Swiss SKA Days, 8 Sept 2021

# MeerKAT Galaxy Cluster Legacy Survey


## Kenda Knowles
### Rhodes University / SARAO

(on behalf of the MGCLS collaboration)

# MeerKAT Galaxy Cluster Legacy Survey

- ☆ **115 targets**
- ☆ ~ 1000 hours with ~60 dishes
- ☆ L-band (900-1670 MHz) – central freq ~ 1.28 GHz
- ☆ 6 – 10 hours per cluster (FULL POL)
- ☆ Radio- and X-ray-selected
  - –80° to +0° dec
  - median z ~ 0.14

# Legacy Data Products

**PUBLIC on acceptance of survey overview paper ( ≤ end of 2021 )**

- ☆ Raw visibilities

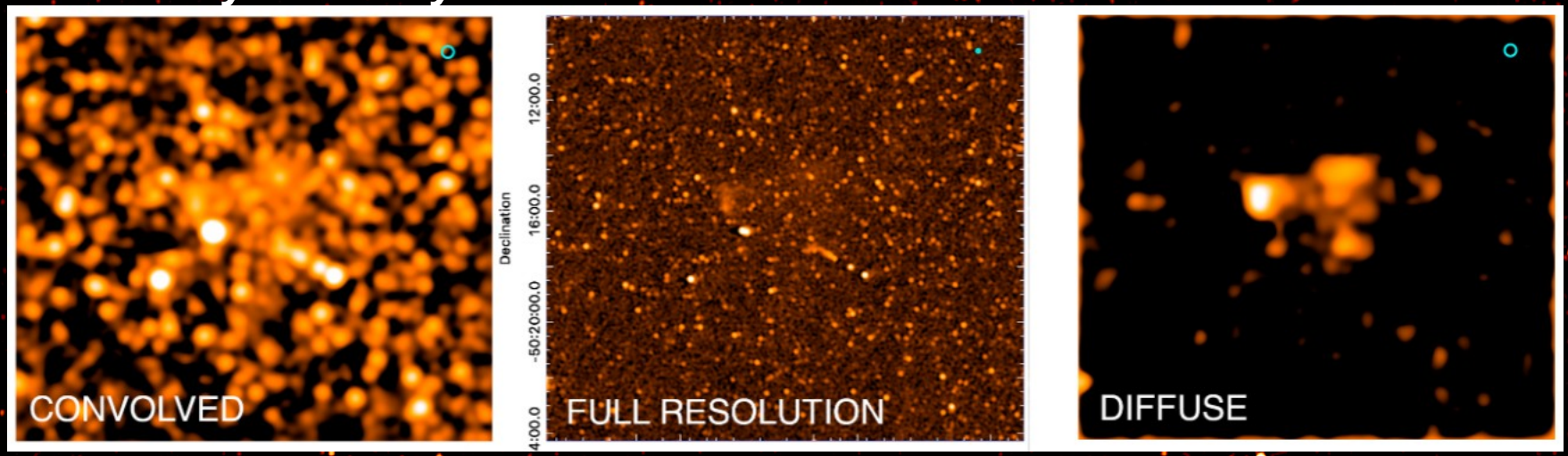
- ☆ Image Products (~4 – 7 uJy/beam RMS)
  - Basic:
    - 16-plane cube (total intensity, spix, 14 freq)
  - Enhanced (~8” and 15” resolution):
    - PB-corrected total intensity + spix cube
    - PB-corrected frequency cube (12 planes)

NO DDE calibration

- ☆ Source catalogues

# Some capabilities....

## Sensitivity on many scales



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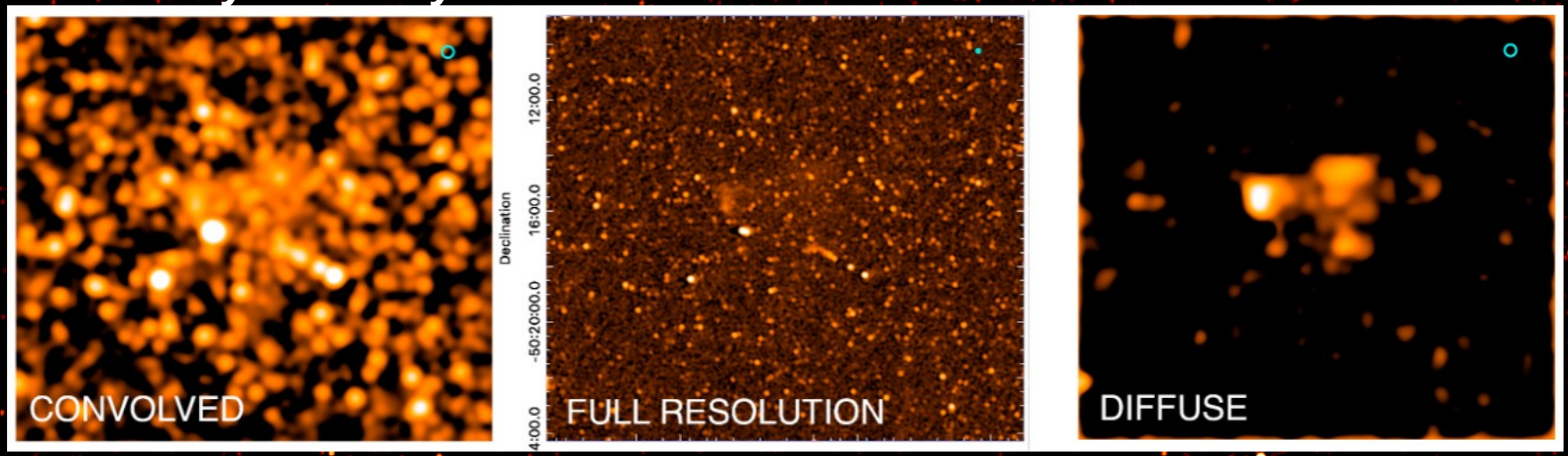
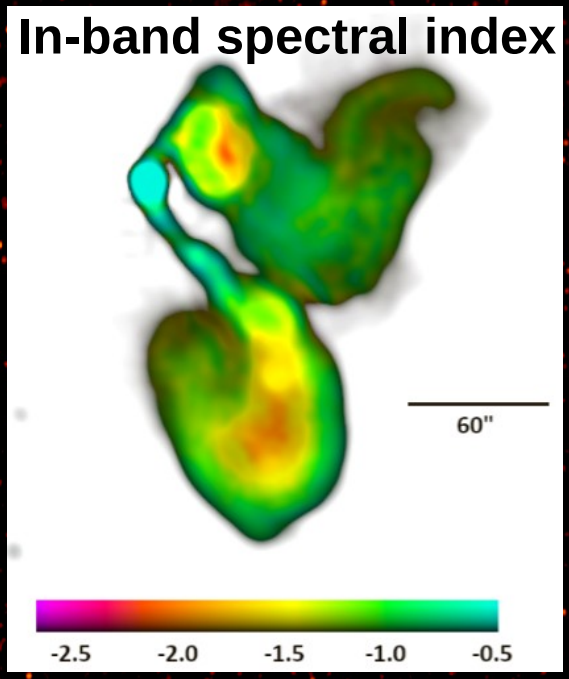



