# *Results from the MeerKAT MIGHTEE survey*

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*with a lot of help from*
*Brad Frank (SARAO/IDIA)*
*and the MIGHTEE team*

*Credit: SARAO*

LMU LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN

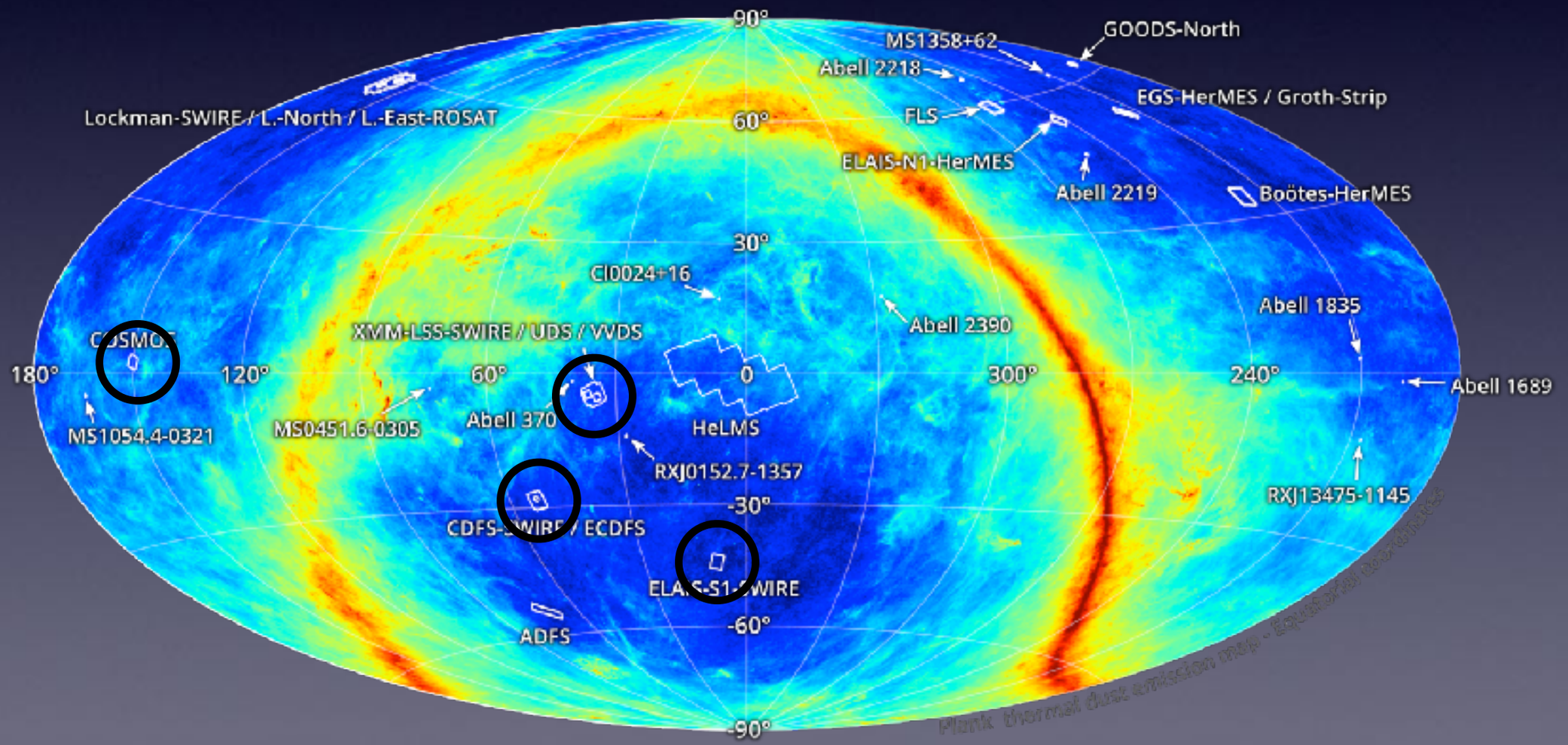
# MeerKAT

- 64 13.5m offset Gregorian dishes
  - Field of view ~1deg$^2$ at 1420MHz (~8x survey speed of VLA)
- 8km maximum baselines with compact core
  - 6arcsec resolution with good surface brightness sensitivity

