

# The Galactic Arecibo L-band Feed Array (GALFA) HI Survey



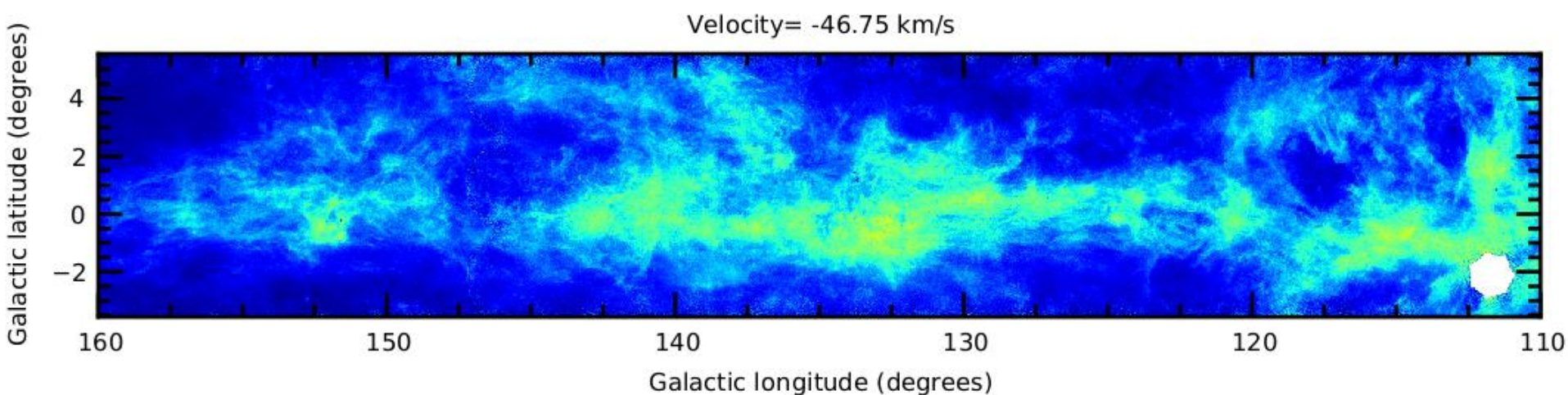
Kevin A. Douglas  
Galt Symposium  
DRAO, 23 Sep. 2014

# Overview

- Galactic HI Surveys: Penticton to Puerto Rico
- The ALFA Instrument and the HI Backend
- Observations and Data Processing
- Science Highlights
- Advertising the Data:  
<https://purcell.ssl.berkeley.edu/>

# Another DRAO Legacy

- The Canadian Galactic Plane Survey (CGPS) has inspired a multitude of similar efforts.
- Galactic Plane surveys, all-sky surveys, multiwavelength observations of the ISM, etc.



# Brief History of GALFA

- About 10 years ago, the GALFA consortium was formed to carry out Galactic studies with Arecibo's new receiver system, ALFA.
- Three sub-consortia, for HI, RRL, and radio continuum investigations.
- GALFA-HI observations were underway by September 2004

# Advantages of Arecibo

- High sensitivity to low-level HI signals
- Seven-element array allows for fast mapping
- Quite good angular resolution,  $\approx 3.5'$
- Multiple back-ends allow commensal observing: majority of GALFA-HI data has been collected in 'piggy-back' mode (TOGS)
- Really good HI spectrometer, GALSPECT, developed by Jeff Mock;  $\Delta v = 0.18$  km/s

