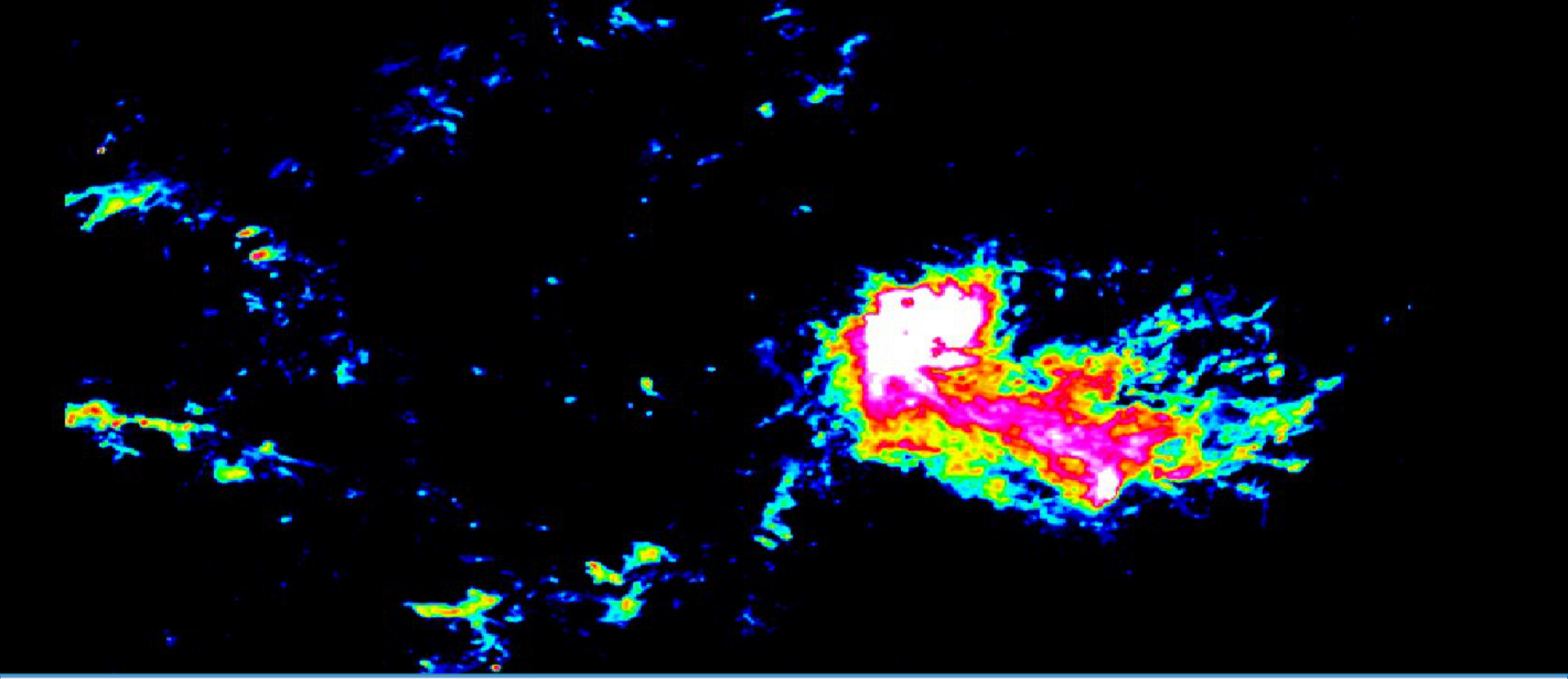


Hydrogen clouds in the Magellanic System

International Centre for Radio Astronomy Research

Bi-Qing For
ICRAR/UWA

The Magellanic System (HI)

