

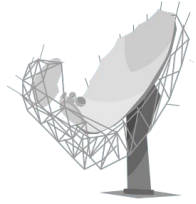


MGCLS

Legacy Hi data release

What is H_I?

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MGCLS - The MeerKAT Galaxy Clusters Legacy Survey

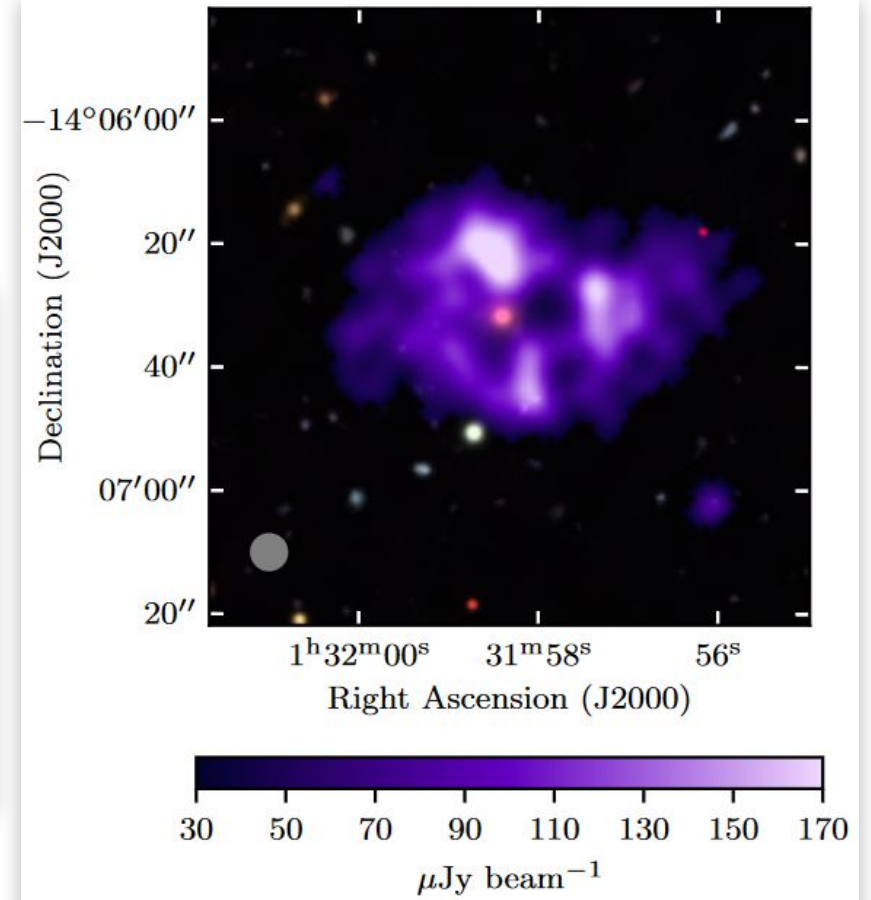
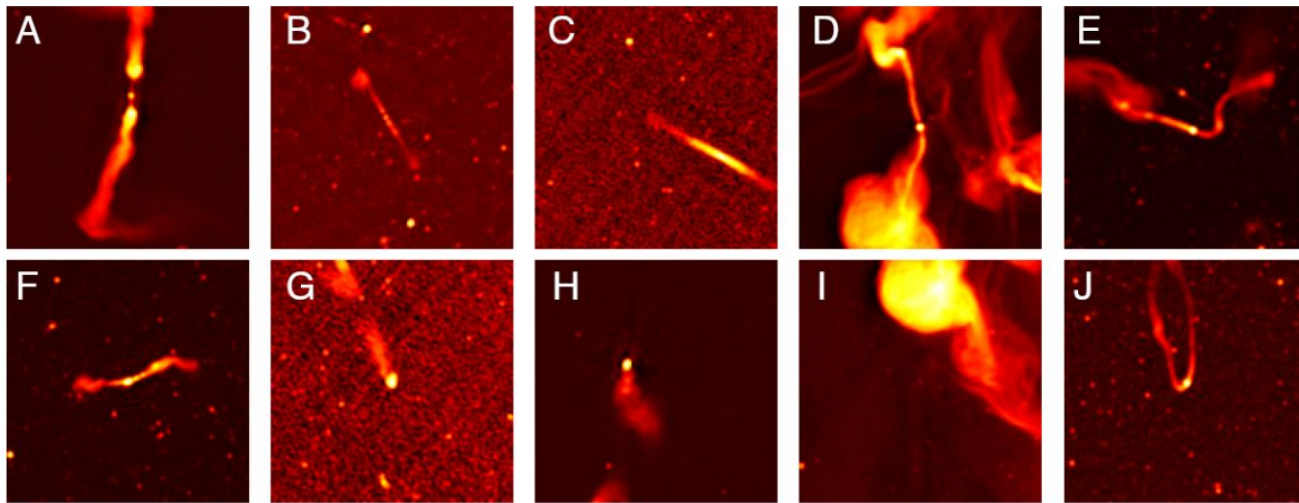
Background information