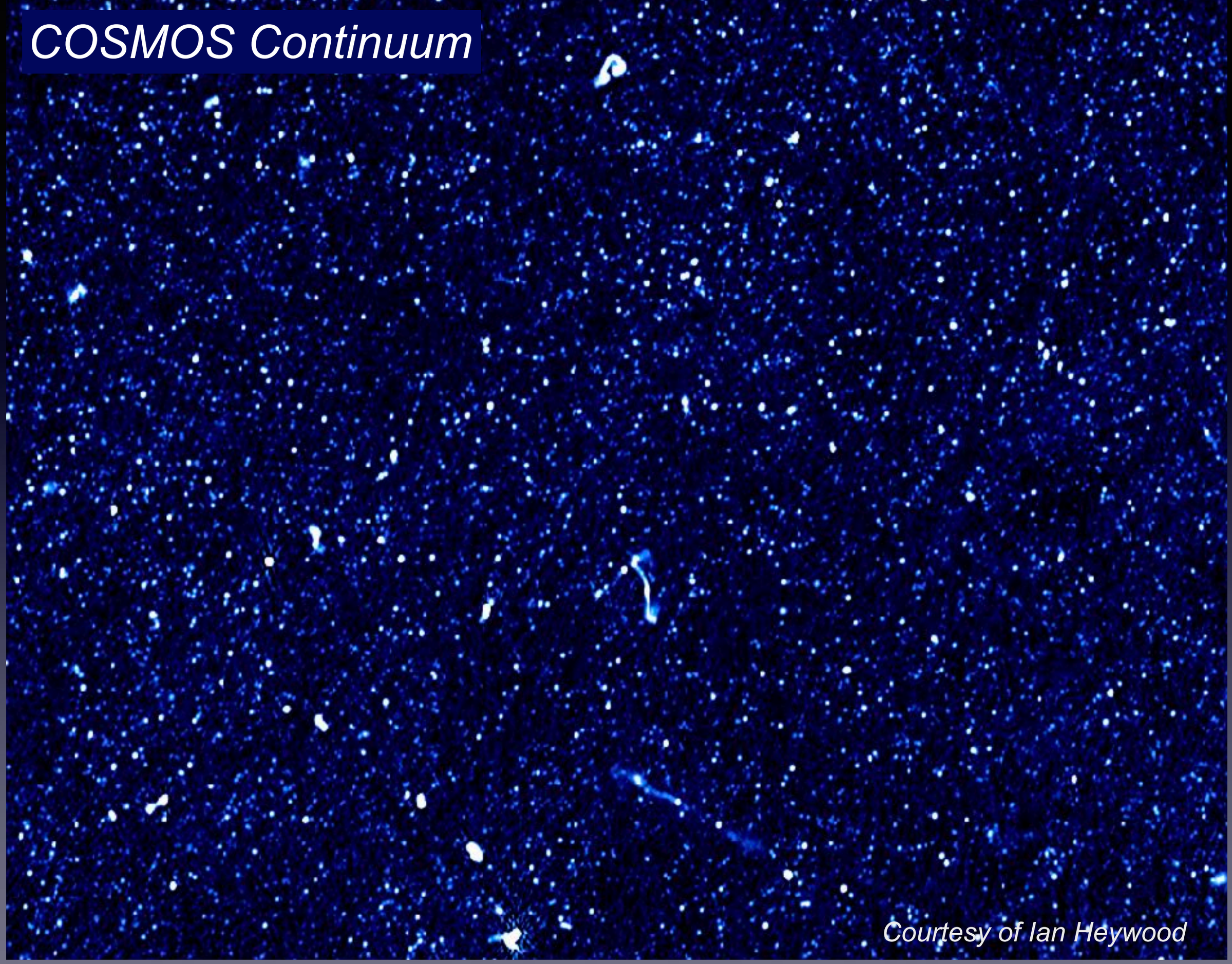
*Image credit: SARAO*

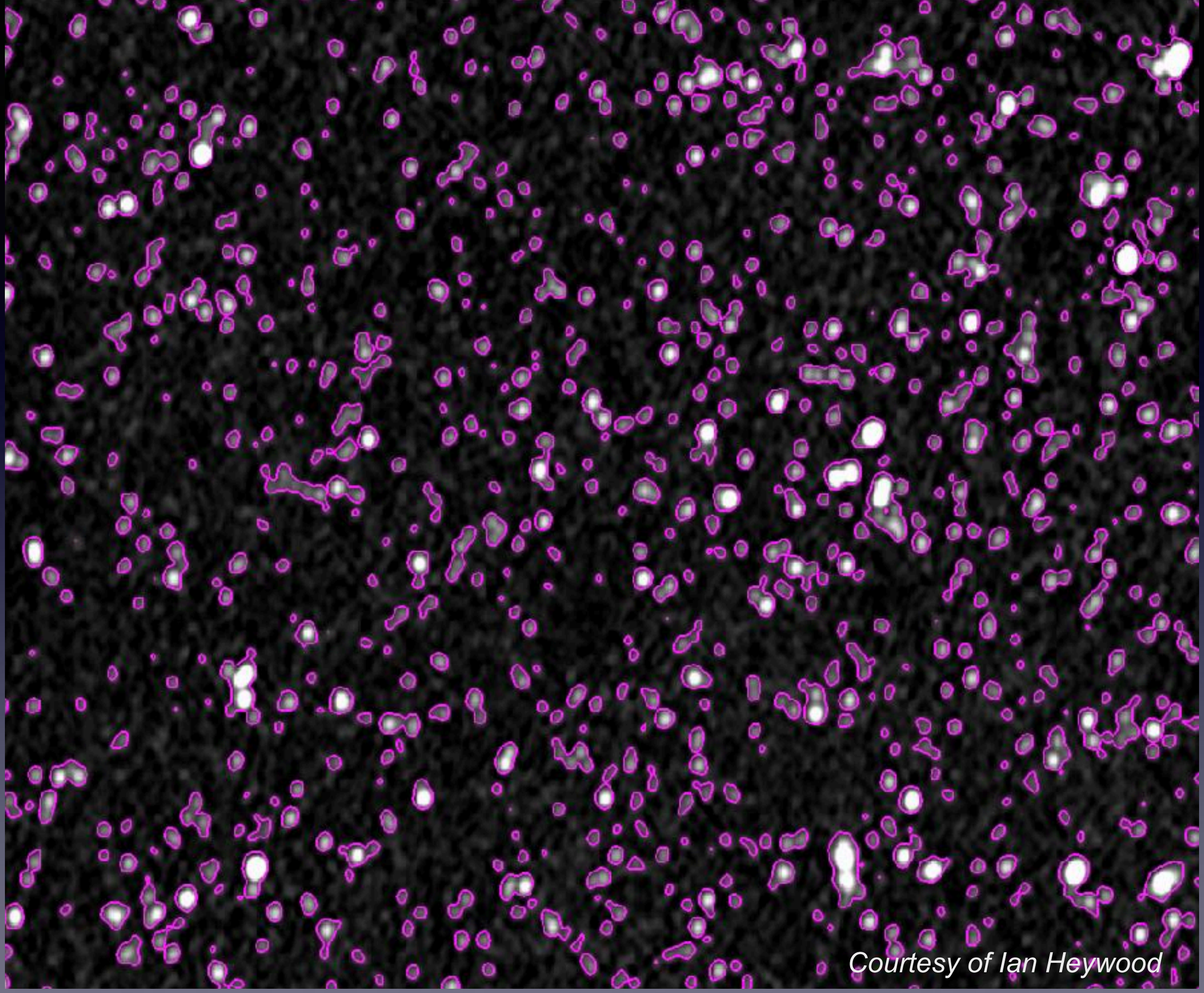
# *MIGHTEE: PIs Matt Jarvis, Russ Taylor*

- MeerKAT International Giga-Hertz Tiered Extragalactic Exploration
- L-band and S-band medium-deep, medium-wide survey
- 20 deg$^2$, ~16 hours per pointing (20h effective) for ~couple μJy sensitivity
- 0<z<3 for star forming galaxies, 0<z<6 for AGN




