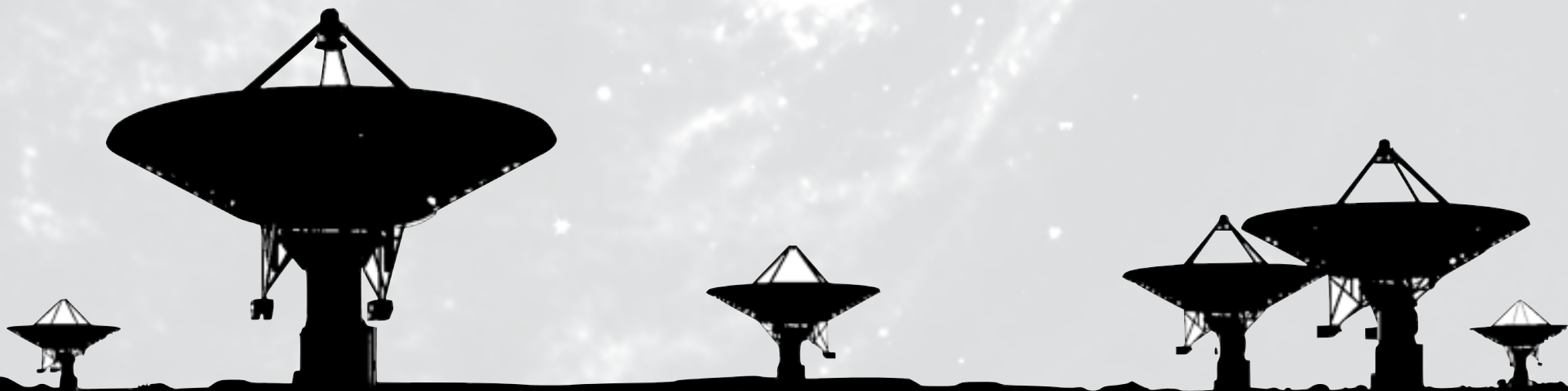




MHONGOOSE

MeerKAT HI Observations of Nearby Galactic Objects:
Observing Southern Emitters



Investigators

Name	Affiliation	Country
Erwin de Blok	Univ of Cape Town	South Africa
Philippe Amram	Lab. Astroph. Marseille	France
Lia Athanassoula	Lab. Astroph. Marseille	France
Chantal Balkowski	Obs de Paris	France
Matt Bershad	Univ of Wisconsin	USA
Rob Beswick	Jodrell Bank	UK
Frank Bigiel	Univ Berkeley	USA
Sarah Blyth	Univ of Cape Town	South Africa
Albert Bosma	Lab. Astroph. Marseille	France
Roy Booth	HartRAO	South Africa
Antoine Bouchard	McGill Univ	Canada
Elias Brinks	Univ of Hertfordshire	UK
Claude Carignan	Univ de Ouagadougou	Burkina Faso
Laurent Chemin	Obs de Paris	France
Françoise Combes	Obs de Paris	France
John Conway	Chalmers Univ	Sweden
Simon Cross	SKA SA	South Africa
Jayanne English	Univ Manitoba	Canada
Benoit Epinat	Lab. Astroph. Marseille	France
Bradley Frank	Univ of Cape Town	South Africa
Jason Fiege	Univ Manitoba	Canada
Jay Gallagher	Univ of Wisconsin	USA
Brad Gibson	Univ Lancaster	UK
George Heald	ASTRON	Netherlands
Trish Henning	Univ New Mexico	USA
Benne Holwerda	Univ of Cape Town	South Africa
Jasper Horrell	SKA SA	South Africa
Helmut Jerjen	RSAA, ANU	Australia
Hans-Rainer Klöckner	Oxford Univ	UK
Bärbel Koribalski	ATNF	Australia
Renée Kraan-Korteweg	Univ of Cape Town	South Africa
Stephane Leon	ESO	Chile
Adam Leroy	NRAO	USA
Ilani Loubser	UWC	South Africa

Name	Affiliation	Country
Stacy McGaugh	Univ of Maryland	USA
Gerhardt Meurer	ICRAR	Australia
Martin Meyer	ICRAR	Australia
Se-Heon Oh	Univ of Cape Town	South Africa
Tom Oosterloo	ASTRON	Netherlands
D.J. Pisano	West Virginia University	USA
Simon Ratcliffe	SKA SA	South Africa
Jerry Sellwood	Rutgers Univ	USA
Eva Schinnerer	MPIA	Germany
Anja Schröder	HartRAO	South Africa
Kartik Sheth	NRAO	USA
Kristine Spekkens	RMC	Canada
Snezana Stanimirovic	Univ of Wisconsin	USA
Kurt van der Heyden	Univ of Cape Town	South Africa
Wim van Driel	Obs de Paris	France
Lourdes Verdes-Montenegro	IAA, Granada	Spain
Fabian Walter	MPIA	Germany
Bradley Warren	ICRAR	Australia
Tobias Westmeier	ATNF	Australia
Eric Wilcots	Univ of Wisconsin	USA
Ted Williams	Rutgers Univ	USA
Patrick Woudt	Univ of Cape Town	South Africa
Albert Zijlstra	Univ Manchester	UK

57 investigators from 12 countries
(SA 14, USA 12, FRA 8, AUS 6, UK 5, ...)

Investigators

Name	Affiliation	Country
Erwin de Blok	Univ of Cape Town	South Africa
Philippe Amram	Lab. Astroph. Marseille	France
Lia Athanassoula	Lab. Astroph. Marseille	France
Chantal Balkowski	Obs de Paris	France
Matt Bershad	Univ of Wisconsin	USA
Rob Beswick	Jodrell Bank	UK
Frank Bigiel	Univ Berkeley	USA
Sarah Blyth	Univ of Cape Town	South Africa
Albert Bosma	Lab. Astroph. Marseille	France
Roy Booth	HartRAO	South Africa
Antoine Bouchard	McGill Univ	Canada
Elias Brinks	Univ of Hertfordshire	UK
Claude Carignan	Univ de Ouagadougou	Burkina Faso
Laurent Chemin	Obs de Paris	France
Françoise Combes	Obs de Paris	France
John Conway	Chalmers Univ	Sweden
Simon Cross	SKA SA	South Africa
Jayanne English	Univ Manitoba	Canada
Benoit Epinat	Lab. Astroph. Marseille	France
Bradley Frank	Univ of Cape Town	South Africa
Jason Fiege	Univ Manitoba	Canada
Jay Gallagher	Univ of Wisconsin	USA
Brad Gibson	Univ Lancaster	UK
George Heald	ASTRON	Netherlands
Trish Henning	Univ New Mexico	USA
Benne Holwerda	Univ of Cape Town	South Africa
Jasper Horrell	SKA SA	South Africa
Helmut Jerjen	RSAA, ANU	Australia
Hans-Rainer Klöckner	Oxford Univ	UK
Bärbel Koribalski	ATNF	Australia
Renée Kraan-Korteweg	Univ of Cape Town	South Africa
Stephane Leon	ESO	Chile
Adam Leroy	NRAO	USA
Ilani Loubser	UWC	South Africa