- 115 galaxy clusters
- Observing run: 2018 - 2019
- MeerKAT L-band 4K mode (0.9 – 1.67 GHz)
- 6-10 hour tracks on each cluster
- Focus on continuum imaging with additional Stokes Q, U, and V images provided
- 4 clusters reduced to H_I
 - Abell 194, Abell 4038, Abell 3562, and Abell 3365



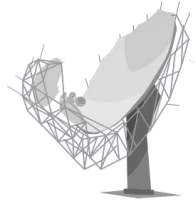
MGCLS - Science so far...

Applications of Machine Learning
e.g. ASTRONOMY^{1,2}



¹ Lochner, M. and Bassett, B. A., *Astronomy and Computing*, vol. 36, 2021. doi:10.1016/j.ascom.2021.100481

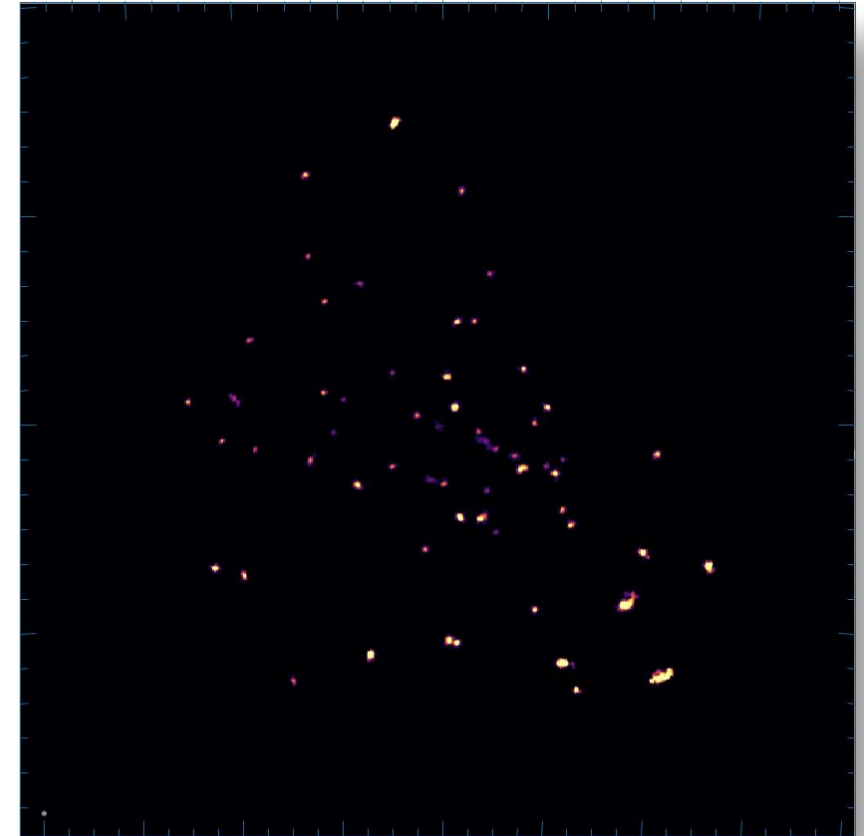
² Knowles, K., *Astronomy and Astrophysics*, vol. 657, 2022. doi:10.1051/0004-6361/202141488