# GALSPECT:

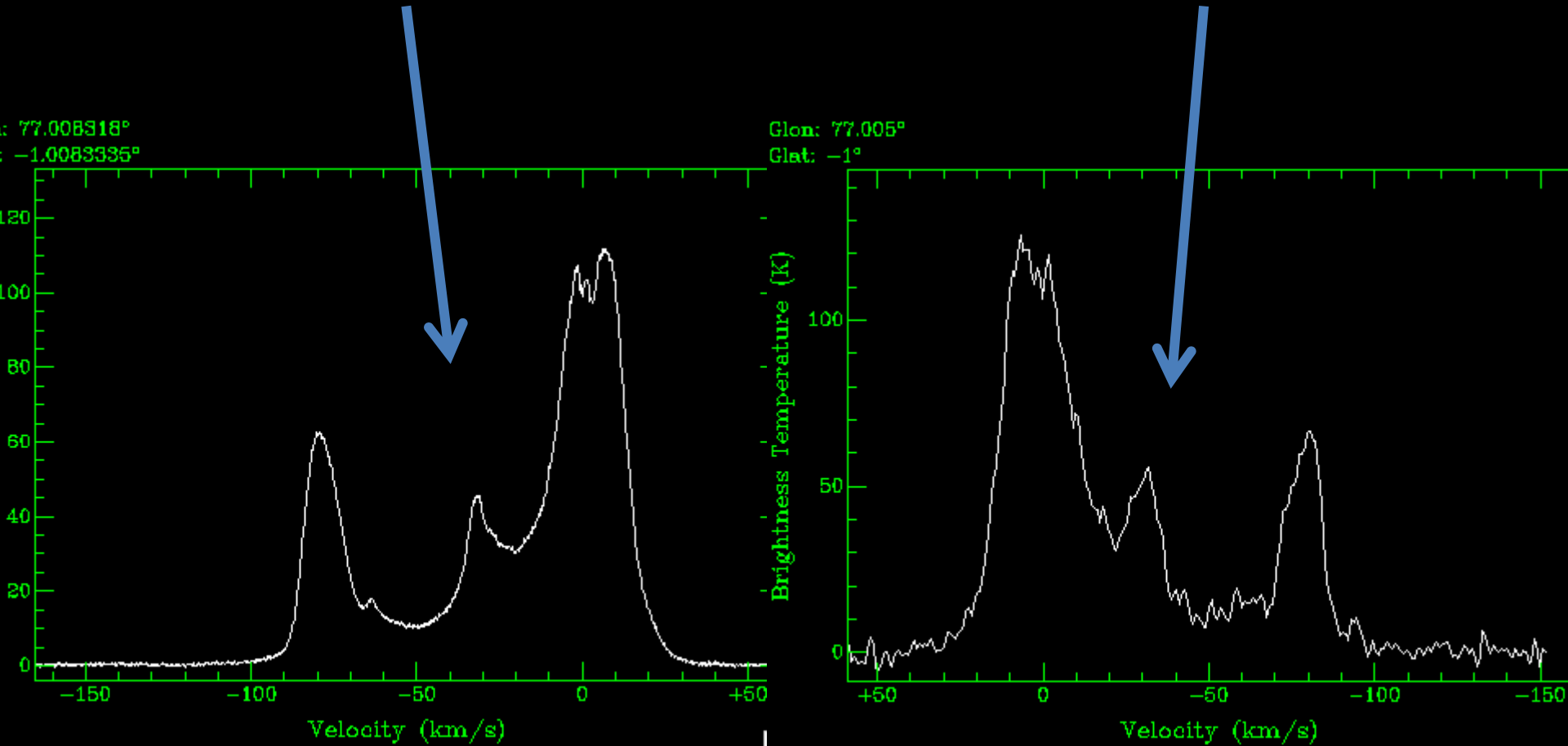
Wertheimer, Mock et al



# ALFA



# GALFA-HI compared to CGPS

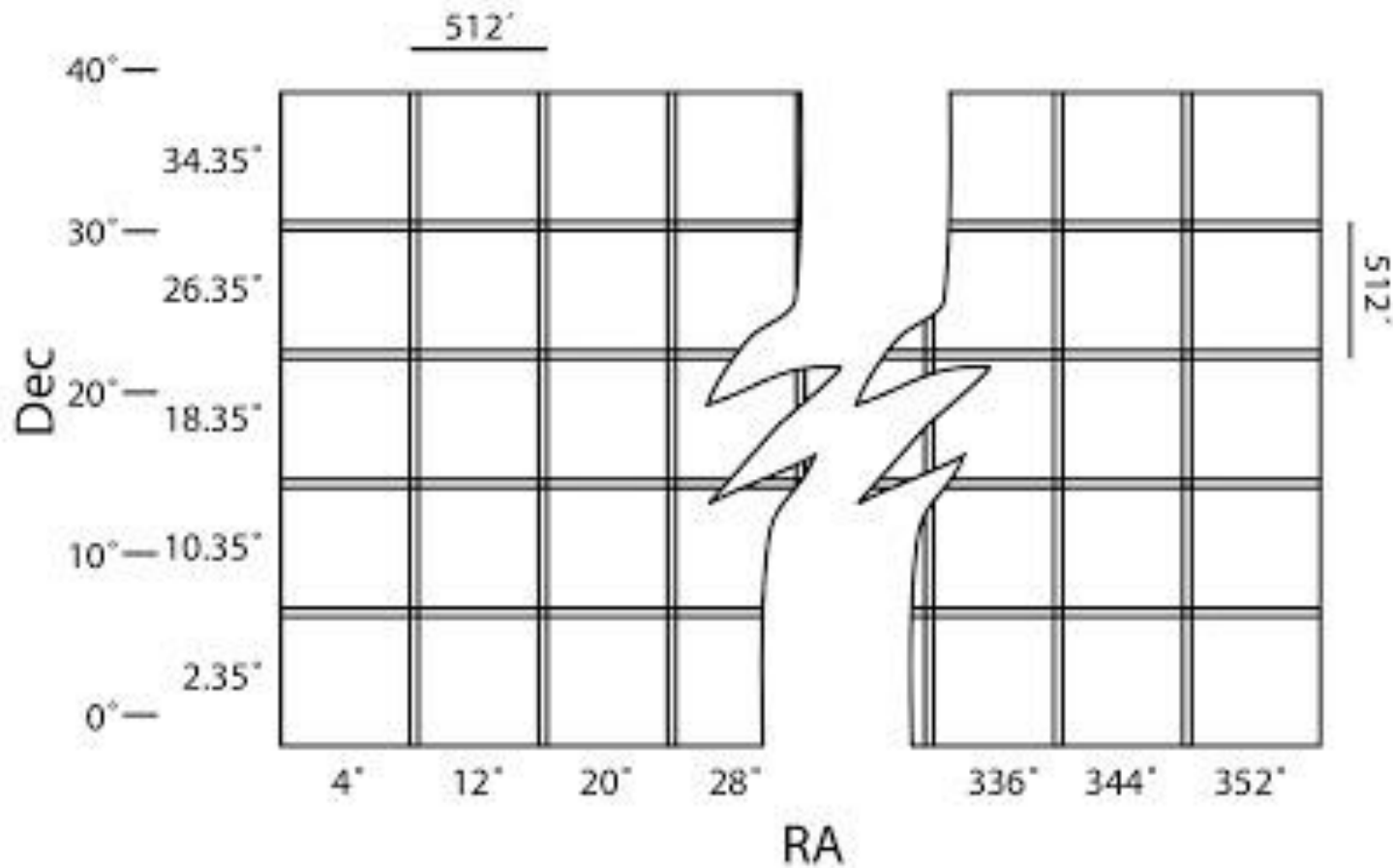


# Data Processing

- GSR software: IDL code developed at UC Berkeley, primarily by Josh Peek.
- Challenging! 14 beams, crossing point calibration, gain variations, RFI inter-modulation products, baseline ripple, sidelobes, stray radiation, et cetera
- End products are datacubes, roughly  $8^\circ$  on a side, with up to 2048 velocity channels



