GBT Galactic HII Region Discovery Survey

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Collaborators

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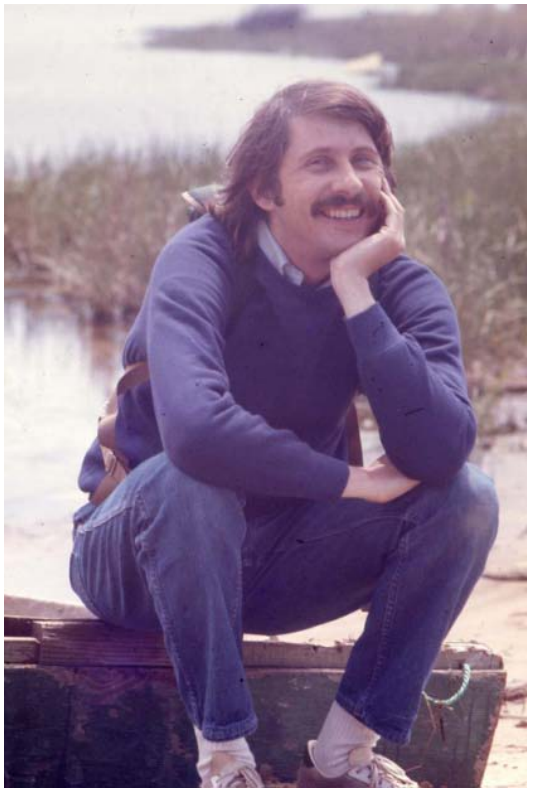


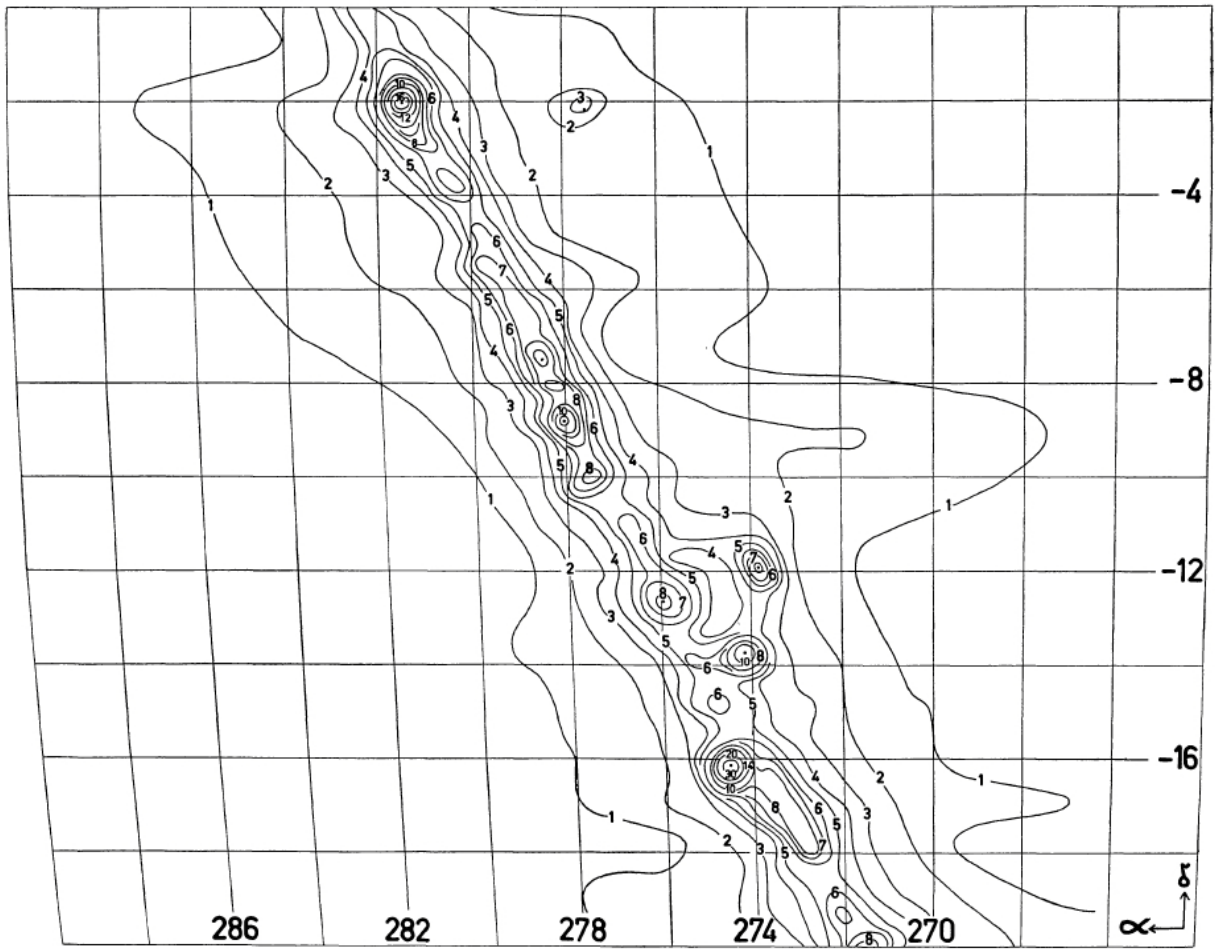
Bob Rood
(University of Virginia)

HII Region Surveys

Eagle Nebula
NGC 6611
M16

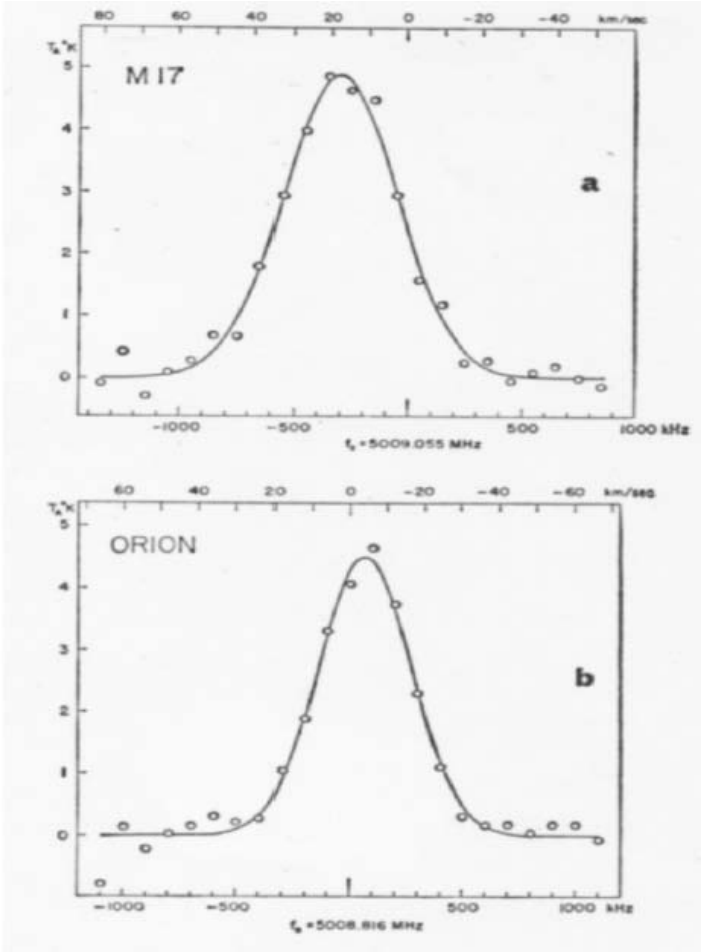
POSS

Radio Continuum Surveys



Westerhout (1958)

