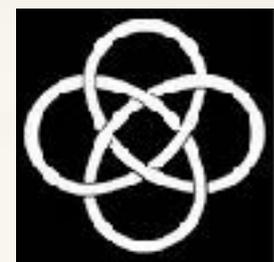


SAGAN

Search & Analysis of Giant radio galaxies with Associated Nuclei

Pratik Dabhade
IUCAA

SKA Pathfinders Radio Continuum Surveys 2016



<https://sites.google.com/site/anantasakyatta/sagan>



Collaborators

- ❖ Joydeep Bagchi
- ❖ Madhuri Gaikwad
- ❖ Shishir Sankhyayan
- ❖ Joe Jacob
- ❖ K.G Biju
- ❖ Francoise Combes
- ❖ Ishwar Chandra C.H
- ❖ Huub Rottgering
- ❖ Timothy Shimwell

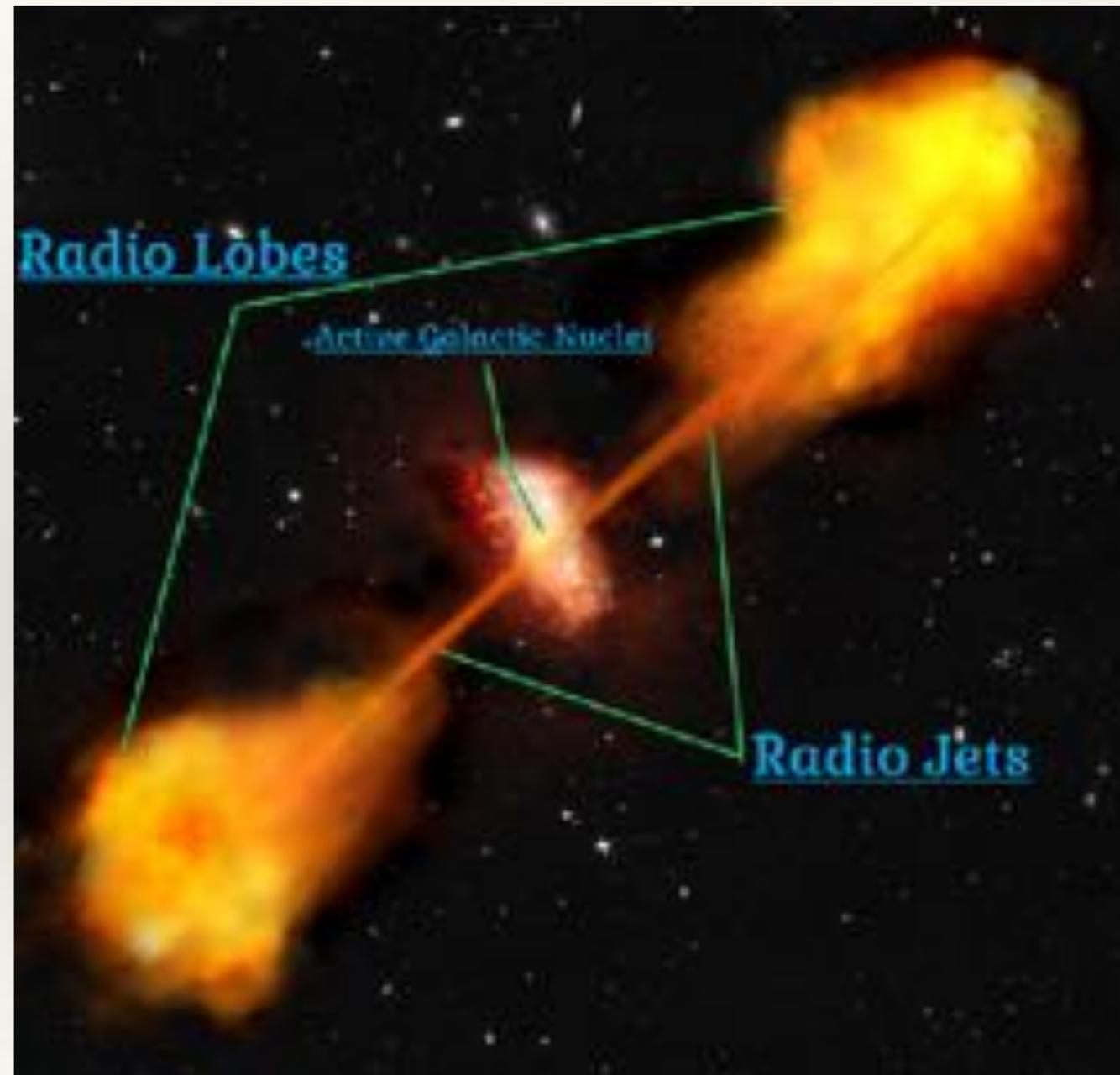
Outline of talk

- ❖ GRG introduction
- ❖ What is SAGAN ?
- ❖ Results
- ❖ Host studies
- ❖ Growth & evolution of GRGs
- ❖ Future plans