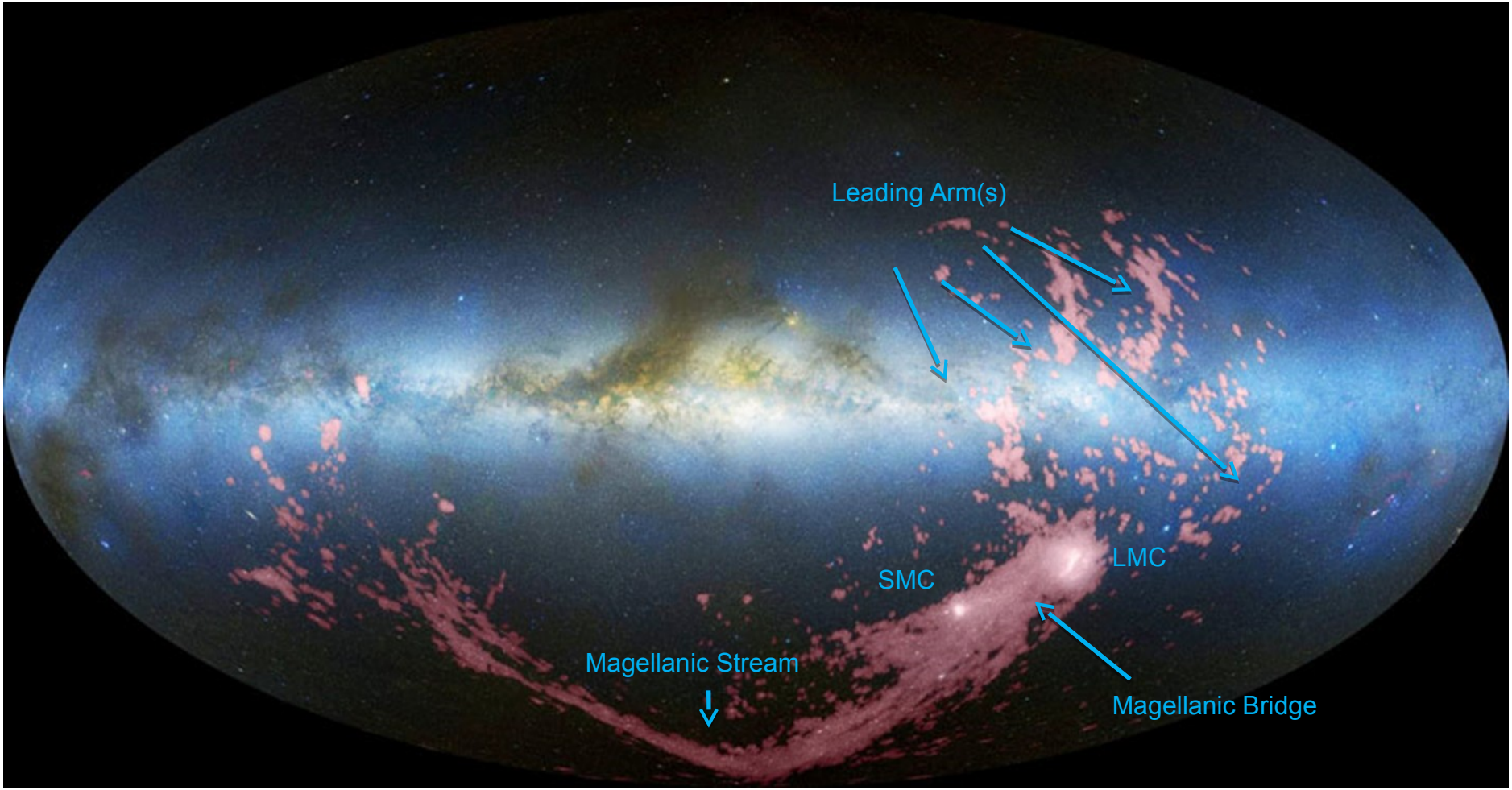
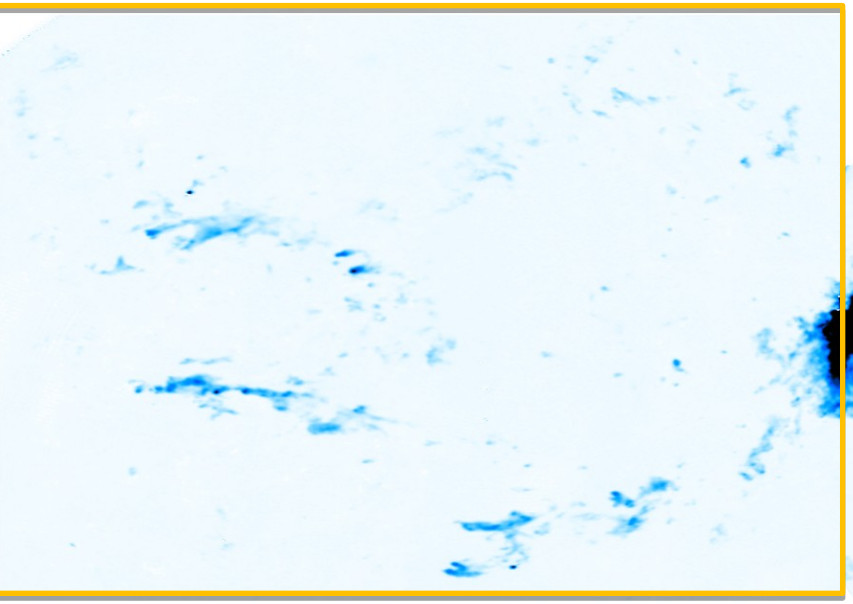