## In-band spectral index



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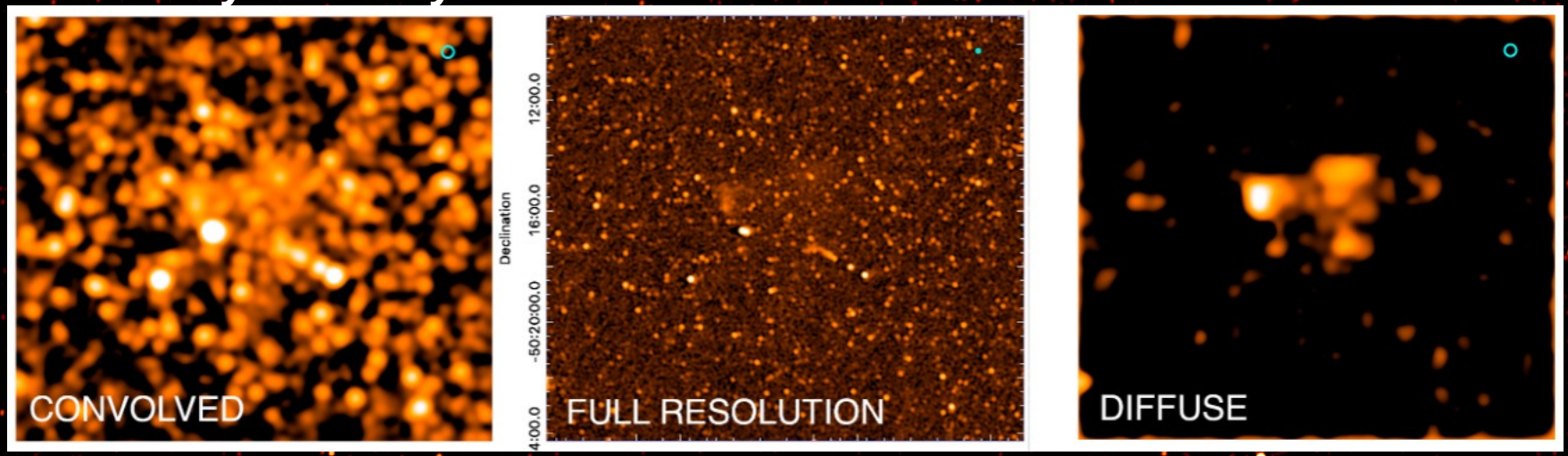


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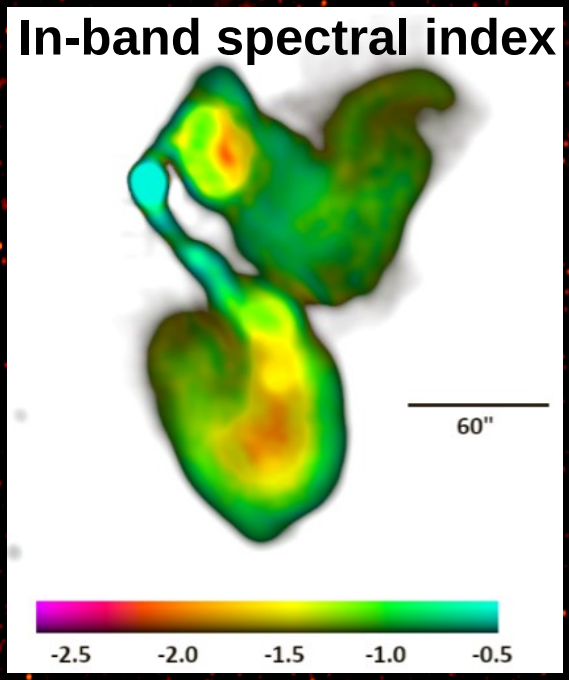
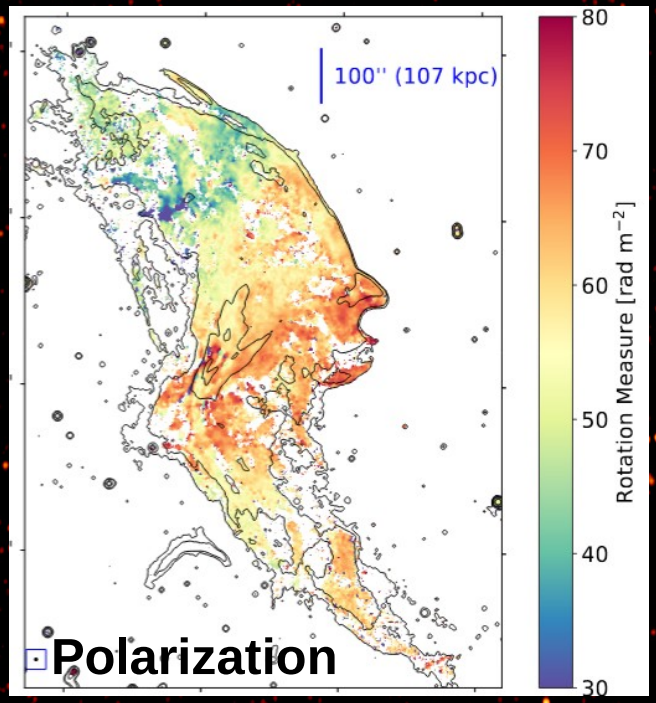
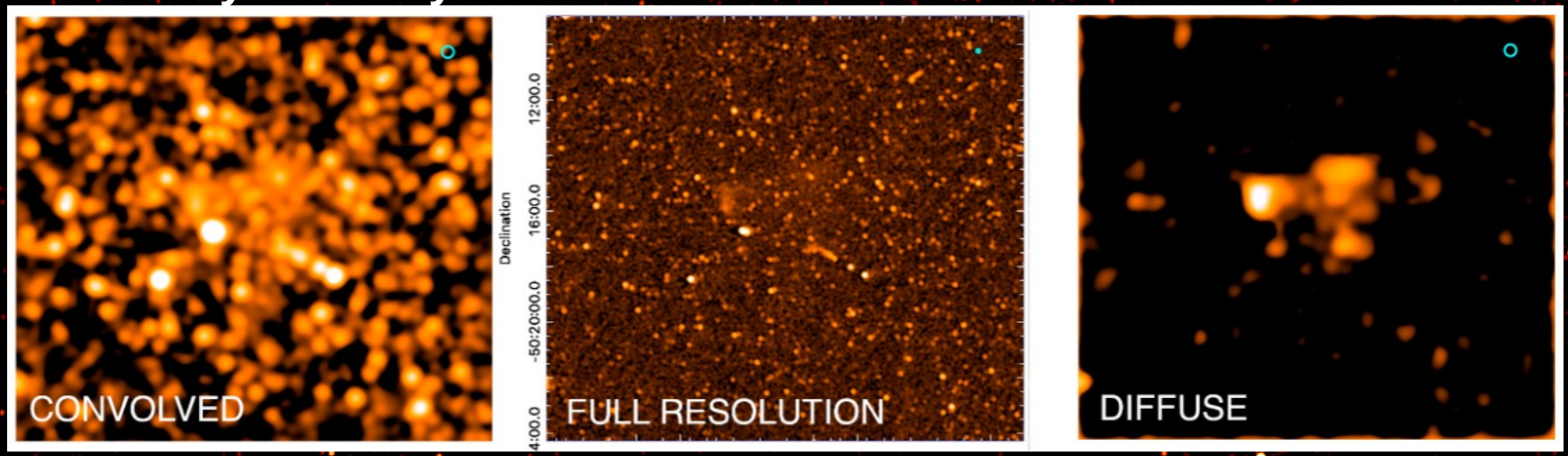



