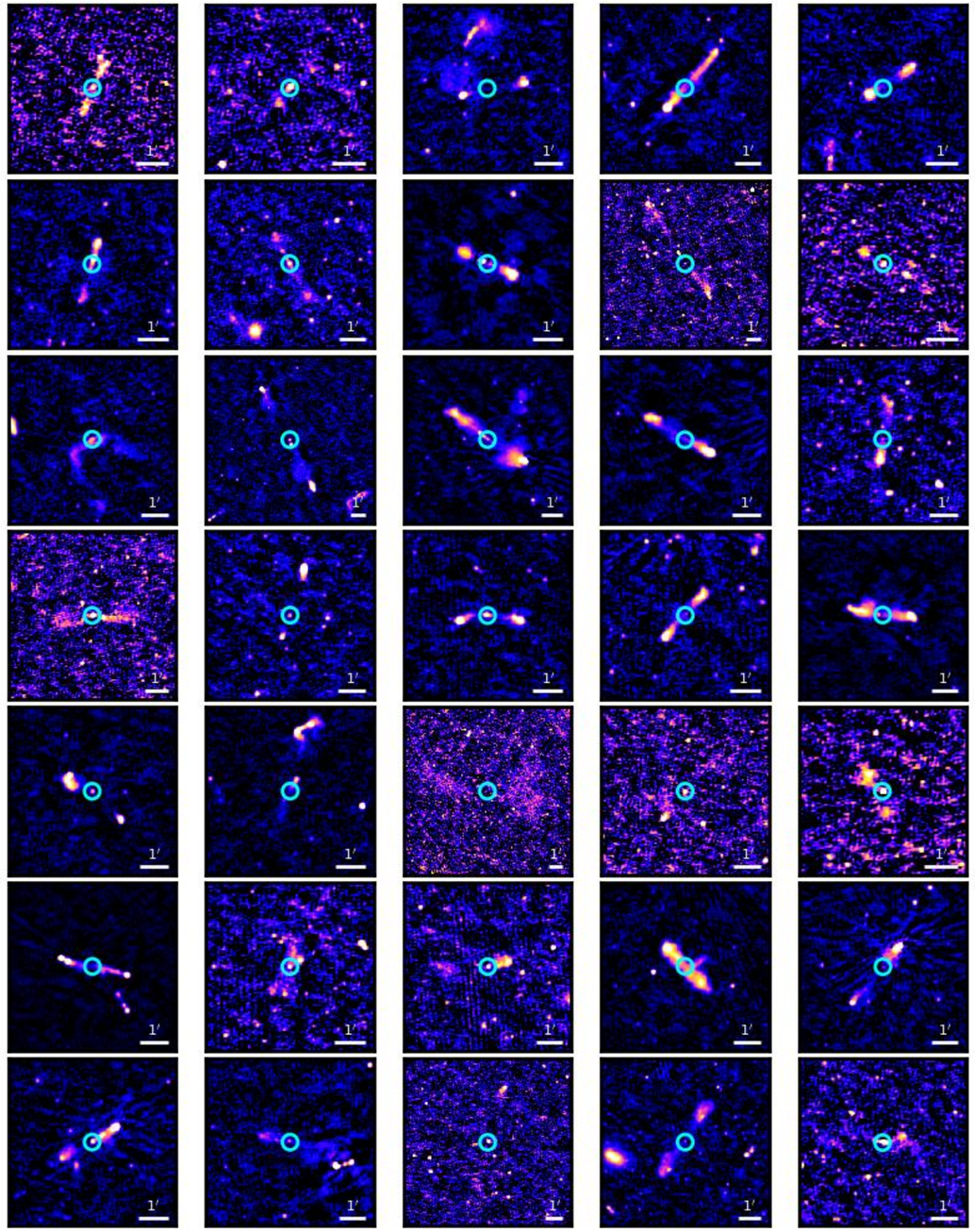
# Giant Radio Galaxies in the LOFAR Deep Fields

Marco Simonte

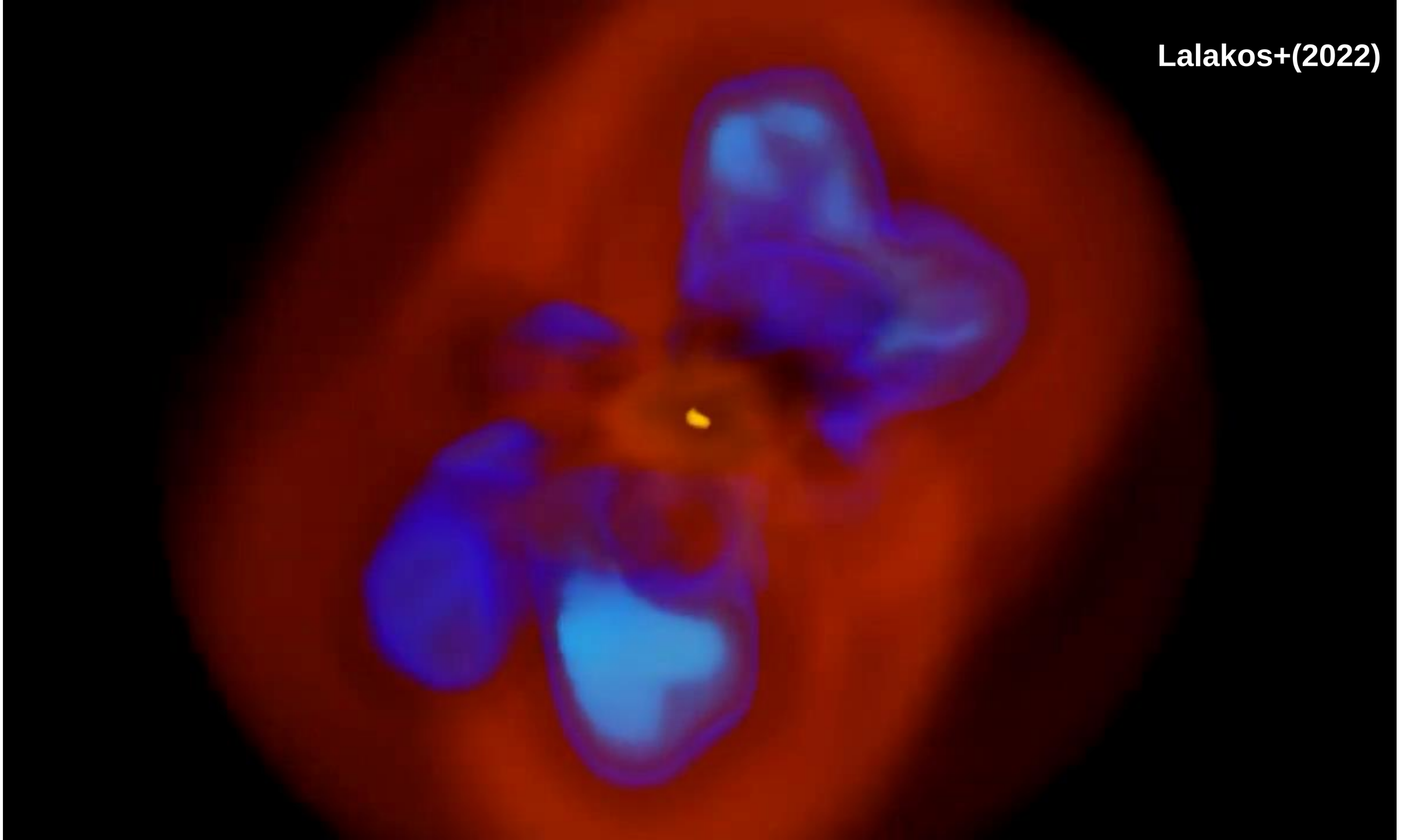
Collaborators: H. Andernach, M. Brüggen,
I. Prandoni, D. Schwarz,
A. G. Willis