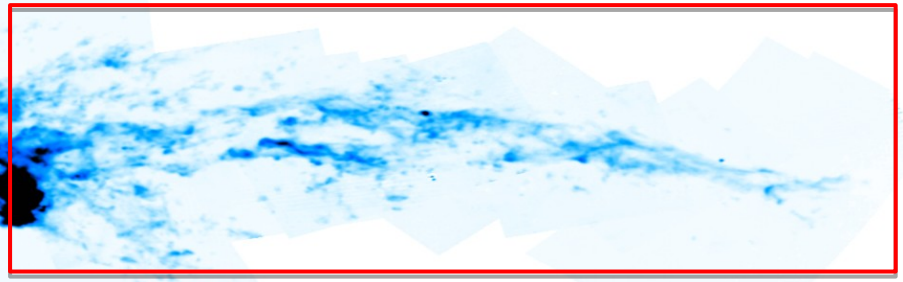
Image credit: Nidever et al. (2010)

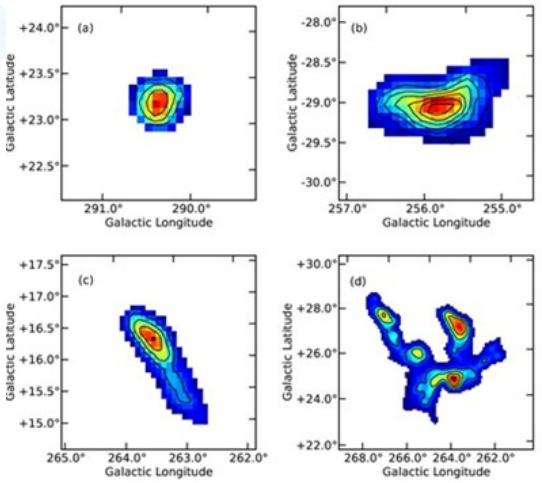
Leading Arm(s) & Magellanic Stream Studies