**COSMOS** (also the CHILES field), **XMM-LSS**, **ECDFS** (also the LADUMA field), **ELAIS S1**


COSMOS Continuum
Courtesy of Ian Heywood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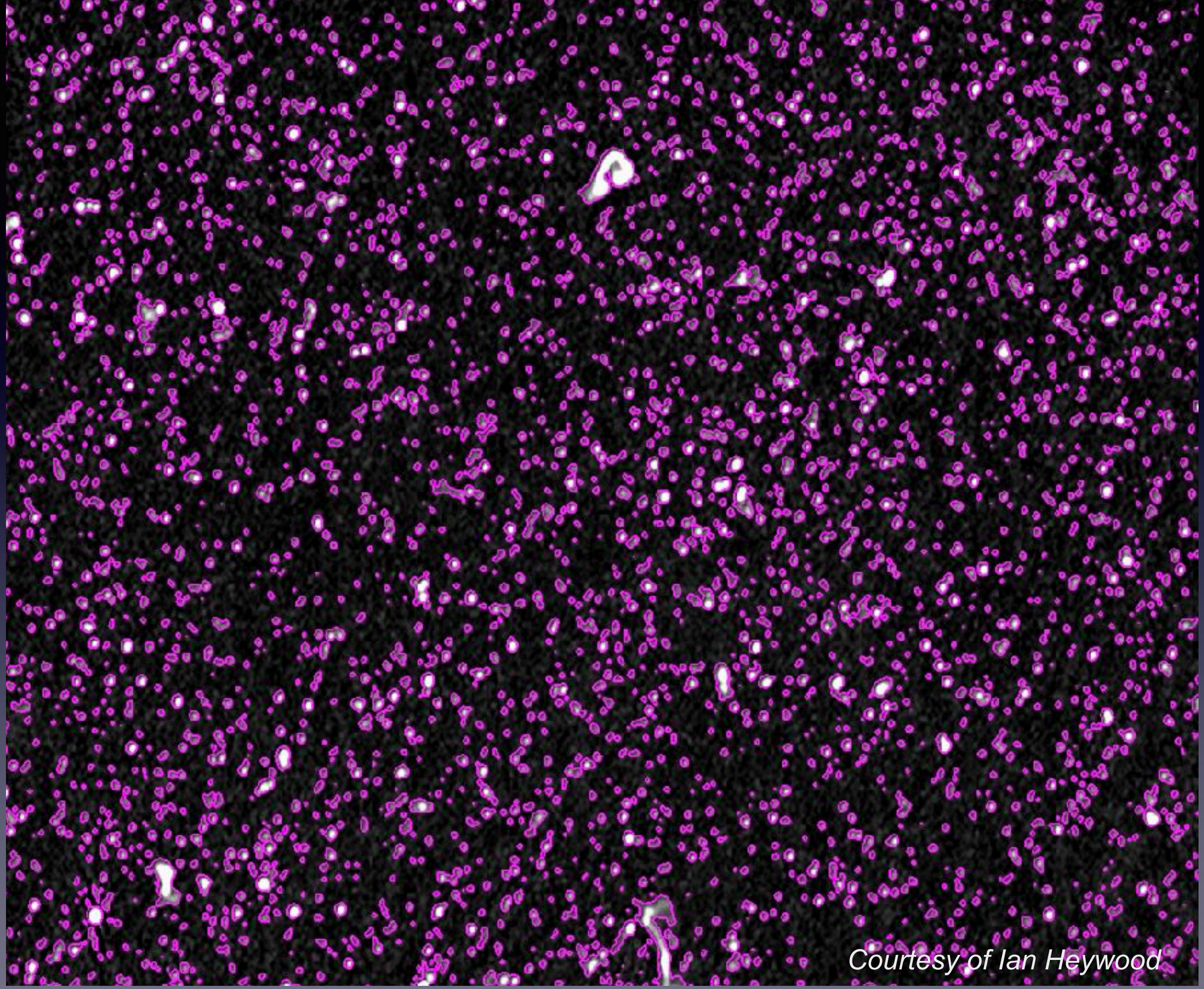