Universität Hamburg
DER FORSCHUNG | DER LEHRE | DER BILDUNG

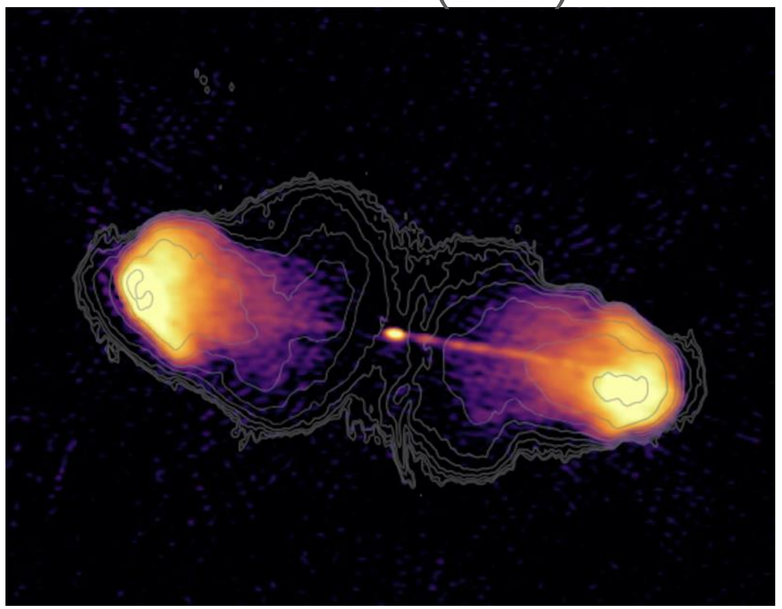
hamburger sternwarte

Simonte et al 2022
(2022MNRAS.515.2032S)


Lalakos+(2022)

# Introduction: the realm of radio galaxies

Mahatma+(2023)



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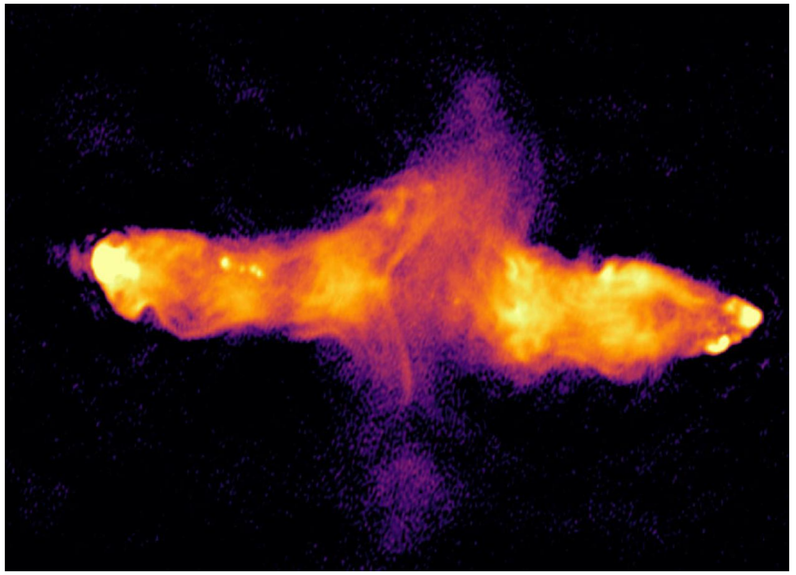
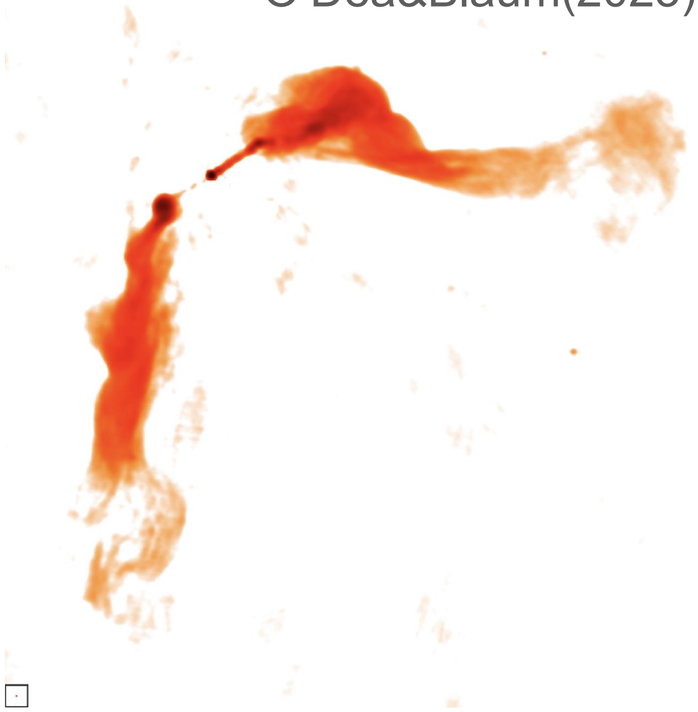


O’Dea&Blaum(2023)



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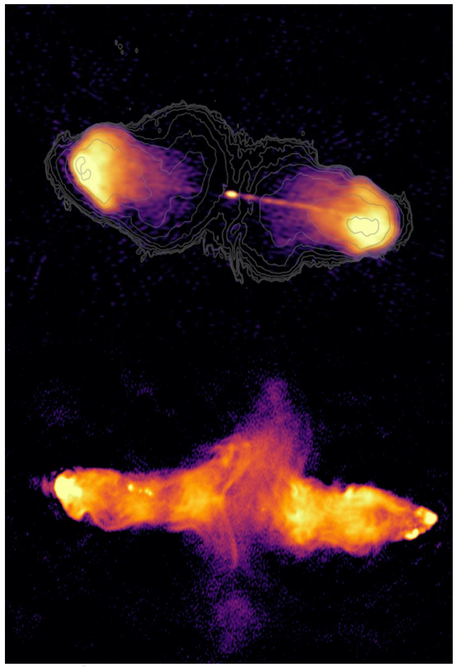
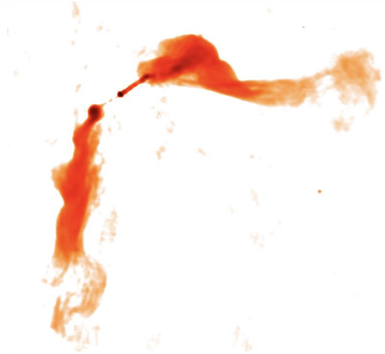
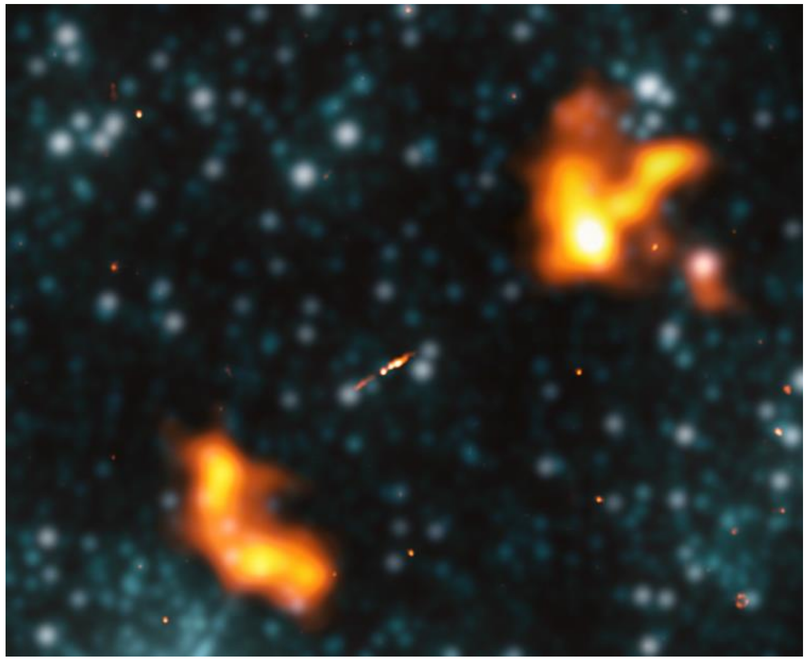




**Giant Radio Galaxies**

(>=700 kpc)

Alcyneous, Oei+(2023)



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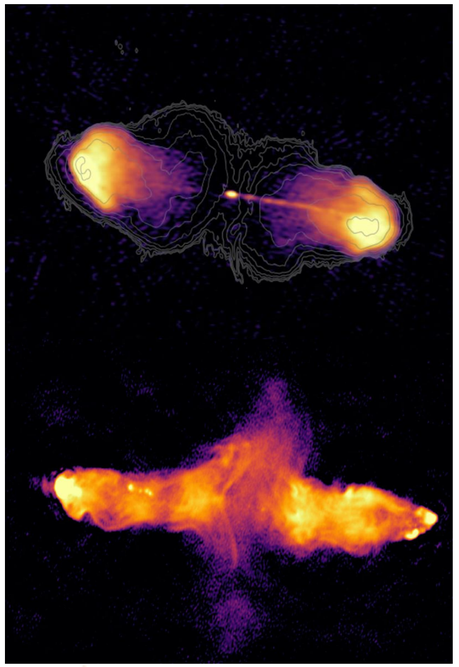