Giant Radio Galaxies

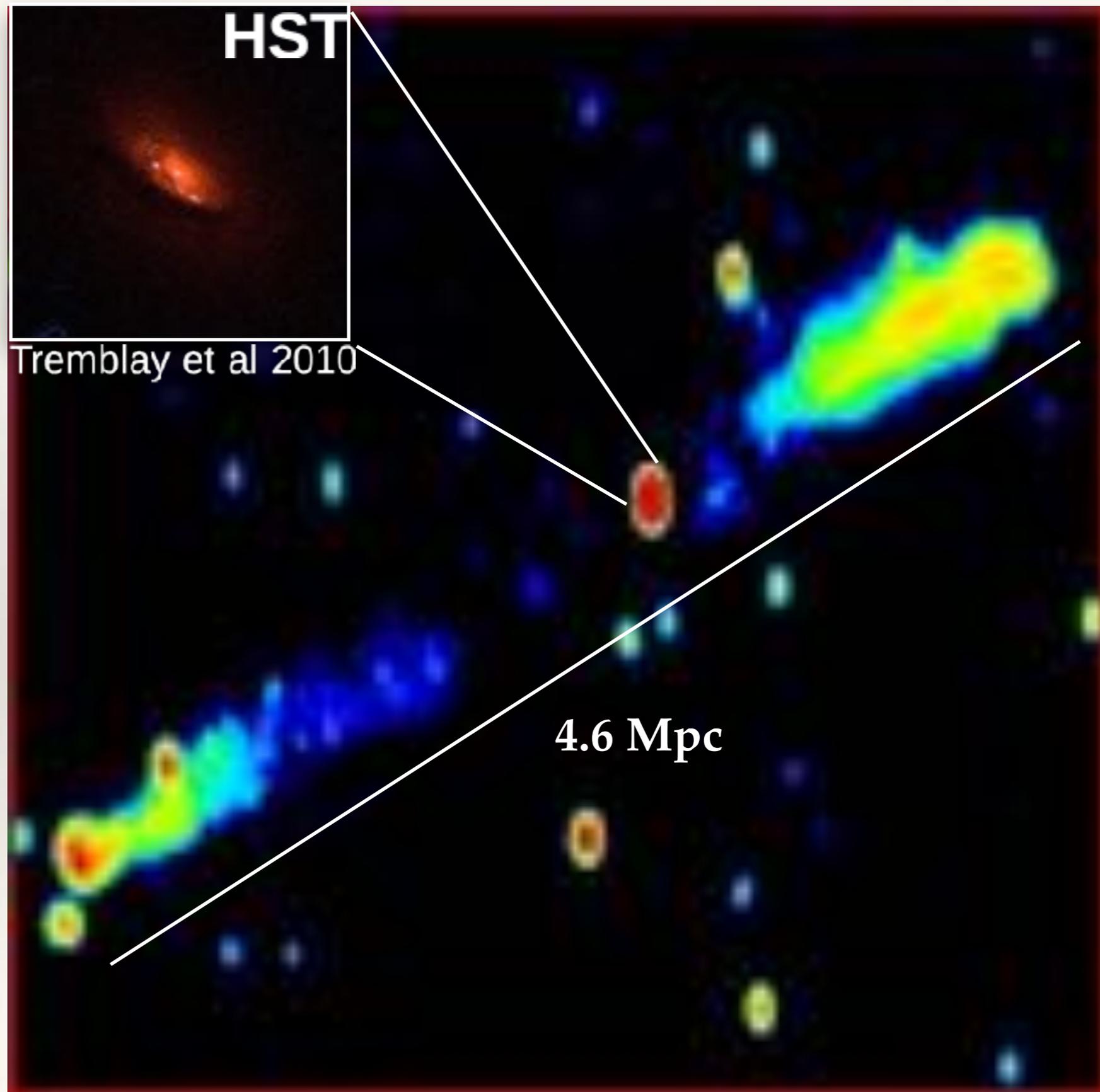
- ❖ Total radio size greater than ~ 700 Kpc.
- ❖ Very few of them are known when compared to thousands of radio galaxies.
- ❖ Almost all of them are FR-II type.

Anatomy of radio galaxy



GRG 3C 236

- ❖ GRGs can grow upto scales of galaxy clusters & more.
- ❖ As they expand to such great extent they are thought to be end point of RG evolution.



Problems related to GRGs

- ❖ Size ?
- ❖ Rare ?
- ❖ Possible contribution to other processes ?

GRGs grow only in sparse environment ?

Very powerful AGN ?

Combination of two ?

Multiwavelength and environment analysis needed of larger sample of GRGs



SAGAN



Search & Analysis of Giant radio galaxies with Associated Nuclei



Goals for SAGAN

- ❖ Make a complete compilation of all known GRGs using data from literature. The data available of these GRGs from research papers over a period of 4 decades is highly non-uniform.
- ❖ Search for low surface brightness GRGs from existing radio survey like NVSS in synergy with other optical spectroscopic surveys like SDSS, 6df and 2MASS.
- ❖ Radio follow up for (multi-frequency) high resolution maps along with good sensitivity and further spectral ageing studies.
- ❖ Studying the host galaxy / AGN properties of GRGs using multiwavelength observations in mid-infrared , millimetre wave etc.
- ❖ Study growth & evolution of GRGs.
- ❖ Study environments of GRGs.