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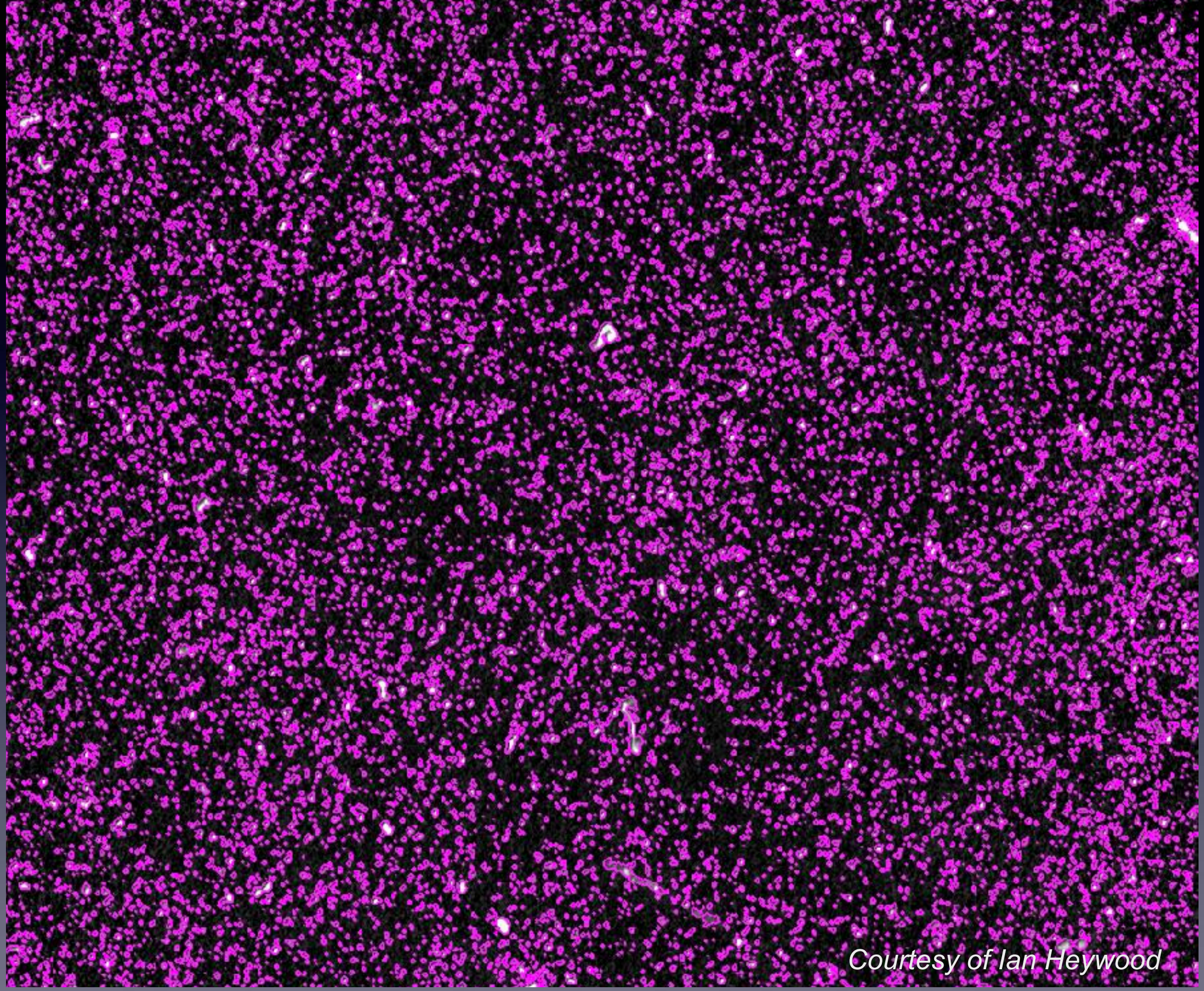
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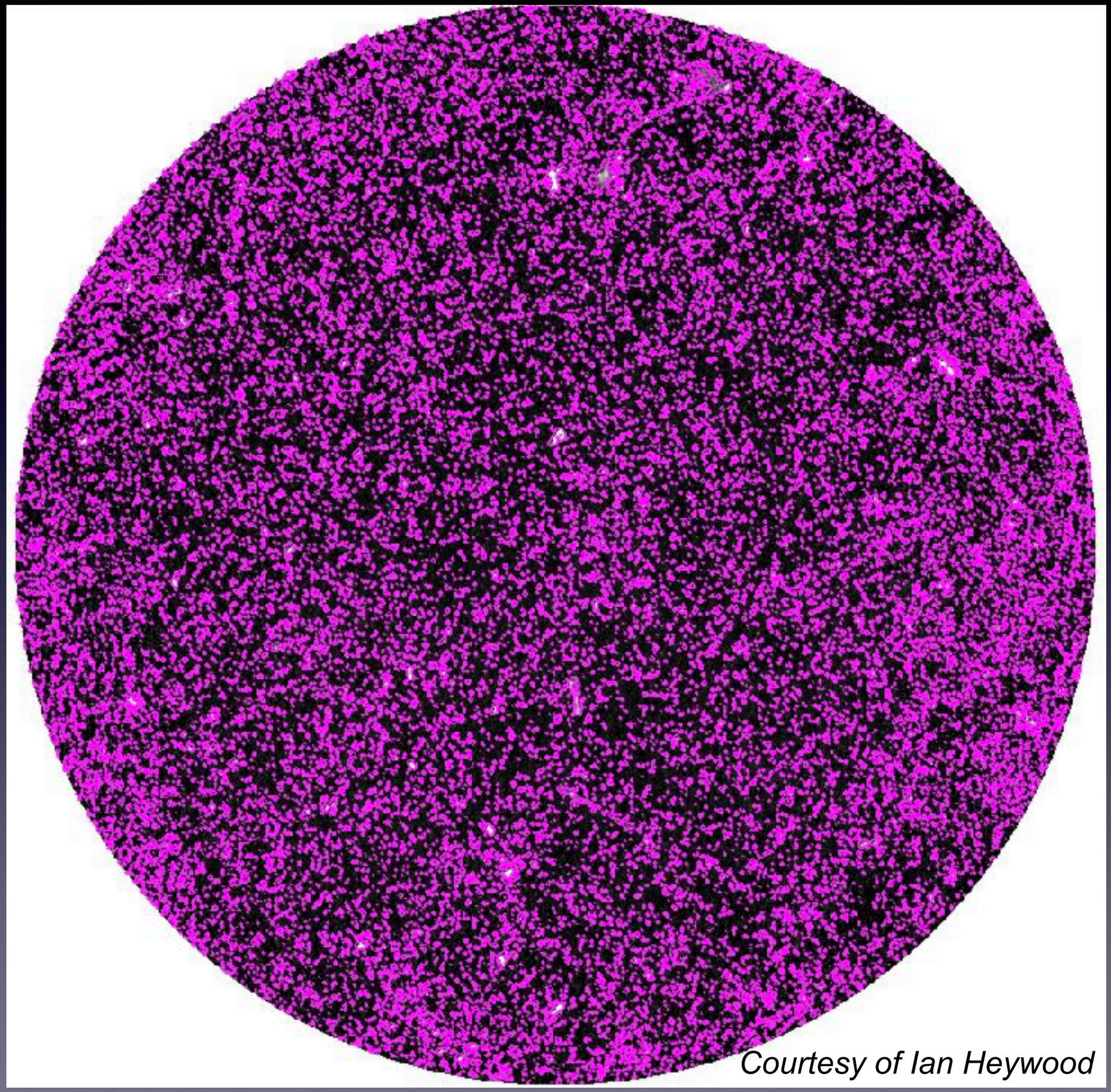
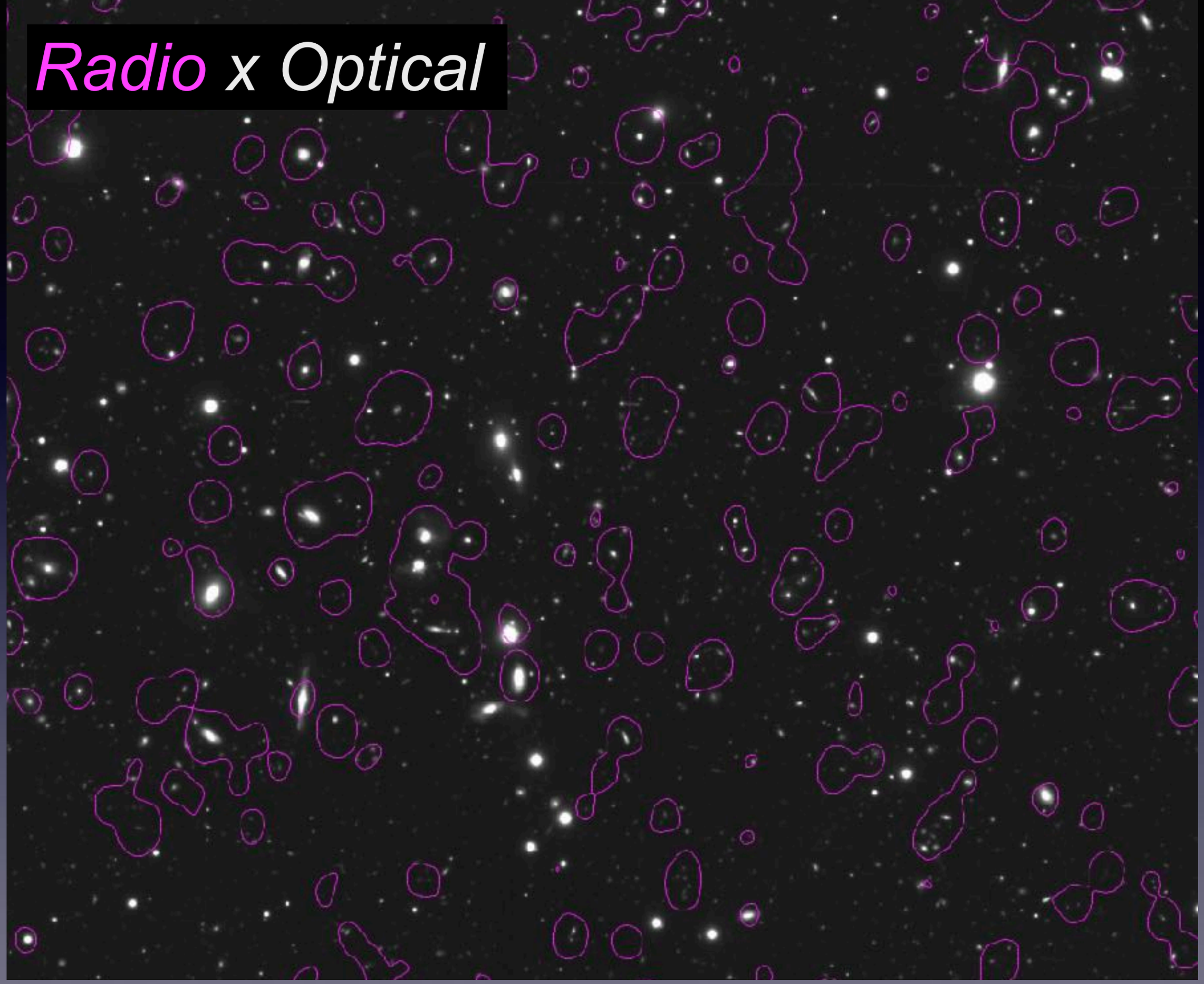
# *COSMOS*