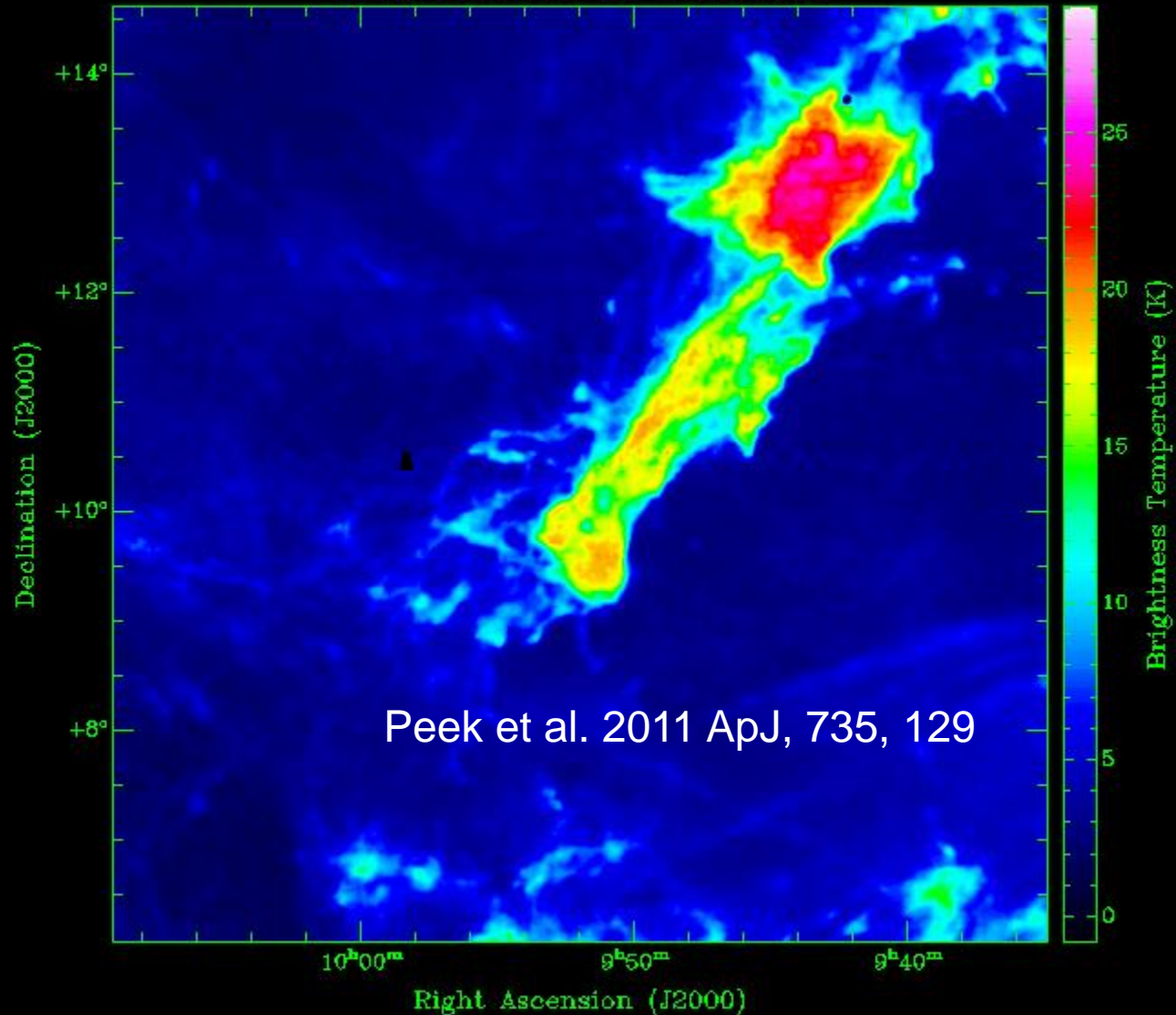
# Tiling up the Arecibo Sky



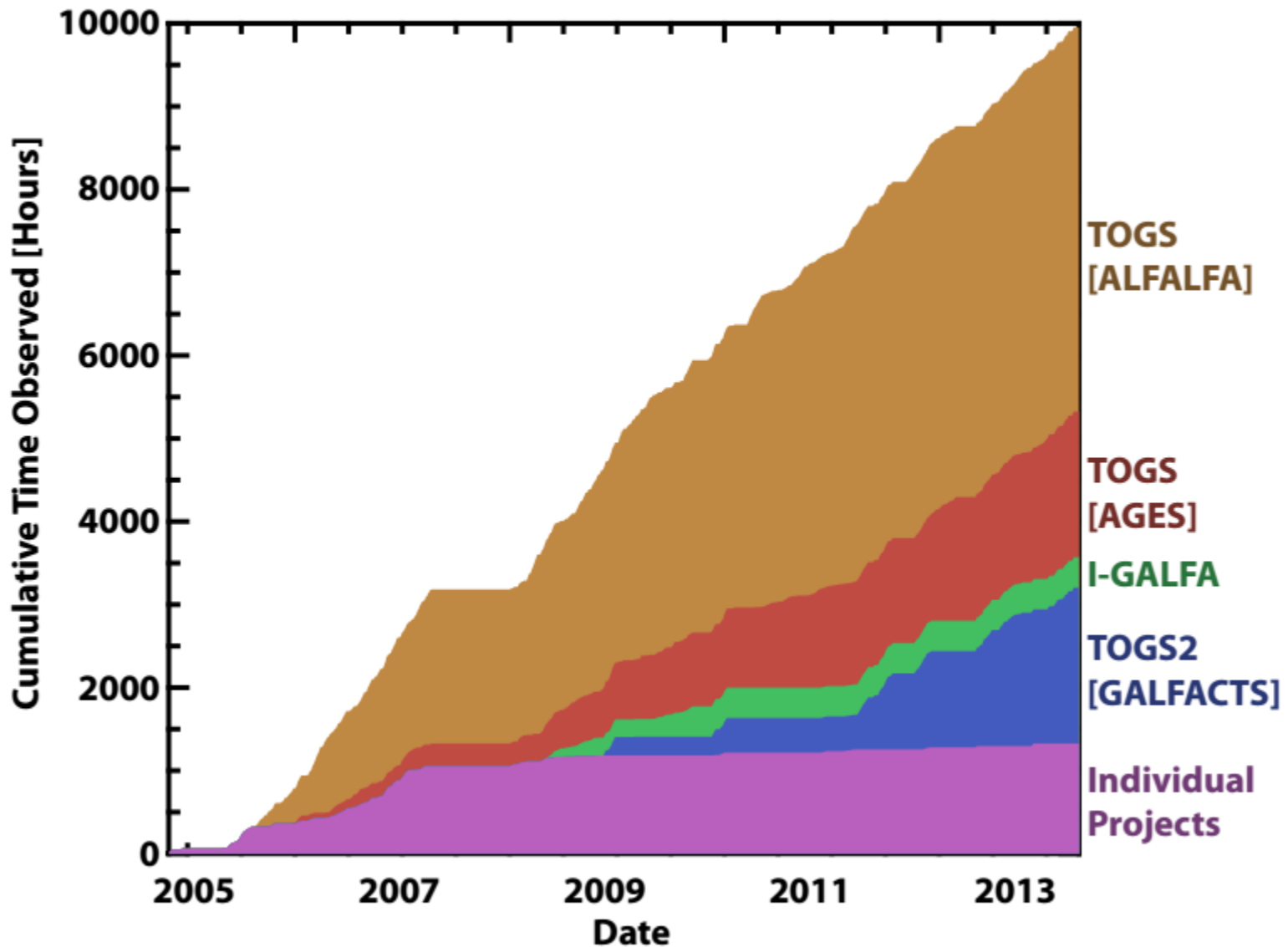
# The (very local) Leo Cold Cloud

Velocity: +3.77 km/s

GALFA-HI RA+DEC Tile 148.00+10.35

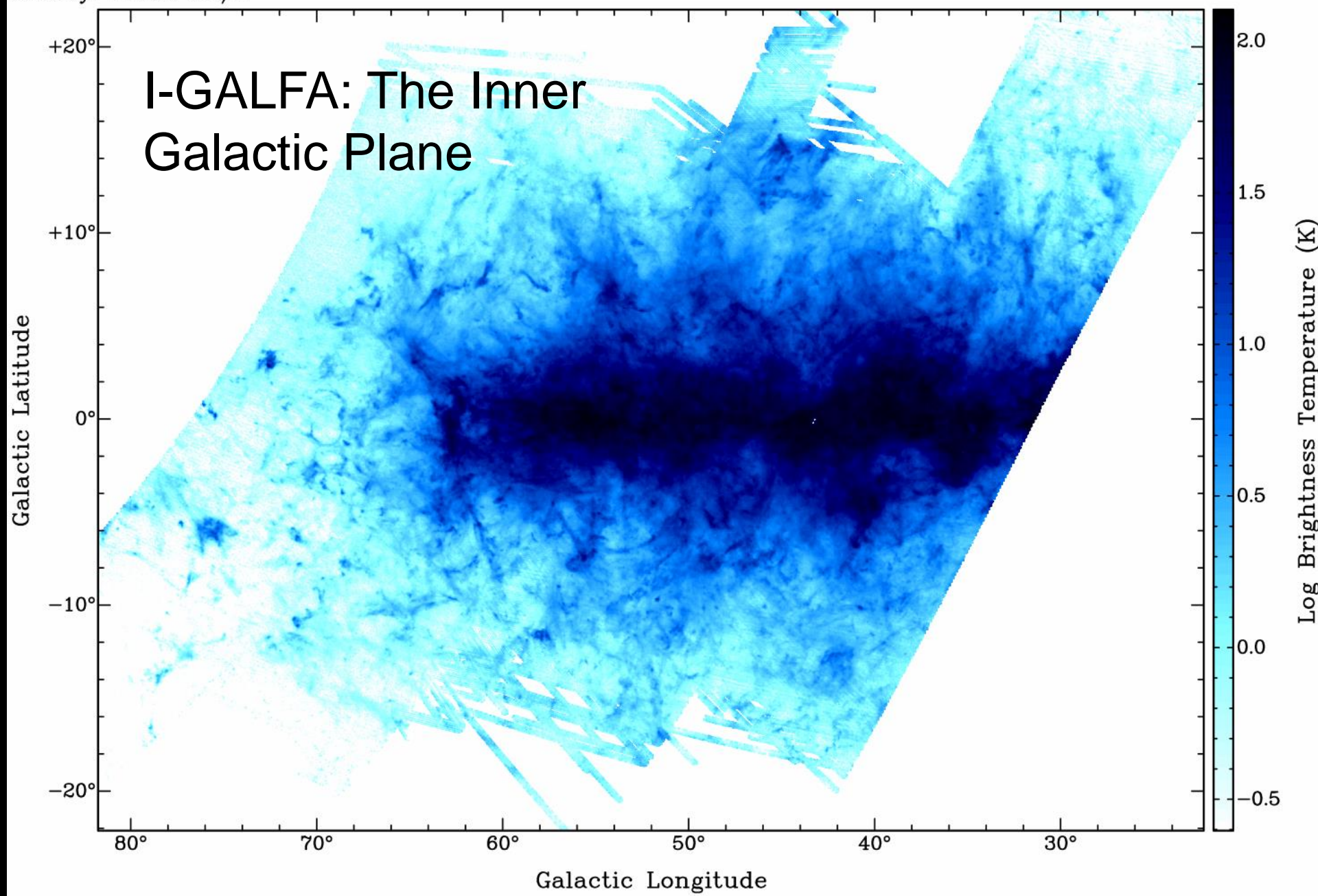


# Observing Progress, 2005-2013



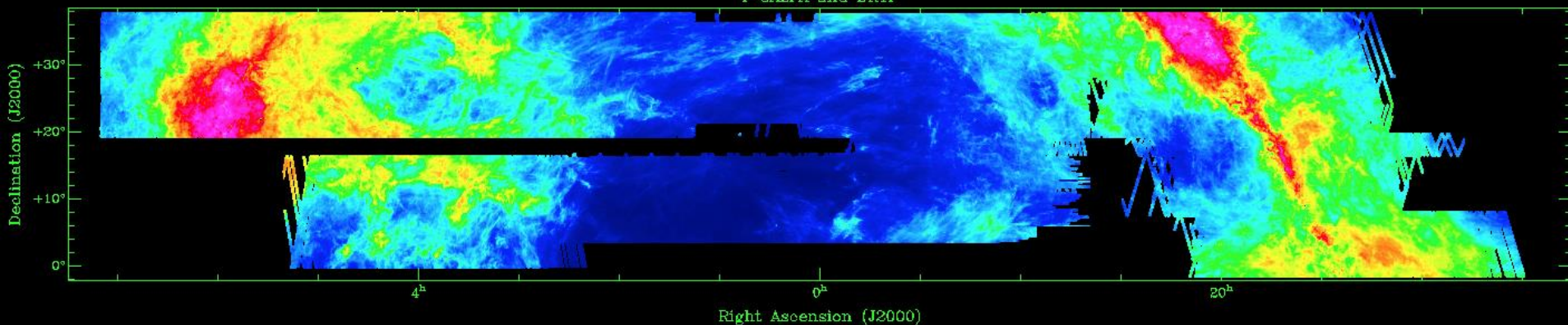