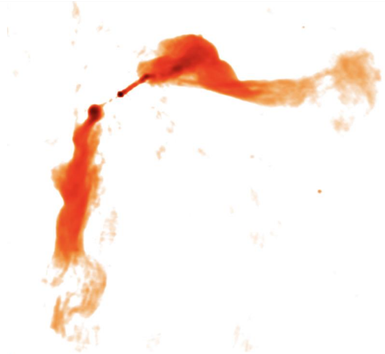

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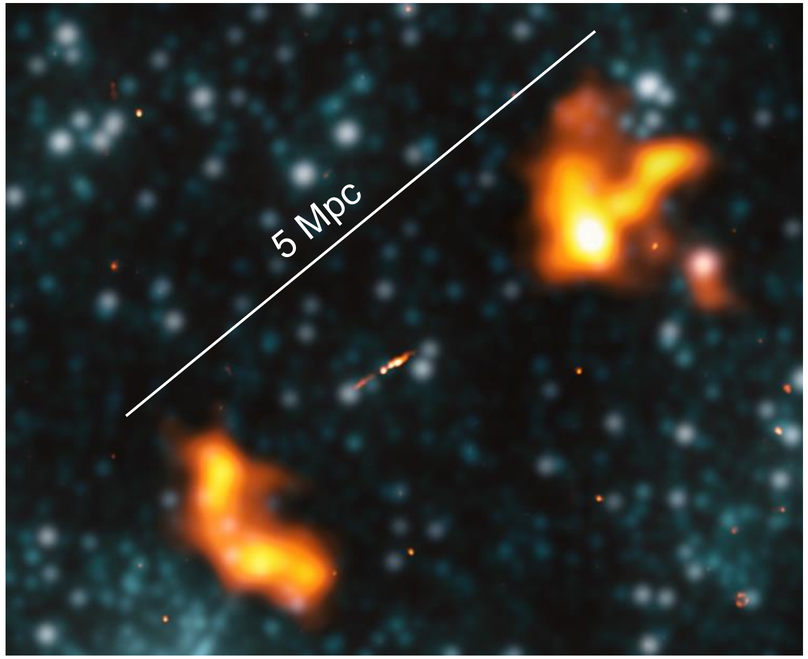
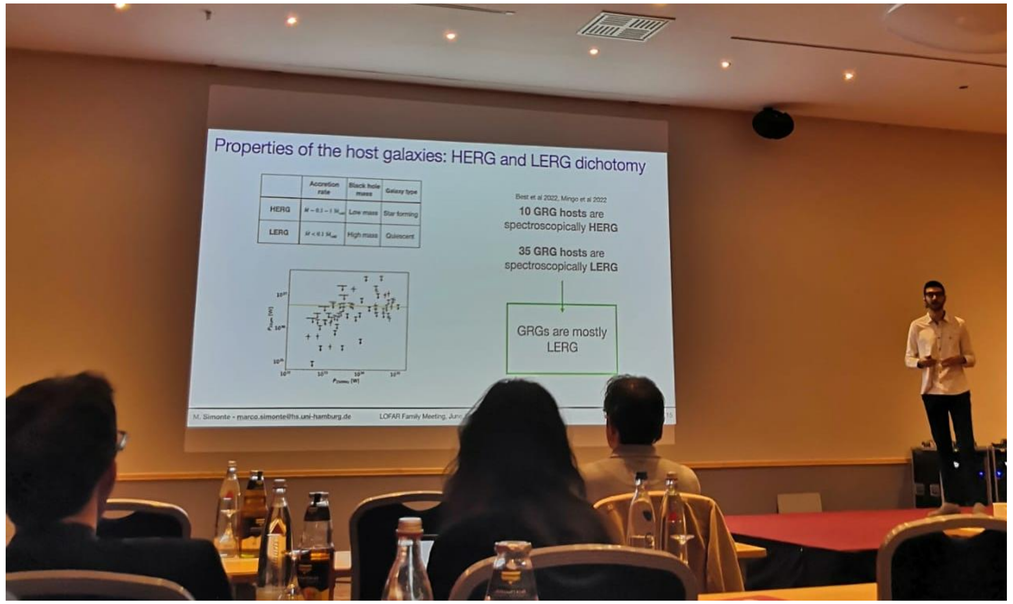


# Giant radio galaxies catalogues

LFM June 2022




My sample: **74 GRGs**

Total nr. of GRGs known
**< 1000**

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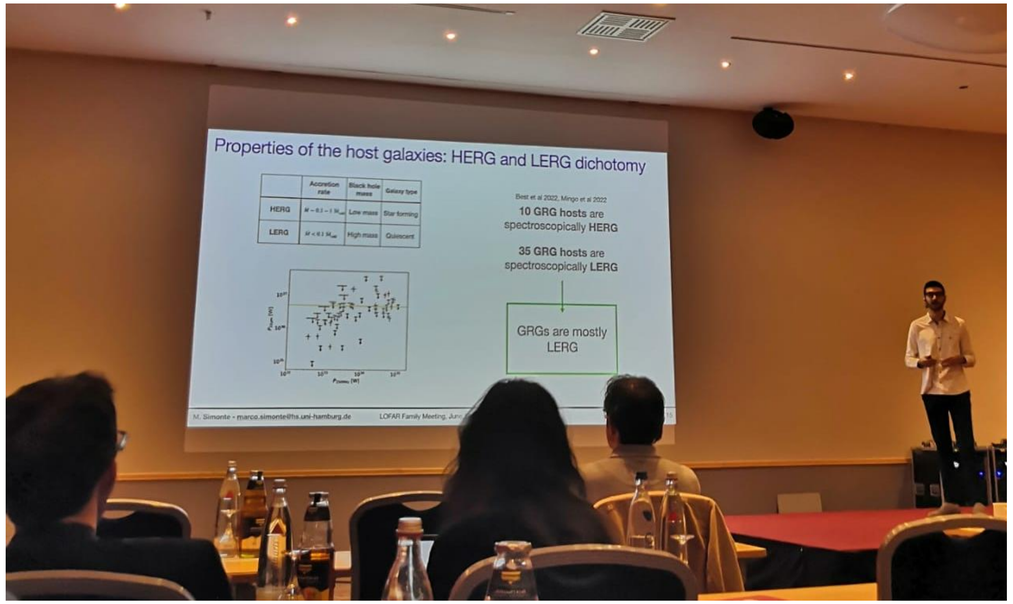


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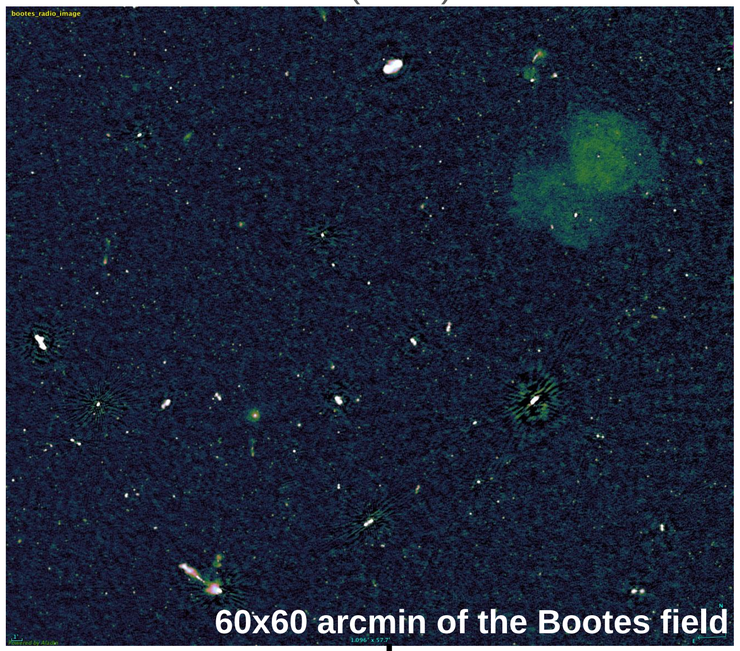
LFM June 2023


My sample: **280 GRGs**

Total nr. of GRGs known
**> 10000**
(Oei+2023,
Mostert+ in prep.)