For et al. (2013): GASS



For et al. (2014): GASS+ATCA

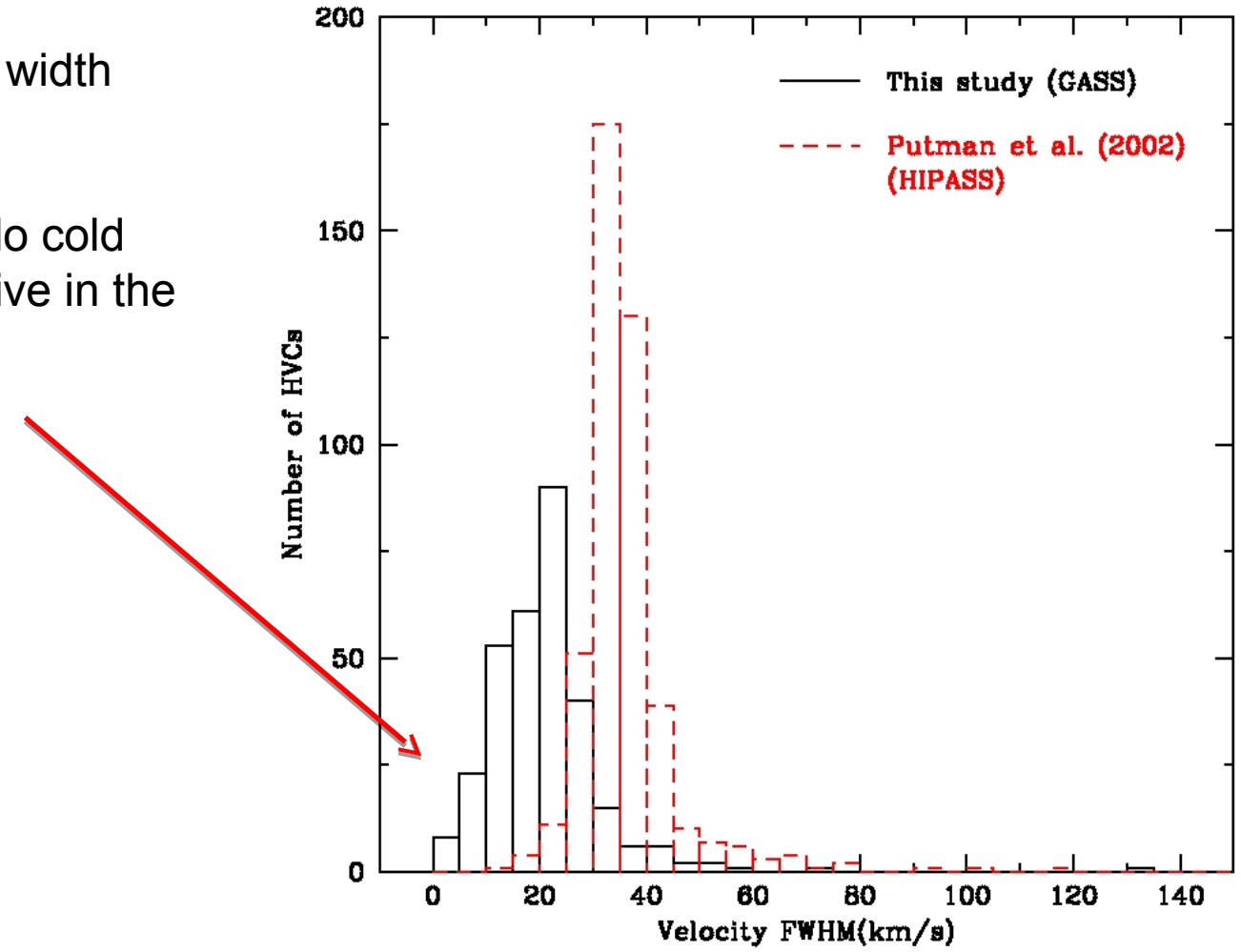




- HVCs catalogs (morphology – head-tail etc)
- Investigating the the effects of interaction with the Galactic halo
- Formation mechanism and compare to simulations