RESULTS

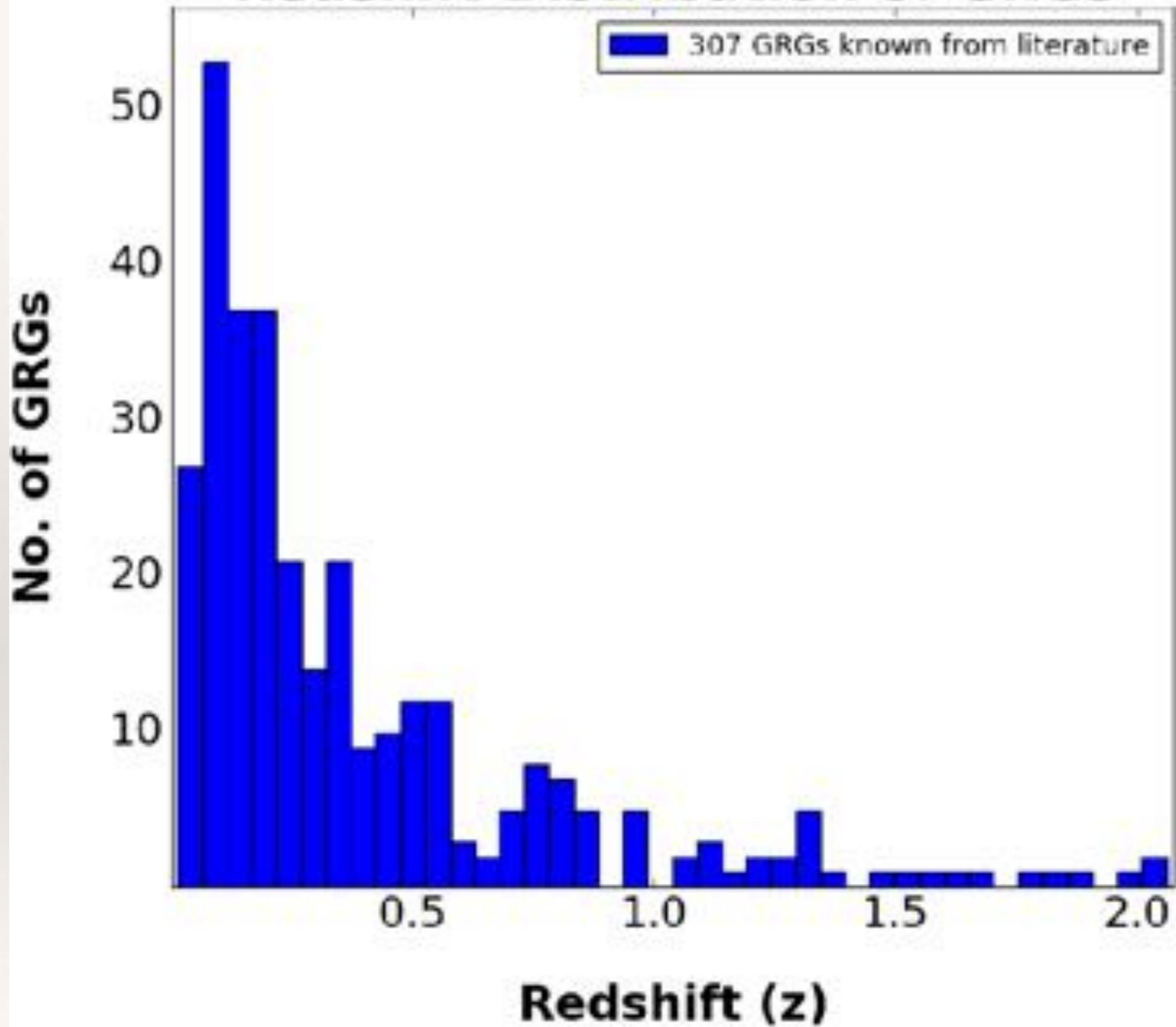
Goals for SAGAN

- ❖ Make a complete compilation of all known GRGs using data from literature. The data available of these GRGs from research papers over a period of 4 decades is highly non-uniform.



We report here for the first time that the total tally is **307 GRGs** known so far .

Redshift Distribution of GRGs



Goals for SAGAN

- ❖ Search for low surface brightness GRGs from existing radio survey like NVSS in synergy with other optical spectroscopic surveys like SDSS, 6df and 2mass.

Nearly 150 new GRGs are found by us so far.