# The Boötes, ELAIS-N1 and Lockman Hole deep field

Boötes
Tasse+(2020)




Lockman Hole
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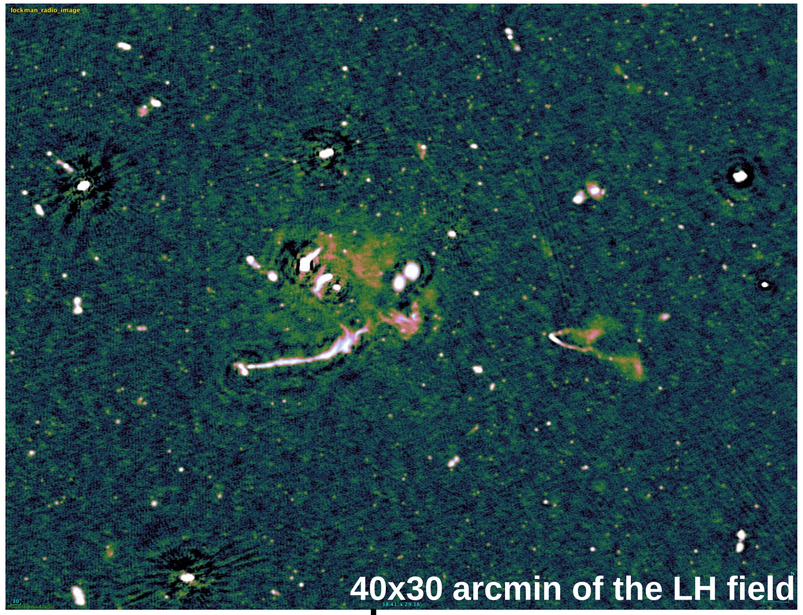
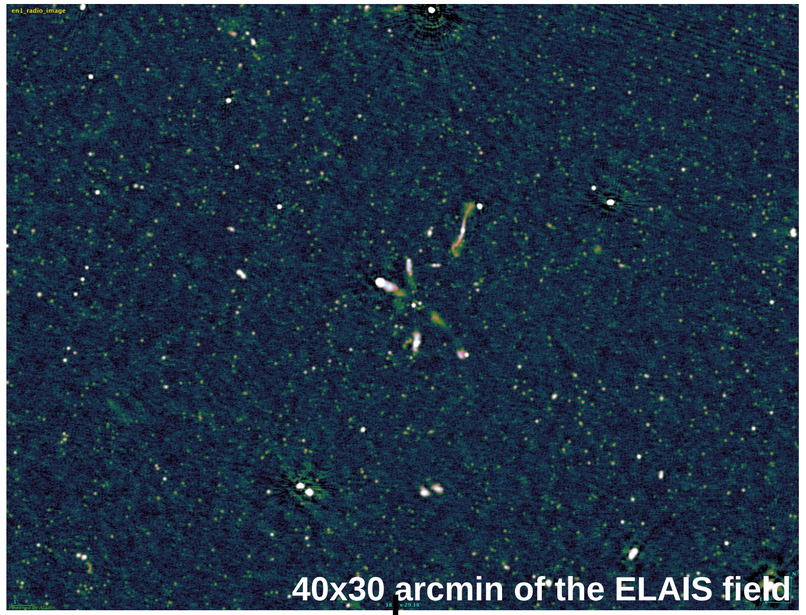



ELAIS-N1
Sabater+(2020)