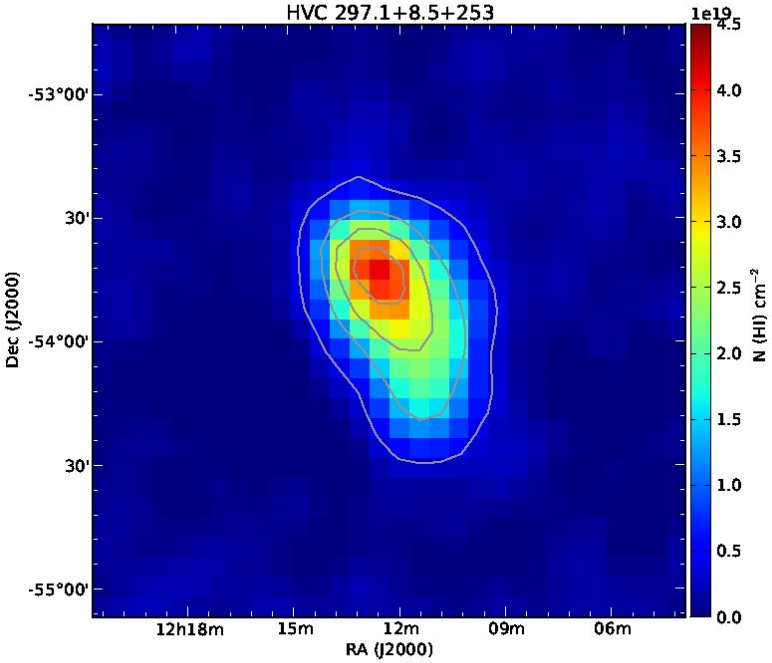
Narrow line width HVCs

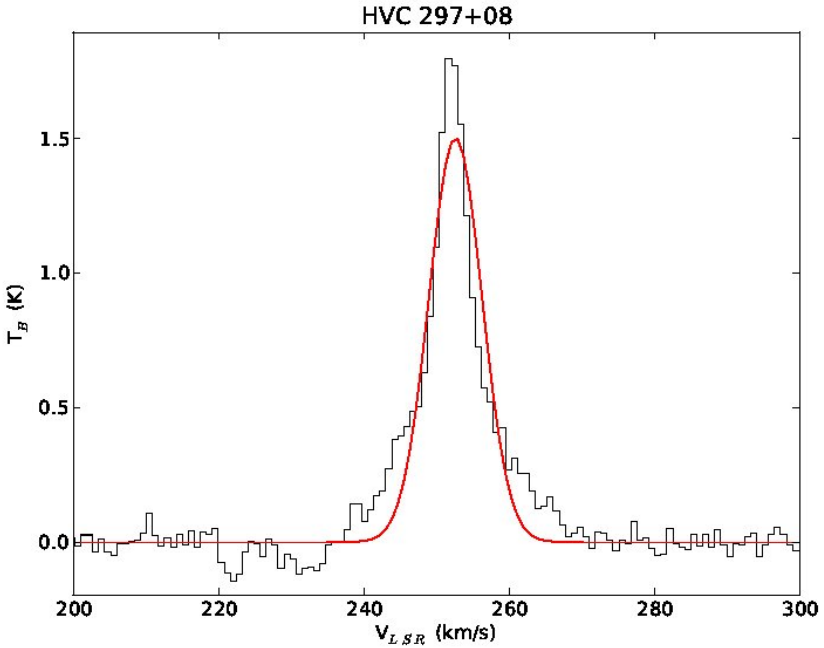
- Narrow line width HVCs
- Cold: how do cold clouds survive in the hot halo?



For et al. (2013)

Two phase medium (stable)