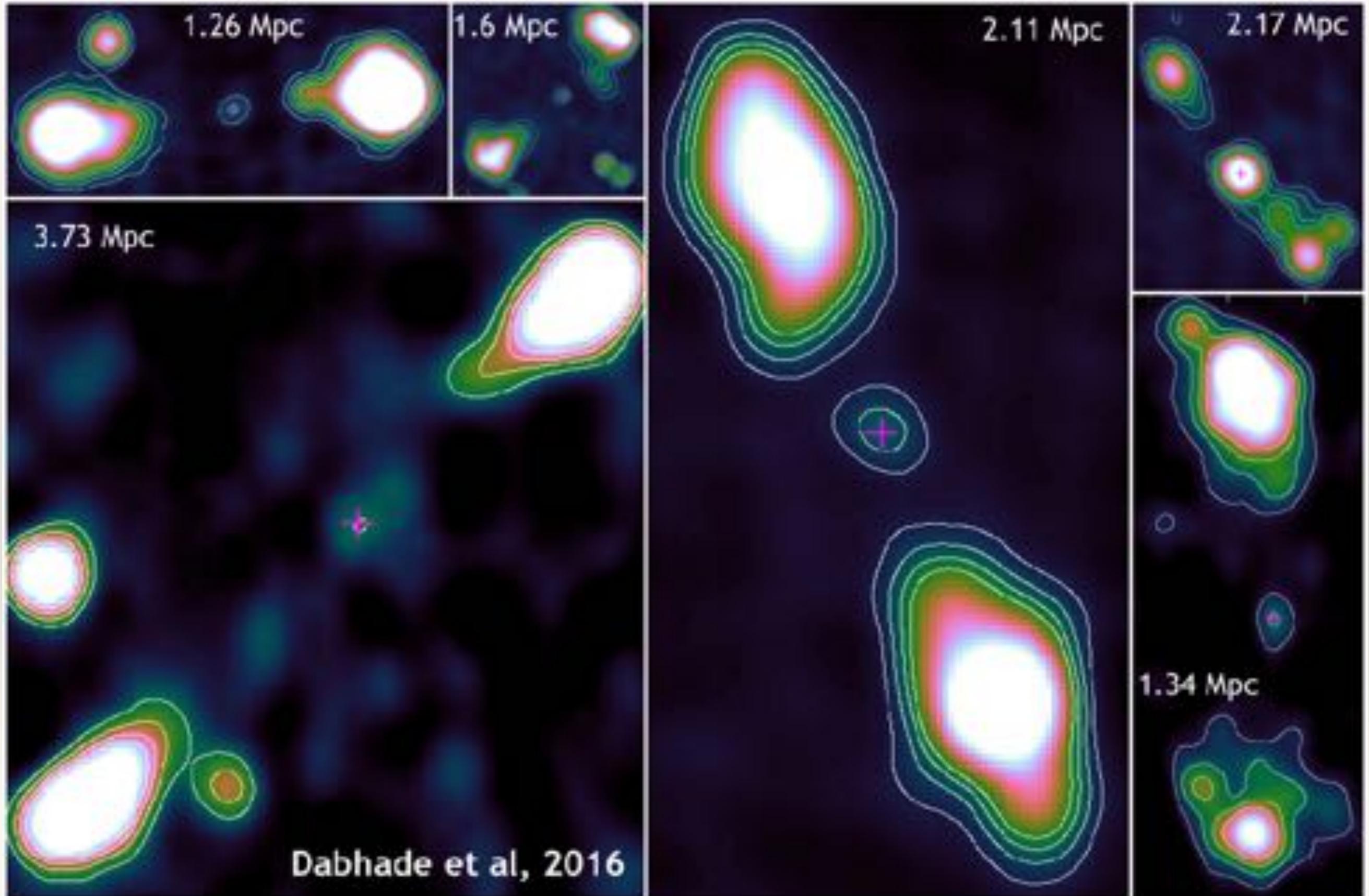
Redshift range ~ 0.04 to 0.8

Ongoing

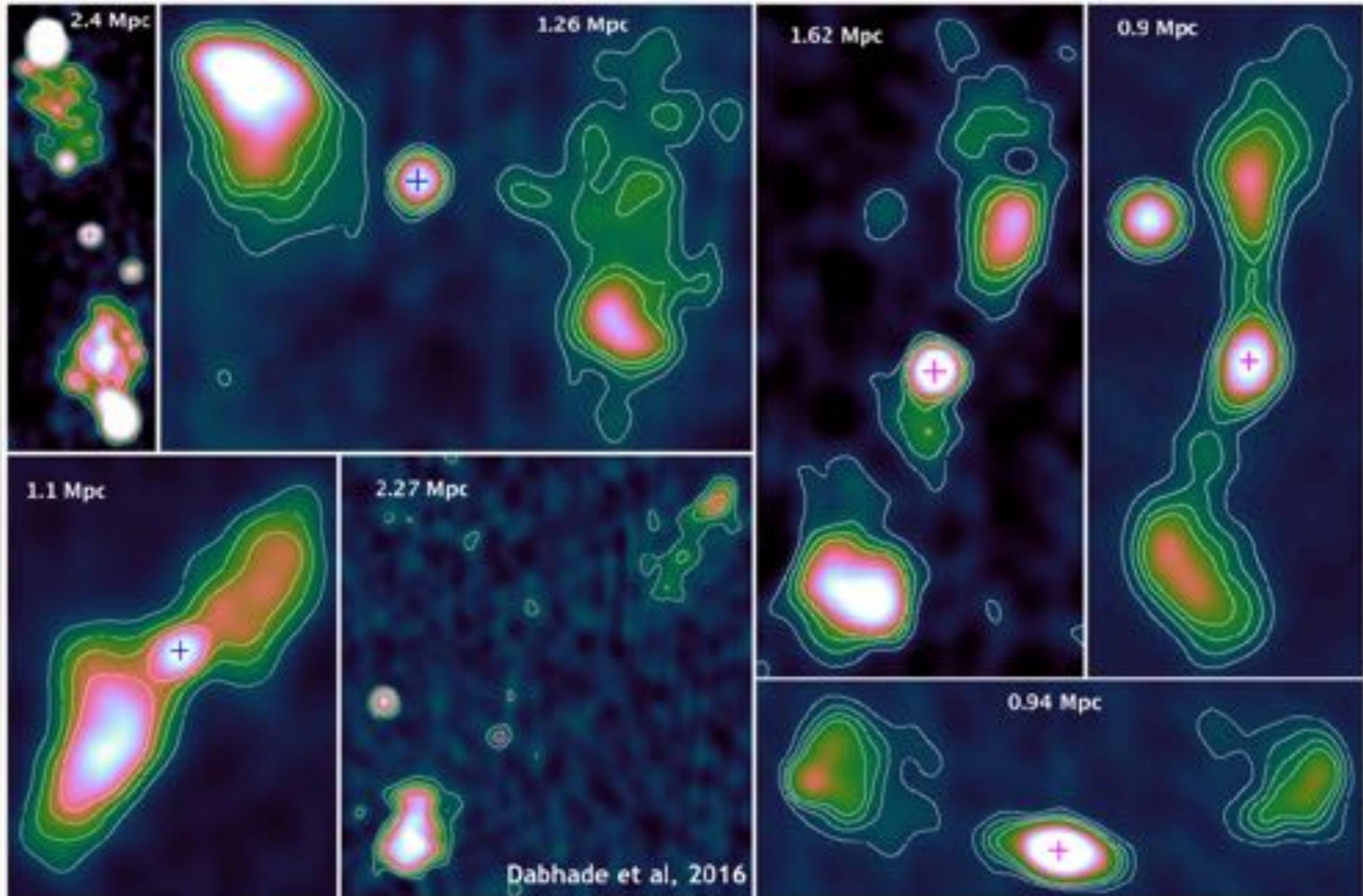
Results of GRCG hunt



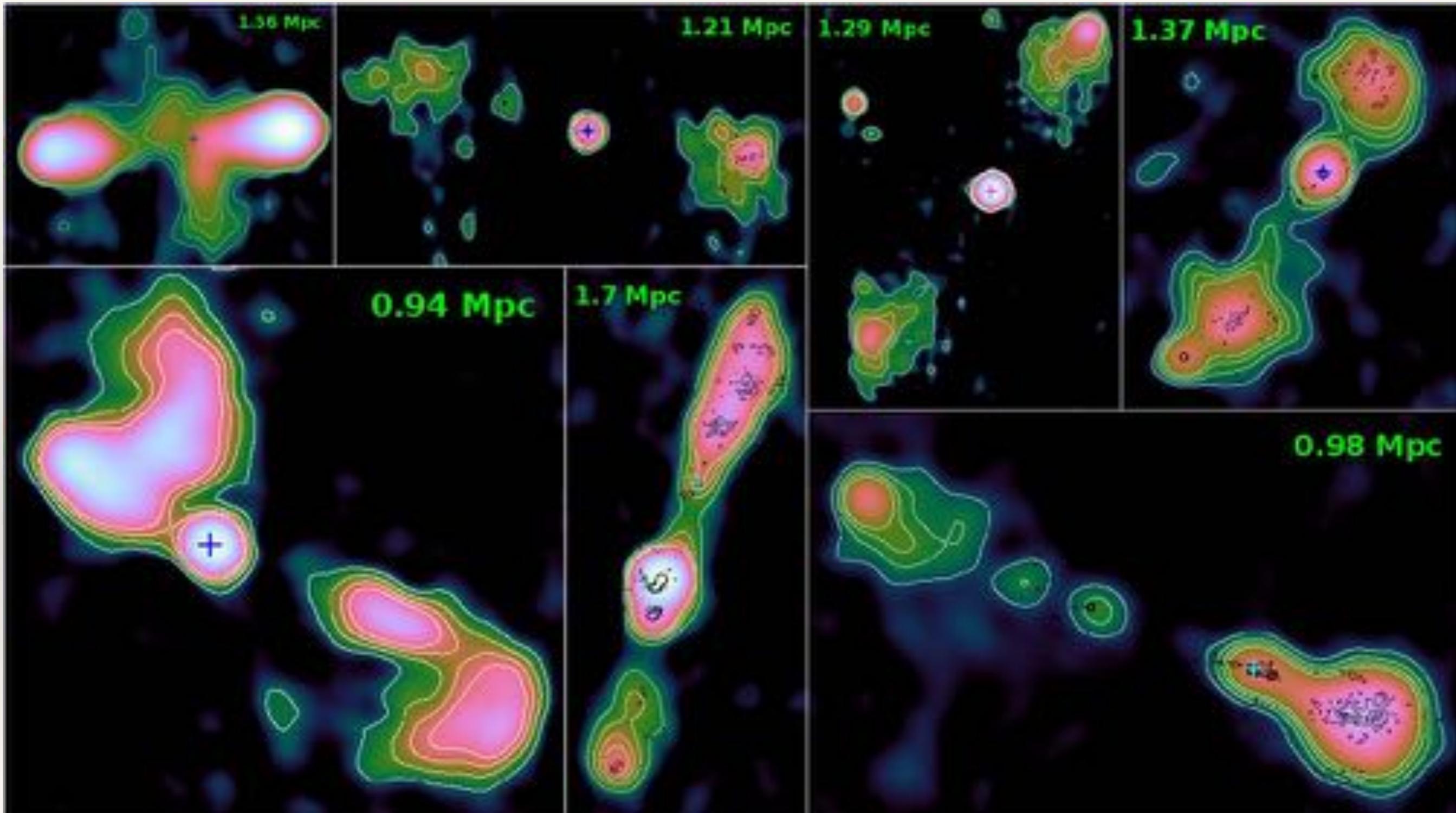
Sample of new GRGs - 1



Sample of new GRGs - 2



Sample of new GRGs - 3



Goals for SAGAN

- ❖ Radio follow up for (multi-frequency) high resolution maps along with good sensitivity and further spectral ageing studies.