Velocity: +40.03 km/s

# I-GALFA: The Inner Galactic Plane

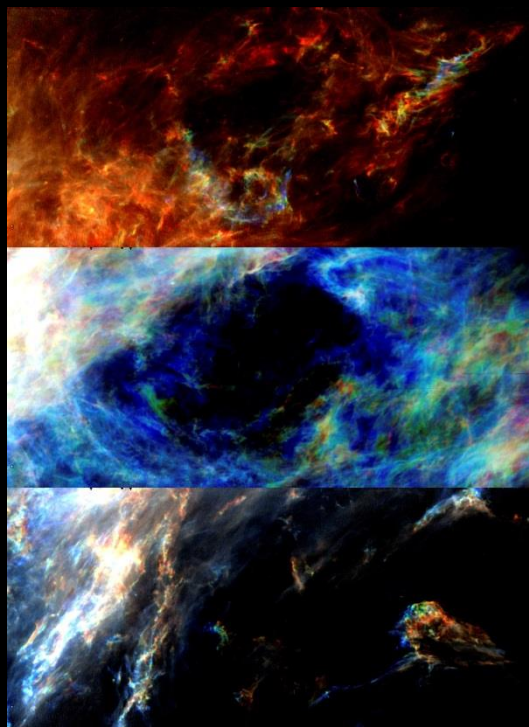


Velocity: +3.31 km/s

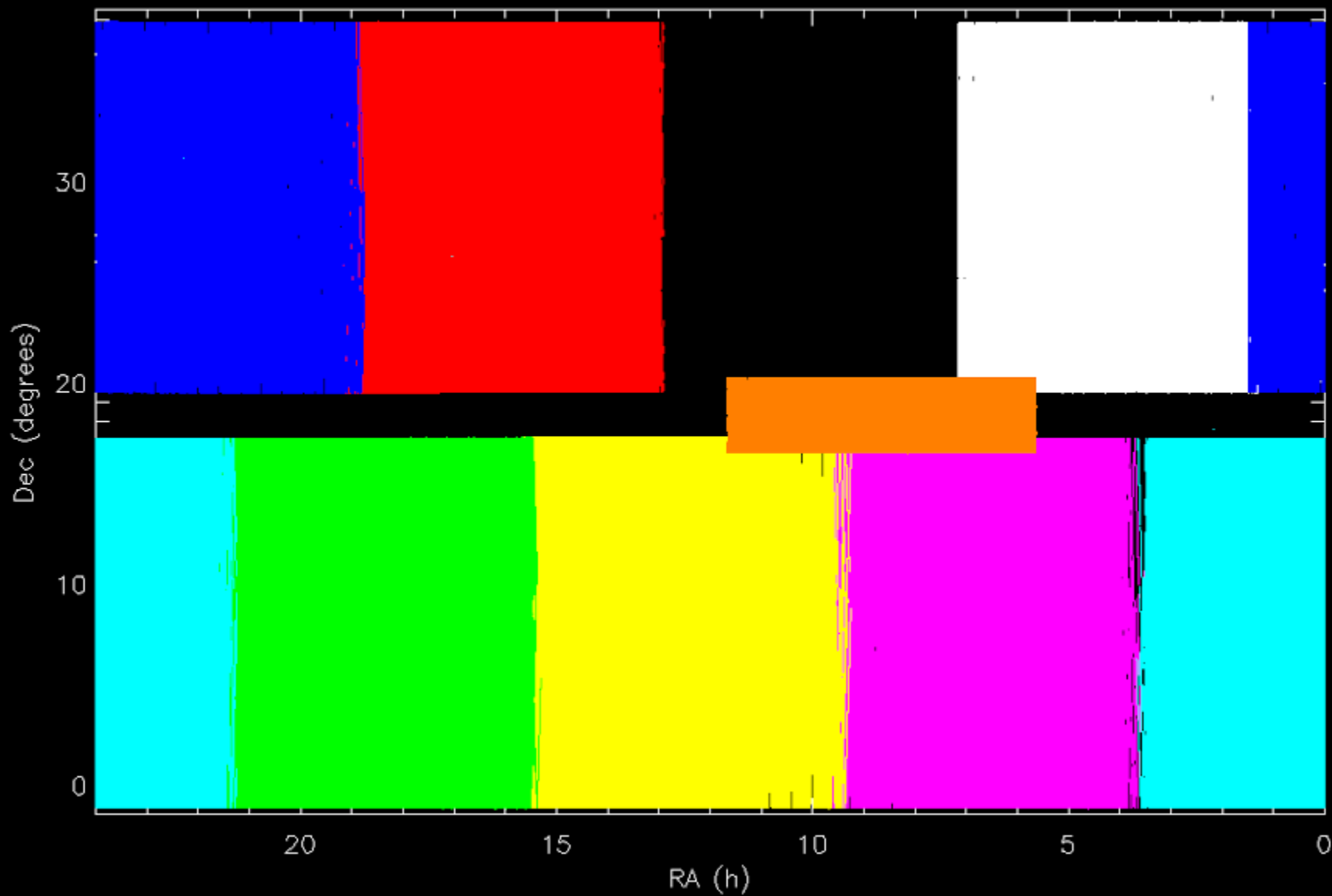
I-CALFA and DR1F



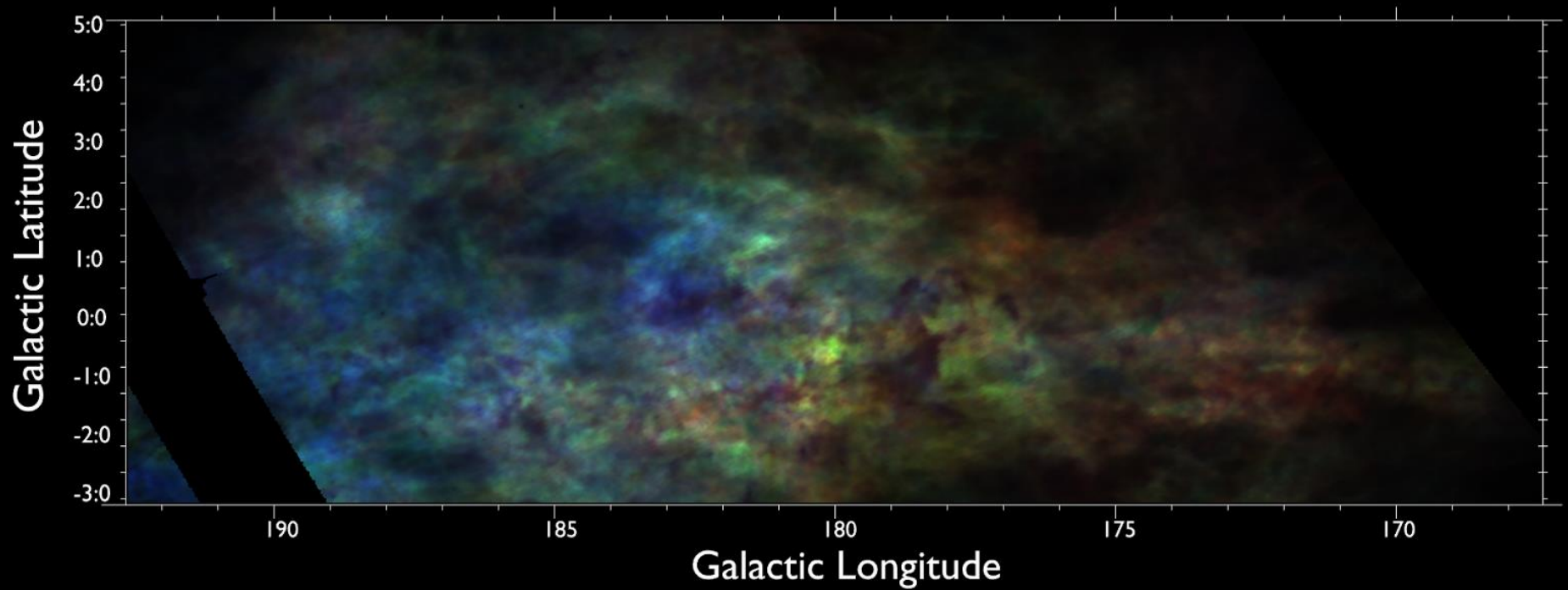
# Jigsaw Mapping & Data Release 1



# GALFACTS fields (first 8 of 