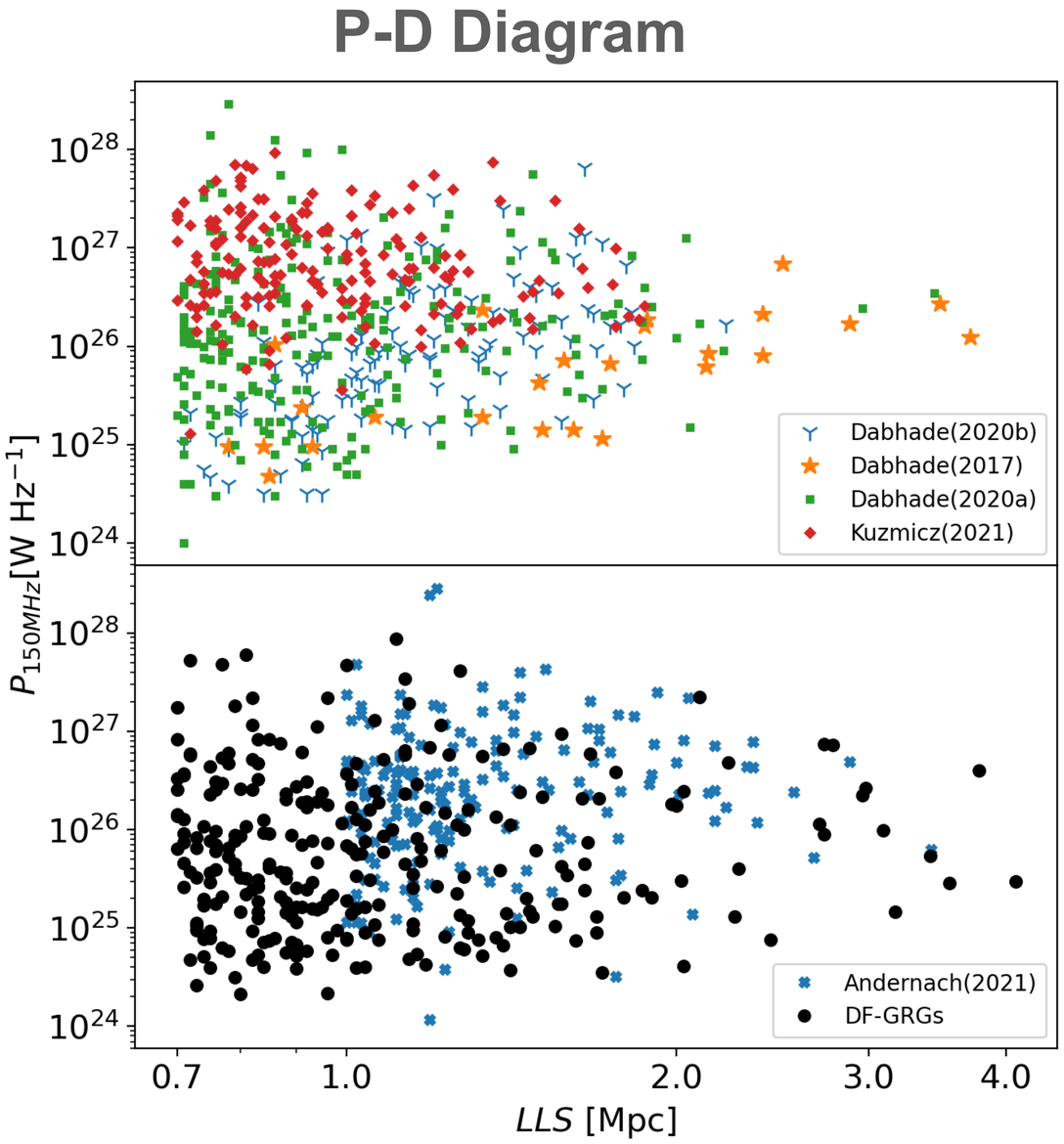



**1610 ERGs** (LAS > 20”), **280 GRGs** (LLS > 700 kpc)

30 kpc < LLS < 4.08 Mpc

0 < z < 5.5

# On the evolution of (Giant) Radio Galaxies:



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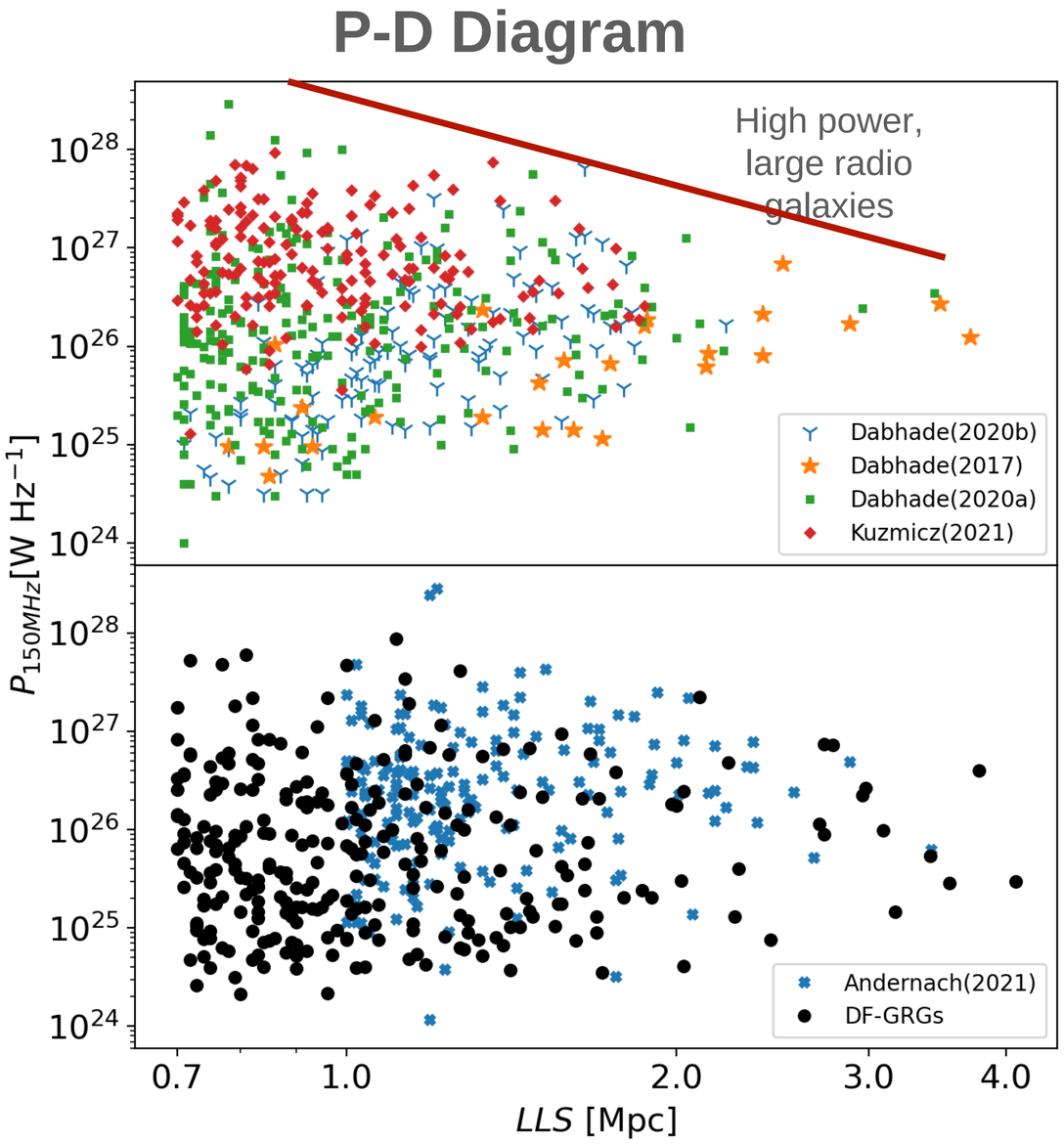


No GRGs are detected in the upper right corner

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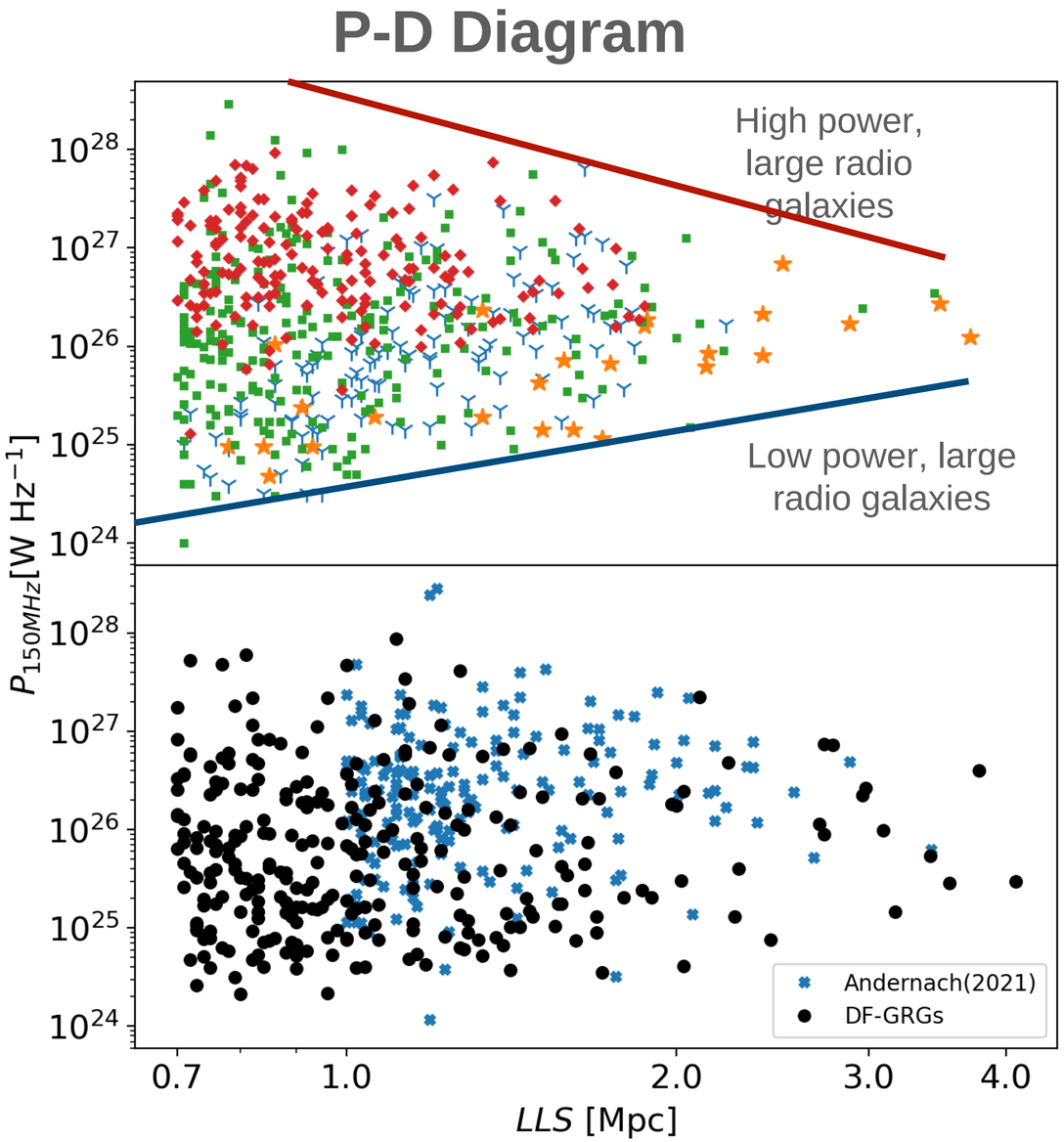


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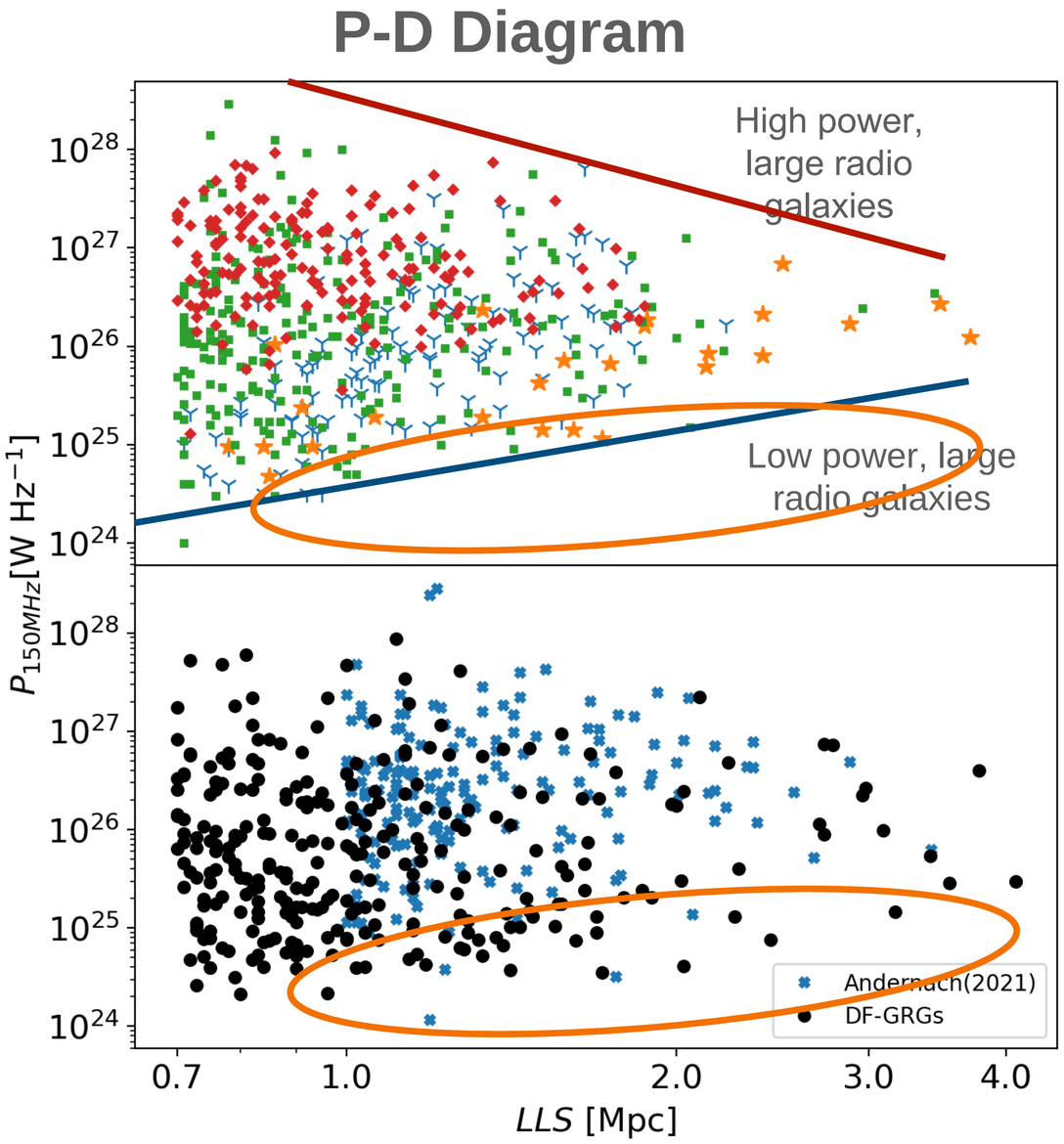