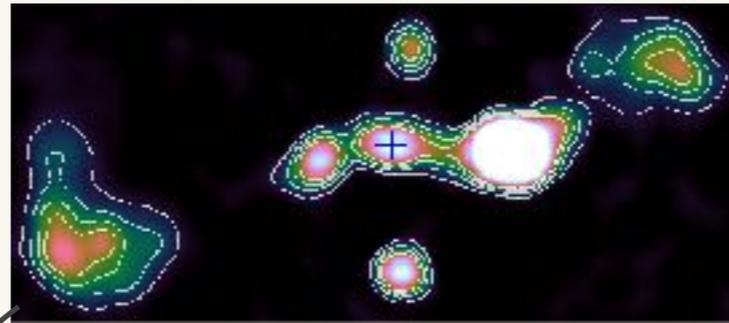


**5 GMRT Proposals and 1 LOFAR proposal accepted.
Multi-frequency data for 10 new GRGs obtained.**

GRC with turbulent morphology ?



Further investigation with GMRT

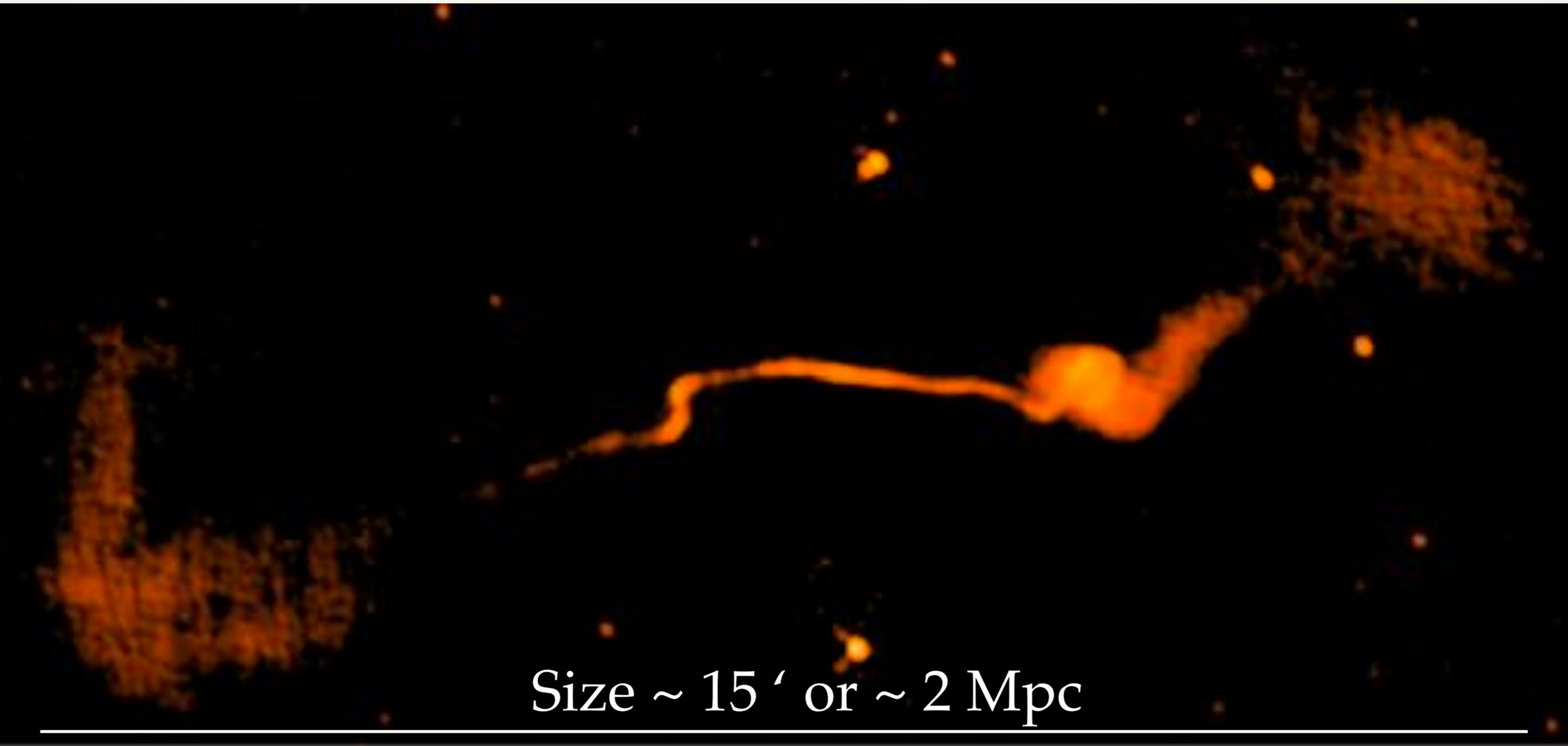


30 dishes of 45 m each. Longest baseline ~ 25 Km!