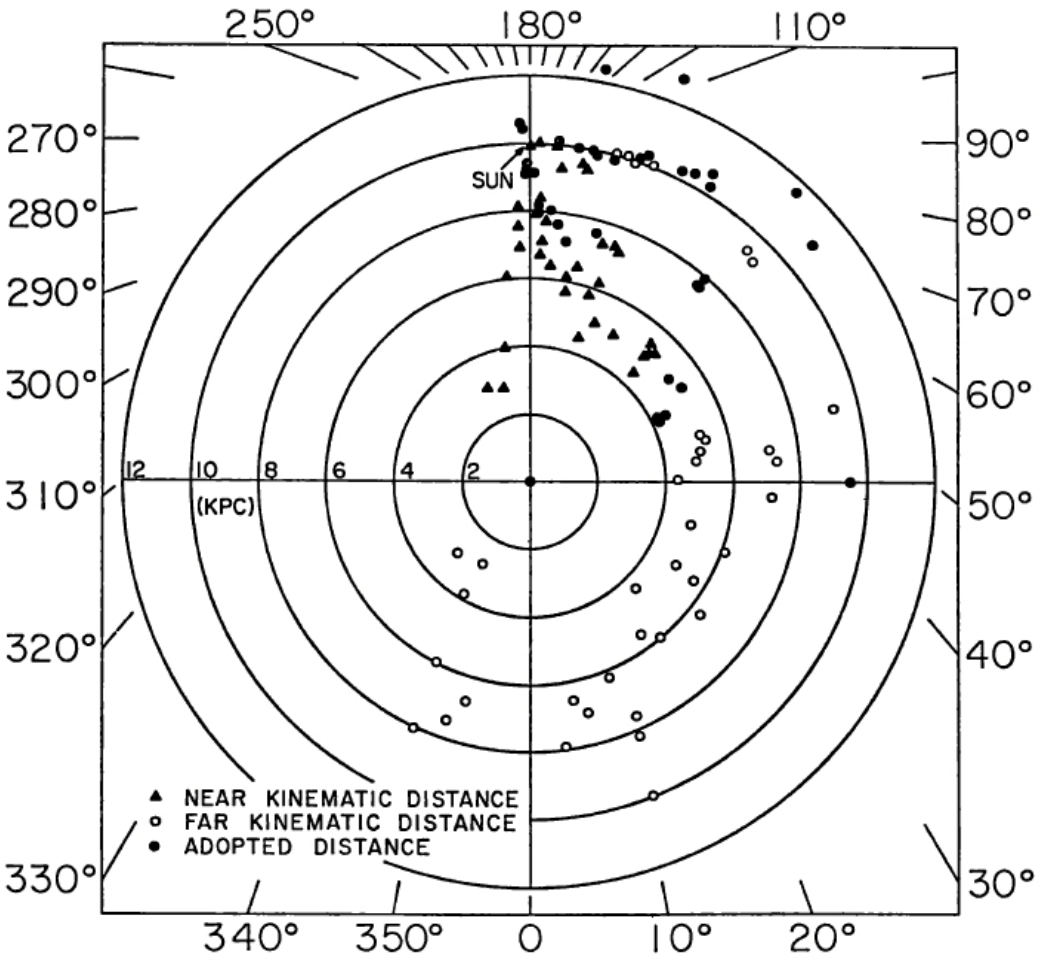
Radio Recombination Lines (RRLs)



H109α

Hoglund & Mezger (1965)

Radio Recombination Line Surveys

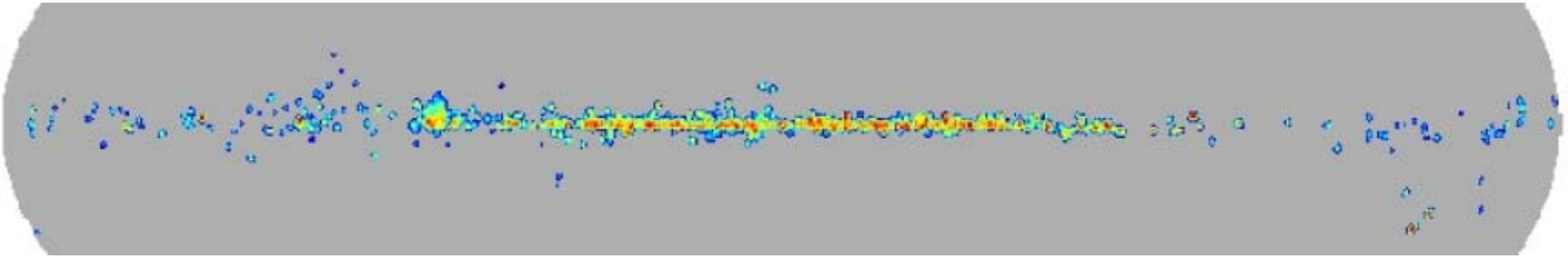


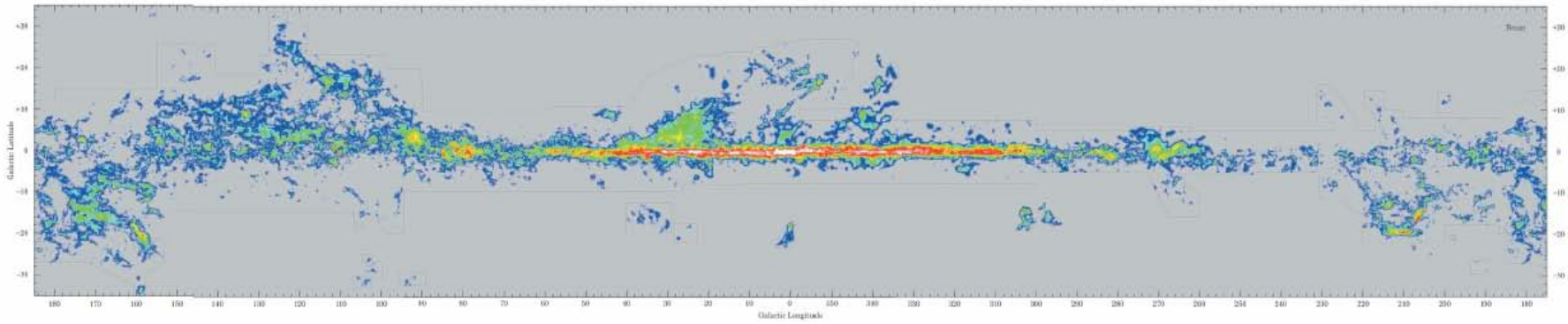
Reifenstein et al. (1970)