MGCLS - H_I: legacy data release

Data reduction information

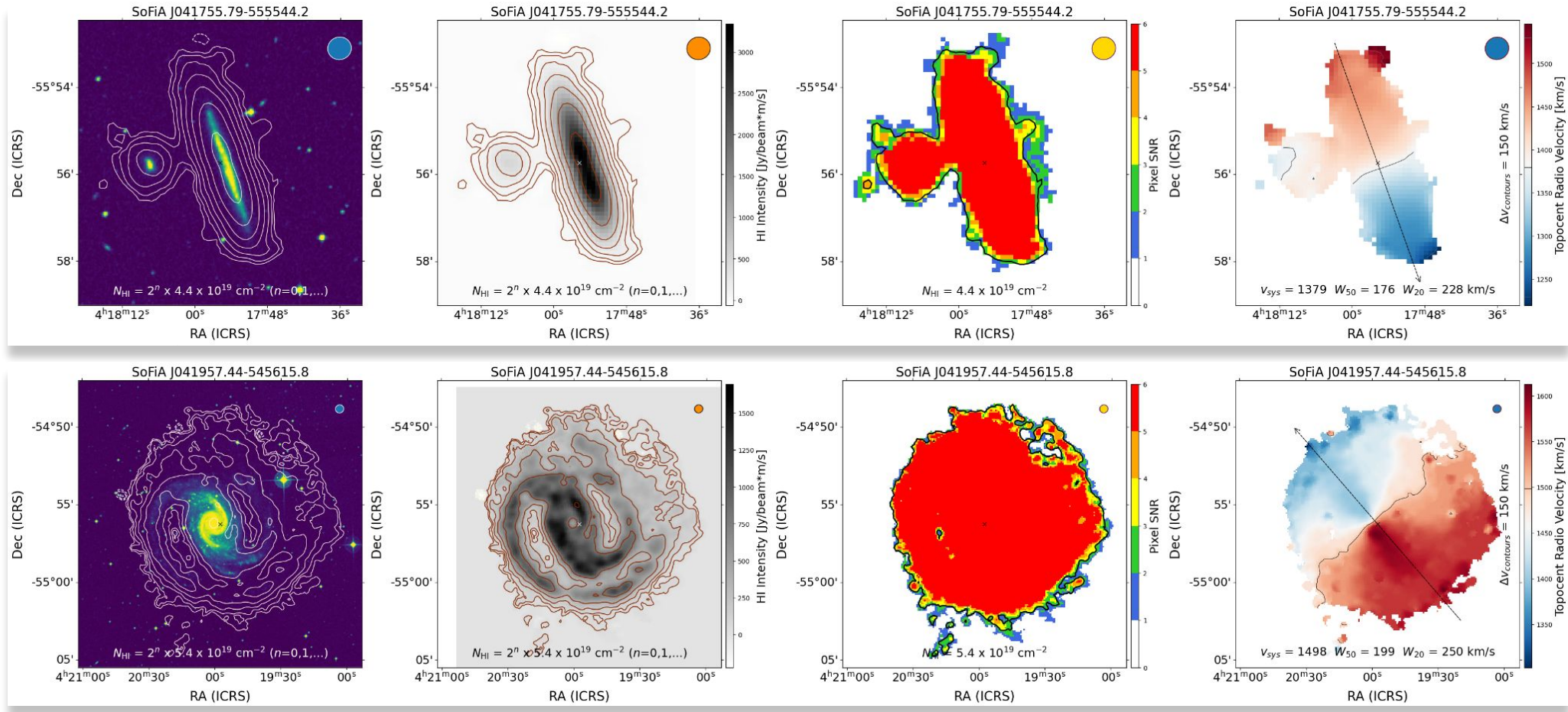
- CARACal data reduction of 23 clusters so far
- Tapered 33 ish arcsec beams to boost sensitivity
- Typical 5σ H_I column density sensitivity of $6.2 \Rightarrow 12.5 \times 10^{18} \text{cm}^{-2}$ ($0.05 \Rightarrow 0.1 M_{\odot} \text{pc}^{-2}$) over a line width of 44.1 km s^{-1}
- SoFiA 2 source detection with manual evaluation using SIP¹