- 1.4deg across
- Restoring beam: 8.4” x 6.8”
- Thermal noise: ~1.7 uJy / beam
- 17.45h on source
- ~9000 sources



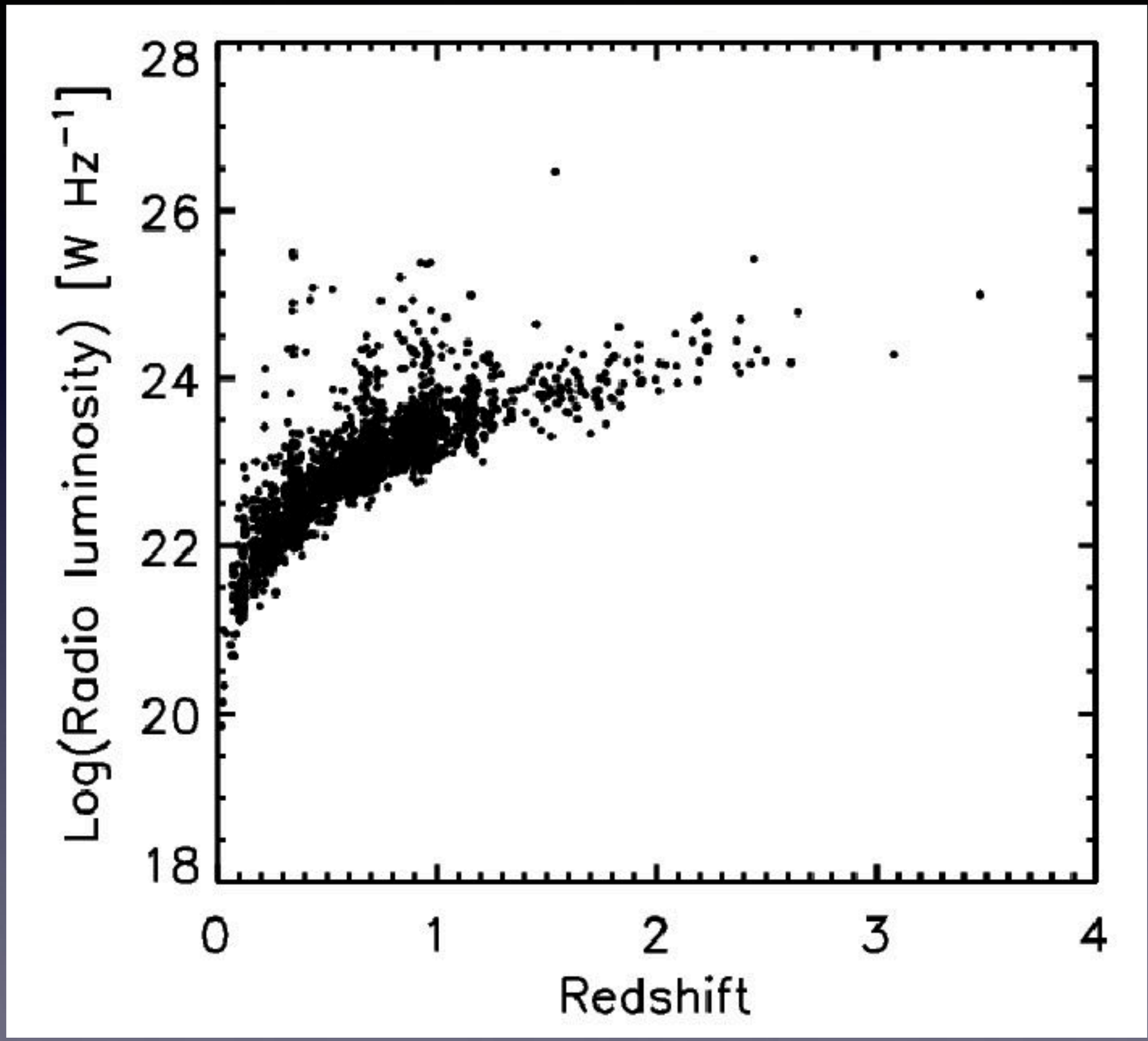
*Courtesy of Ian Heywood*

# *Radio x Optical*



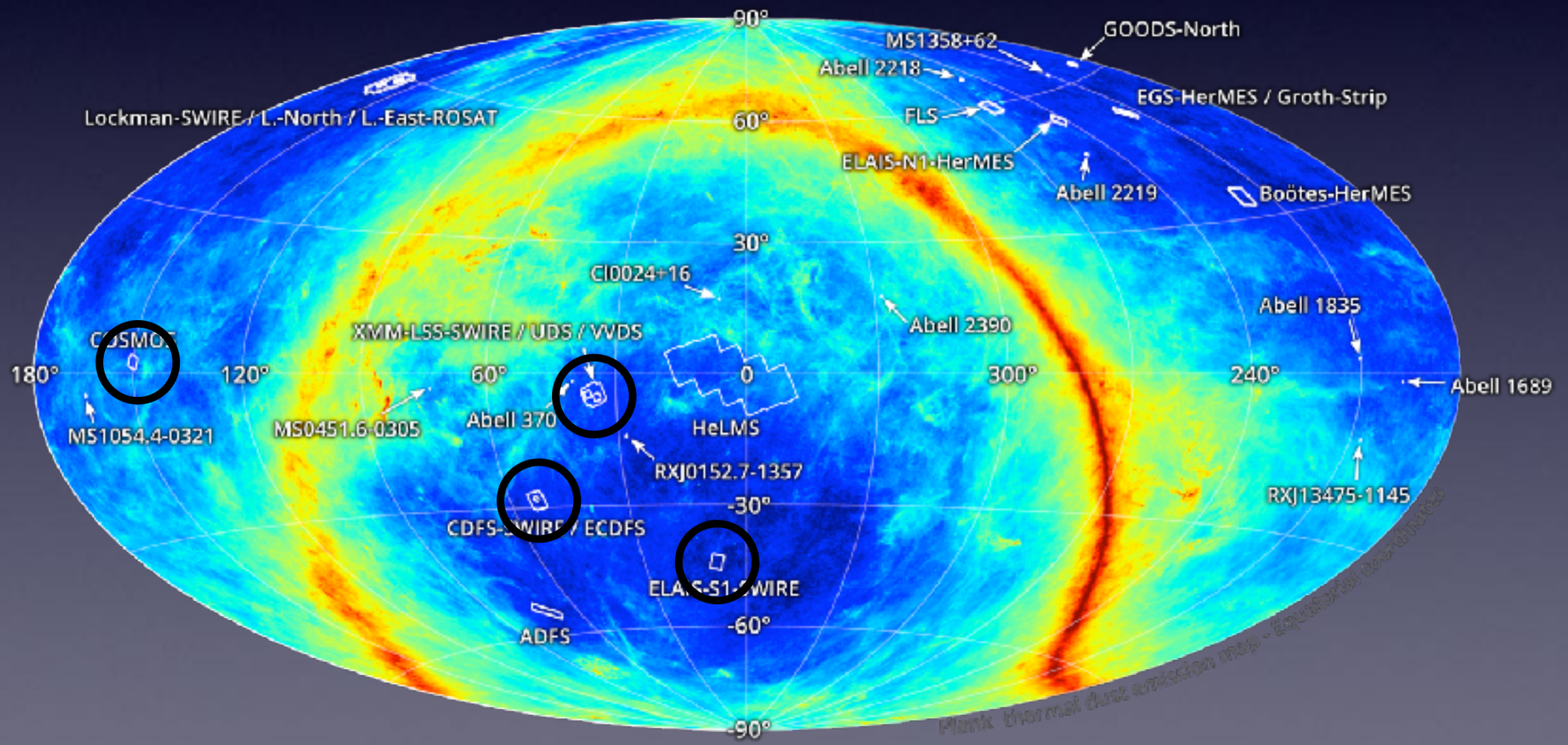
# *COSMOS*

- uGRIZYJHKs + Spitzer + Herschel photometry → SED fitting
- Once crossmatched, have luminosity, SFR, stellar mass, etc
- Will have this for 20 square degrees



# *MIGHTEE-HI*

- Observations are taken in spectral line mode → commensal HI survey
- Working group coordinating HI science (co-chairs N Maddox & B Frank)
- Frequency coverage 1420<**ν**<900MHz, or 0<z<0.58 for HI
- Early Science (“4k mode”) 44km/s channels, full science (“32k”) 5.5km/s