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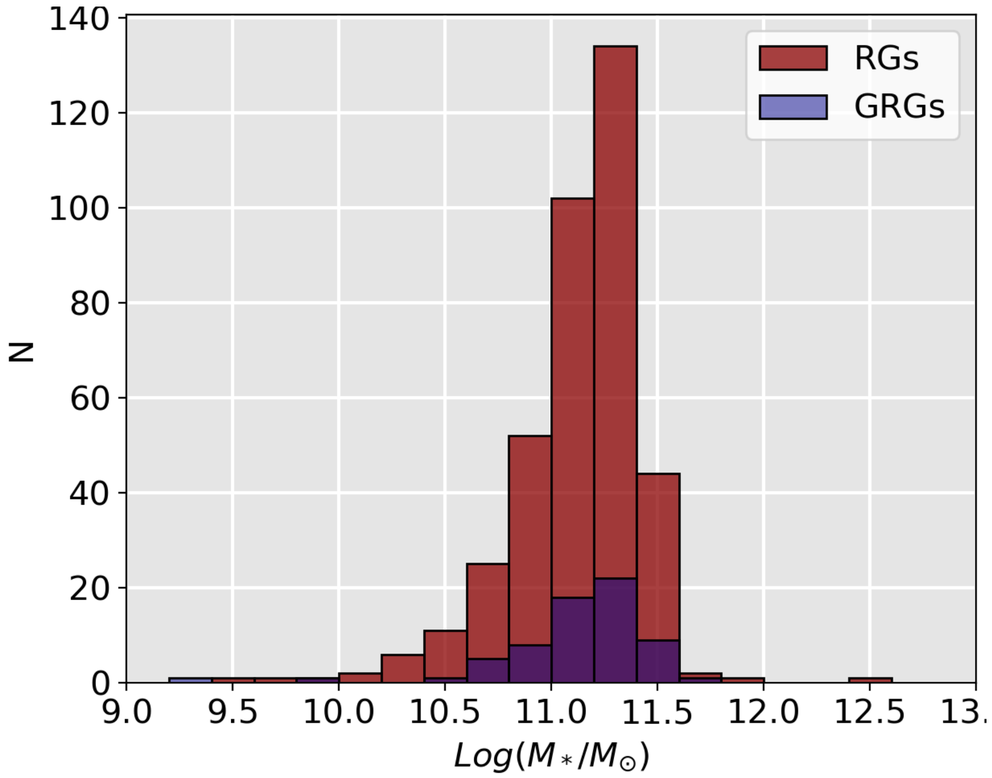
We have been starting to observe large (> 1 Mpc) and faint ($\sim 10^{24}\mathrm{WHz}^{-1}$) GRGs.

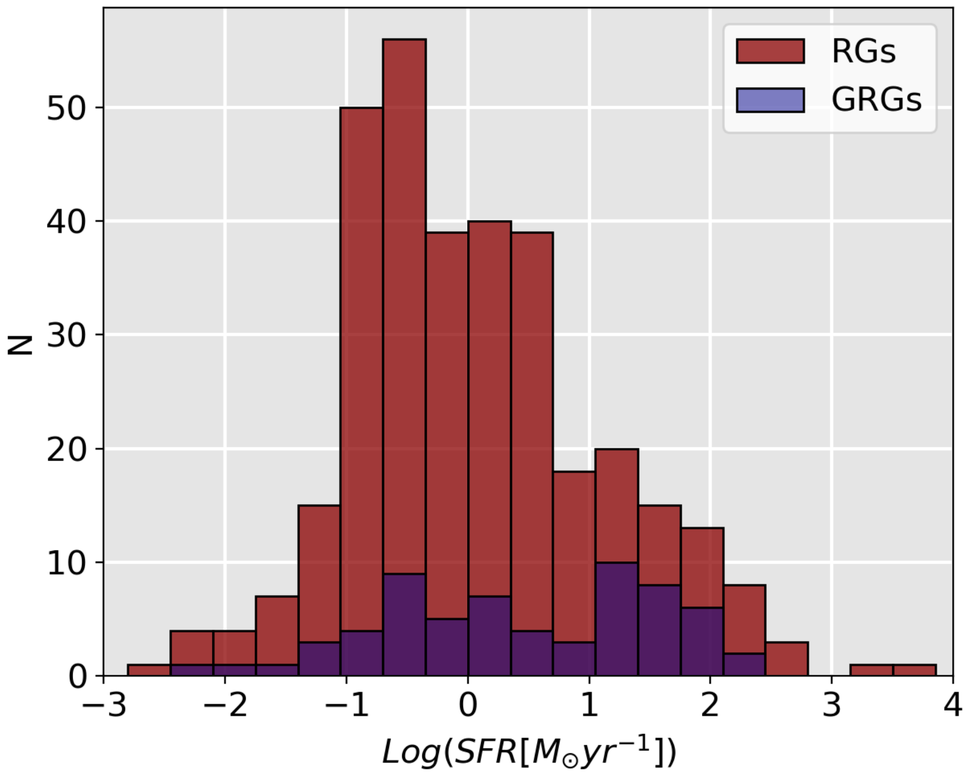
# Properties of the host galaxies: stellar mass and SFR

Best+(2023)

GRG hosts:
$10^{10.5} < M/M_{\odot} < 10^{12}$
(Similar to RGs)




26 GRG hosts with SFR > 10 $M_{\odot} yr^{-1}$



# Properties of the host galaxies: HERG and LERG dichotomy

Best+(2023)