12)



# HI toward the Outer Galaxy

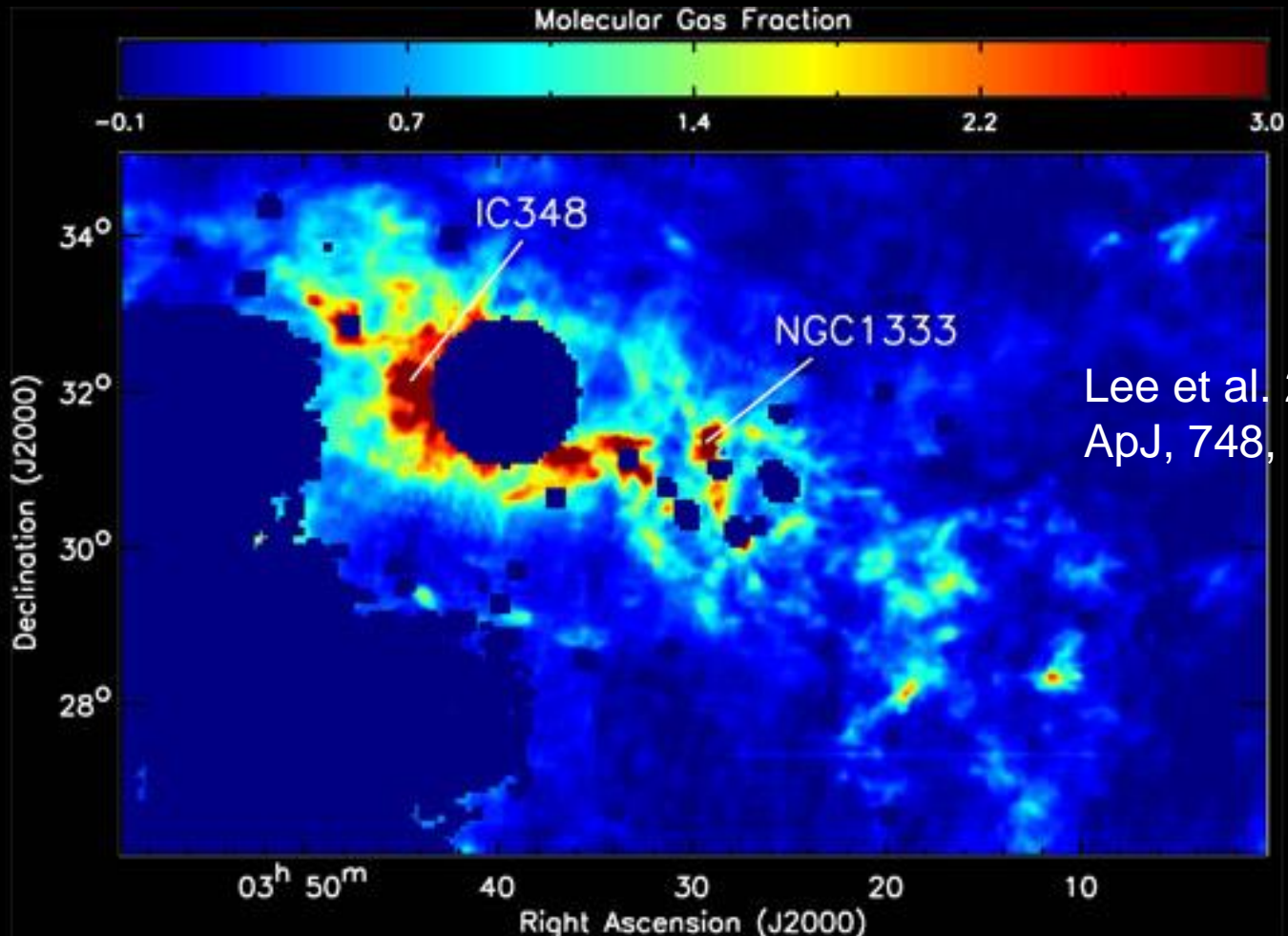


# Recent Results

- Catalogue of compact HI sources
- Statistical characterization of IS turbulence
- Multiwavelength ISM investigations
- Reduction of latest GALFACTS fields
- Improvements to pipeline – better data on the way!