¹ GitHub: [kmhess/SoFiA-image-pipeline](https://github.com/kmhess/SoFiA-image-pipeline)

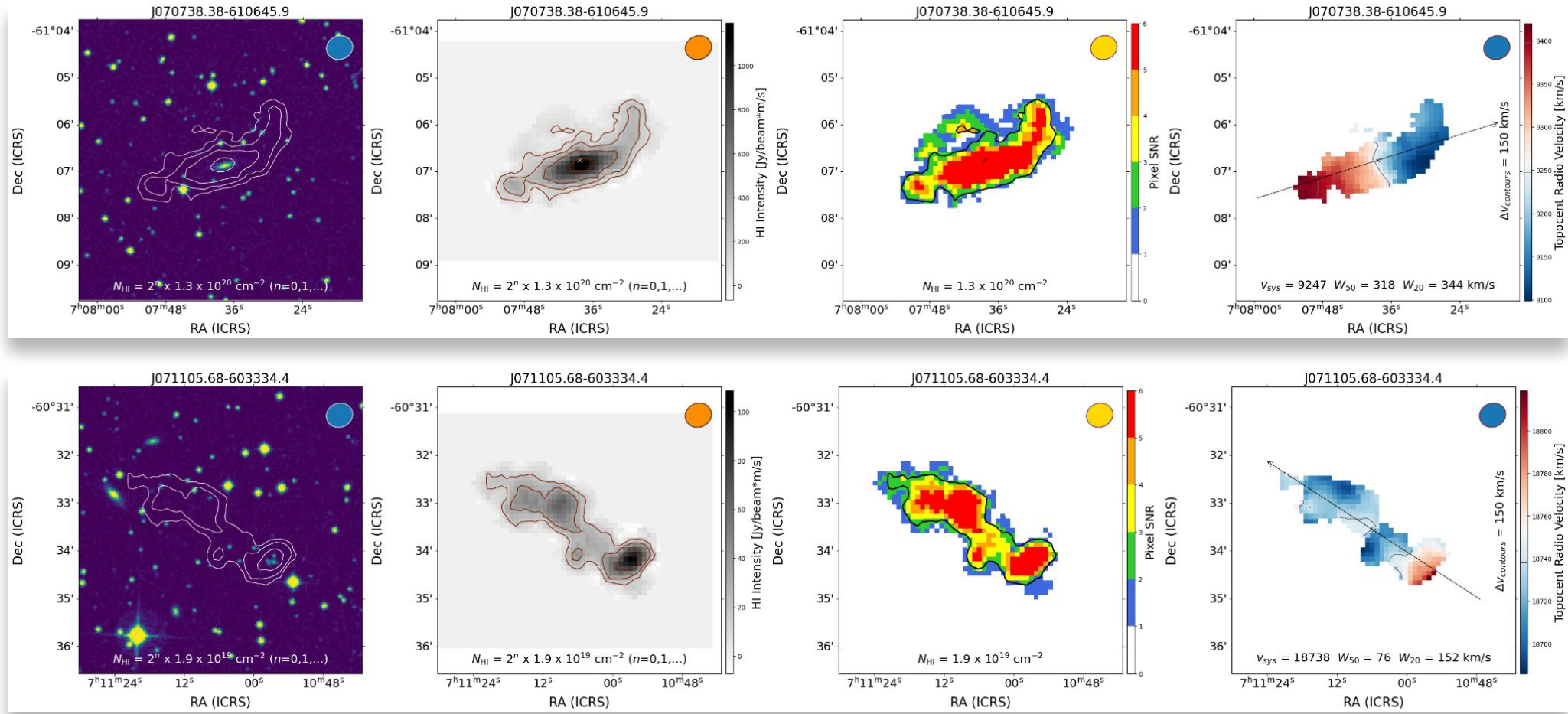


MGCLS - H_I: Example sources





MGCLS - H_I: Example sources



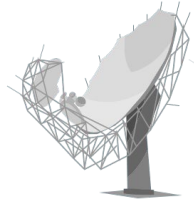


MGCLS - H_I: Positioning

Targeted science approaches

- H_I stacking
- Rough cluster membership allocation
- Subgroup identification
- Dynamic environmental effects (e.g. RPS)

- H_I morphology ML clustering (resolution limited)



MGCLS - H_I: Data access

AWS S3 cloud storage

- Field H_I cubes
- SoFiA 2 moment maps, minicubes, and catalogues

Access API

- Astropy AWS wrapper functionality

Intermission