| | **Accretion rate** | **Black hole mass** | **Galaxy type** |
|---|---|---|---|
| **HERG** | $\dot{M} \sim 0.1 - 1\dot{\mathrm{M}}_{\mathrm{edd}}$ | Low mass | Star forming |
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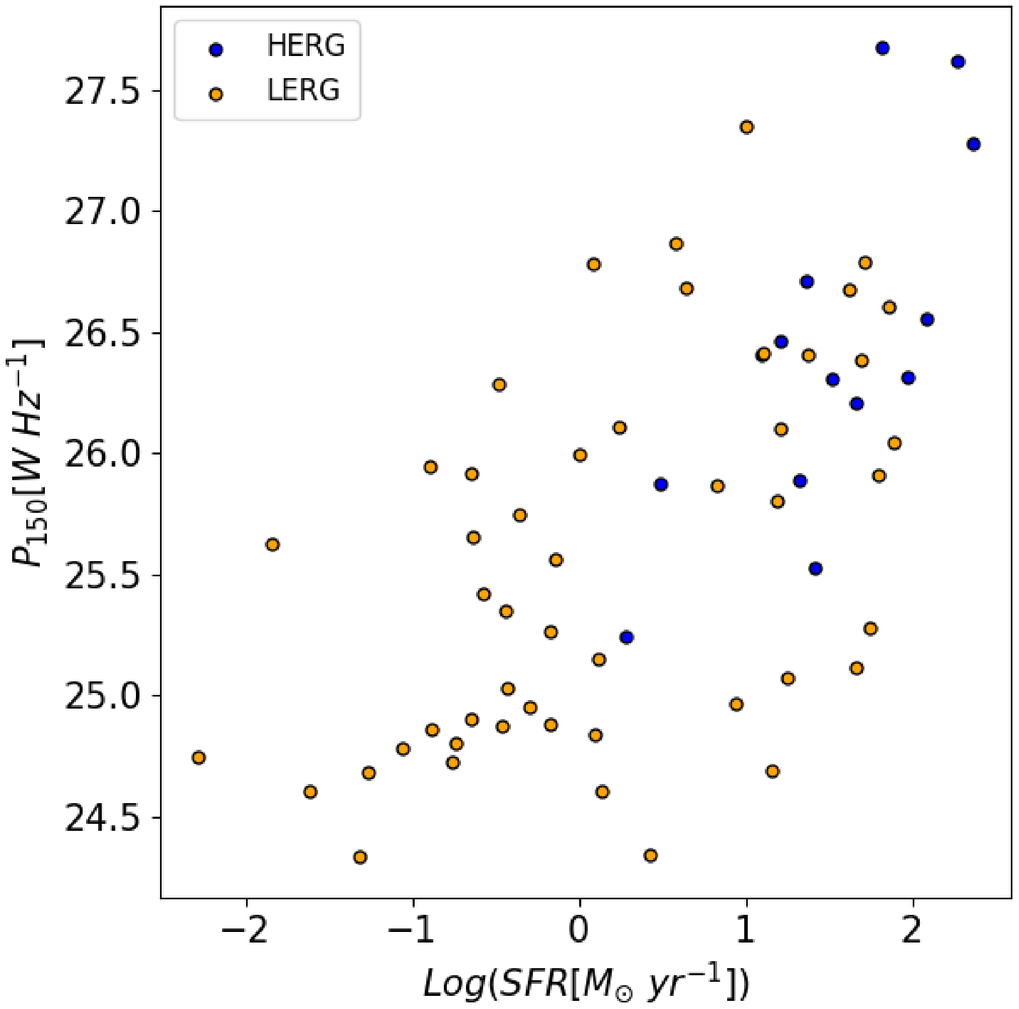

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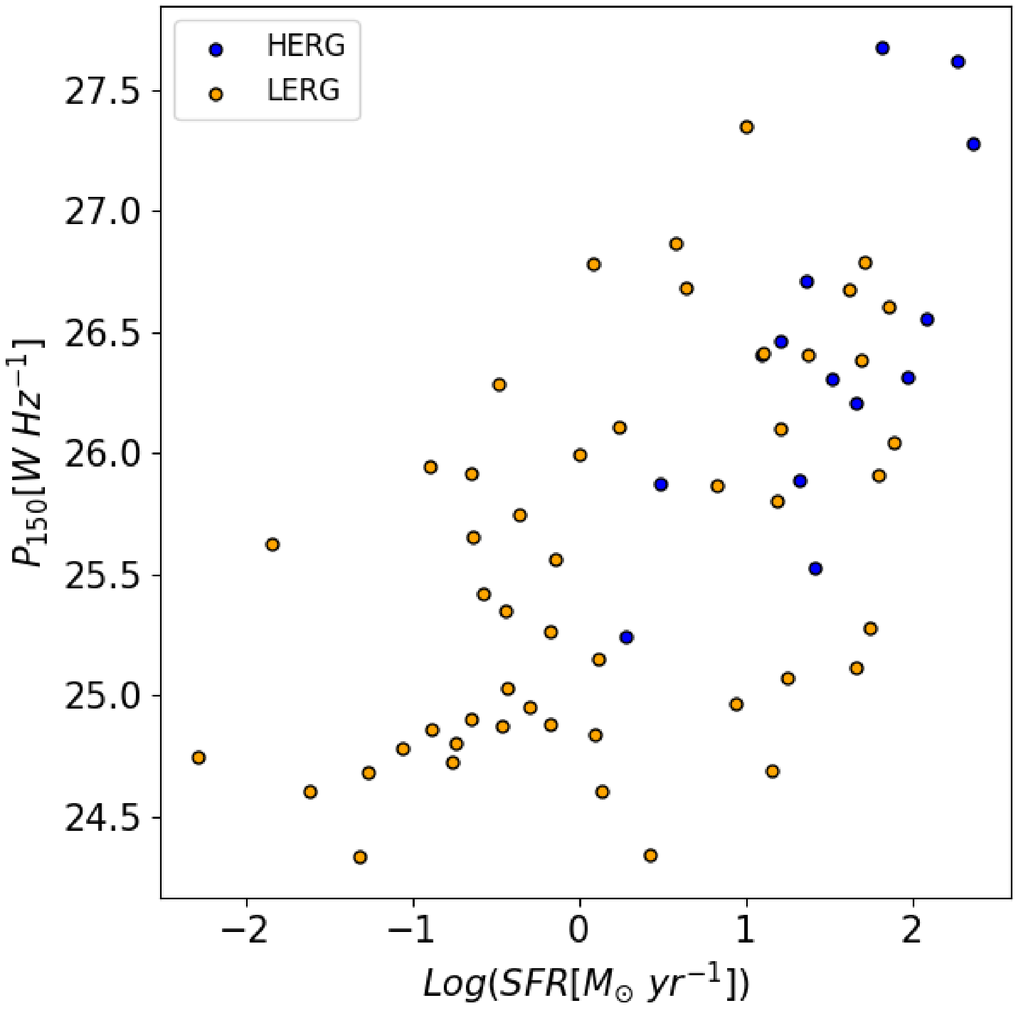

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1. GRGs are mostly LERG
2. Only powerful sources are HERG, regardless the FRI/II dichotomy (Mingo+2022)

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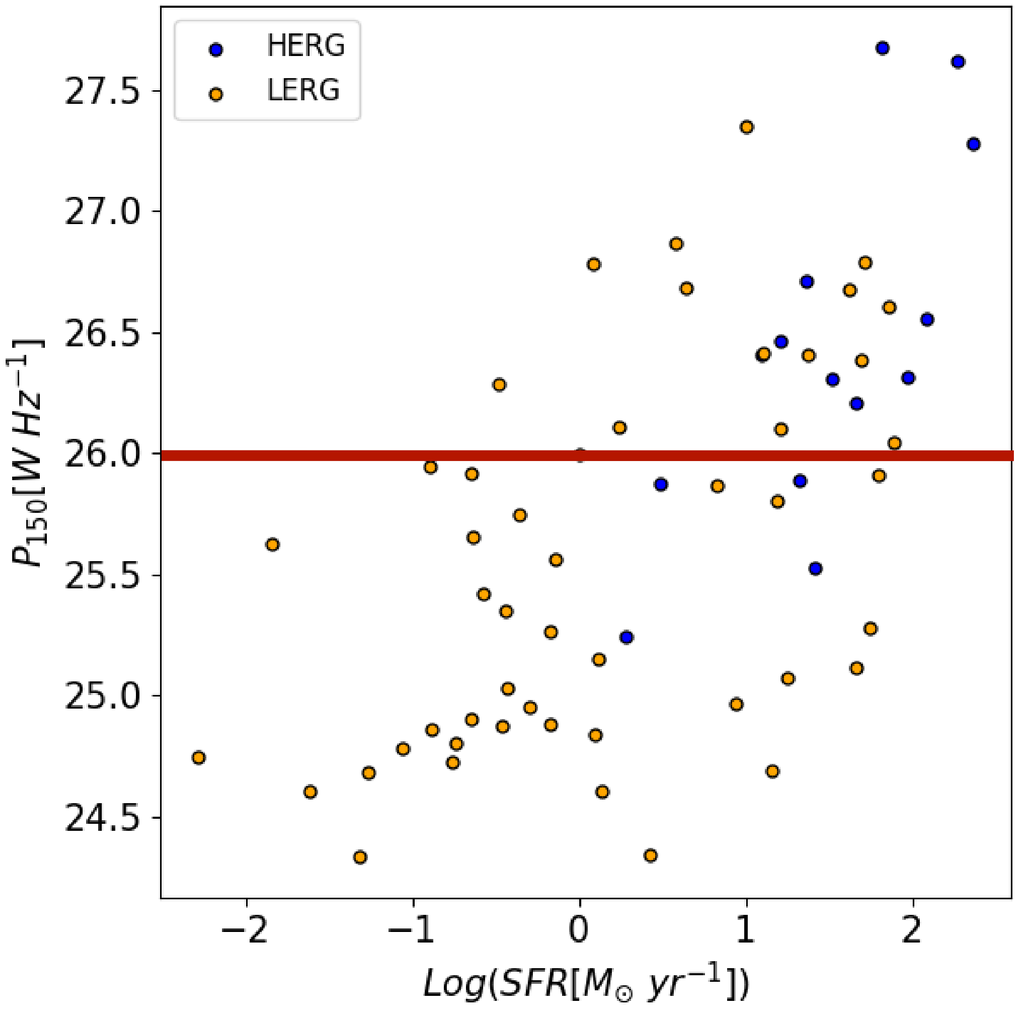