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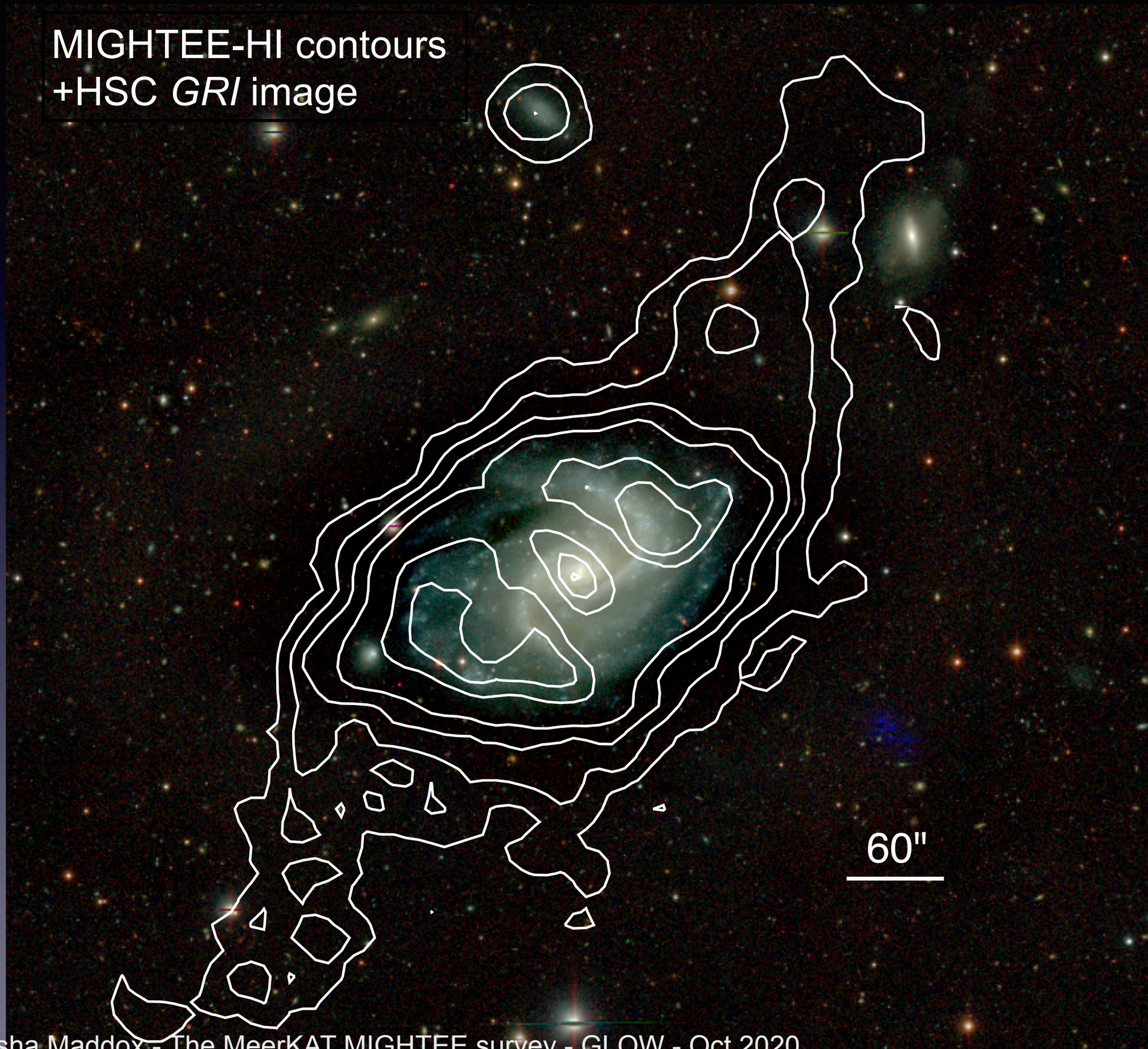
# *Science cases for MIGHTEE-HI:*

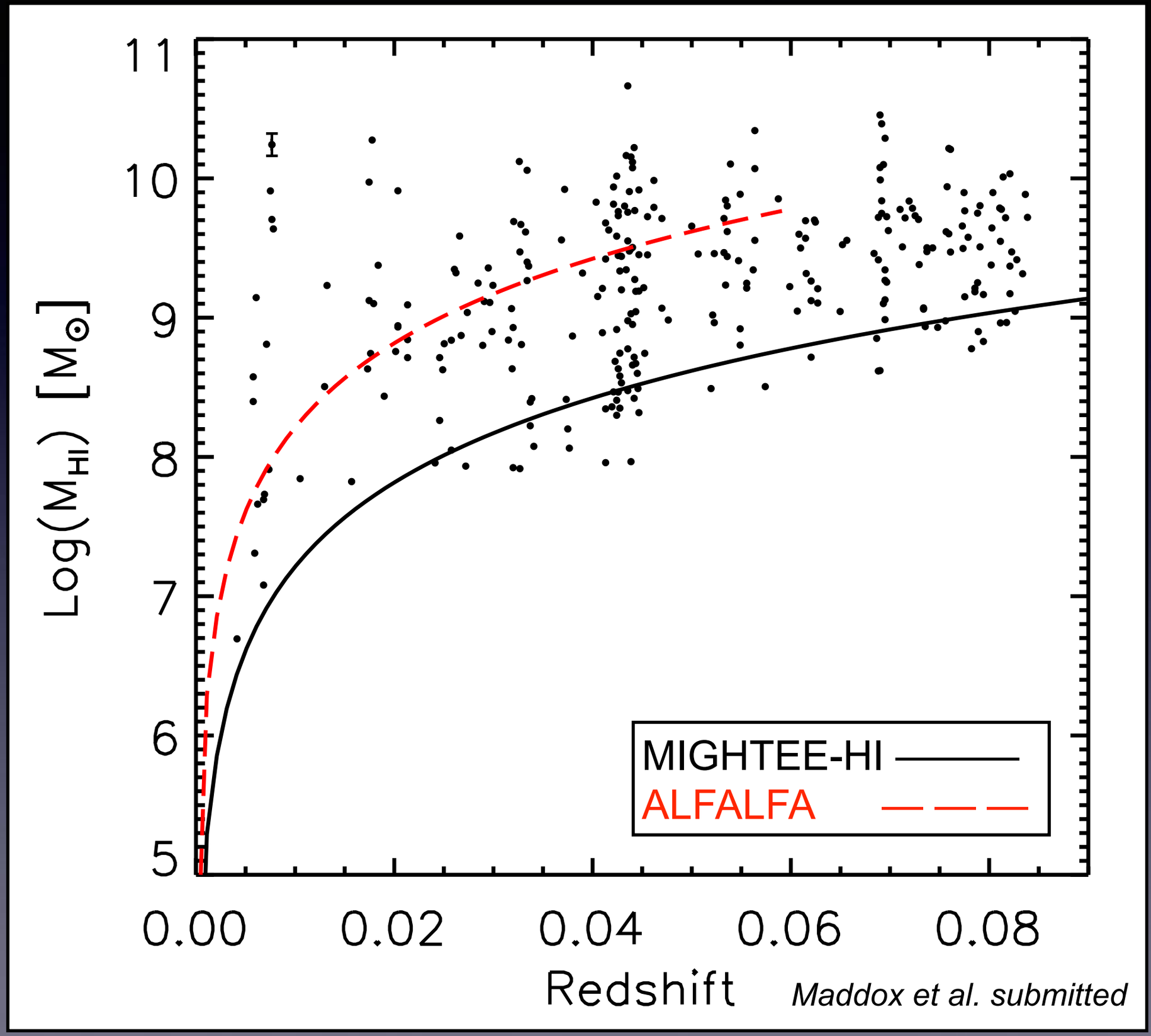
- *Large area, increased redshift range* → HIMF, HI evolution
- *Resolved galaxies* → dynamics, TF relation
- *Low mass galaxies* → Too big to fail, too shy to shine
- *Continuum synergy* → HI-rich galaxies are also starforming
- *HI as a function of environment* → groups, clusters, filaments, voids
- *HI as a function of stellar properties* → star formation, stellar mass
- *HI and AGN* → emission, absorption, fueling, feedback
- *Statistical techniques* → Stacking
- *Simulations/Modelling/Visualization* → HI cycle
- etc...