Name	Affiliation	Country
Stacy McGaugh	Univ of Maryland	USA
Gerhardt Meurer	ICRAR	Australia
Martin Meyer	ICRAR	Australia
Se-Heon Oh	Univ of Cape Town	South Africa
Tom Oosterloo	ASTRON	Netherlands
D.J. Pisano	West Virginia University	USA
Simon Ratcliffe	SKA SA	South Africa
Jerry Sellwood	Rutgers Univ	USA
Eva Schinnerer	MPIA	Germany
Anja Schröder	HartRAO	South Africa
Kartik Sheth	NRAO	USA
Kristine Spekkens	RMC	Canada
Snezana Stanimirovic	Univ of Wisconsin	USA
Kurt van der Heyden	Univ of Cape Town	South Africa
Wim van Driel	Obs de Paris	France
Lourdes Verdes-Montenegro	IAA, Granada	Spain
Fabian Walter	MPIA	Germany
Bradley Warren	ICRAR	Australia
Tobias Westmeier	ATNF	Australia
Eric Wilcots	Univ of Wisconsin	USA
Ted Williams	Rutgers Univ	USA
Patrick Woudt	Univ of Cape Town	South Africa
Albert Zijlstra	Univ Manchester	UK

57 investigators from 12 countries
(SA 14, USA 12, FRA 8, AUS 6, UK 5, ...)

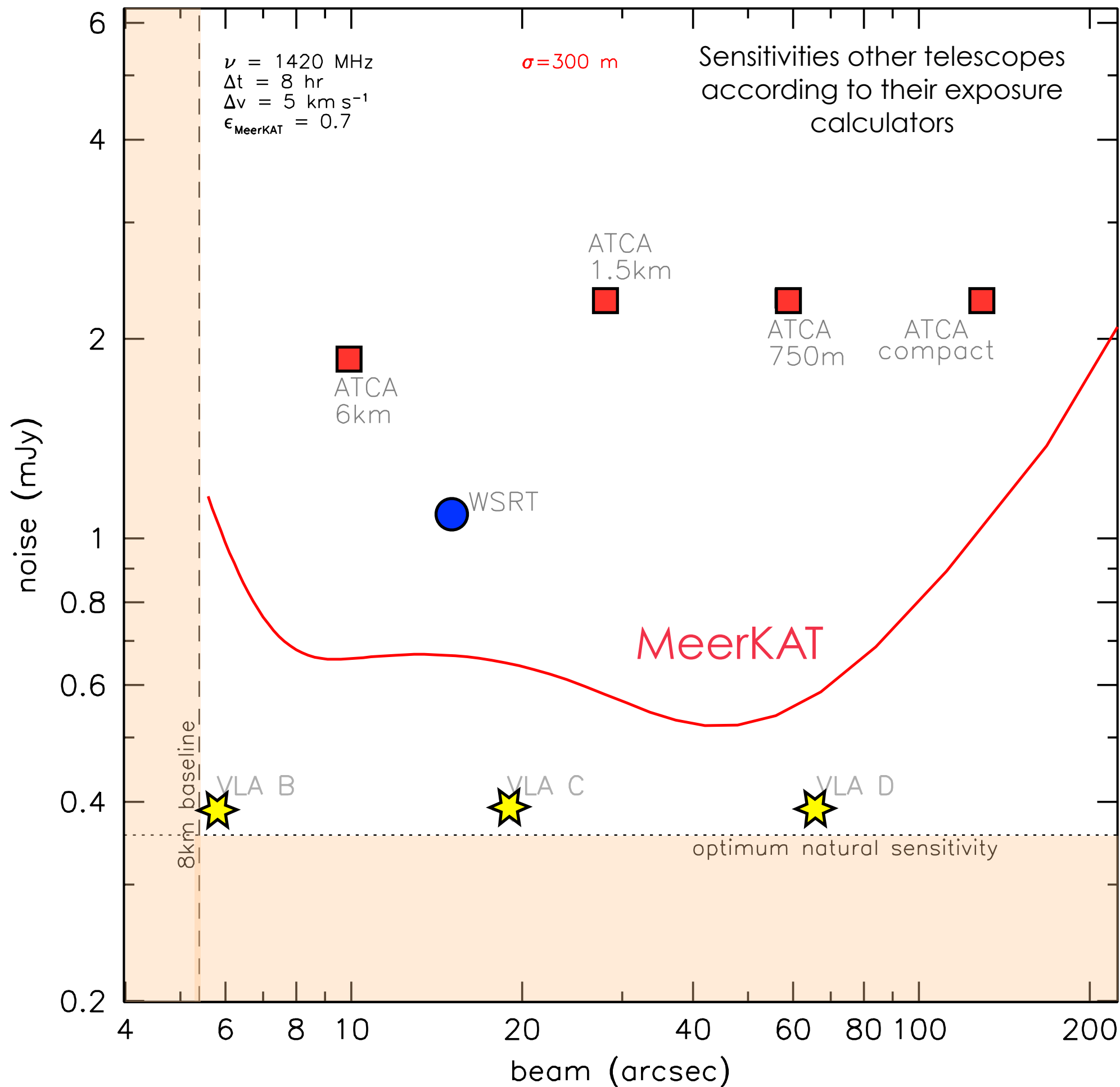
Motivation

- SKA Key Science Question: “*How do galaxies assemble and evolve?*”
- SKA and precursors will study evolution of HI content over cosmic time
- Difficult to study sub-kpc physical processes
- Comprehensive study of nearby galaxies to characterise “Galactic Ecosystem”

Why MeerKAT?