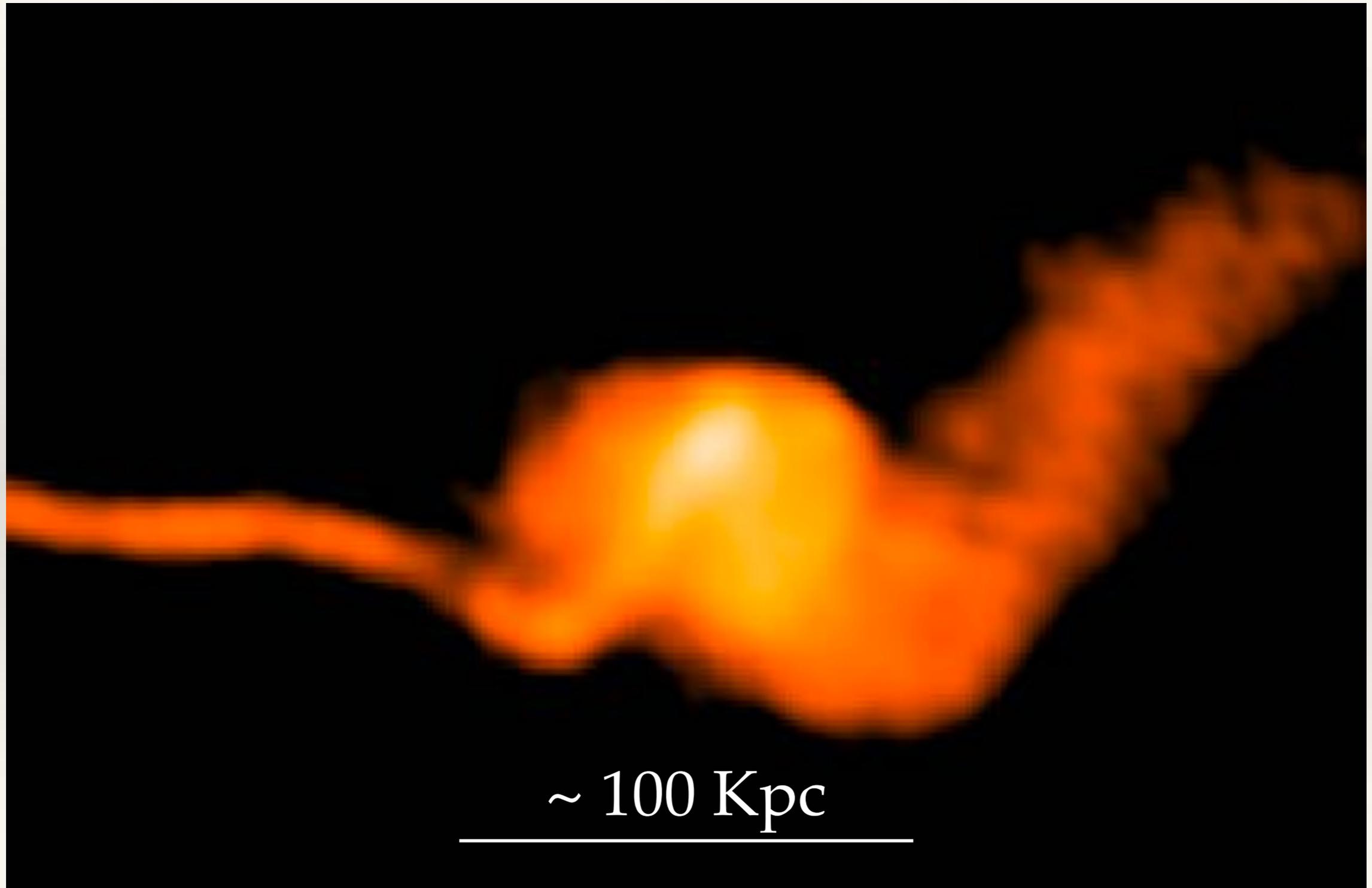
GMRT 610 MHz

~ 5'' resolution and ~ 40 microJy rms

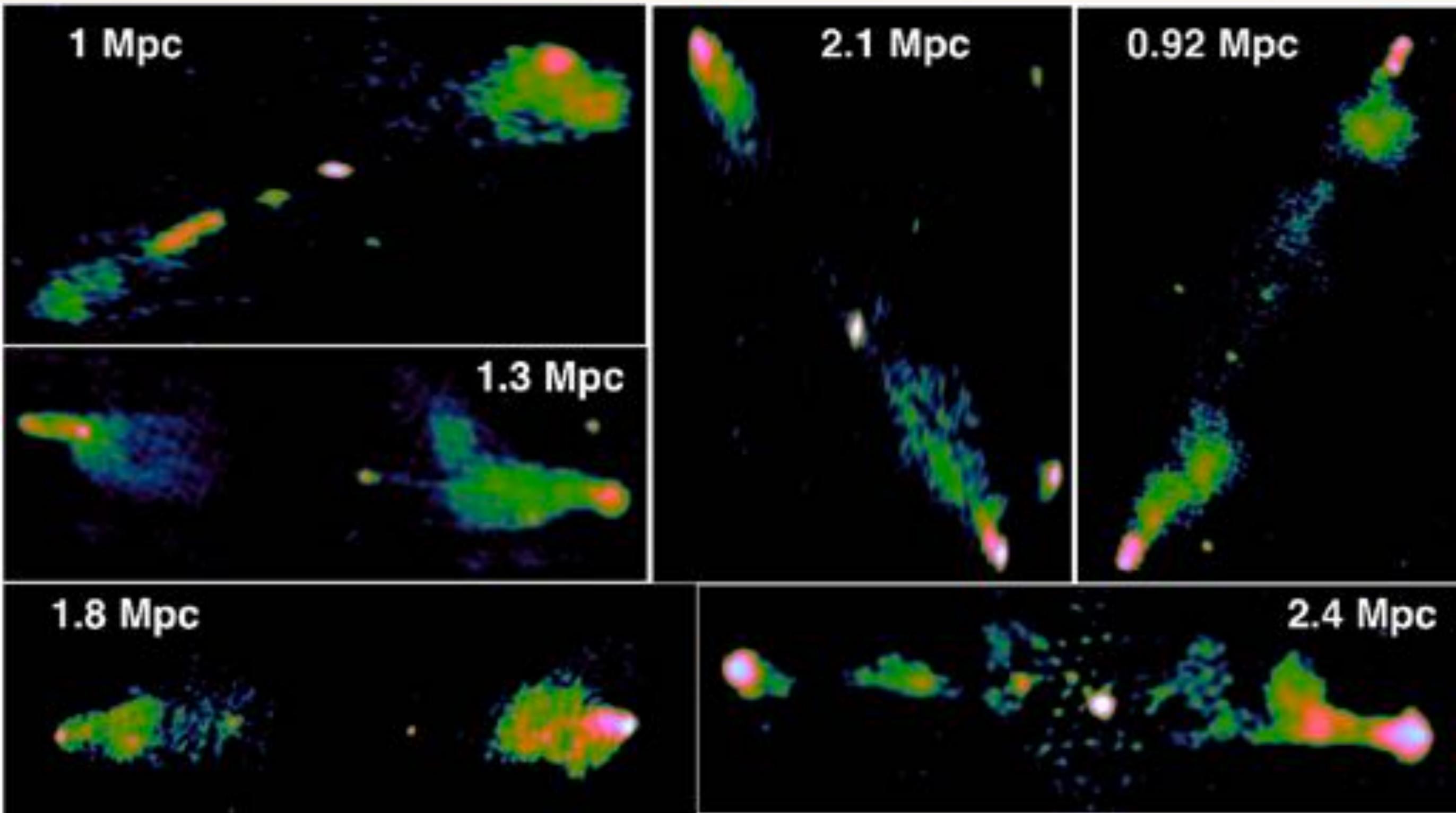


Size ~ 15 ' or ~ 2 Mpc

Omega shaped kink (100 kpc)