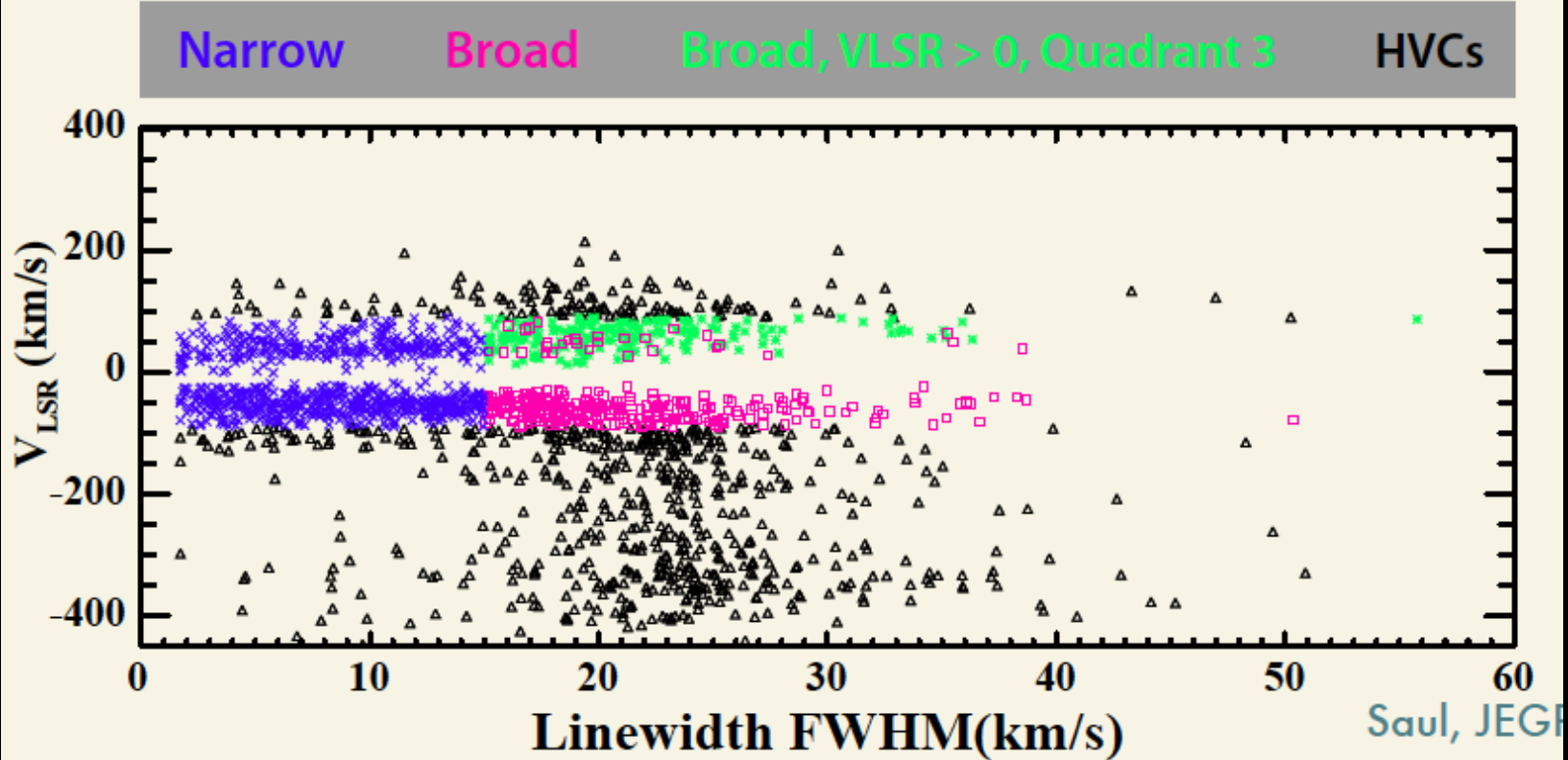
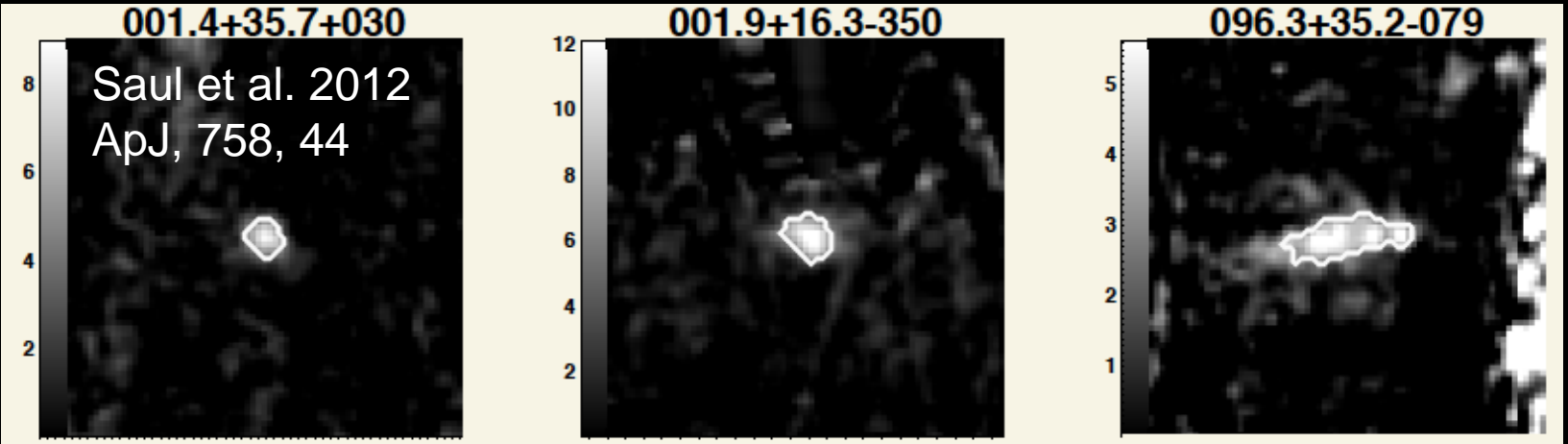