- Excellent column density sensitivity:
 - low column density HI
 - outer disks,
 - infall, outflow, accretion
 - connection with cosmic web
- High resolution
 - detailed dynamics
 - relation between gas and star formation

Point source sensitivity

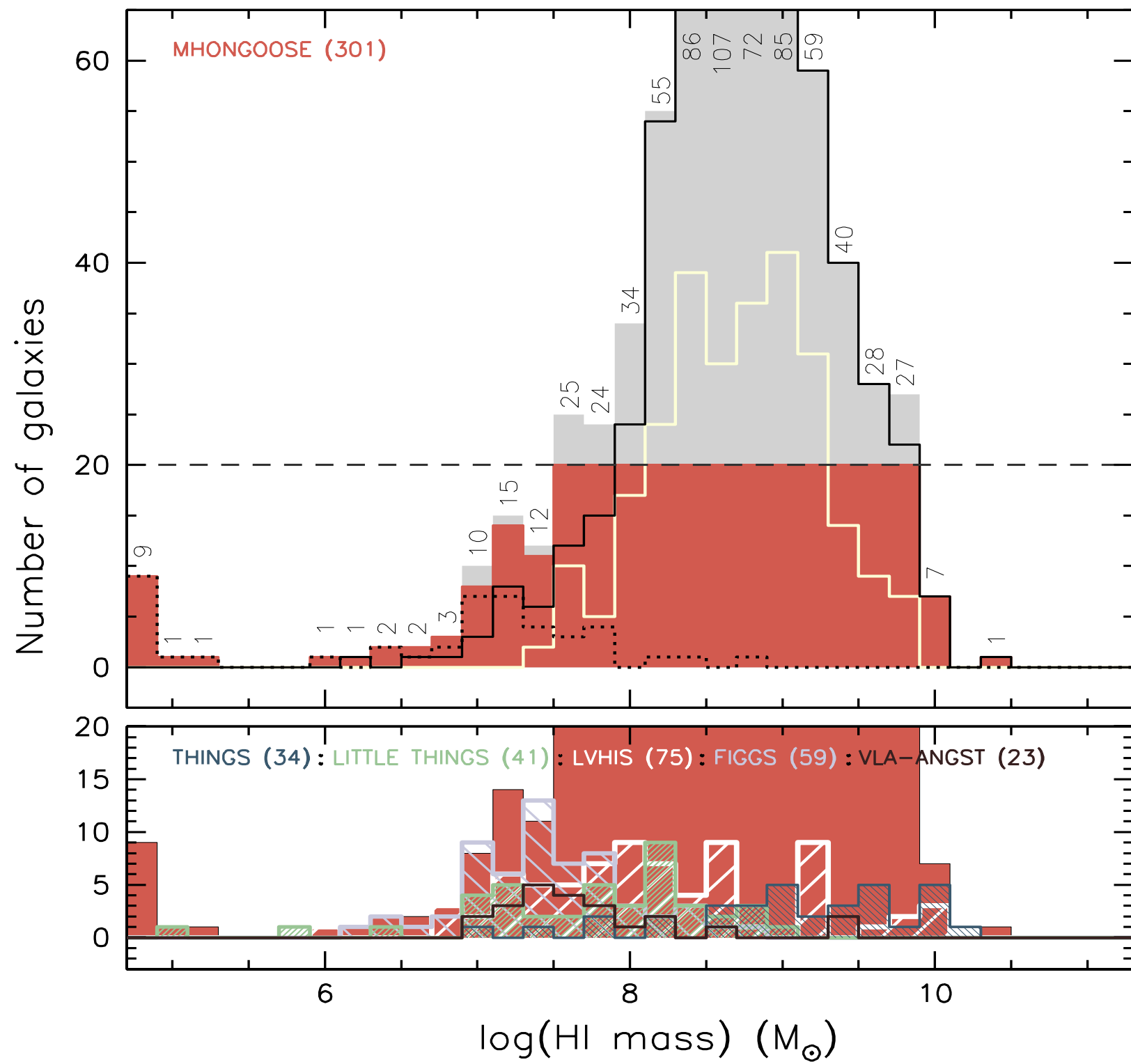


Key Science Questions

- The distribution of dark matter in galaxies and comparison with dark matter models
- The importance and effects of cold gas accretion
- Detection of link between galaxies and cosmic web
- Relation between dark and baryonic matter on galactic scales

The Sample

- Select from HICAT, NHICAT and K04
- Declination $< +25$ degrees
- $V_{LG} < 1500 \text{ km s}^{-1}$ ($D < 20 \text{ Mpc}$)
- $|b| > 20$ degrees
- Select equal number in bins of $\log(M_{HI})$
- 20 galaxies per bin to get good $(M_{HI}, \cos i)$ coverage: 301 galaxies



Observations

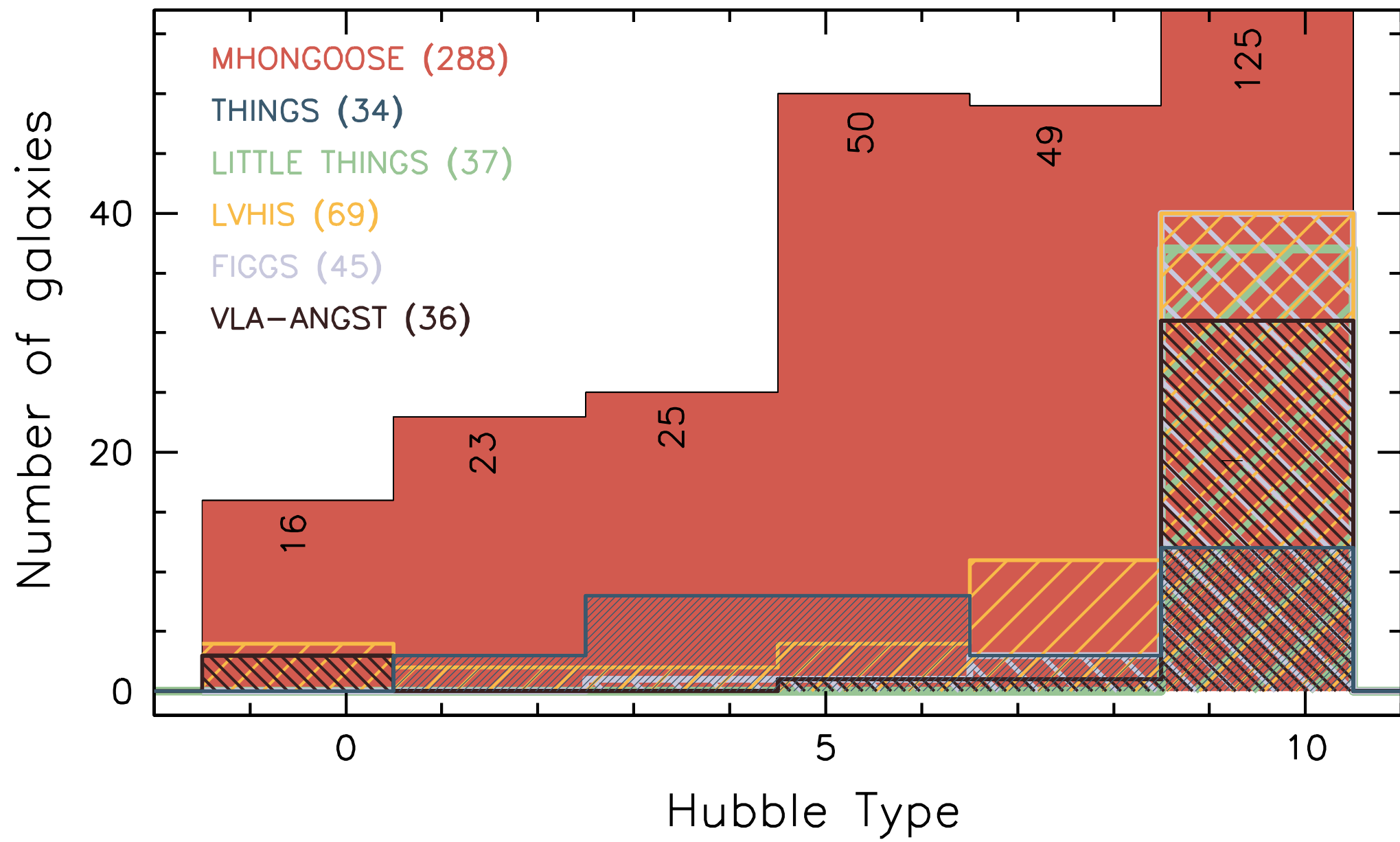
- Observe all 301 galaxies for 8 hours
 - 5σ of $5 \times 10^{20} \text{ cm}^{-2}$ at $10''$ over 16 km s^{-1} with 5 km s^{-1} chans
 - Edge of “star forming disk”
- Observe 10% for 200 hours
 - 5σ of 1.2×10^{19} (5×10^{17}) cm^{-2} at $30''$ ($90''$) over 16 km s^{-1} with 5 km s^{-1} chans
 - Outer disk, accretion, cosmic web