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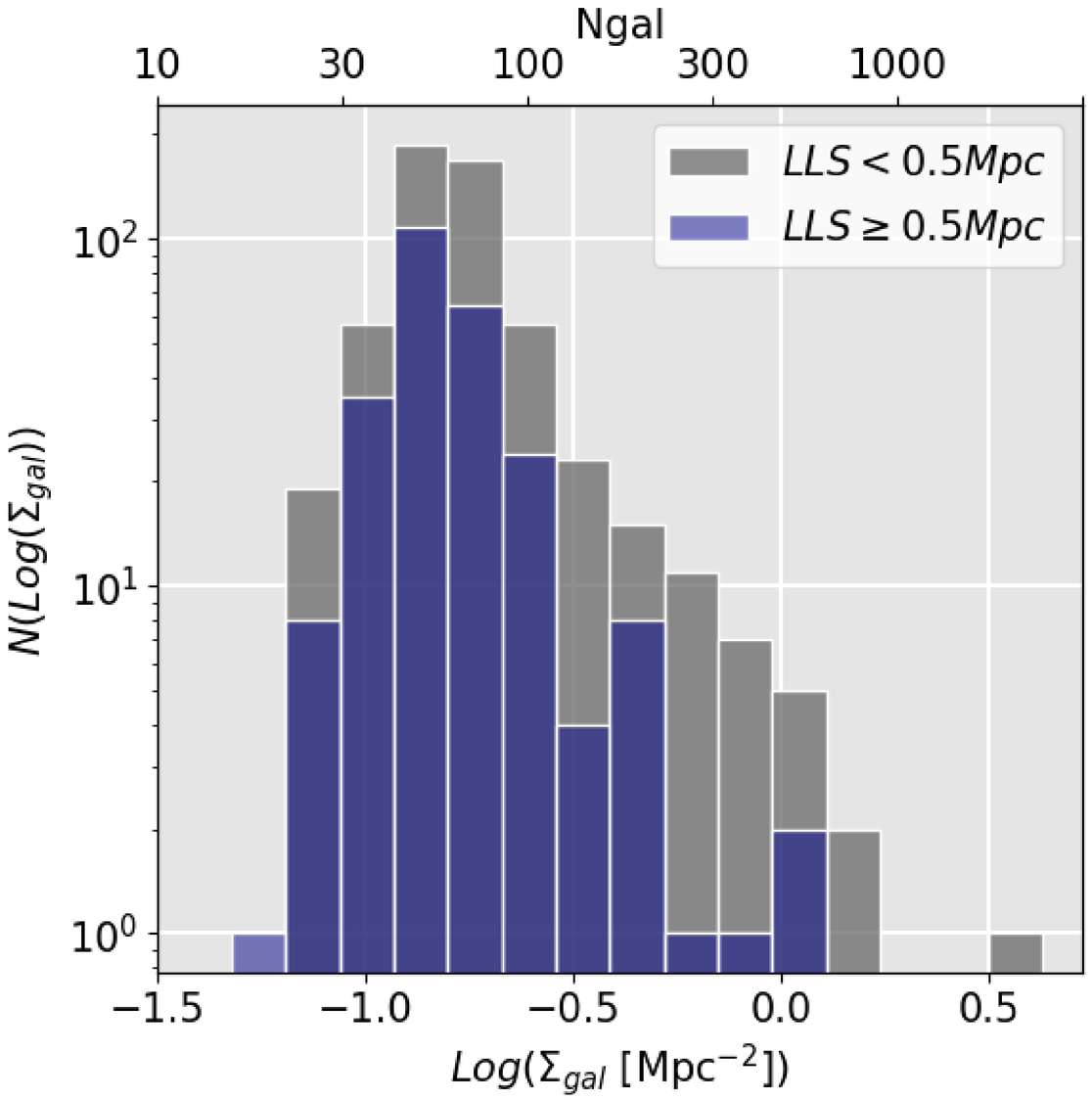


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Count the number of galaxies around (G)RG hosts within 10 Mpc (z<0.7)

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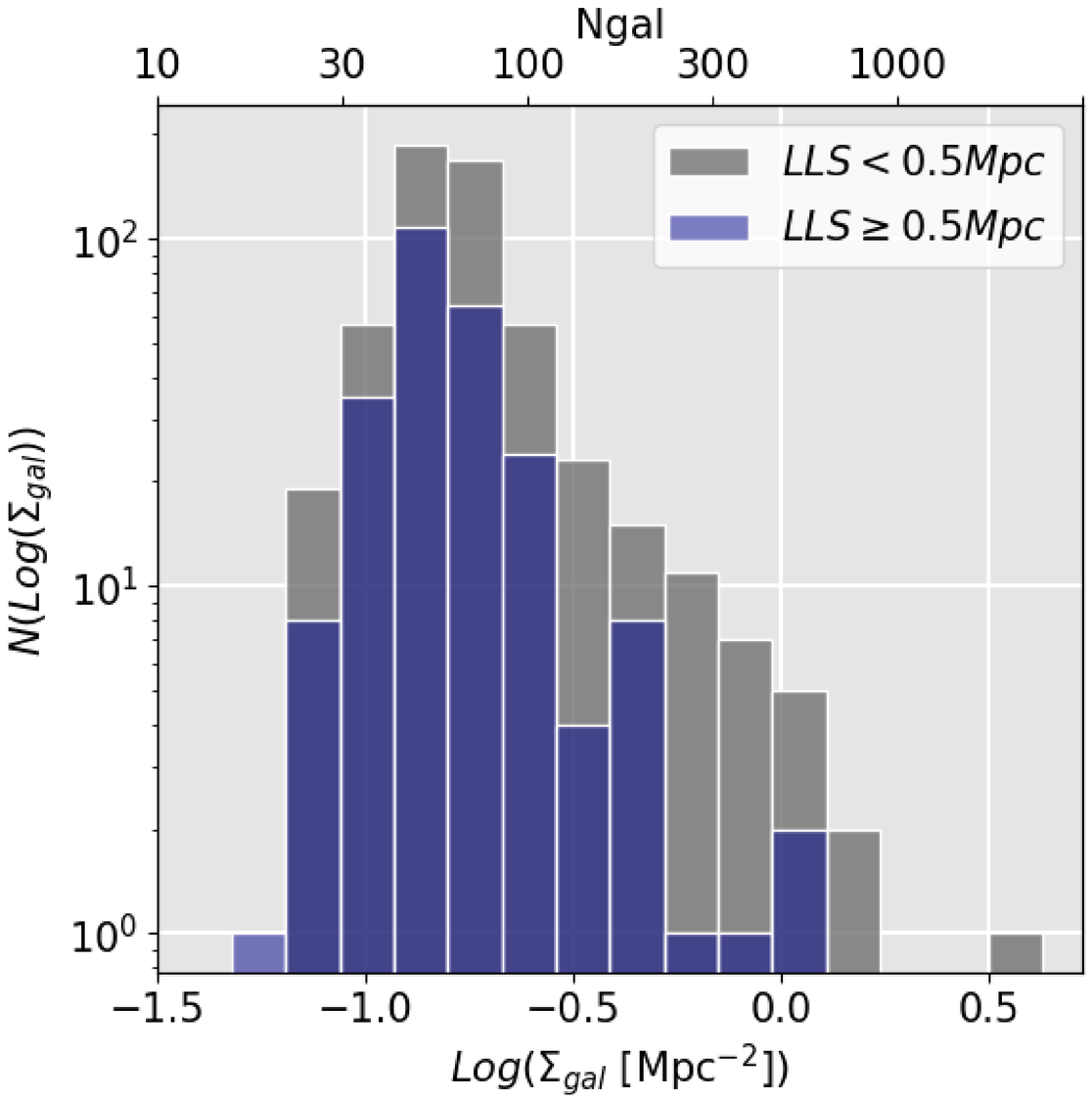


From DESI Survey:
Count the number of galaxies around (G)RG hosts within 10 Mpc (z<0.7)

↓

Probably **YES!**

The two distribution are slightly different (p-value = 0.002)

# Conclusions and final remarks

- We have been starting to observe large (> 1 Mpc) and faint ($\sim 10^{24}$ W Hz$^{-1}$ (GRGs.
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- GRGs and RGs hosts have similar stellar mass
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Recurrent activity?

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Recurrent activity?

- Slightly different environment for very large and smaller radio galaxies

Inhomogeneities in the IGM within 1 Mpc?