HII Region Emission

Simulated 30 GHz HII Region Emission (mK)
Master Catalog of 1442 Objects

Paladini et al. (2003)



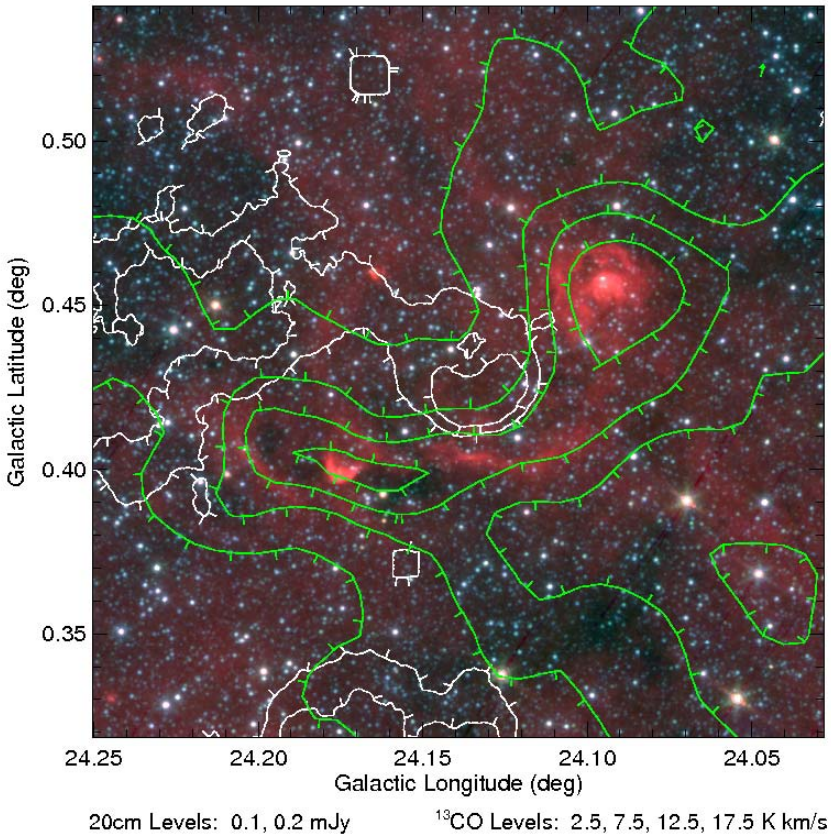


CO Integrated Emission (K km/s)

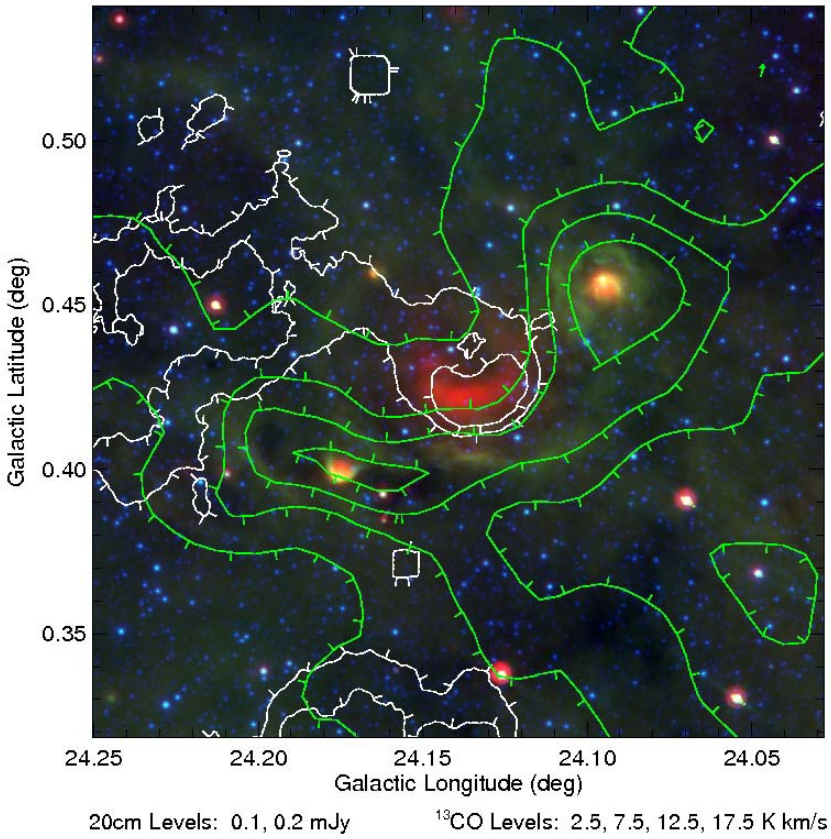
Dame et al. (2001)

HII Region Targets

RGB → 8, 4.5, 3.6 microns



RGB → 24, 8, 3.6 microns



Spitzer IR MAGPIS 20cm (white contour) GRS 13CO (green contour)

GBT HII Region Survey

Coincident 24μ m and 20 cm

Flux > 100 mJy @ 20 cm

$-16^{o} < \ell < +67^{o}$ and $-1^{o} < b < 1^{o}$

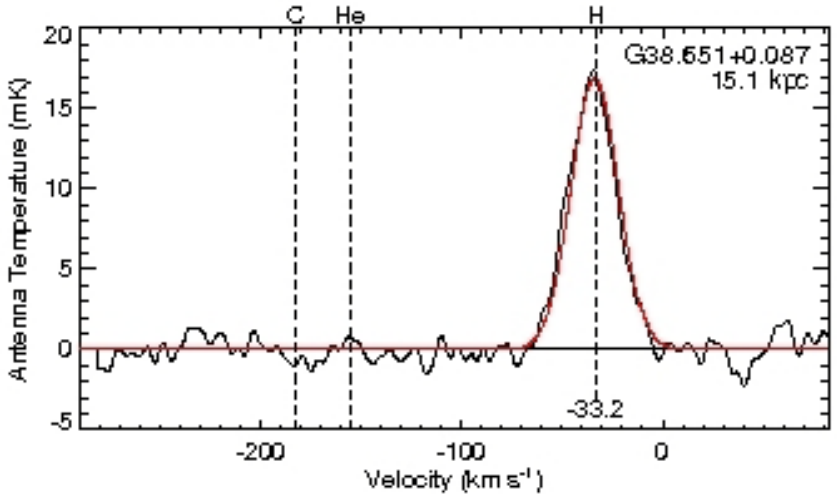
H87α - H93α (8 - 10 GHz)