GMRT 610 MHz



Goals for SAGAN

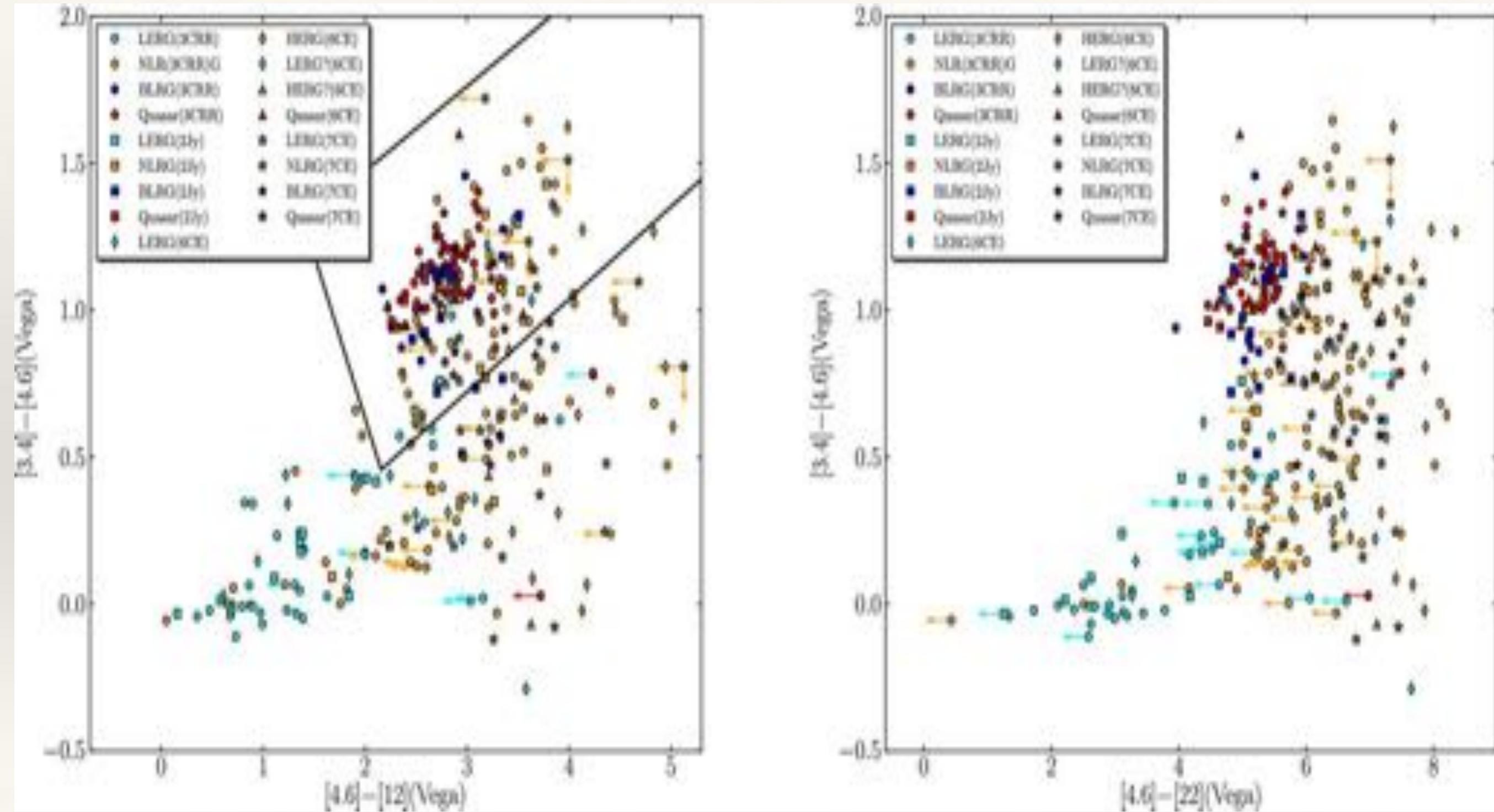
- ❖ Studying the host galaxy / AGN properties of GRGs using multi wavelength observations in mid-infrared , millimetre wave etc.



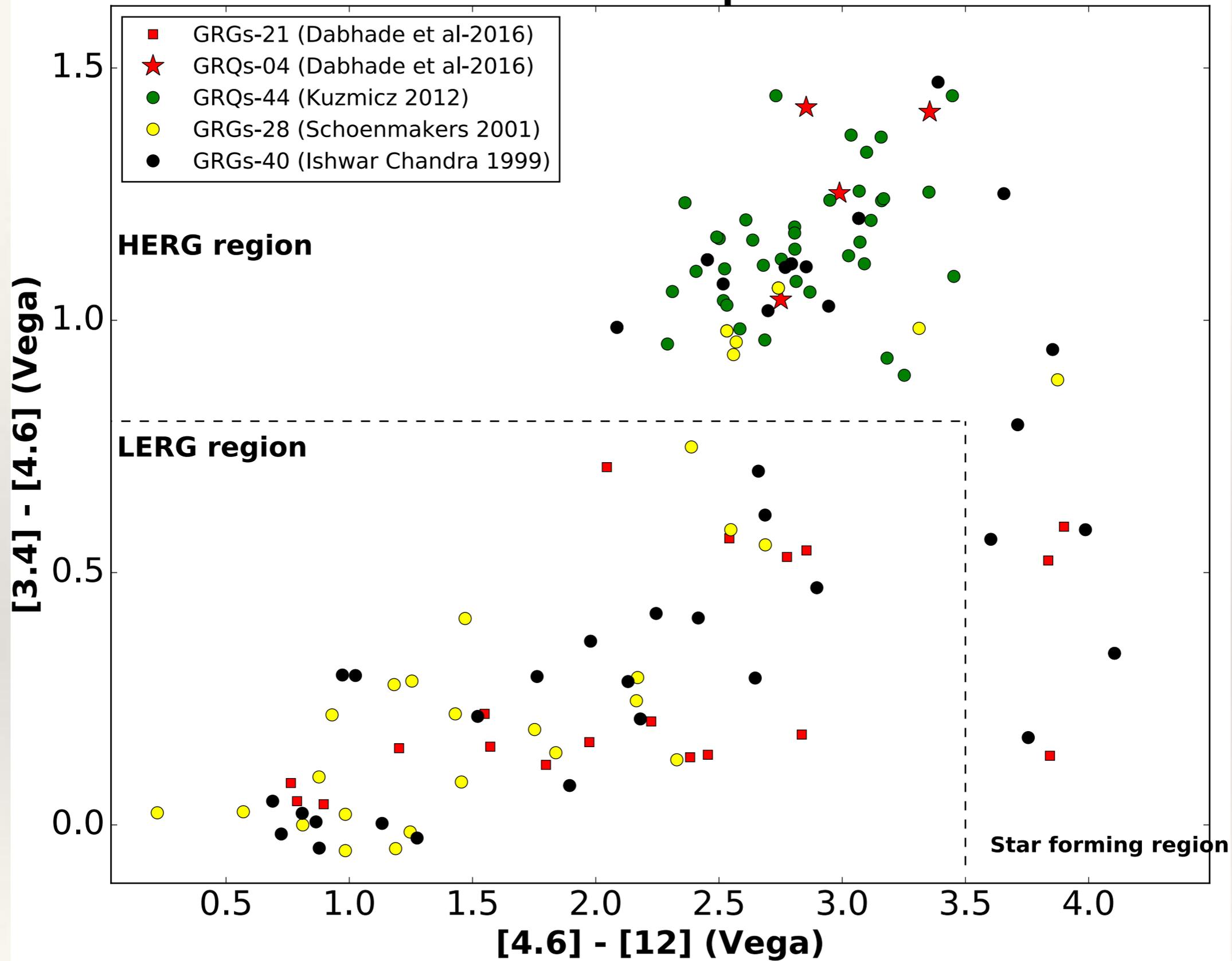
Molecular lines observations using IRAM to detect CO
&
mid-IR studies of hosts.