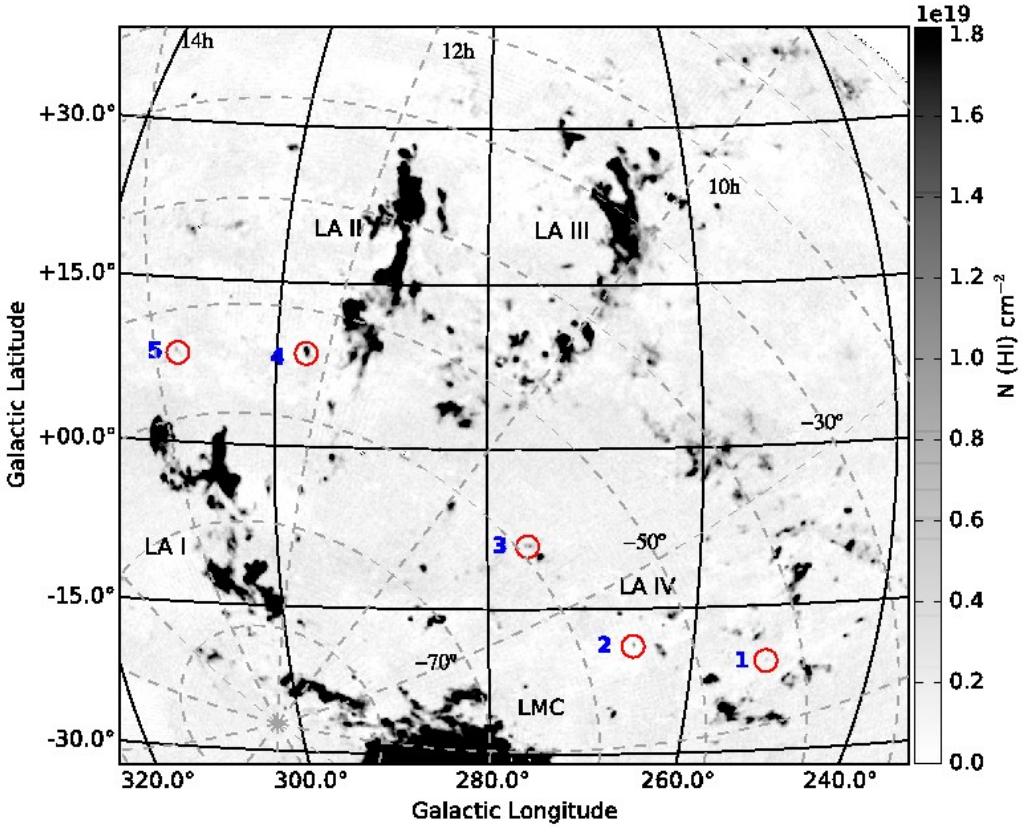


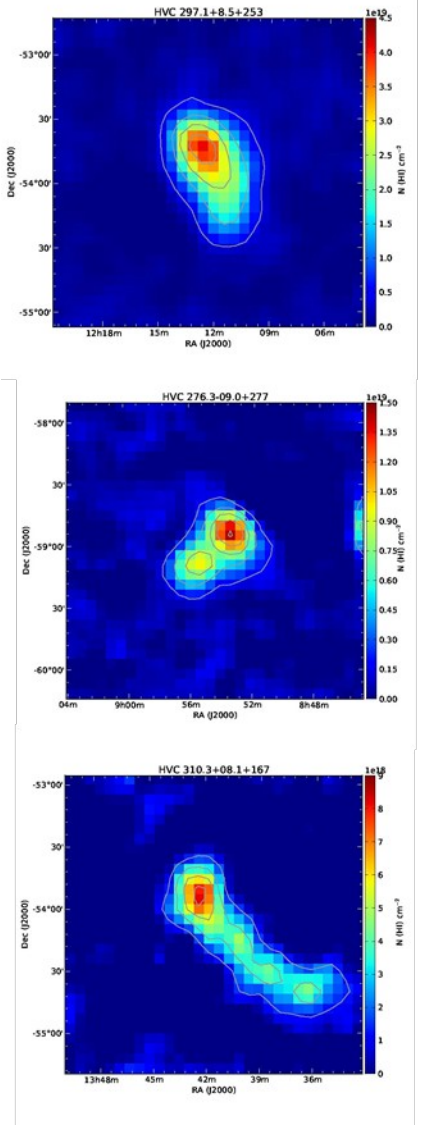


Cold cloud is surrounded by a warm envelope

Follow up observation with ATCA: For et al (2016)