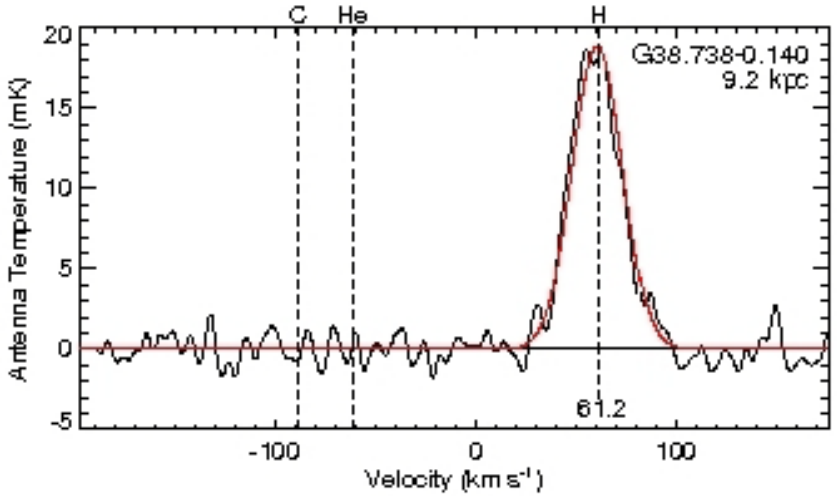
HPBW ~ 80 arcsec

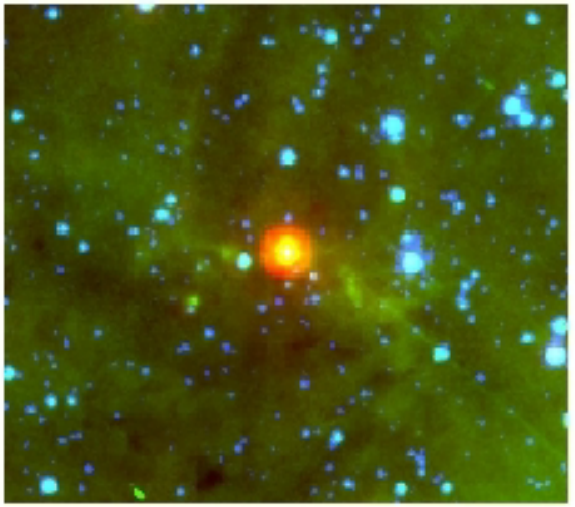
$\Delta\nu = 12$ kHz ($\Delta v = 0.4$ km s^{-1})

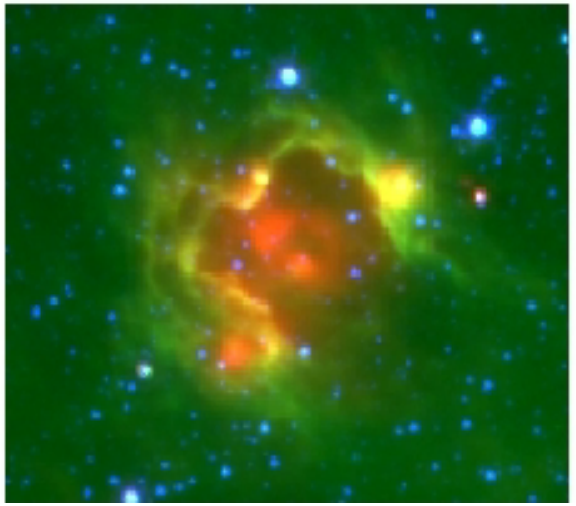
All HII regions ionized by a single O-type star within the Solar orbit