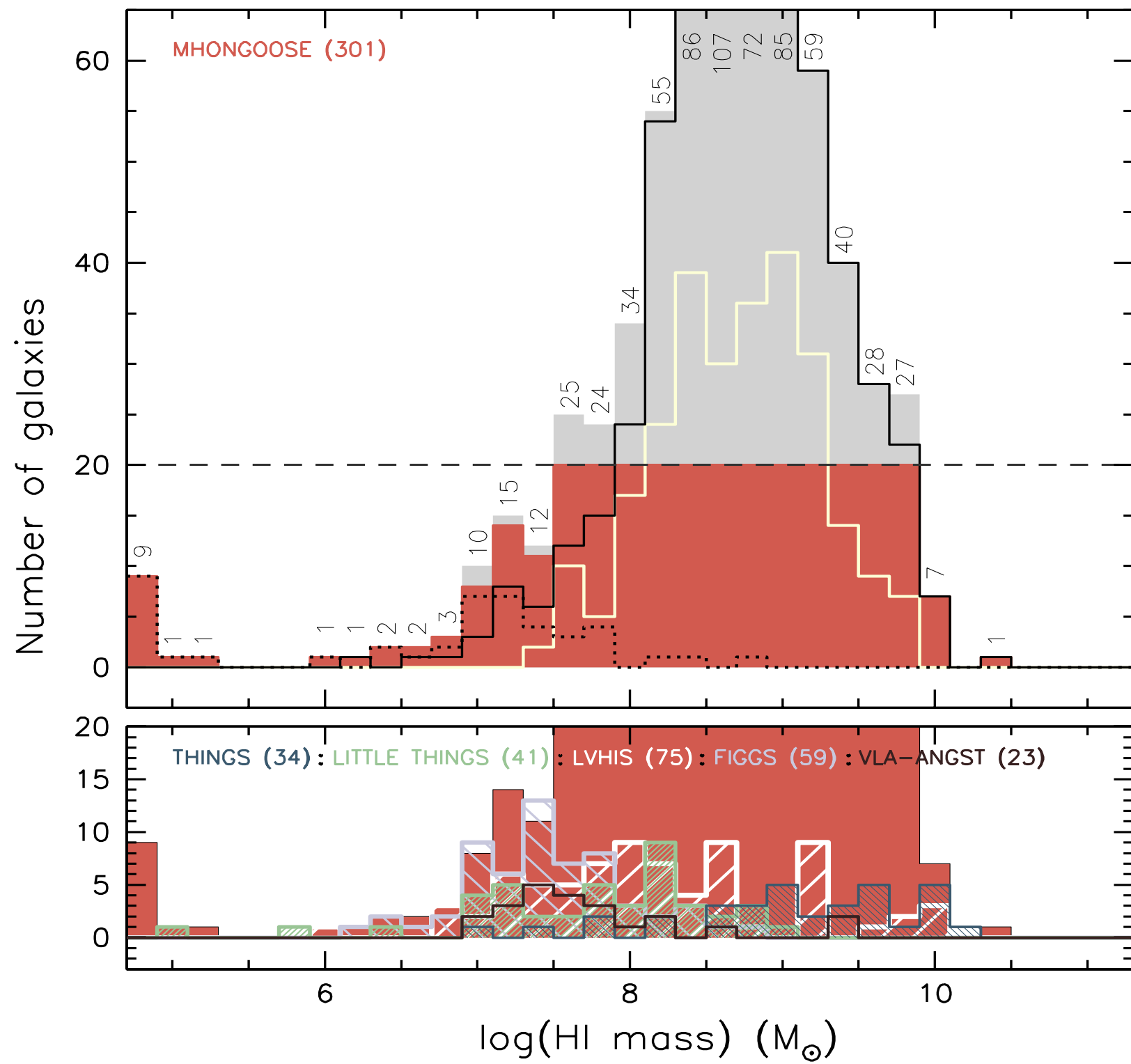
Observations

- Total observing time required: 8216 hours
- Parallel multi-wavelength effort
- Investigate flexible pipelines
- Investigate automated galaxy characterization (GALAPAGOS)