Polarization

# Some capabilities....

## Sensitivity on many scales

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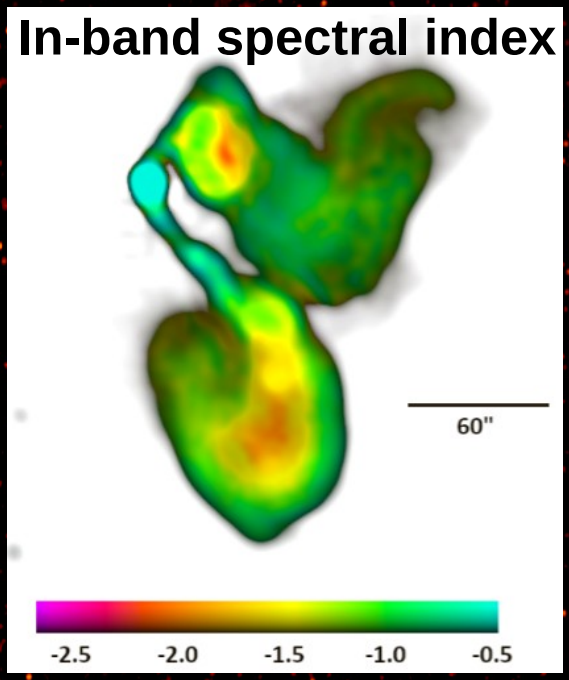
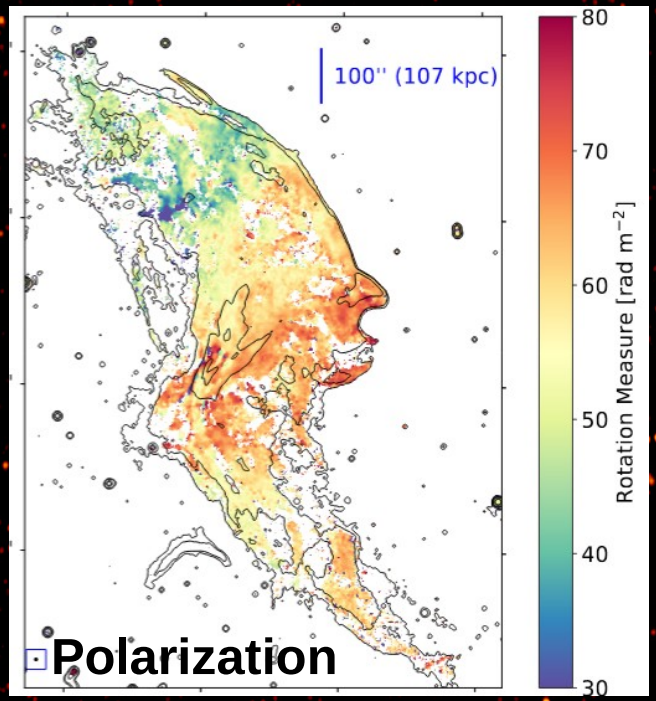
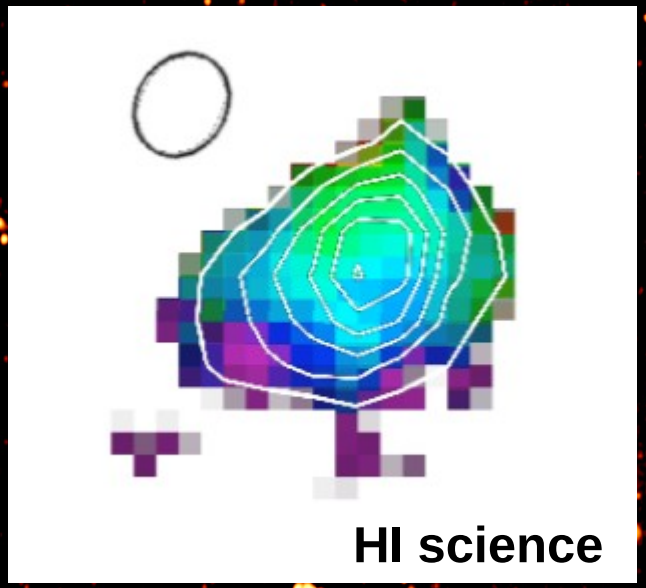
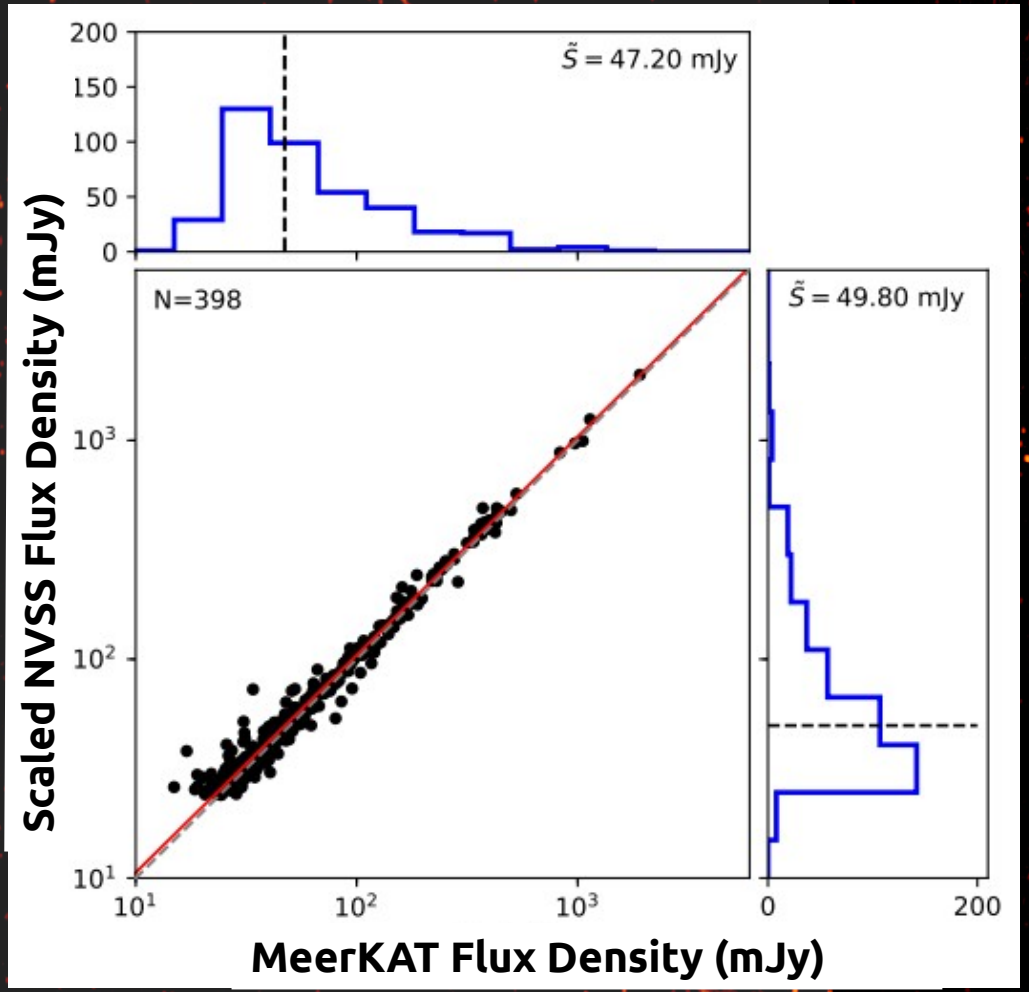