GBT Spectra



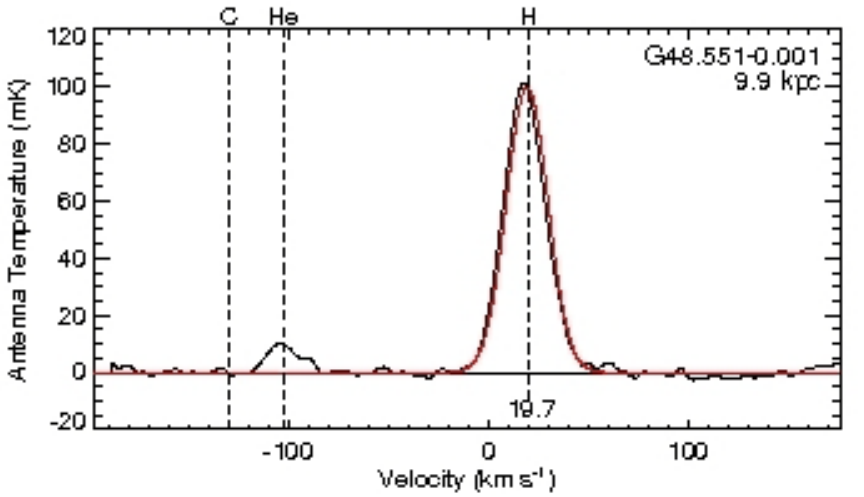


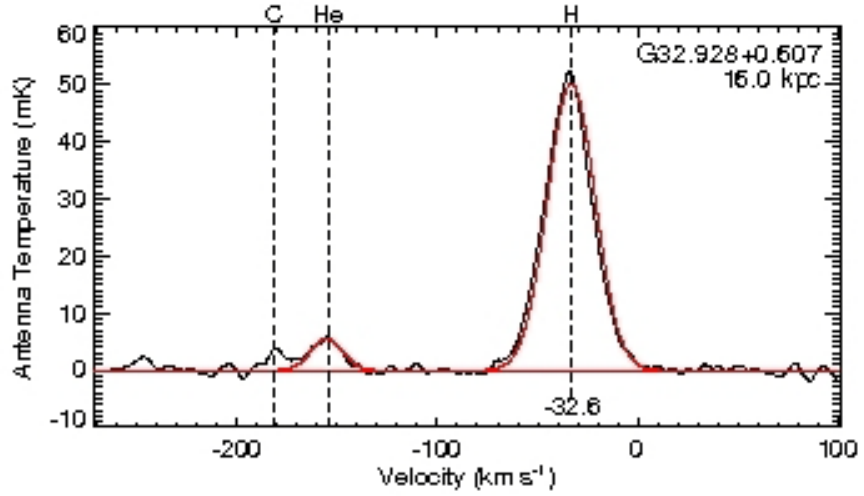


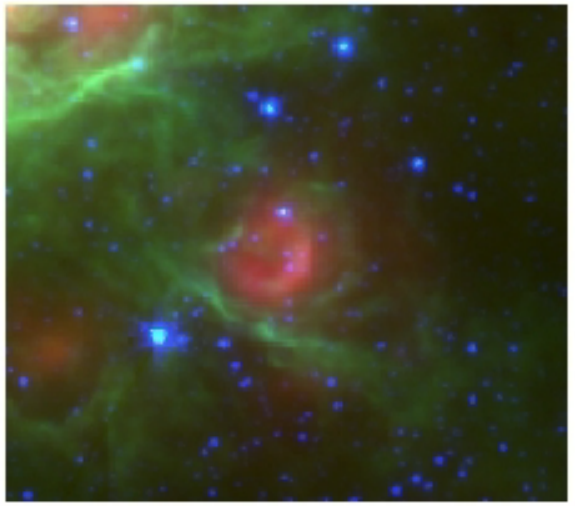


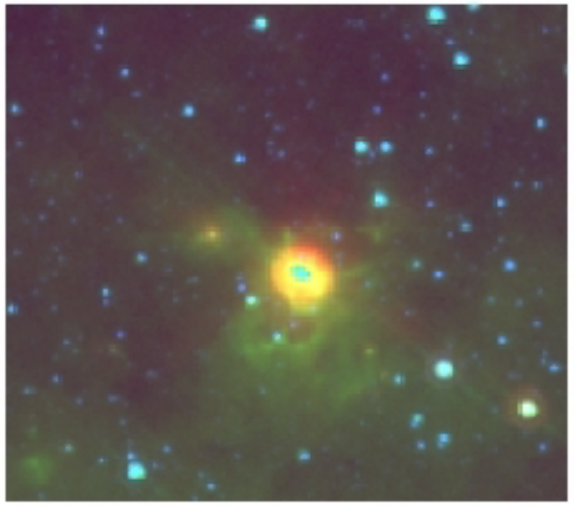
5'