# HI-H<sub>2</sub> interface in Perseus MC

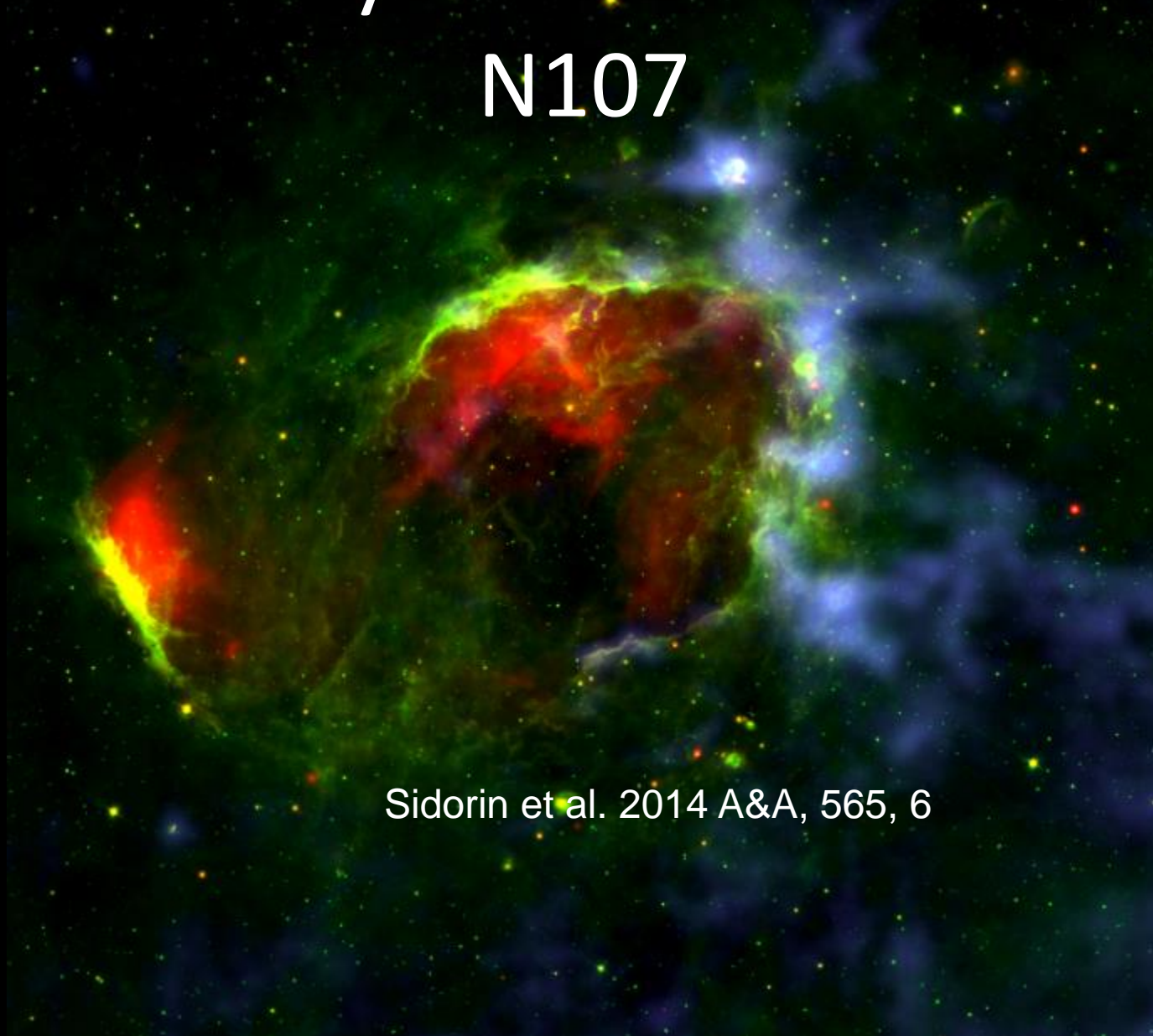


Lee et al. 2012  
ApJ, 748, 75

# 1,964 compact clouds in GALFA-HI (DR1)

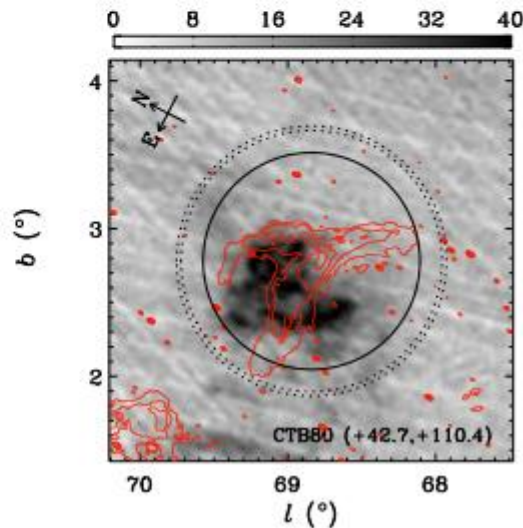
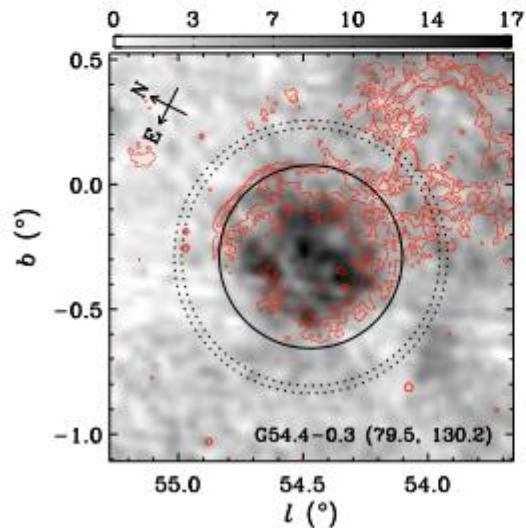
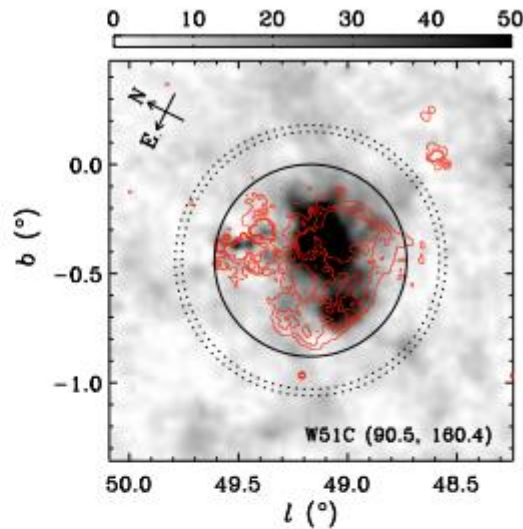
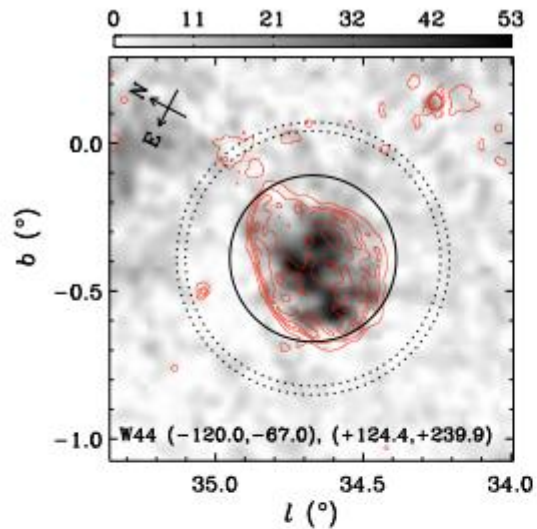