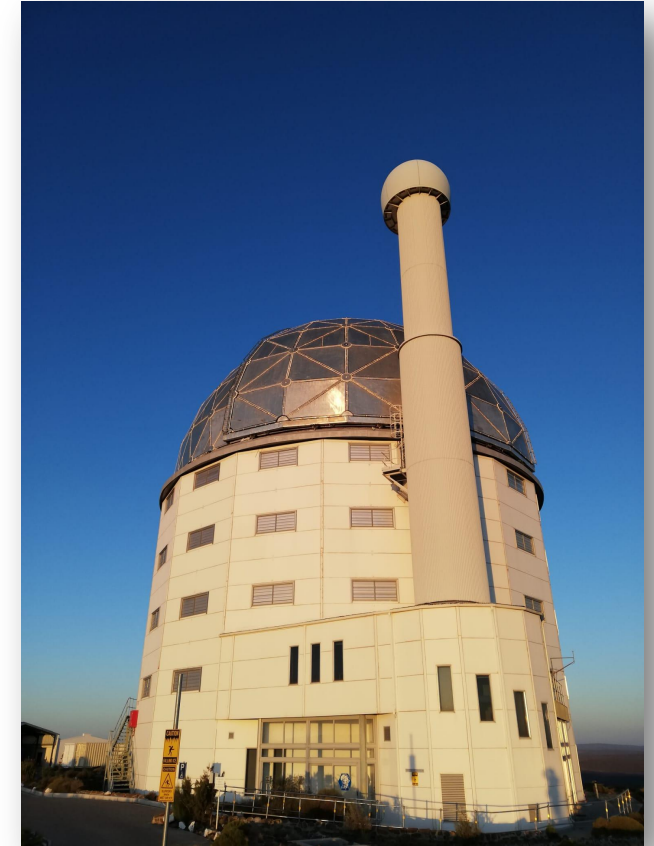
LEMBAS² – Legacy Exploitation of MeerKAT: Building A Spectroscopic Survey

Targets:

- J0328.1-5542 (A3126) – redshift ≈ 0.086
- J0540.1-4322 (A3360) – redshift ≈ 0.085

Awarded time:

- 67 hours top priority 1 and 2 observing time
- Bonus 12 hours of priority 3 time
- May-October 2023 semester



Summary

- 23 MGCLS fields reduced to H_I
- Dataproducts include:
 - Primary beam corrected cubes
 - Moment maps and catalogues
 - Individual source maps and minicubes
- Data will be hosted on AWS and accessible through bespoke API scripts using astropy-AWS functionalities
- LEMBAS² will begin spectroscopic follow up of H_I selected fields