GBT Spectra



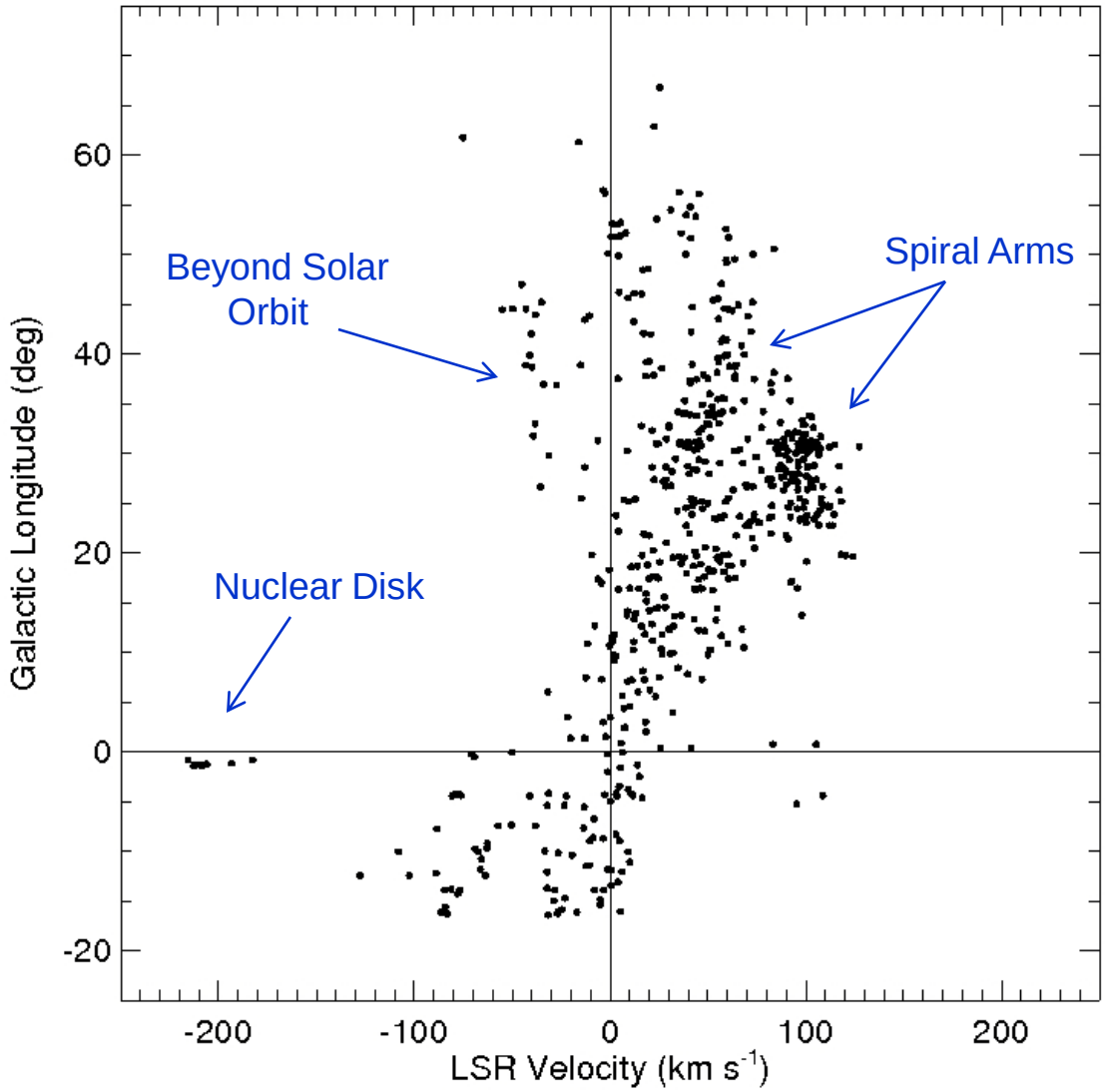






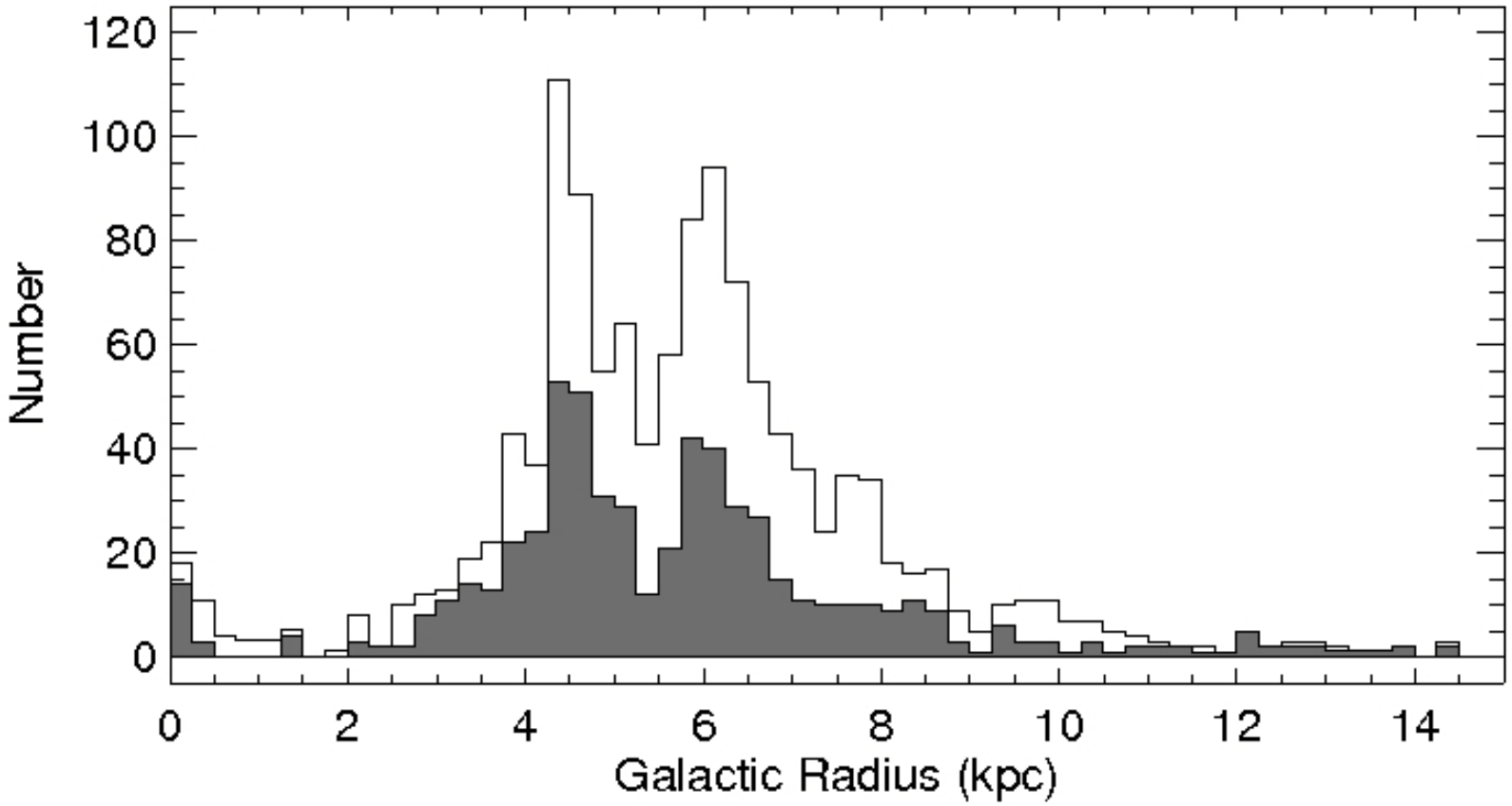
5'

Longitude-Velocity Diagram

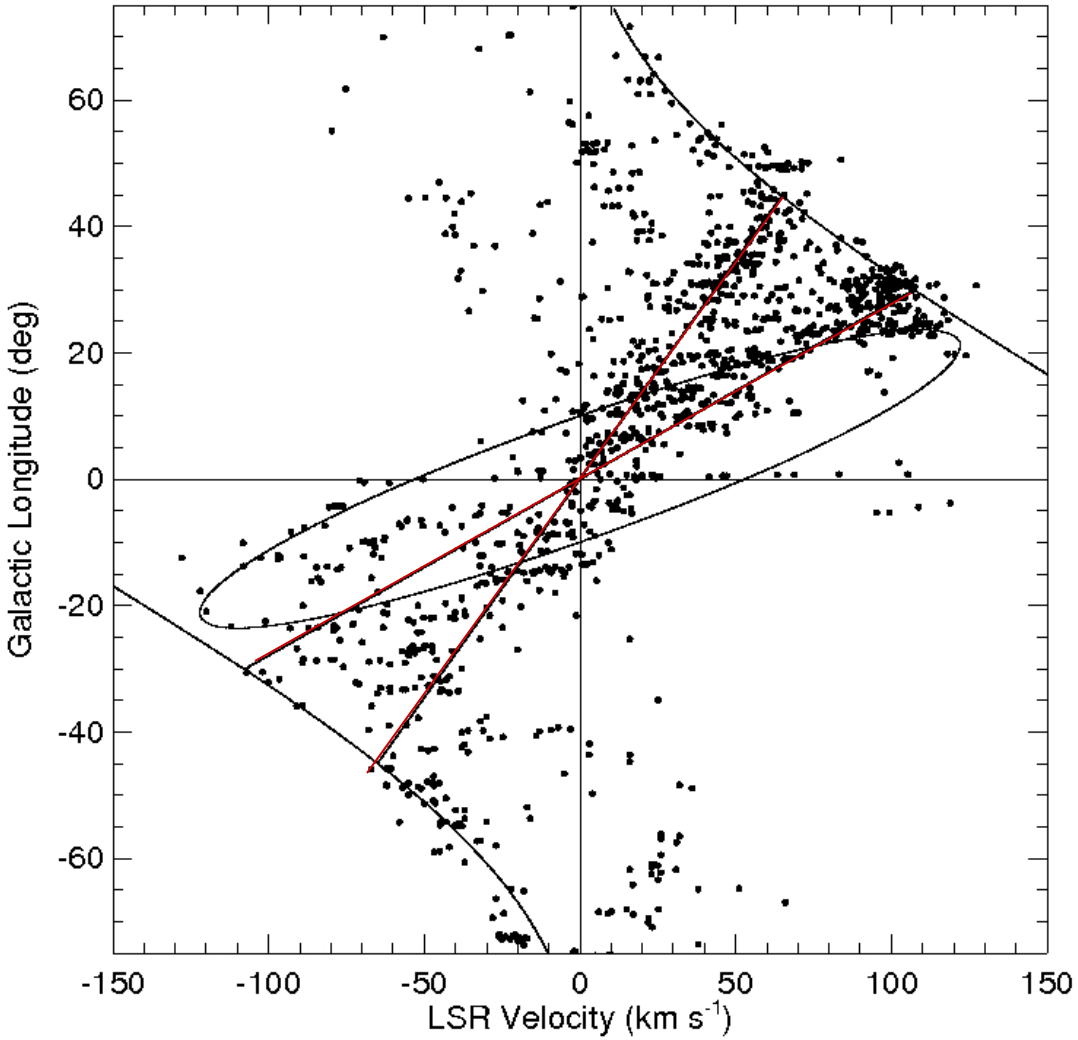


602 Detections
448 Directions
95%

HII Region Radial Distribution



Galactic Structure



Summary

- Detected 602 RRLs (448 directions)
- 95% of sample targets detected
- Doubled number of know HII regions in this part of the Milky Way
- 25 HII regions detected beyond the Solar orbit in the first Galactic quadrant