# ISM Study of GLIMPSE bubble N107



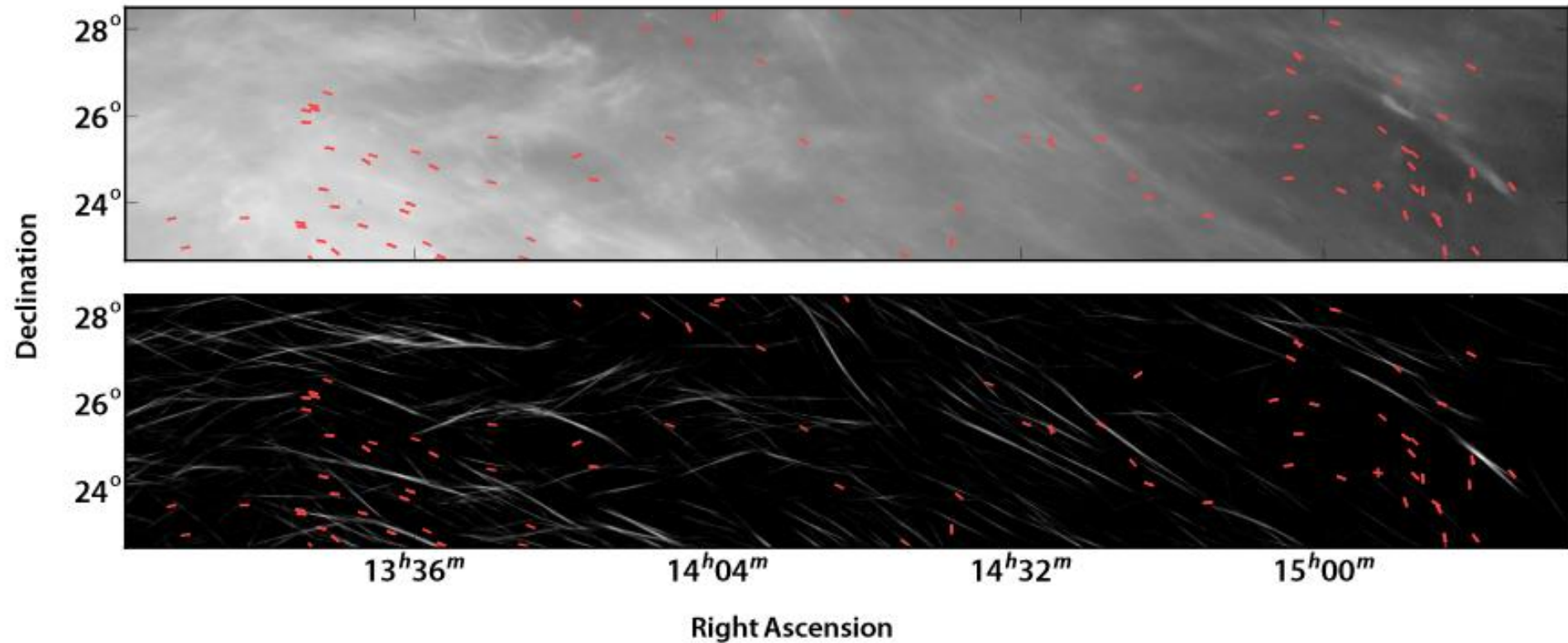
Sidorin et al. 2014 A&A, 565, 6

# HI Shells associated with SNRs



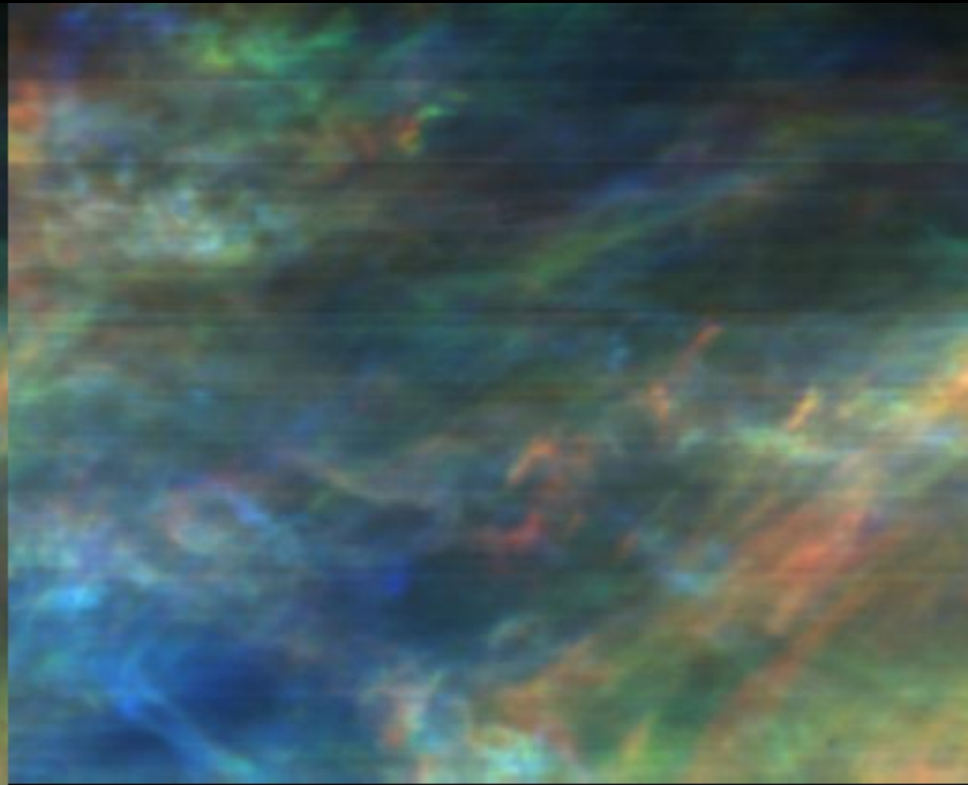
Park et al. 2013  
ApJ, 777, 14

# HI Fibers, aligned with B fields?



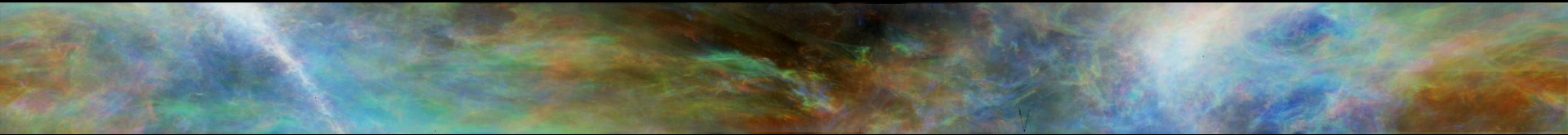
Clark et al. 2014  
ApJ, 789, 82

# Recent Improvements



# Conclusions

- Survey science continues to excite
- Arecibo-based GALFA-HI efforts are paying off
- Lots of good data available now, and much more to come.



- Check out <https://purcell.ssl.berkeley.edu/>

Thank  
you!