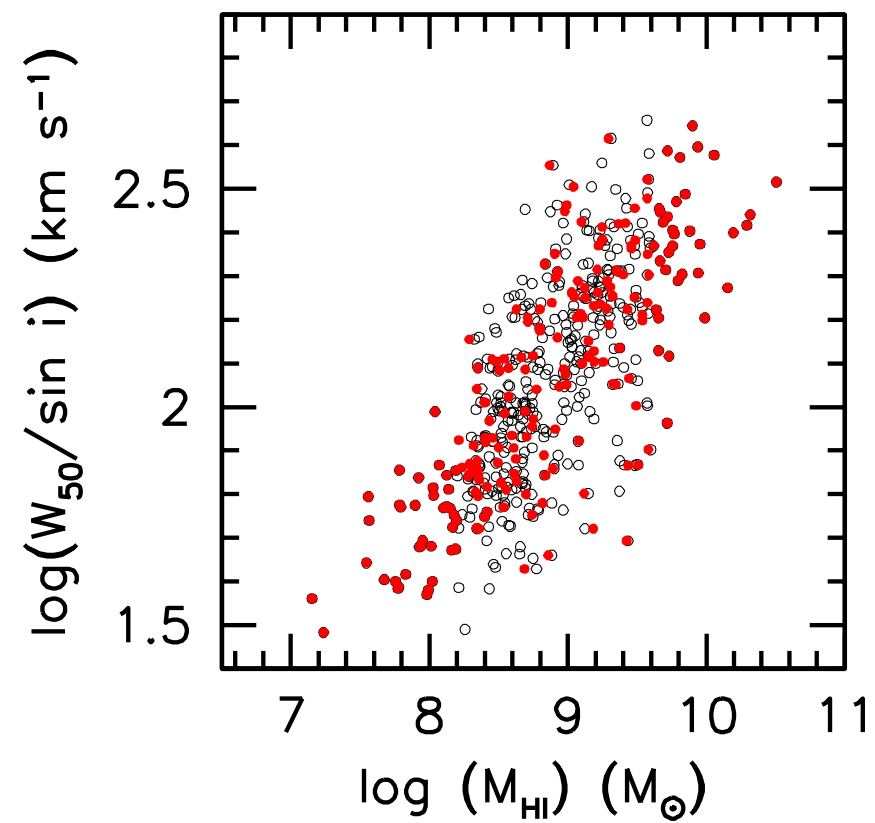
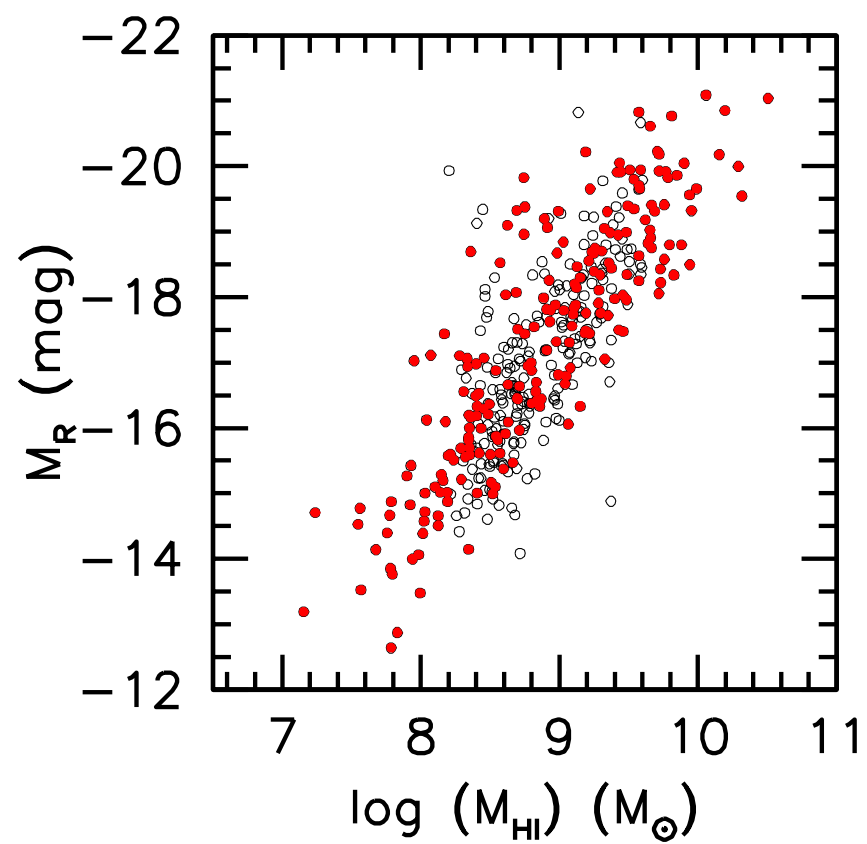
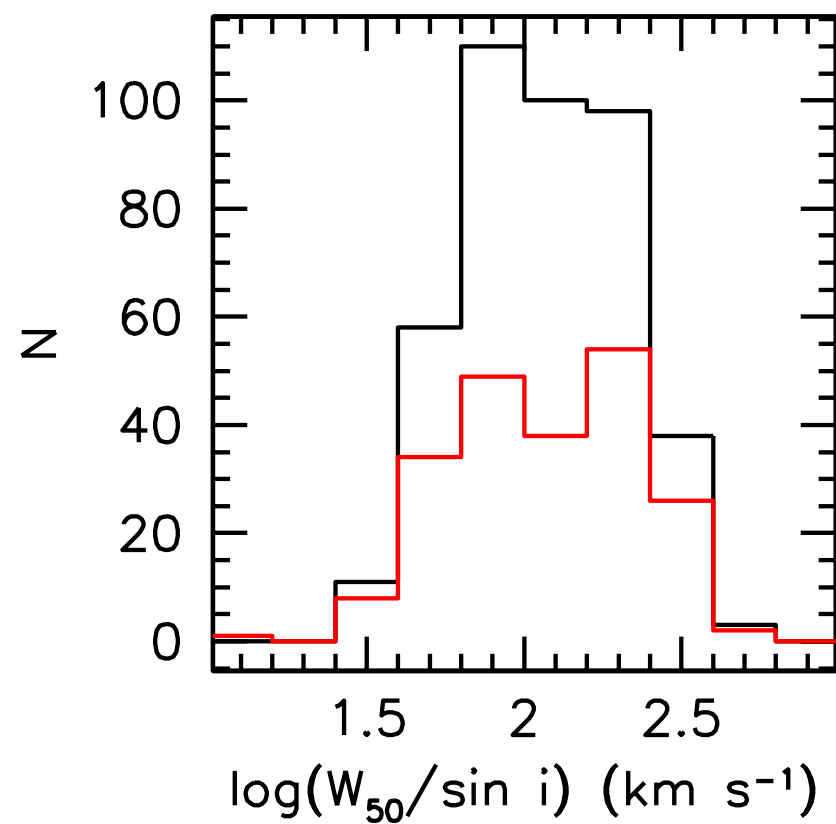
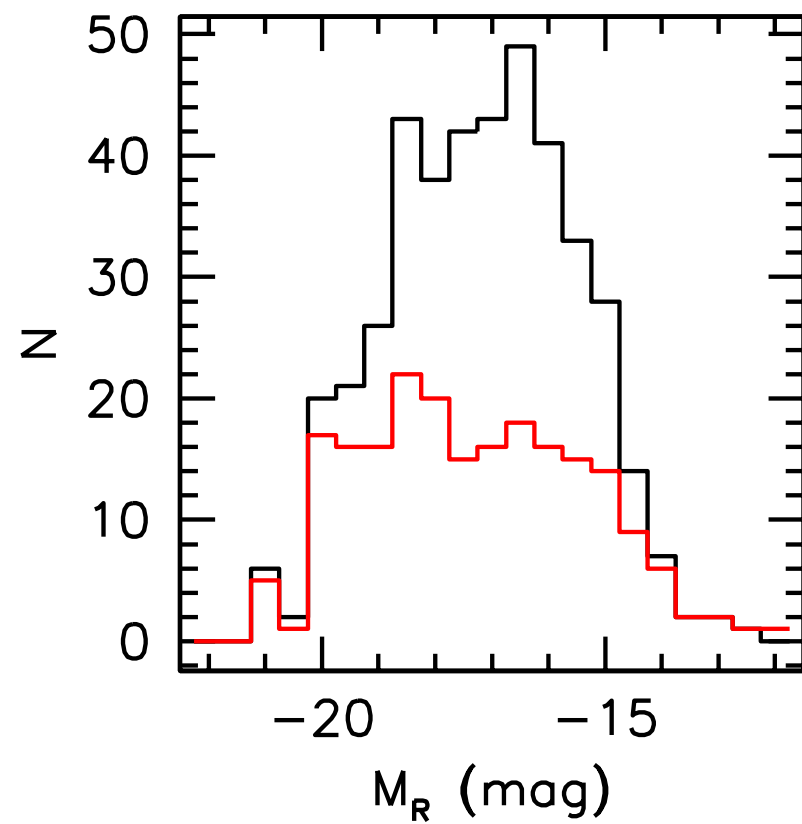
Why more?