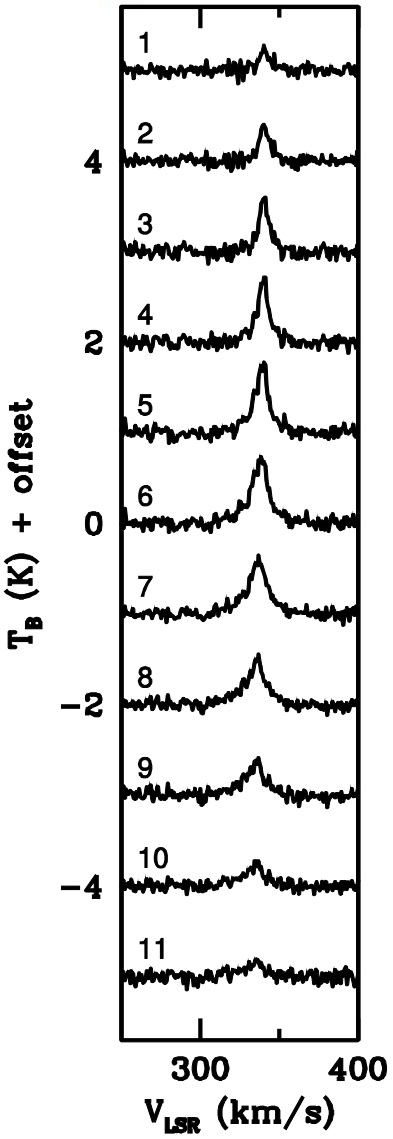
Probing Environmental Effect

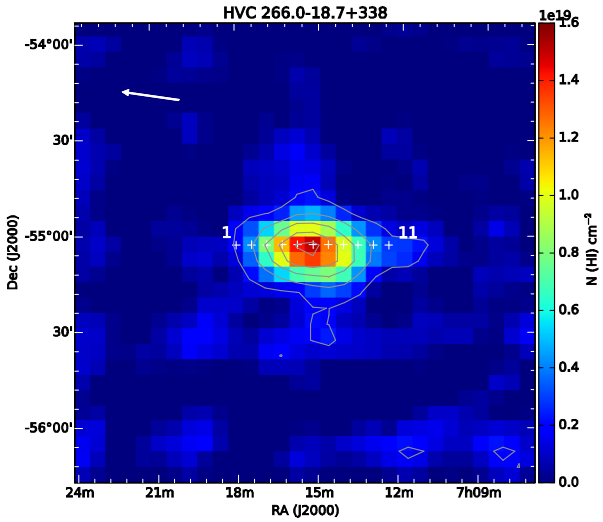


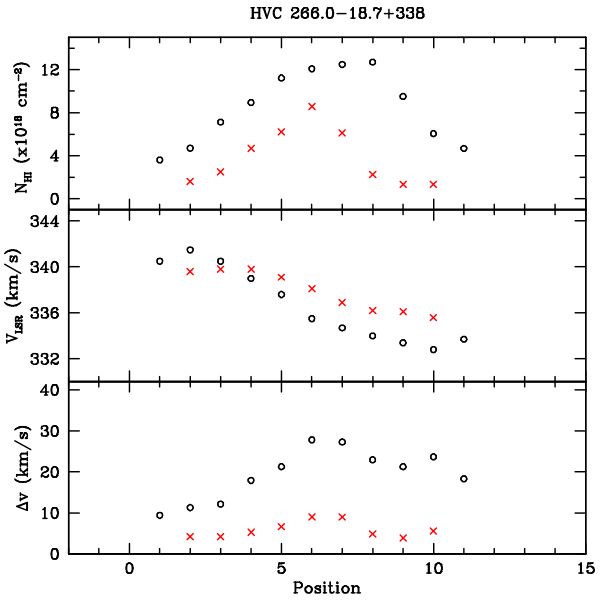


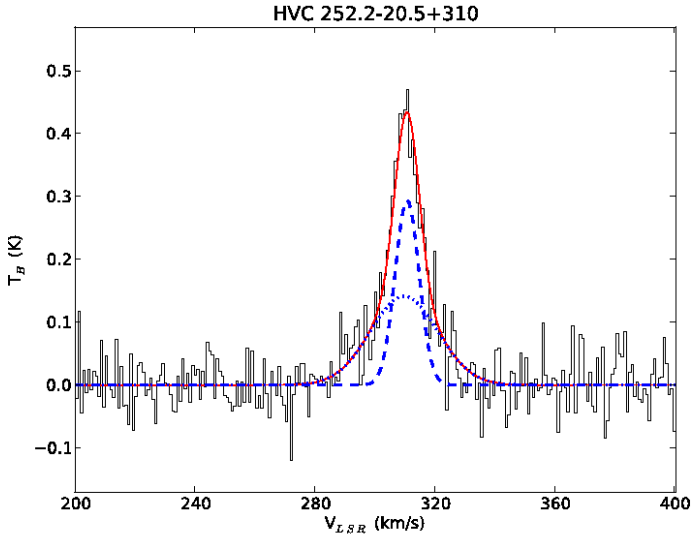
- Deriving the physical parameters and properties
- Resolving multiphase structure

GASS

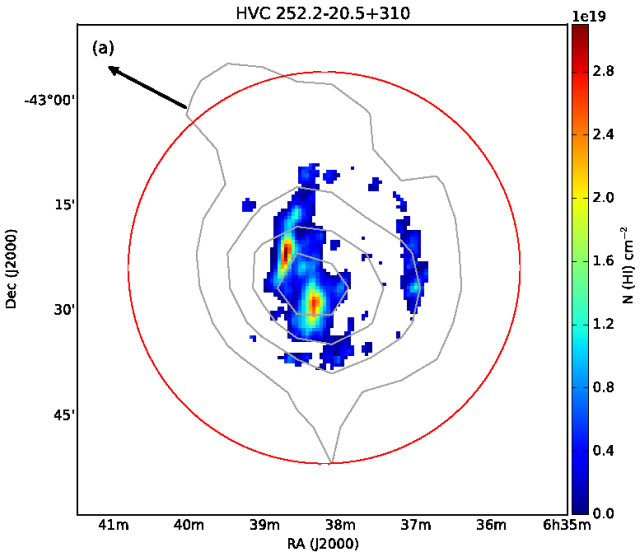

1
2
3
4
5
6
7
8
9
10
11
4
2
0
−2
−4
300
400
T_B (K) + offset
V_{LSR} (km/s)

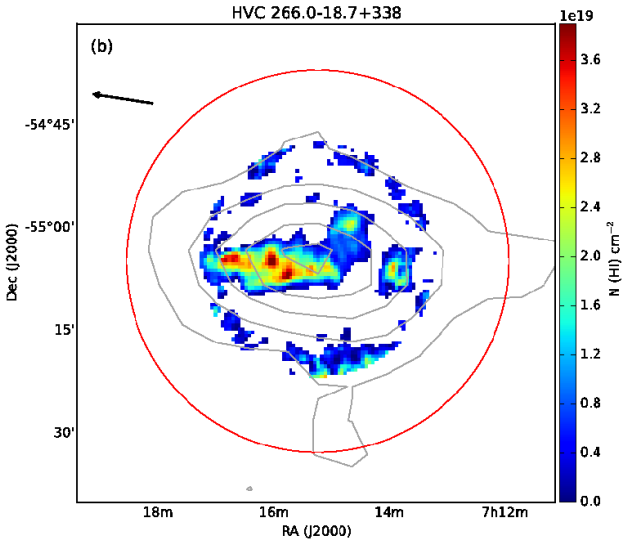

HVC 266.0-18.7+338
1e19
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
N (HI) cm^{-2}
-54°00'
30'
-55°00'
30'
-56°00'
Dec (J2000)
1
11
24m
21m
18m
15m
12m
7h09m
RA (J2000)