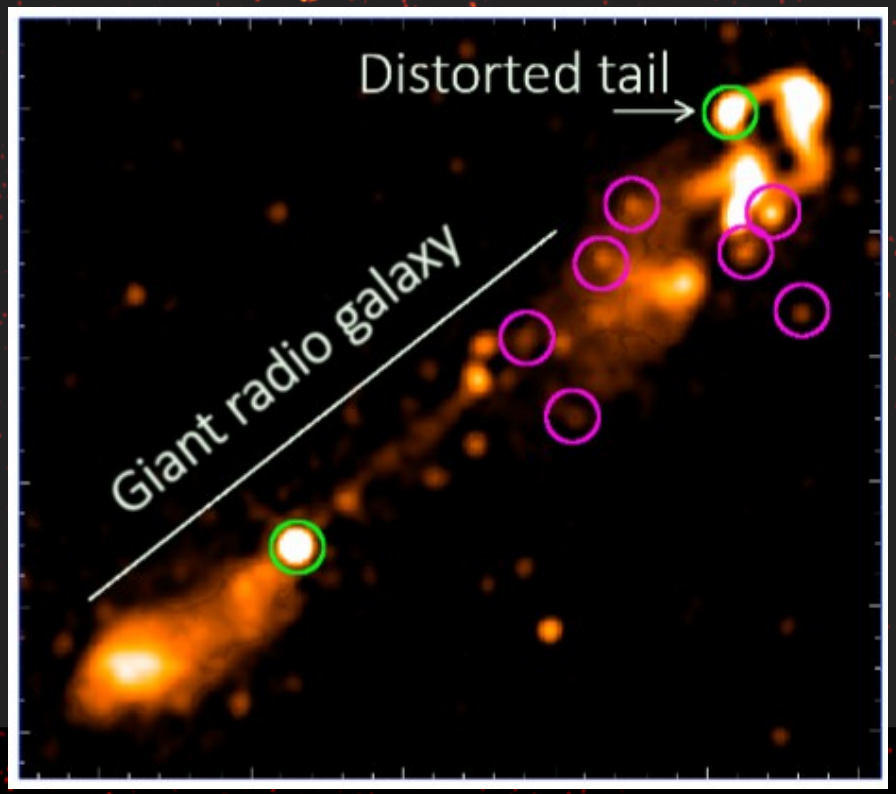
# Source Catalogues

- **Compact source** catalogue (all clusters)
  - single-gaussian source fits from pyBDSF
  - ~ 626,000 sources
    - median: 6000 / field
    - max: 8600 / field
  - artefact excision applied (removes ~2.6% sources per field)



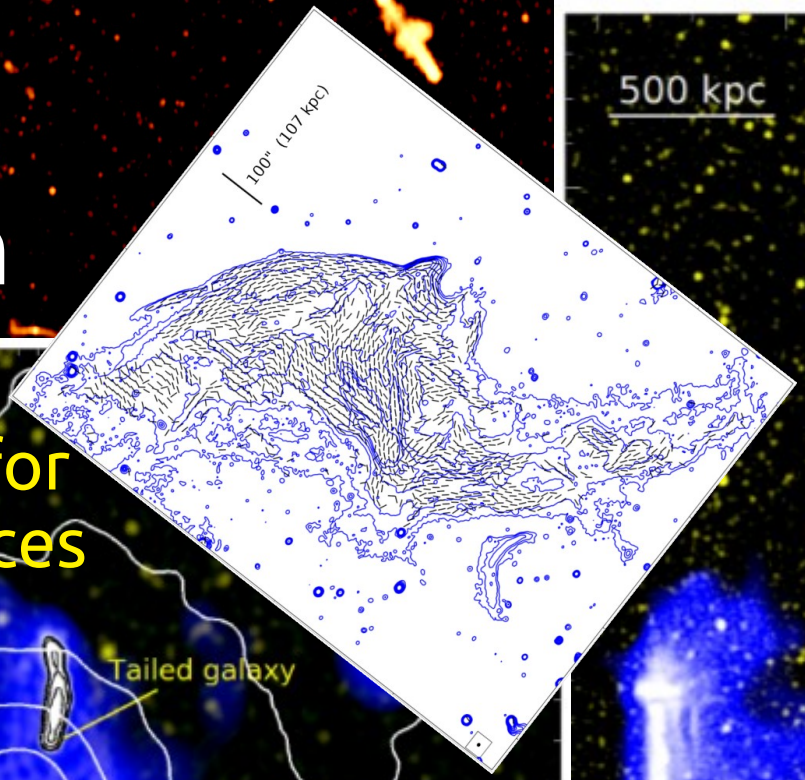
# Source Catalogues

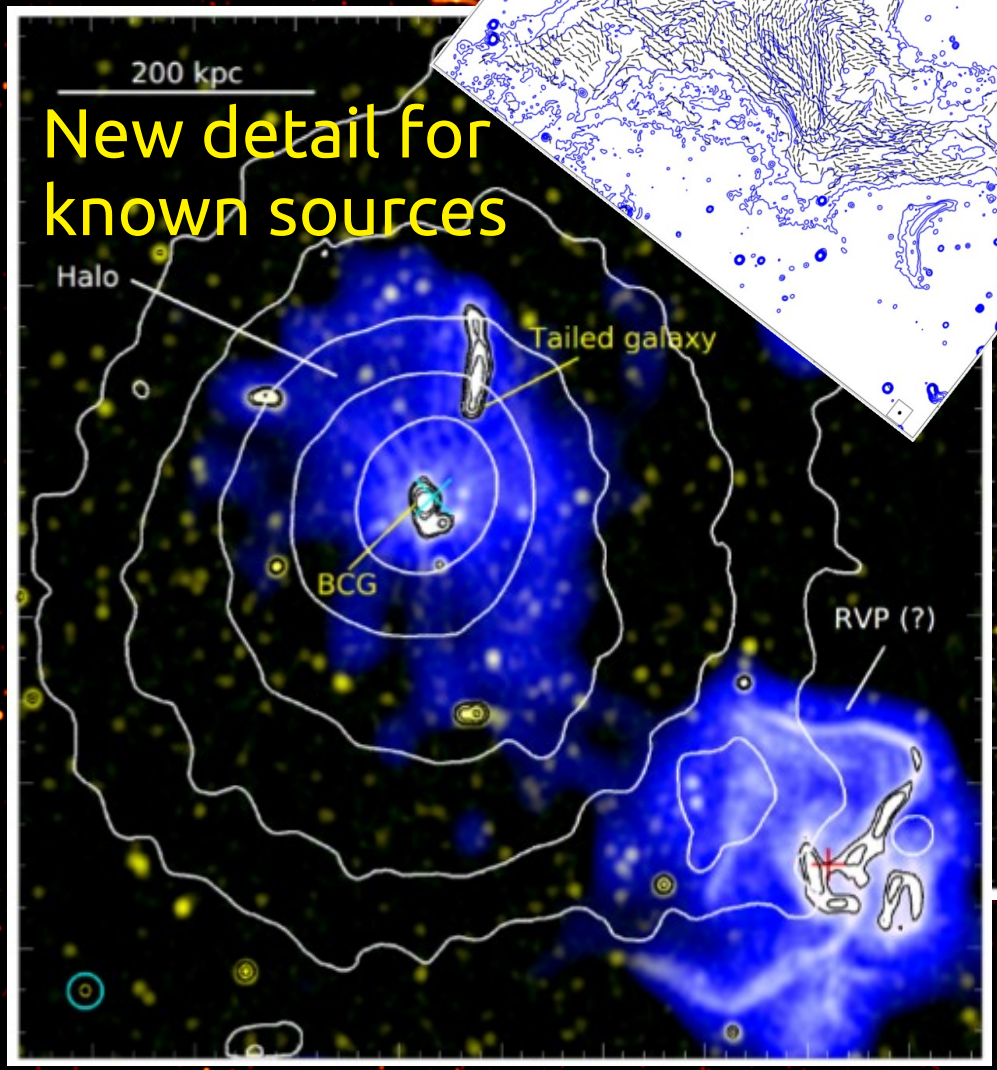
- Abell 209 and Abell S295
  - optical cross-match catalogue (DECaLS)
  - extended / well-resolved source catalogue