- Previous surveys exist: why observe more?
- No survey covers complete range in properties
- Heterogeneous combination does not work
- All THINGS galaxies had already been observed before THINGS





- Does an *H I selected* sample provide a comprehensive view of the local galaxy population?



Black: HICAT
Red: MHONGOOSE

Observations

- Observe all 301 galaxies for 8 hours
 - 5σ of $5 \times 10^{20} \text{ cm}^{-2}$ at $10''$ over 16 km s^{-1} with 5 km s^{-1} chans
 - Edge of “star forming disk”
- Observe 10% for 200 hours
 - 5σ of 1.2×10^{19} (5×10^{17}) cm^{-2} at $30''$ ($90''$) over 16 km s^{-1} with 5 km s^{-1} chans
 - Outer disk, accretion, cosmic web

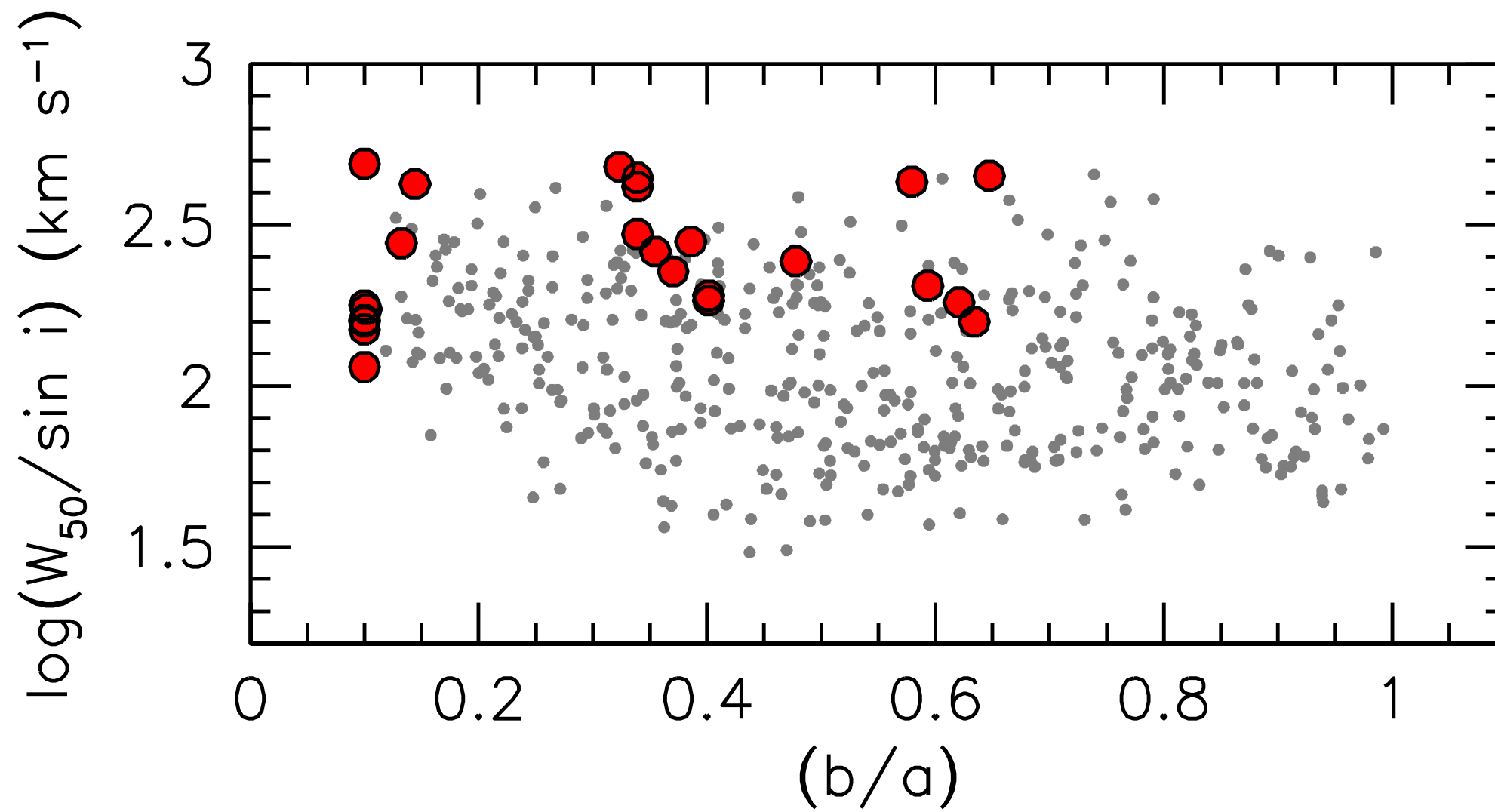