Future

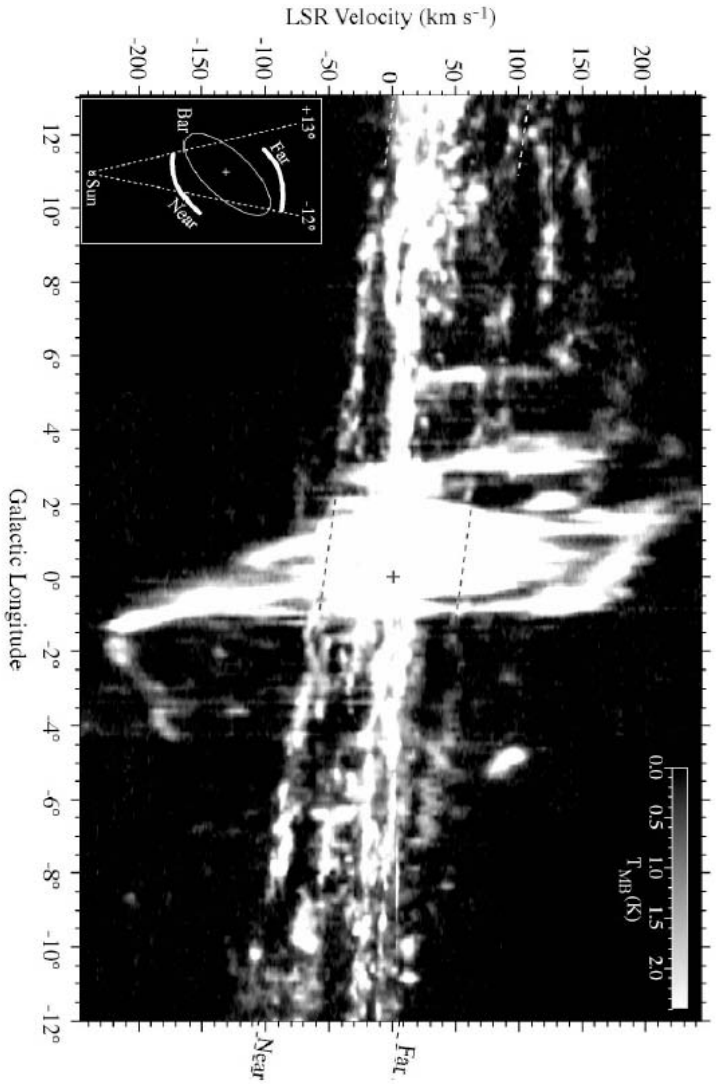
- Determine distances (HI E/A experiments)
- Galactic structure
- Galactic chemical evolution

Additional Slides

Spiral Arms


Norma
Scutum-Crux
Sagittarius
Sun
Orion
Perseus
Cygnus
10 000 ly

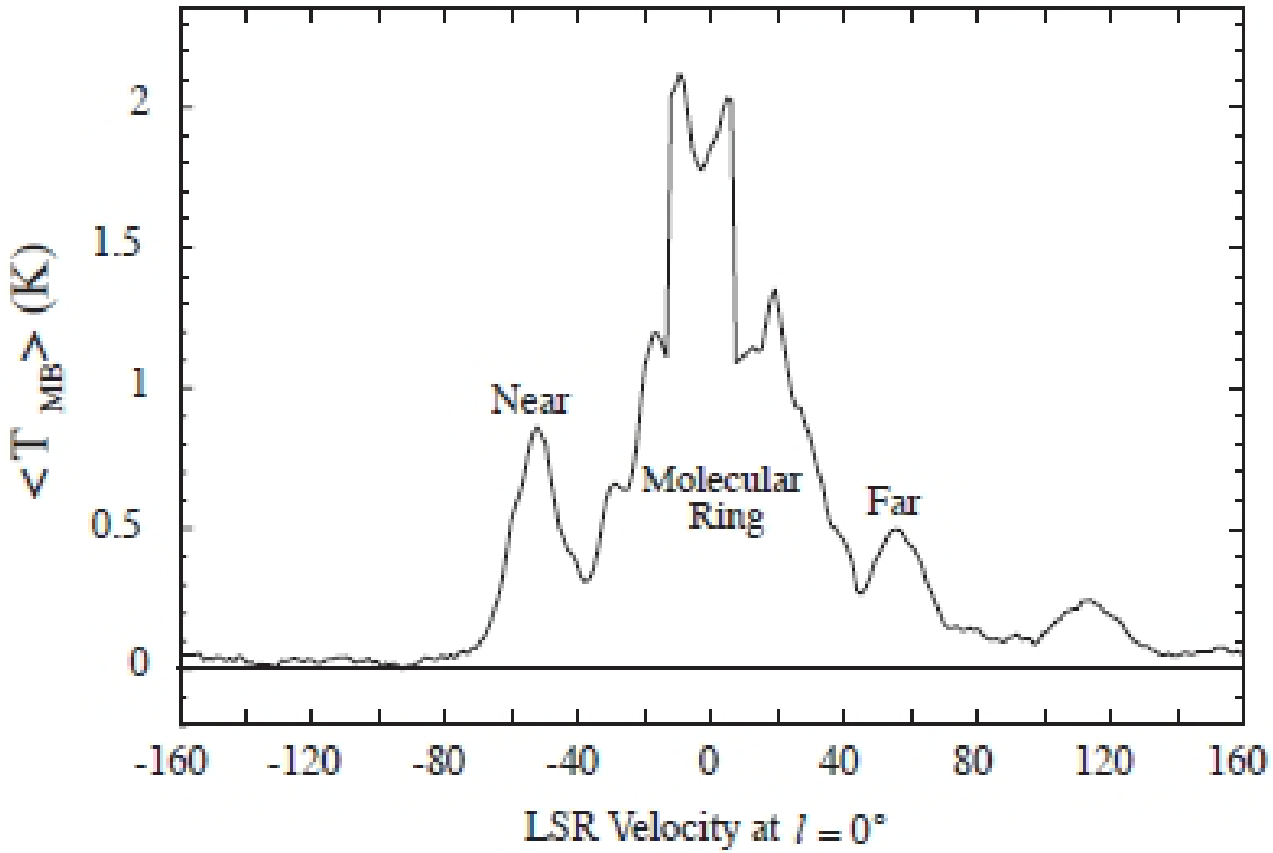
3 kpc Arm (Carbon Monoxide)



$$CO\,(1 \rightarrow 0)$$

Dame & Thaddeus (2008)