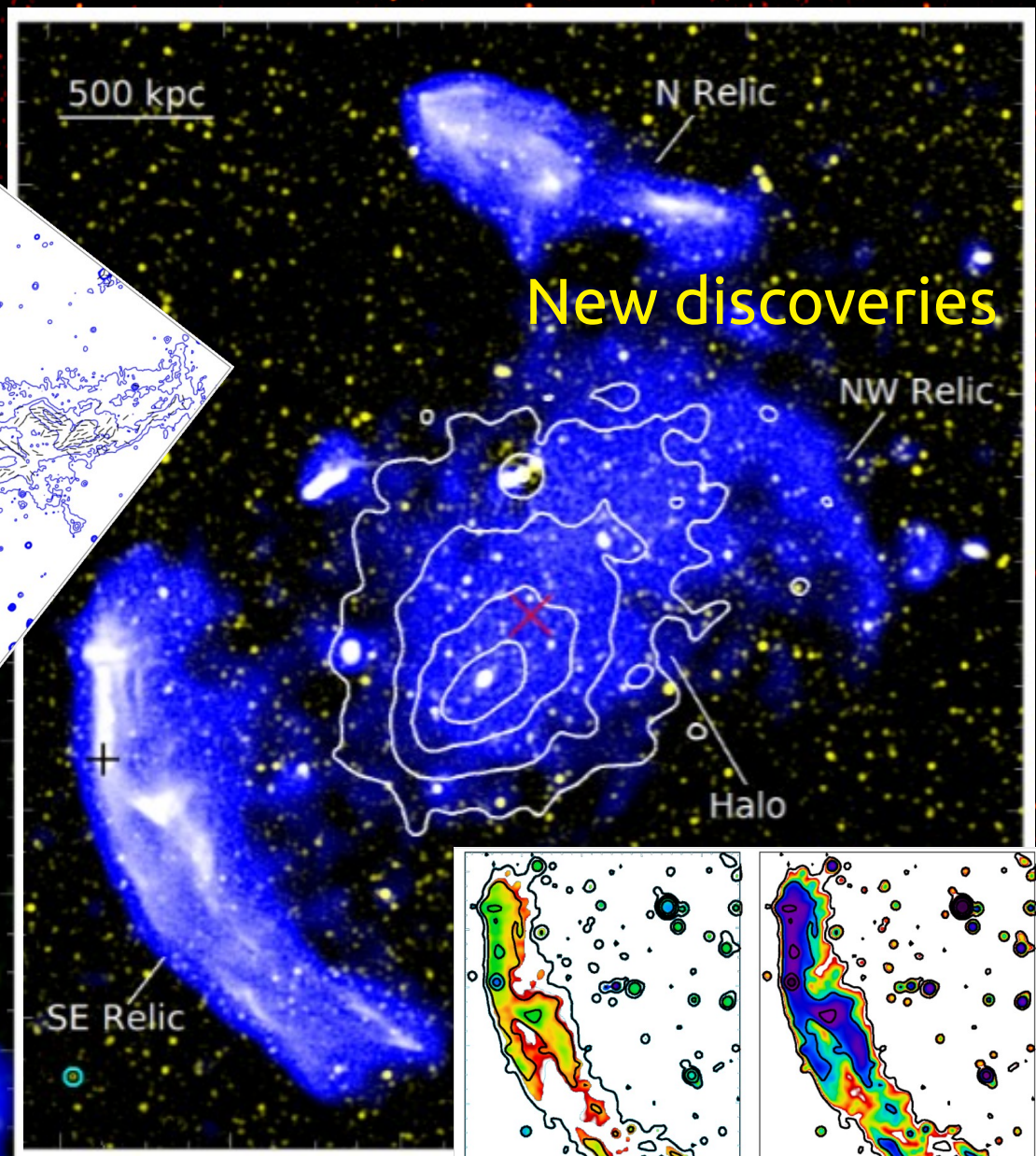


☆ 62 clusters ( ~54% ) - **99 distinct detections (56 new)**

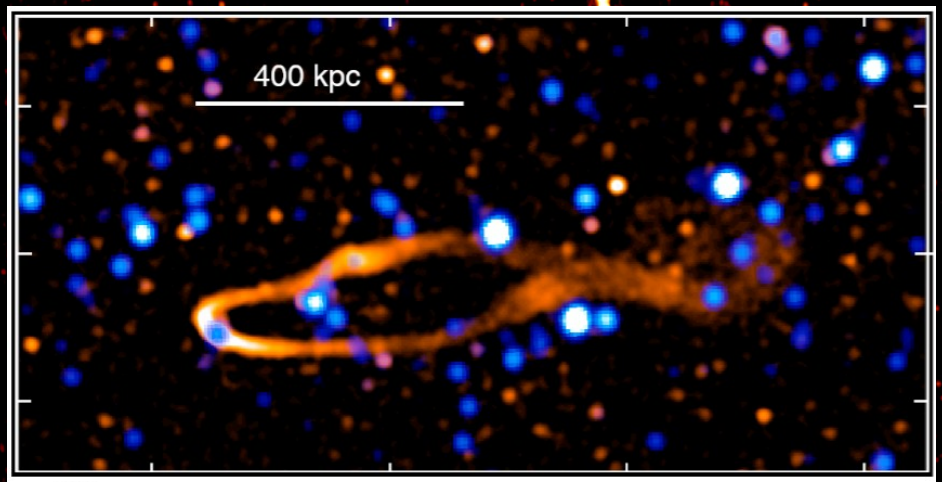