HALOGAS

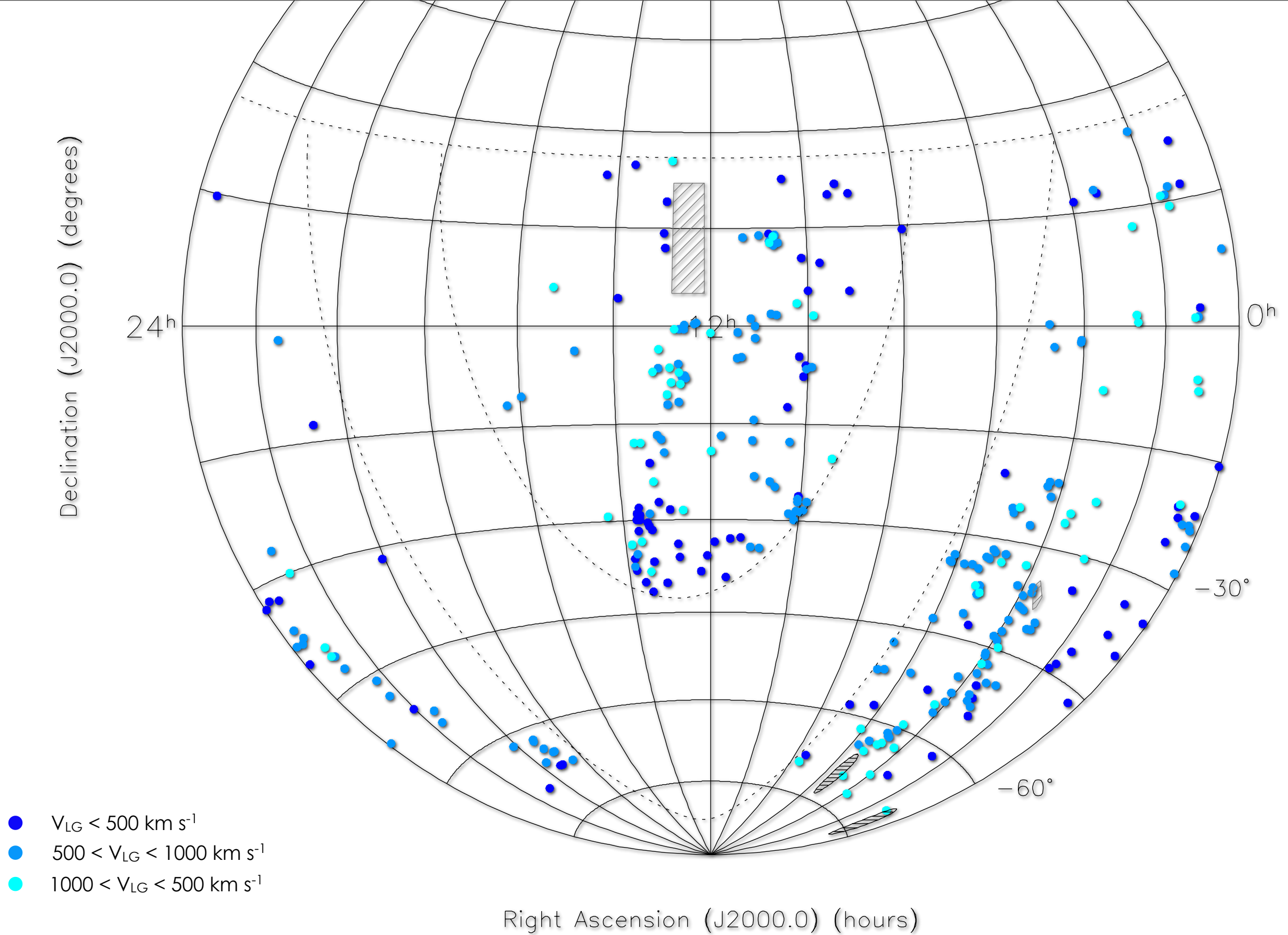
- HALOGAS at WSRT
- low column density detections in ~20 northern spirals and dwarfs



Figure 2: Comparison of shallow THINGS and deep HALOGAS observations of NGC 925. Left: The HI distribution in NGC 925 from THINGS, convolved to the WSRT resolution. Lowest contour at $9 \cdot 10^{19} \text{ cm}^{-2}$, with each contour double the previous value. Center: False-color image of the baryonic components. Colors as in Fig. 1. Right: The HI distribution as observed by the deep WSRT HALOGAS survey. Lowest contour $1.8 \cdot 10^{19} \text{ cm}^{-2}$ with each contour double the previous value. (HI maps: courtesy G.Heald and the HALOGAS collaboration.)