# *GLOW 2019: individual HI detections*

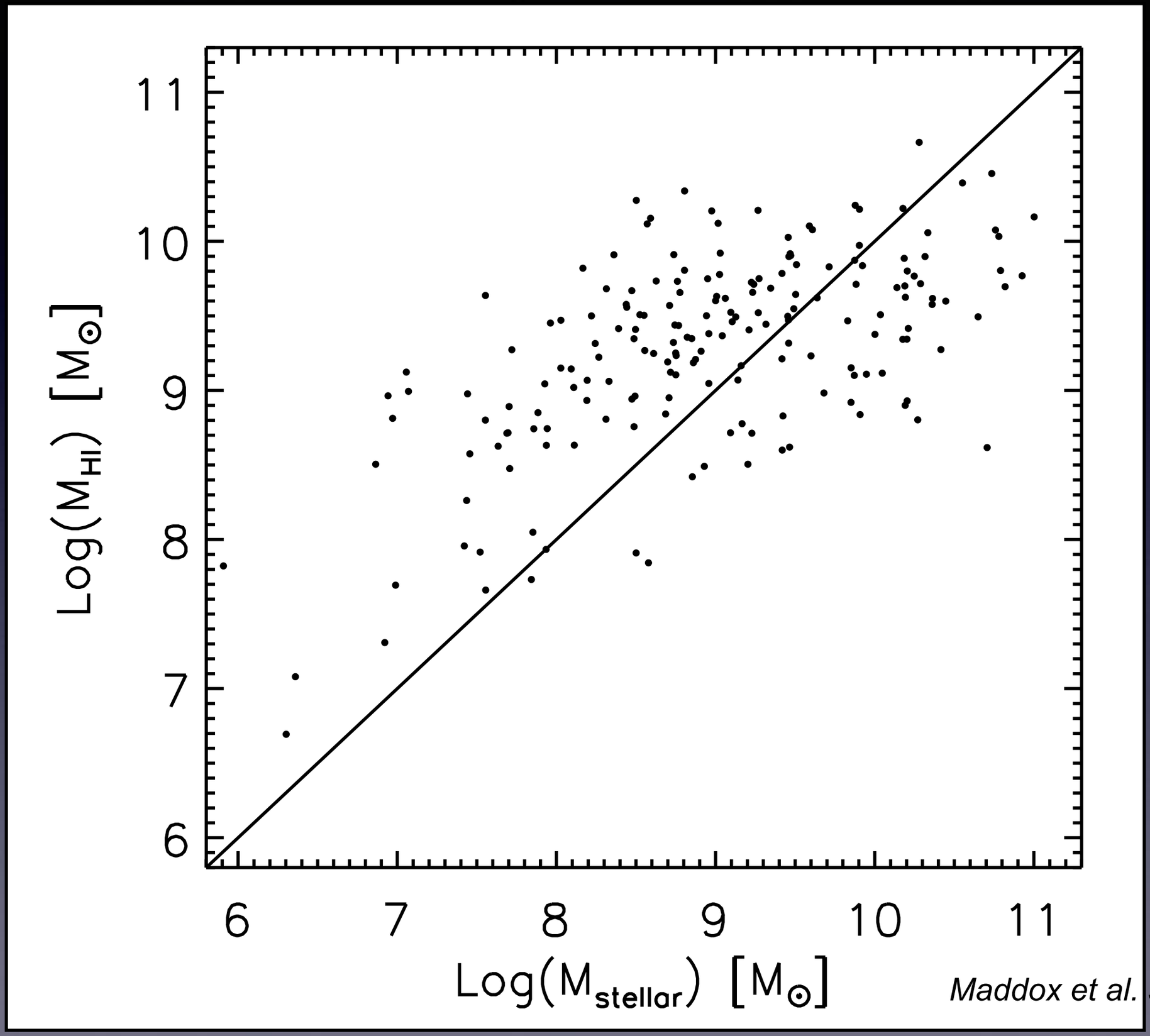
- Lowest contour $1x10^{20}$ atoms $cm^{-2}$
- Mass of NGC895 $M_{HI}=1.7x10^{10}\ M_{\odot}$
- Mass of companion $M_{HI}=5x10^{7}\ M_{\odot}$



# *GLOW 2020: ensemble of ~350 Early Science galaxies*



# *GLOW 2020: full survey will have >1000 galaxies*




*Maddox et al. submitted*

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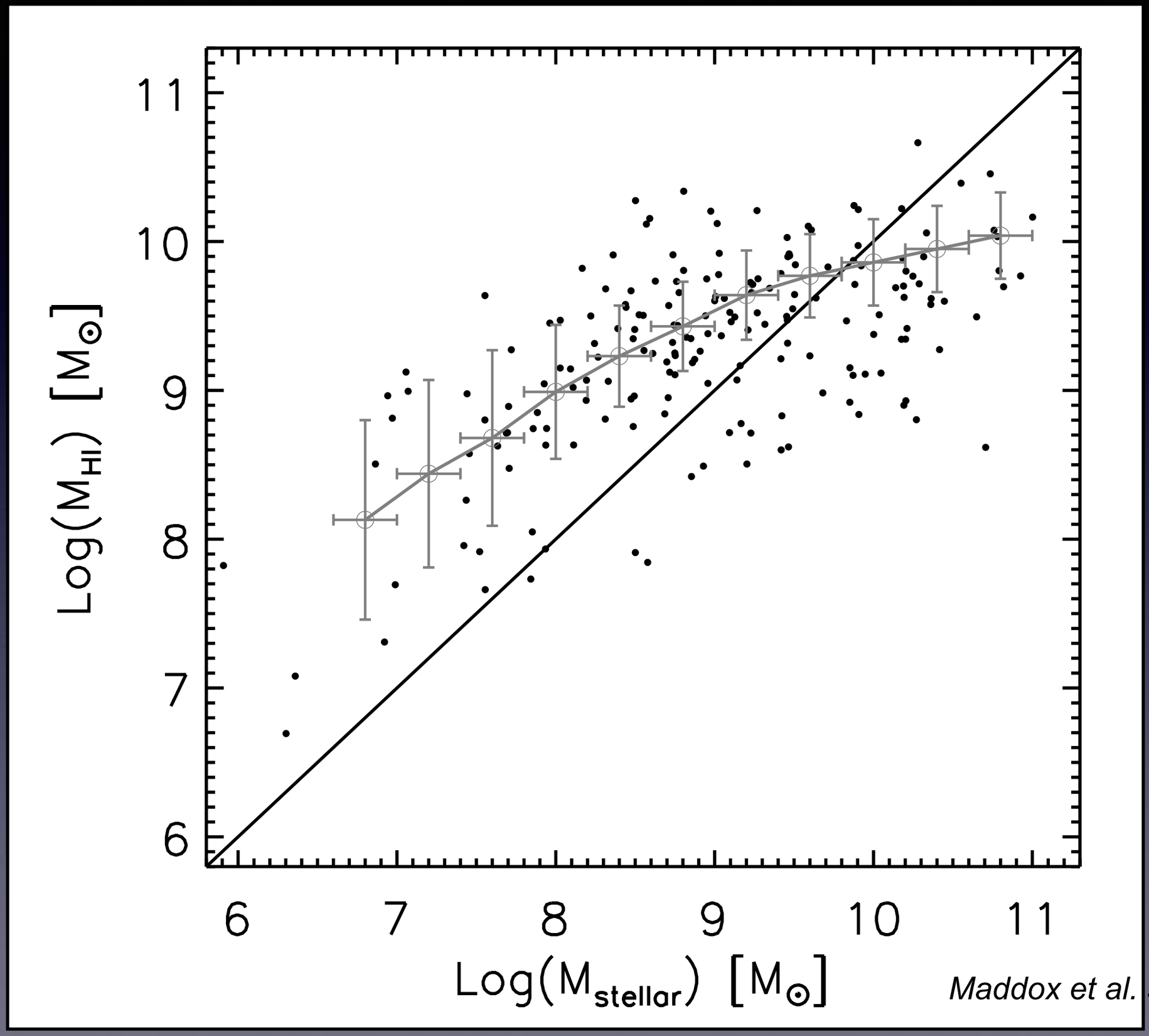