# Diffuse Cluster Emission

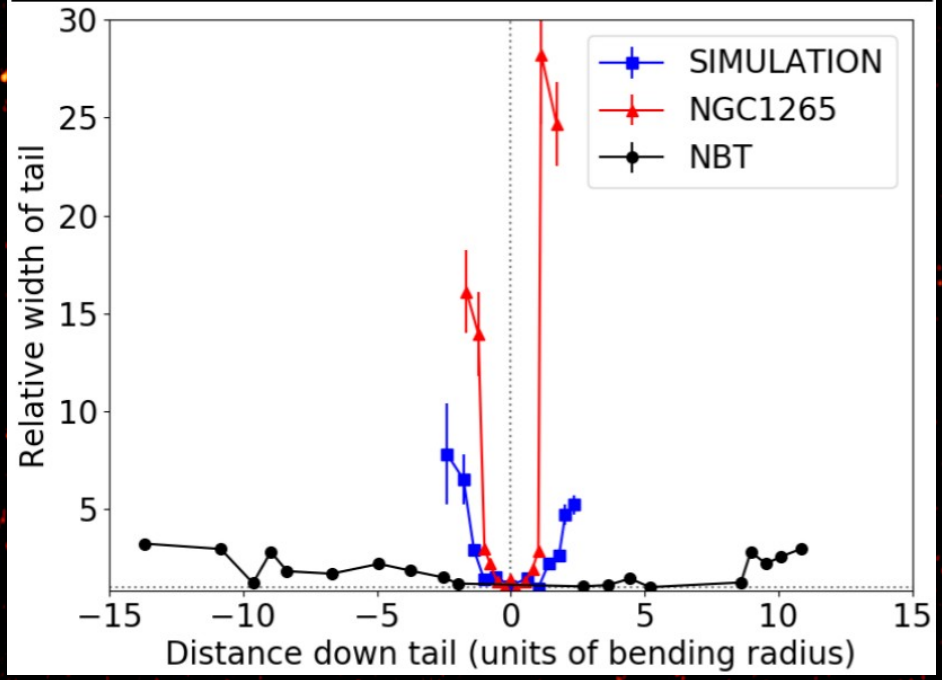


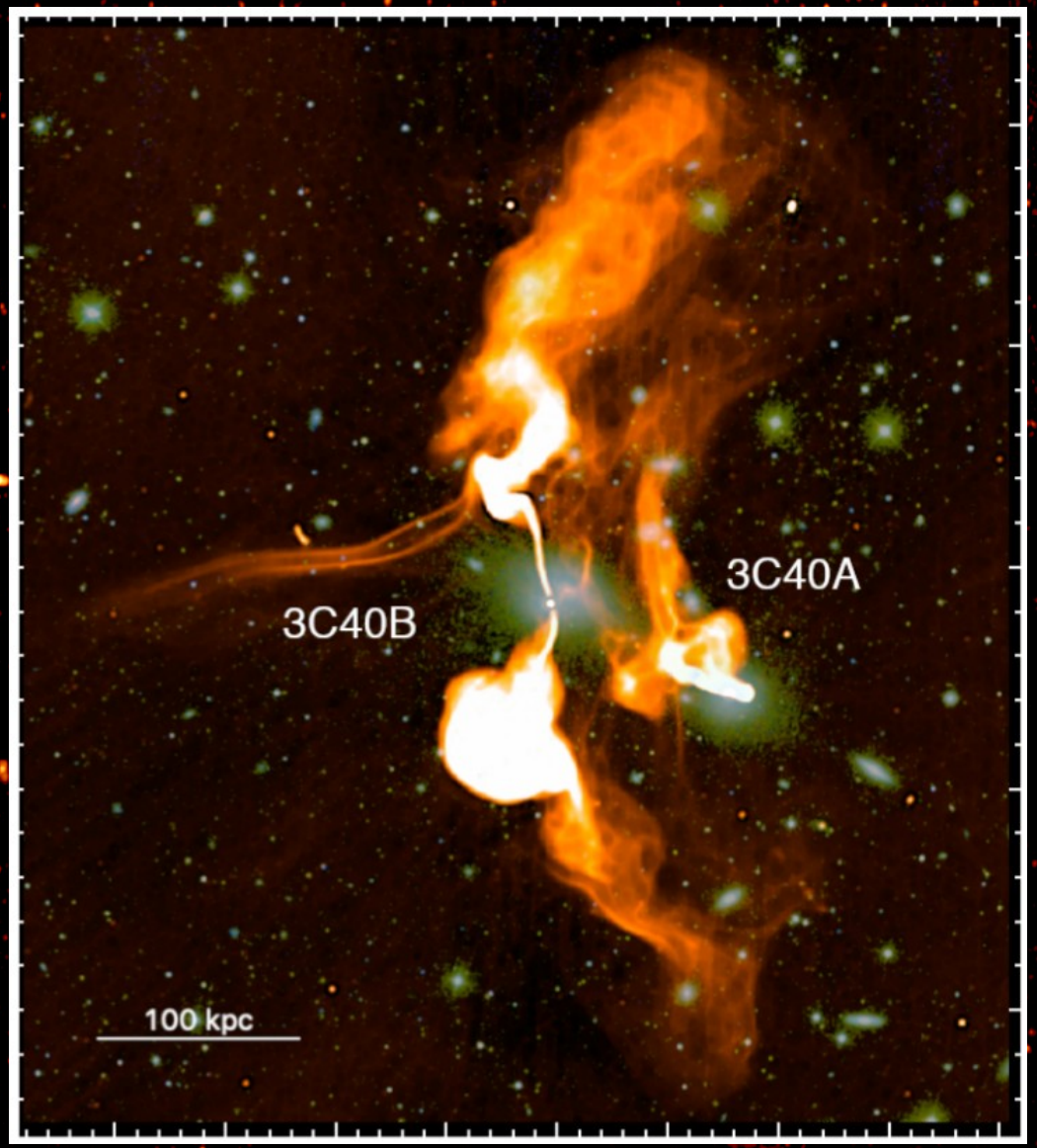



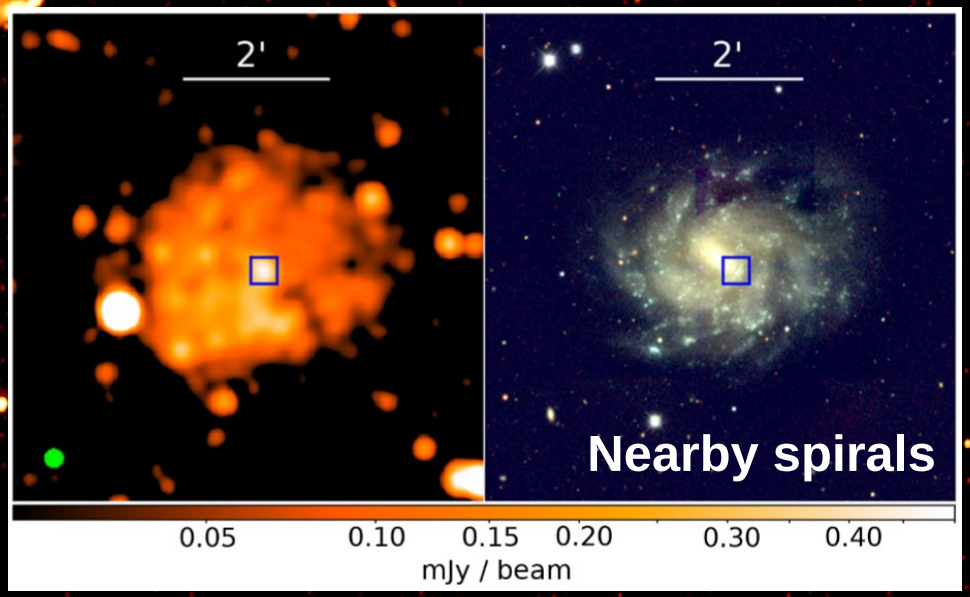
# Radio AGN: weird and wonderfuls...