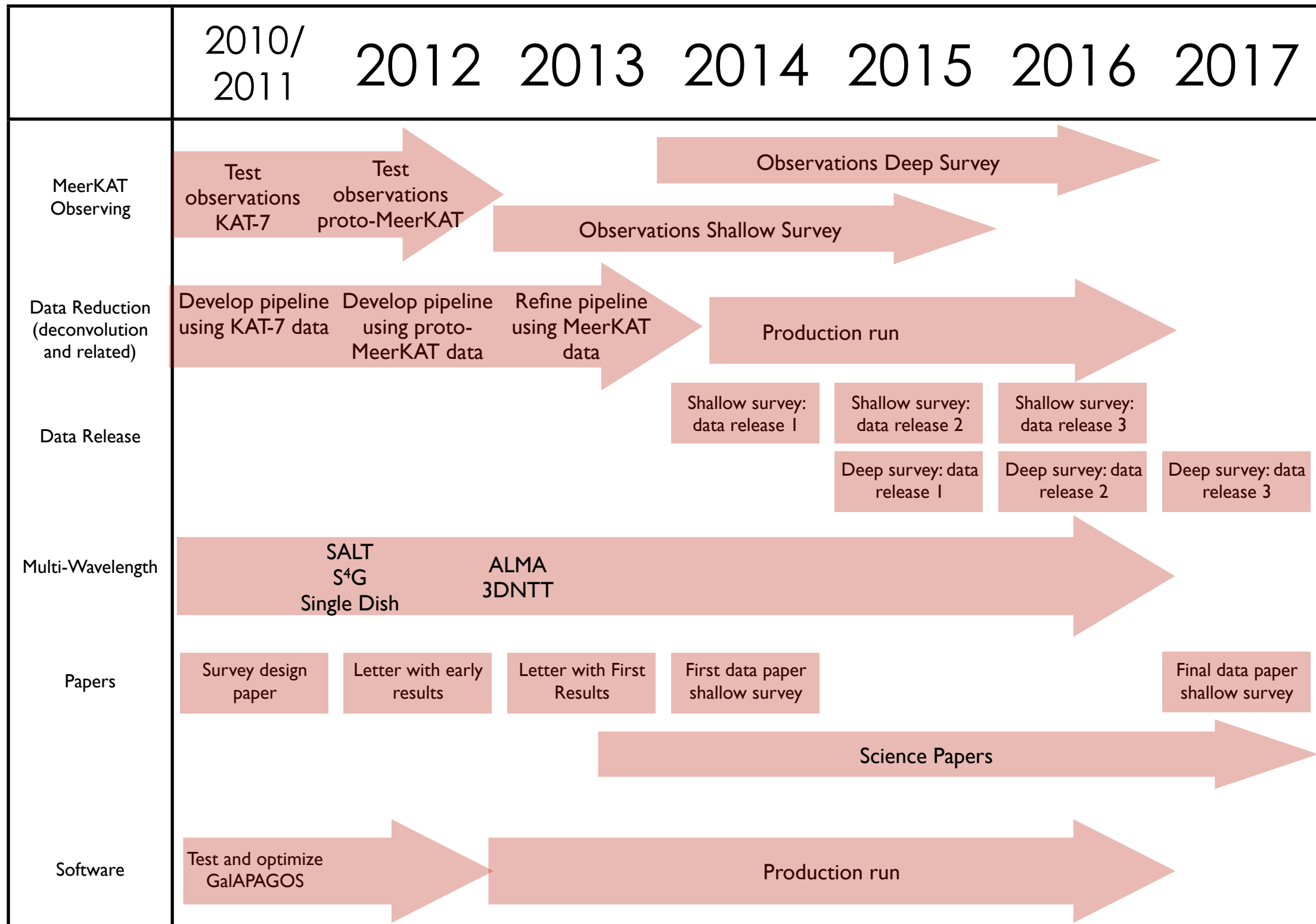
HALOGAS coverage

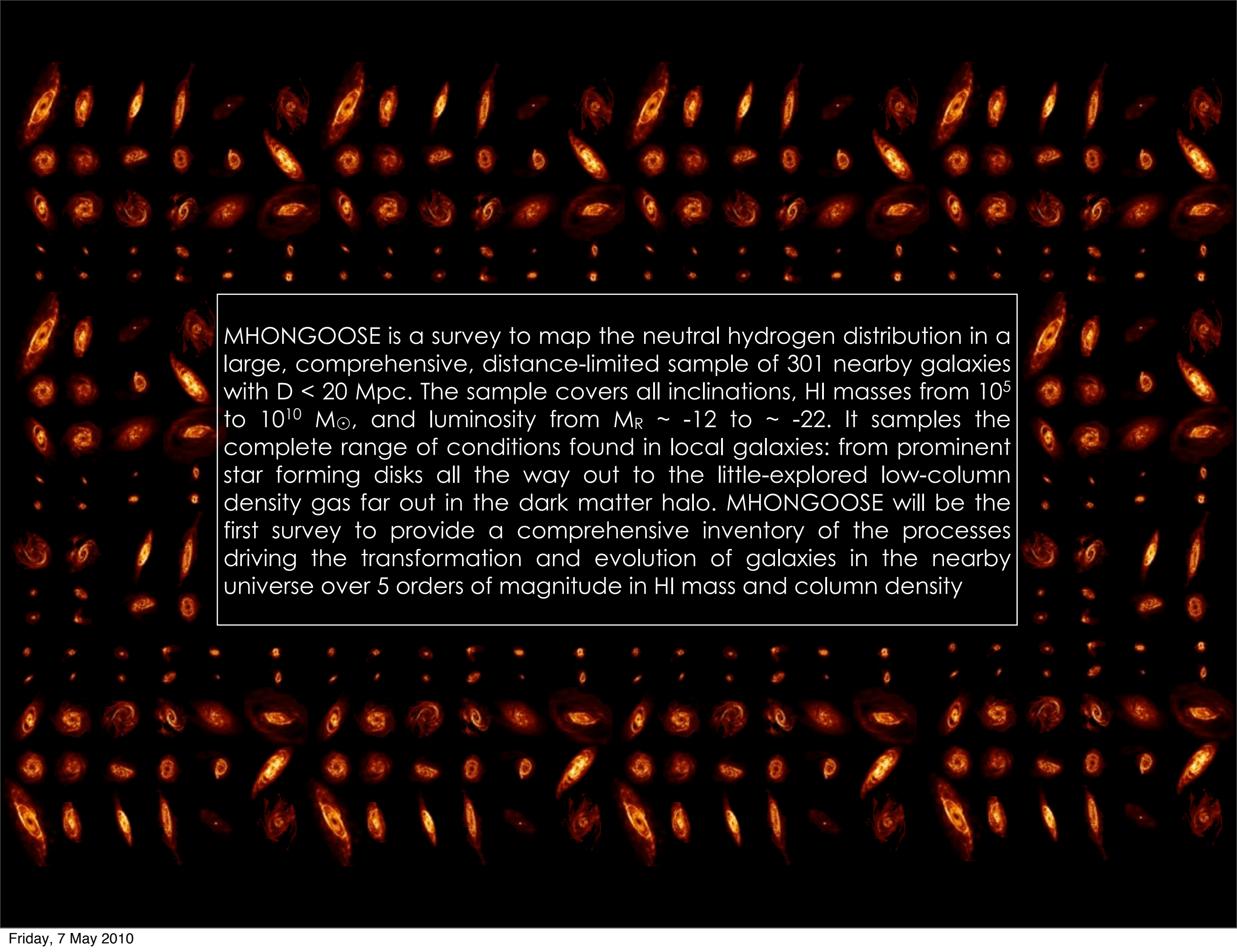




Sky distribution of MHONGOOSE sample

MHONGOOSE timeline





MHONGOOSE is a survey to map the neutral hydrogen distribution in a large, comprehensive, distance-limited sample of 301 nearby galaxies with $D < 20$ Mpc. The sample covers all inclinations, HI masses from 10^5 to $10^{10} M_{\odot}$, and luminosity from $M_R \sim -12$ to ~ -22 . It samples the complete range of conditions found in local galaxies: from prominent star forming disks all the way out to the little-explored low-column density gas far out in the dark matter halo. MHONGOOSE will be the first survey to provide a comprehensive inventory of the processes driving the transformation and evolution of galaxies in the nearby universe over 5 orders of magnitude in HI mass and column density