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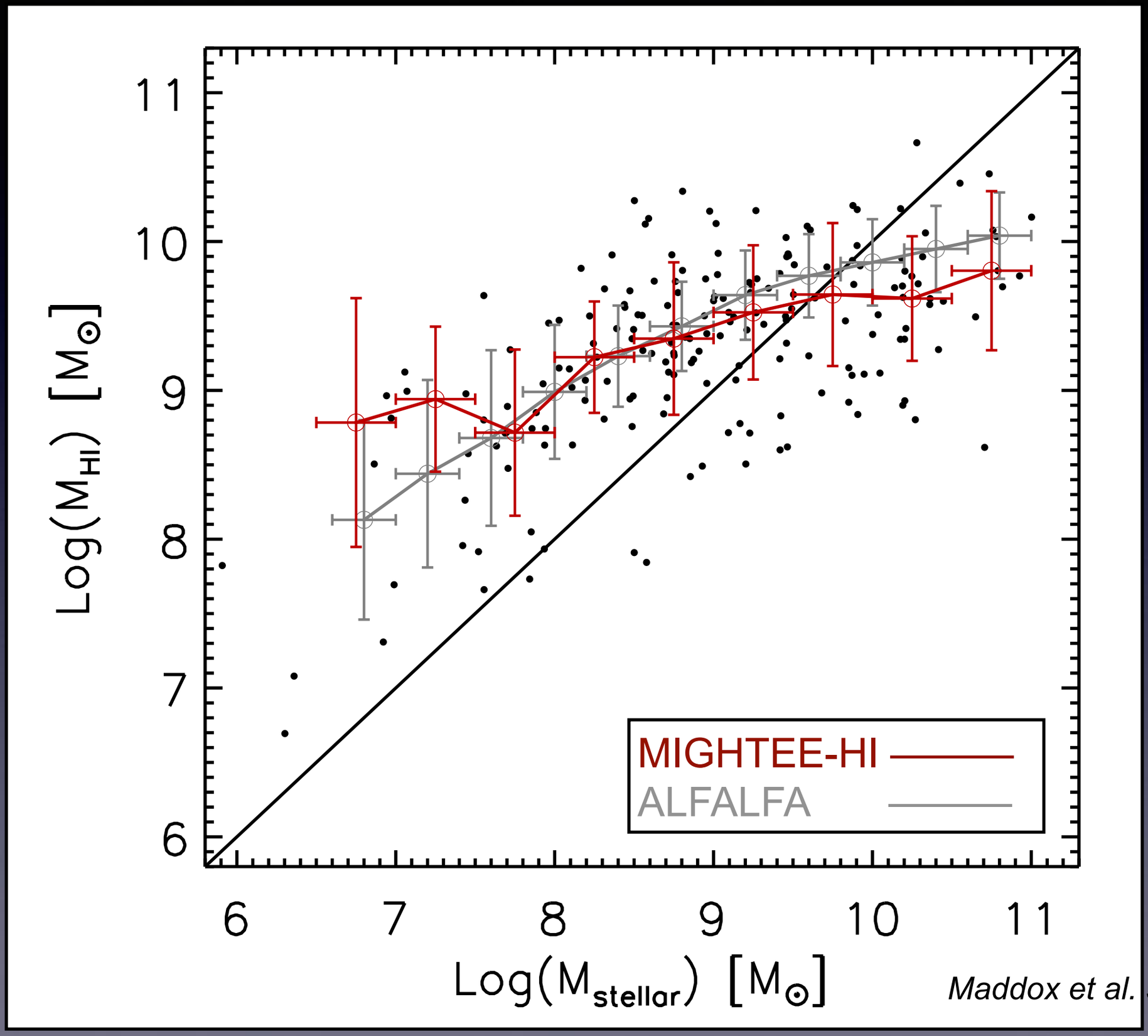


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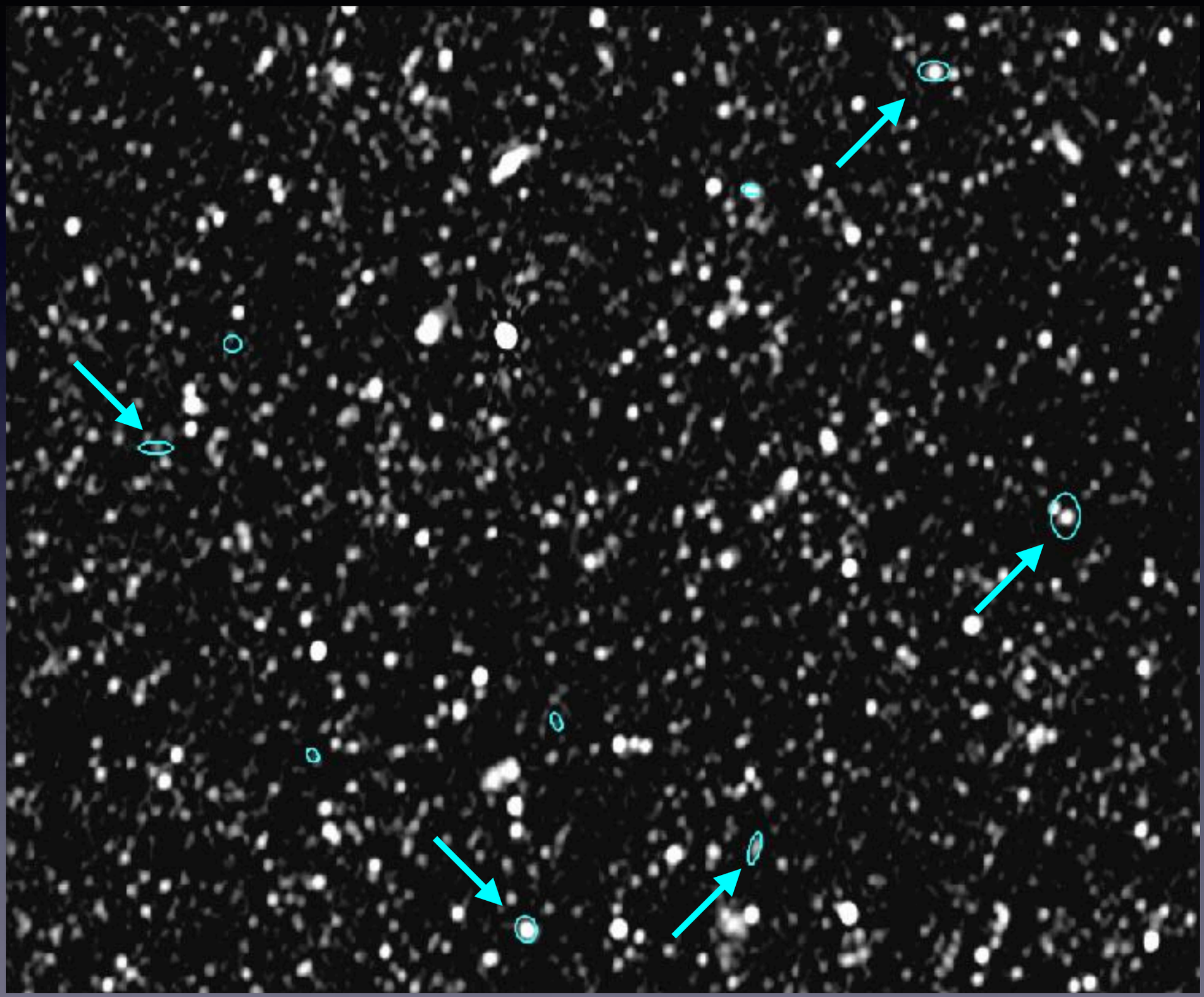
# *MIGHTEE-HI x MIGHTEE*

- HI-rich galaxies are star forming, should be visible in continuum



# *MIGHTEE Survey progress:*

- 5 deg$^2$ Early Science (COSMOS + part of XMMLSS) data reduced
  - ✓ HI catalogues available, continuum catalogues mostly available
  - ✓ A 1310—1420MHz HI cube, >3deg$^2$, 4k resolution = 33Gb
- Ongoing: 484 hours of observations (400h on source) completed
- Observations taken in all MIGHTEE fields, in 32k mode
- Reduction strategy set and functional
- Data reach expected sensitivity (~2uJy/beam continuum)

✓ HI: 8 Early Science projects underway with 2 papers submitted

✓ Continuum: >20 Early Science projects underway with 3 submitted