Mid-IR properties of radio AGN

WISE colour colour plot (Gurkan et al 2014)



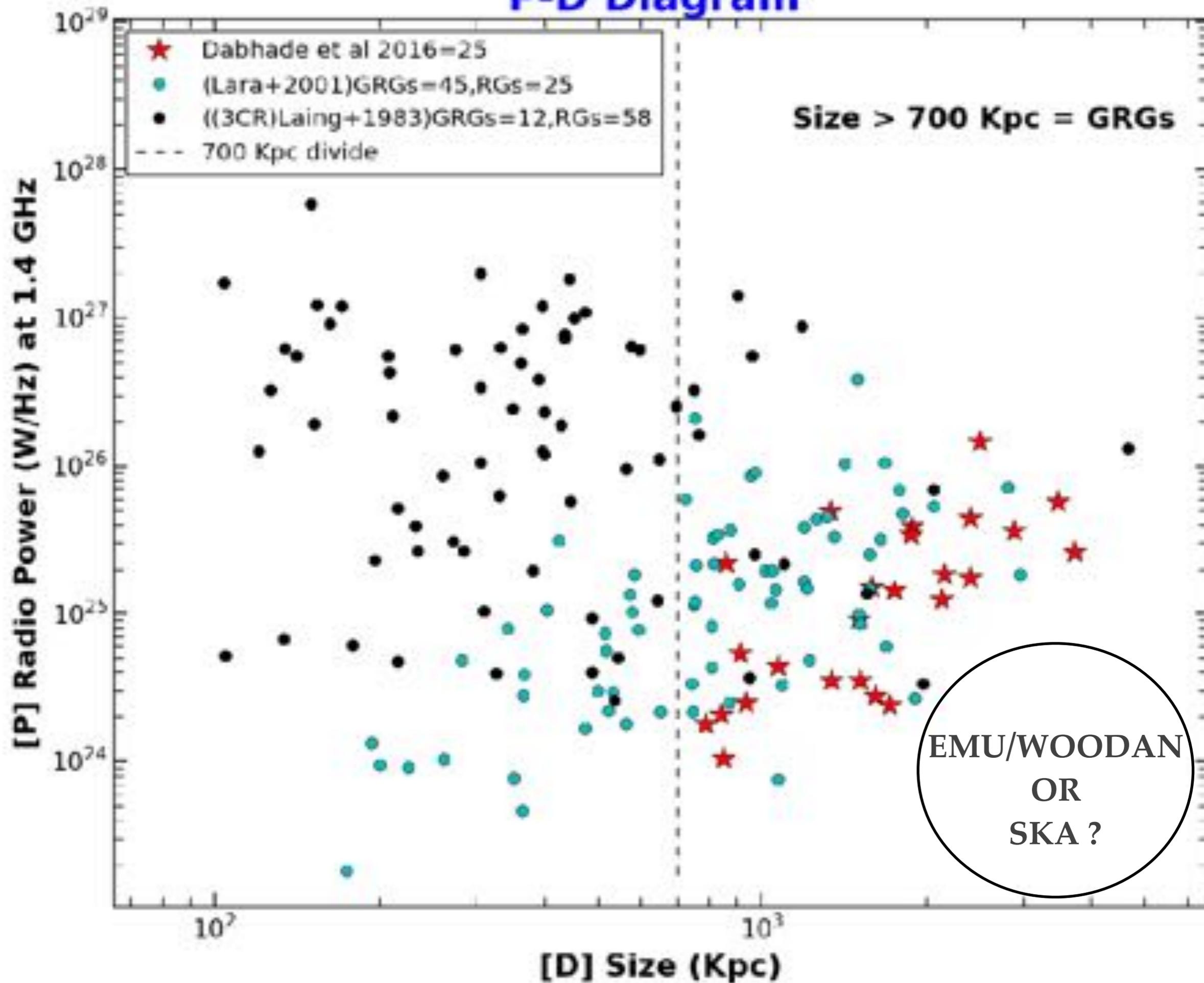
WISE colour-colour plot for GRGs



Goals for SAGAN

- ❖ Study growth & evolution of GRGs.

P-D Diagram



Future plans

- ❖ Systematic environment studies of GRGs- Clusters or voids ?
- ❖ With future high resolution and sensitive surveys we will observe high z GRGs (whose nature is unknown).



Somewhere, something incredible is waiting to be known.

- Carl Sagan

Thank you

A vibrant astronomical image of a nebula, likely the Helix or Ring Nebula, showing intricate red and green filaments and numerous bright stars against a dark cosmic background. The red filaments form a complex, swirling pattern, while the green stars are scattered throughout the scene.