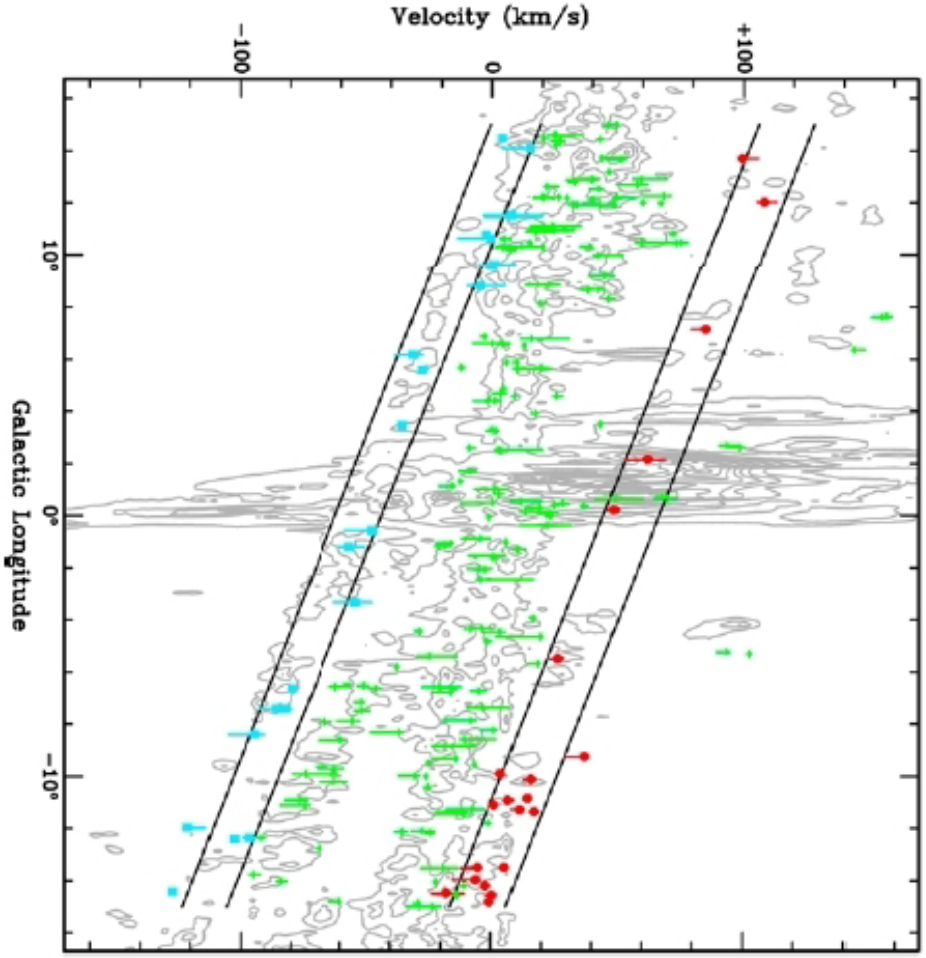
3 kpc Arm (Carbon Monoxide)



$CO\,(1 \rightarrow 0)$

Dame & Thaddeus (2008)

3 kpc Arm (Methanol Masers)

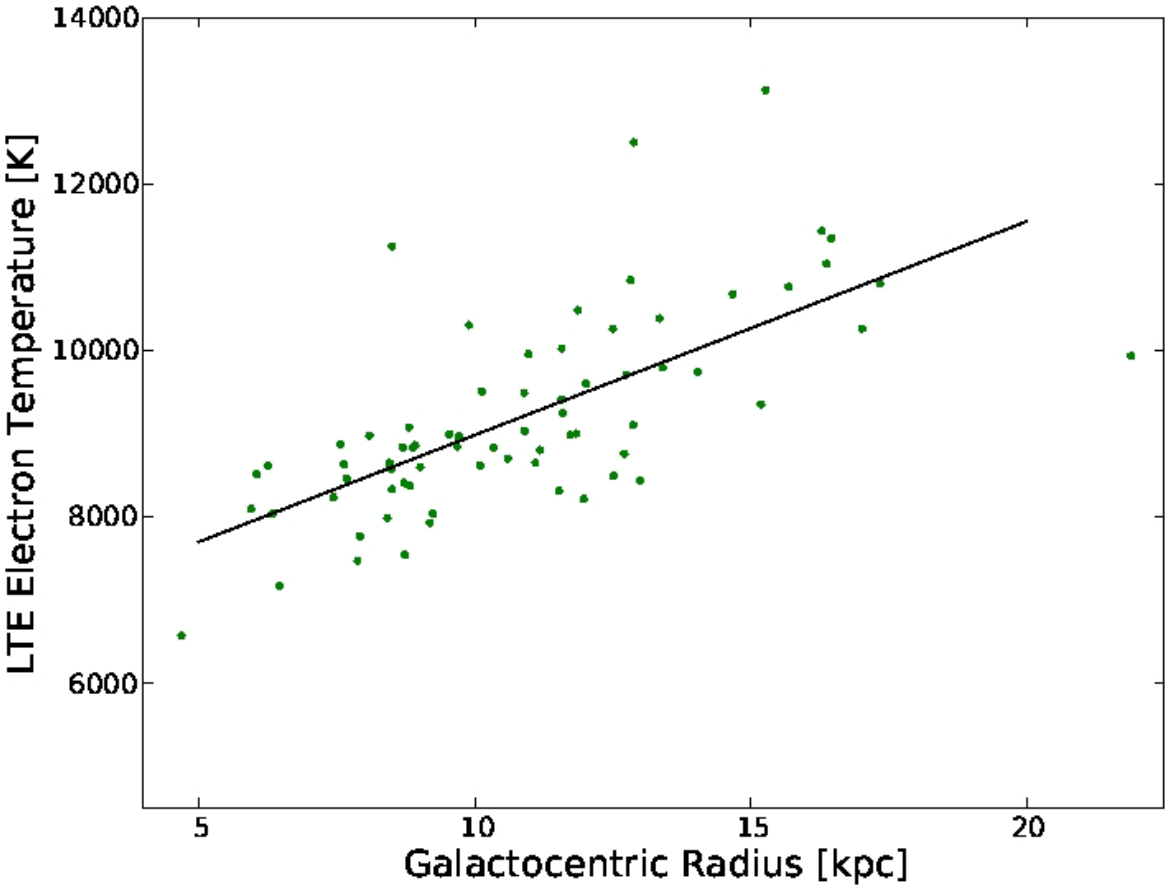


$CH_3OH\,(5_1 \rightarrow 6_0\ A^+)$

Green et al. (2009)

HII Region Electron Temperature Gradient

GBT 9 GHz RRL and Continuum



HII Region Electron Temperature Gradient

GBT 9 GHz RRL and Continuum