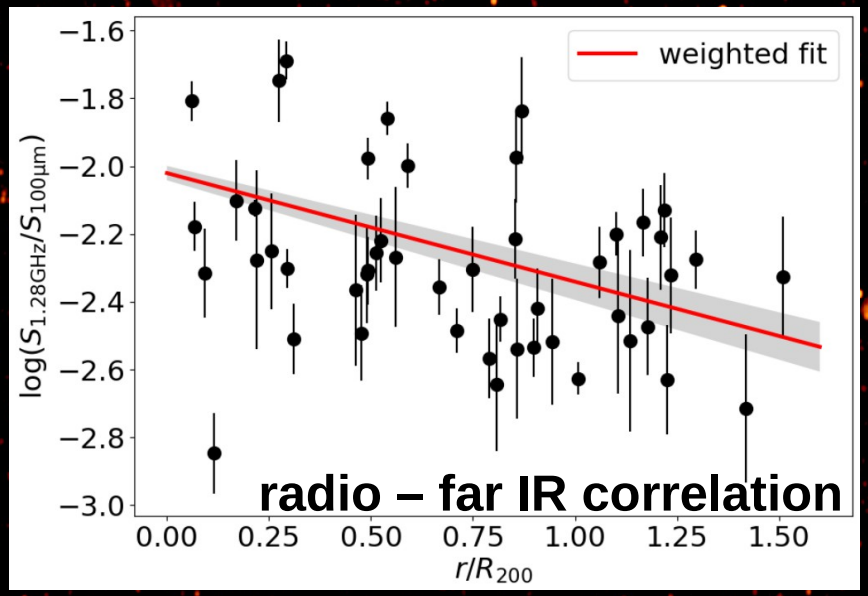


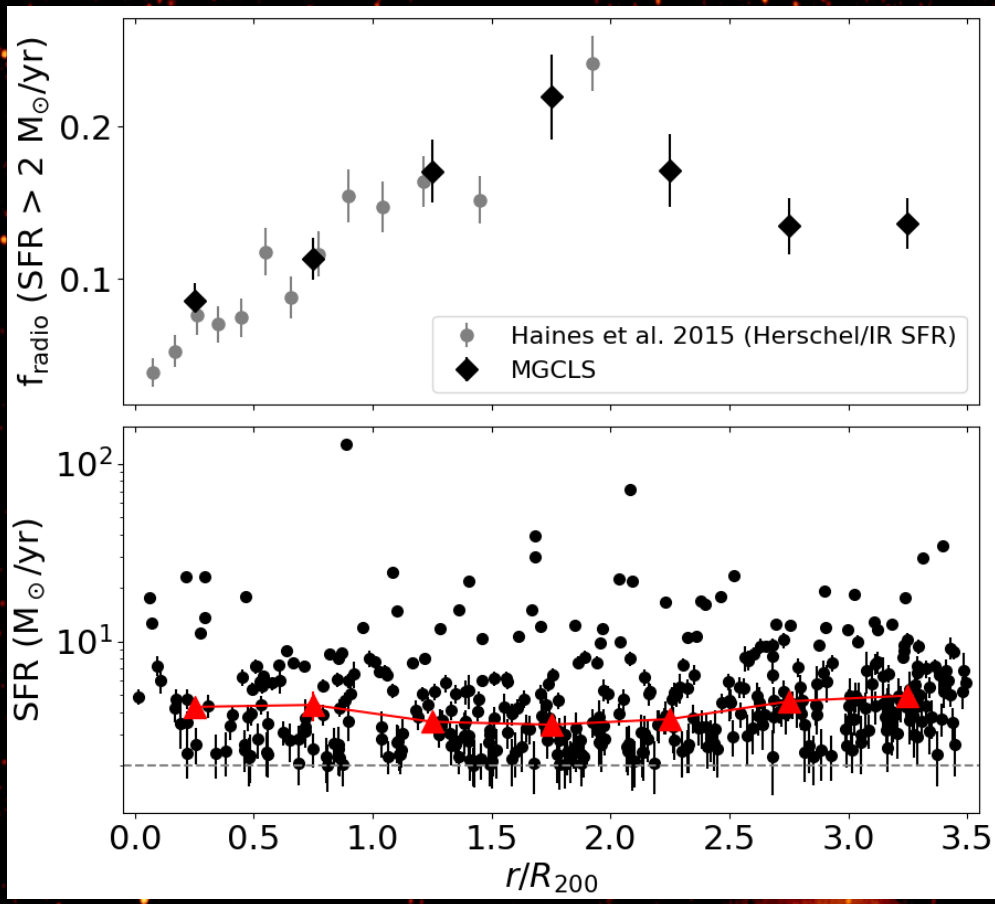



# Star formation

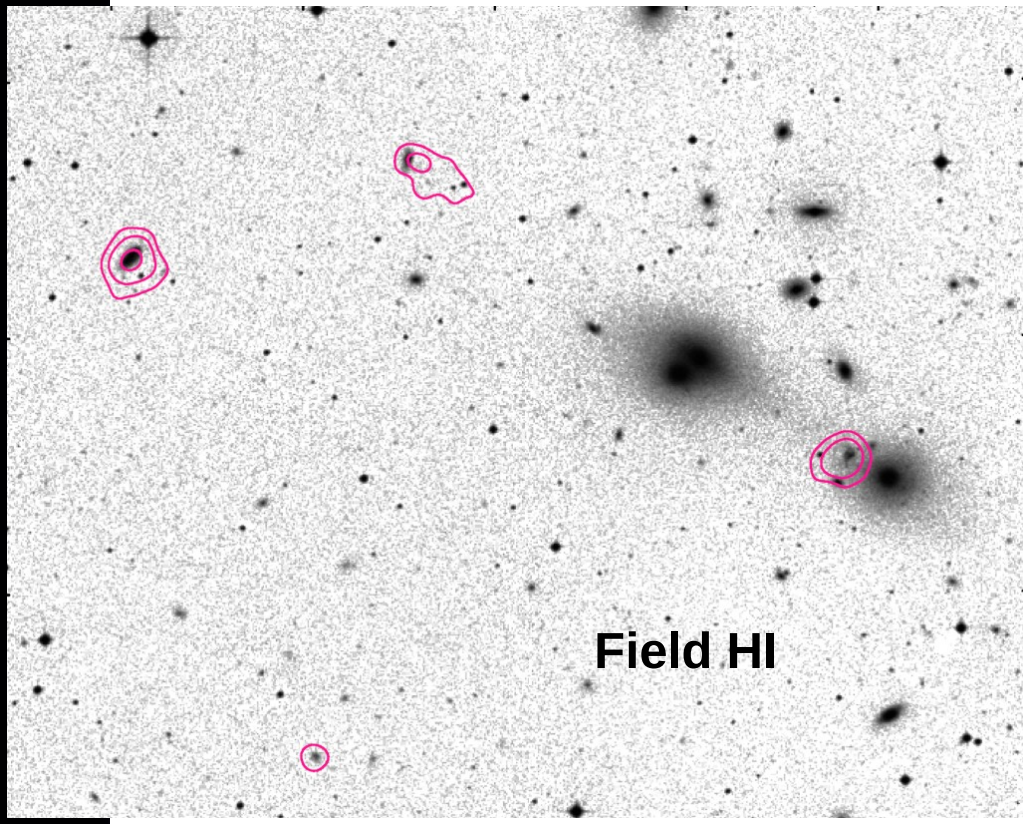


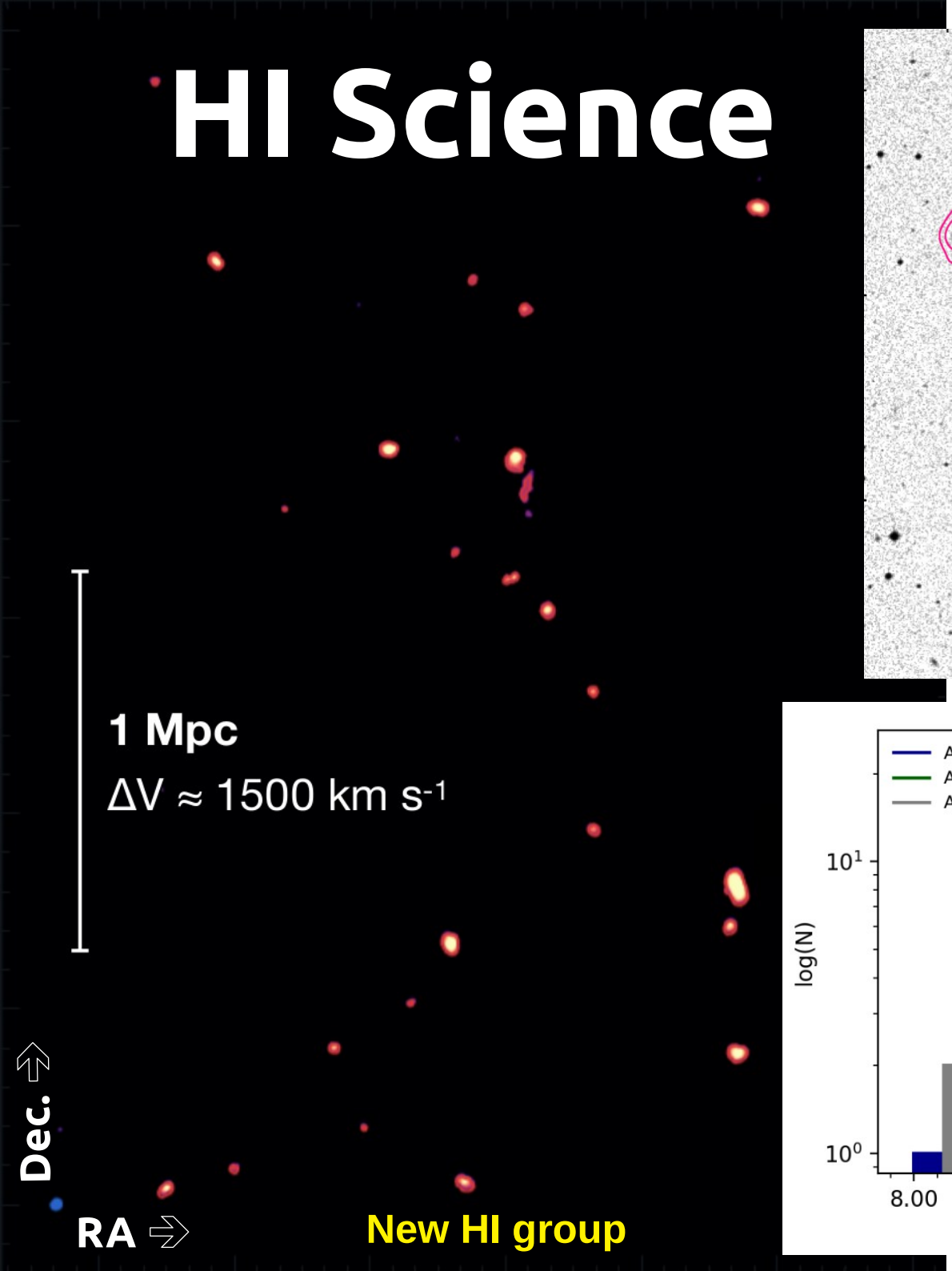



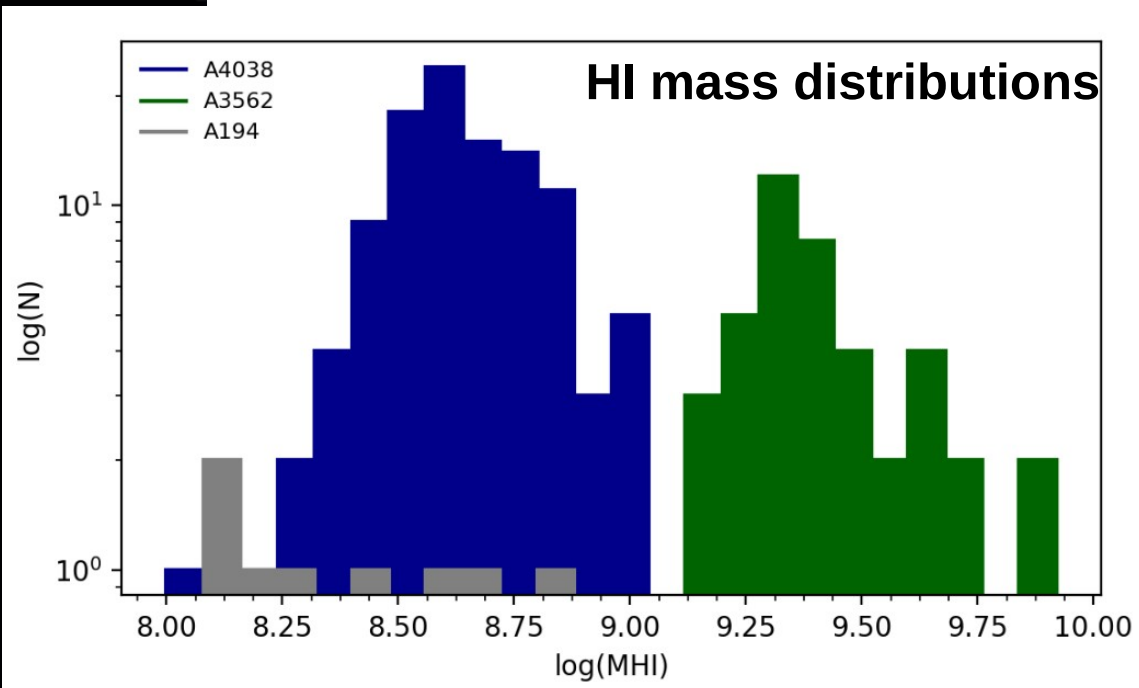




radio SFR studies beyond $R_{200}$

# HI Science


Field HI


1 Mpc
ΔV ≈ 1500 km s-1
Dec.
RA
New HI group


HI mass distributions
A4038
A3562
A194
log(N)
log(MHI)
10^1
10^0
8.00
8.25
8.50
8.75
9.00
9.25
9.50
9.75
10.00

# Summary

- ☆ MGCLS datasets have broad range of applications
  - sensitivity on wide range of scales
  - polarization
  - in-band spectral indices
  - HI science

- ☆ Paper in journal review - Legacy products will be public on acceptance

- ☆ Excellent tool to prepare for the SKA in calibration, science, simulations, theory

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