HVC 266.0−18.7+338
N_{HI} (x10^{18} cm^{-2})
12
8
4
0
344
340
336
332
V_{LSR} (km/s)
40
30
20
10
0
Δv (km/s)
0
5
10
15
Position


HVC 252.2-20.5+310
0.5
0.4
0.3
0.2
0.1
0.0
−0.1
T_B (K)
200
240
280
320
360
400
V_{LSR} (km/s)

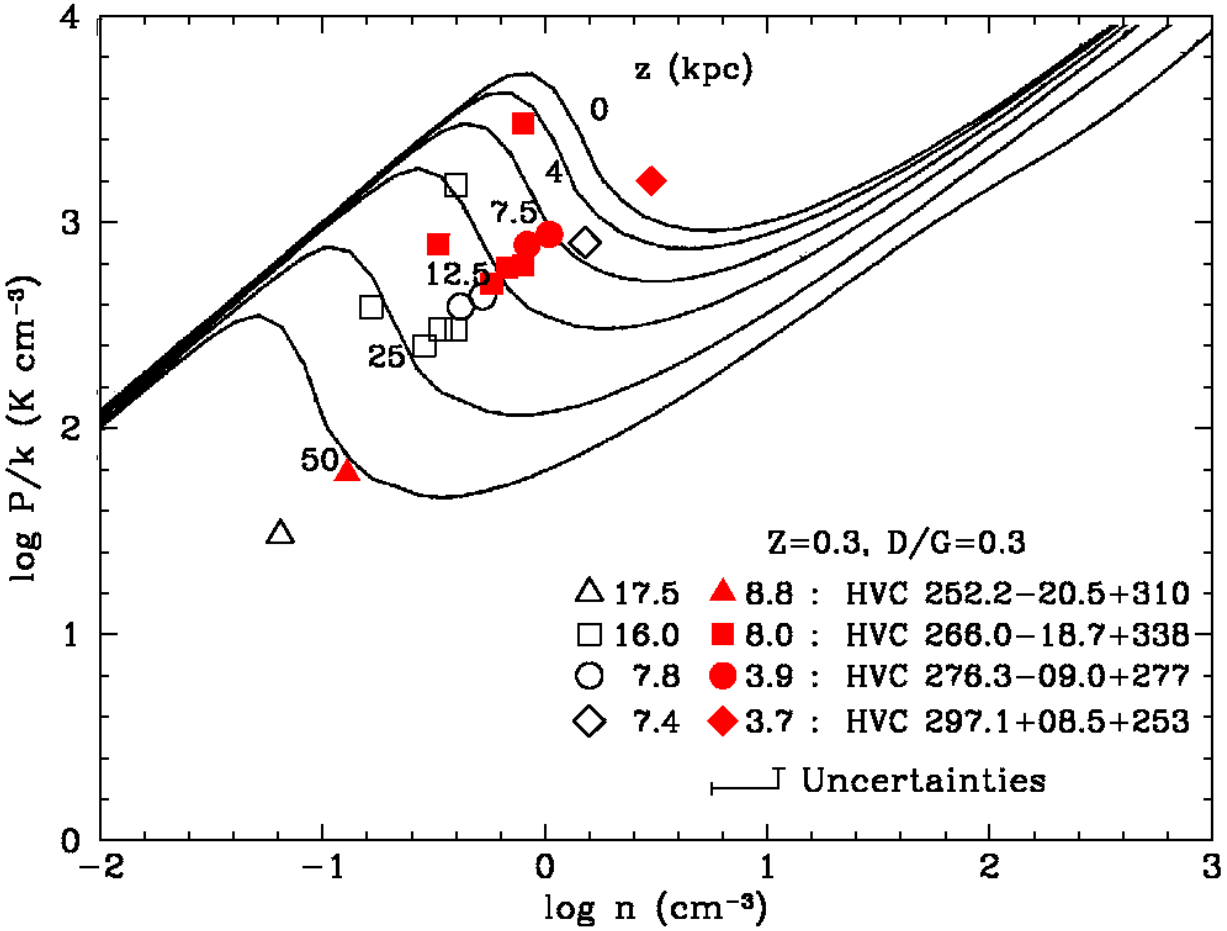
ATCA





- Red: 12% peak sensitivity
- P/k = nTk
- Tk: Linewidth
- n: assumed distance, measured angular diameter
- Phase diagram: P/k vs n

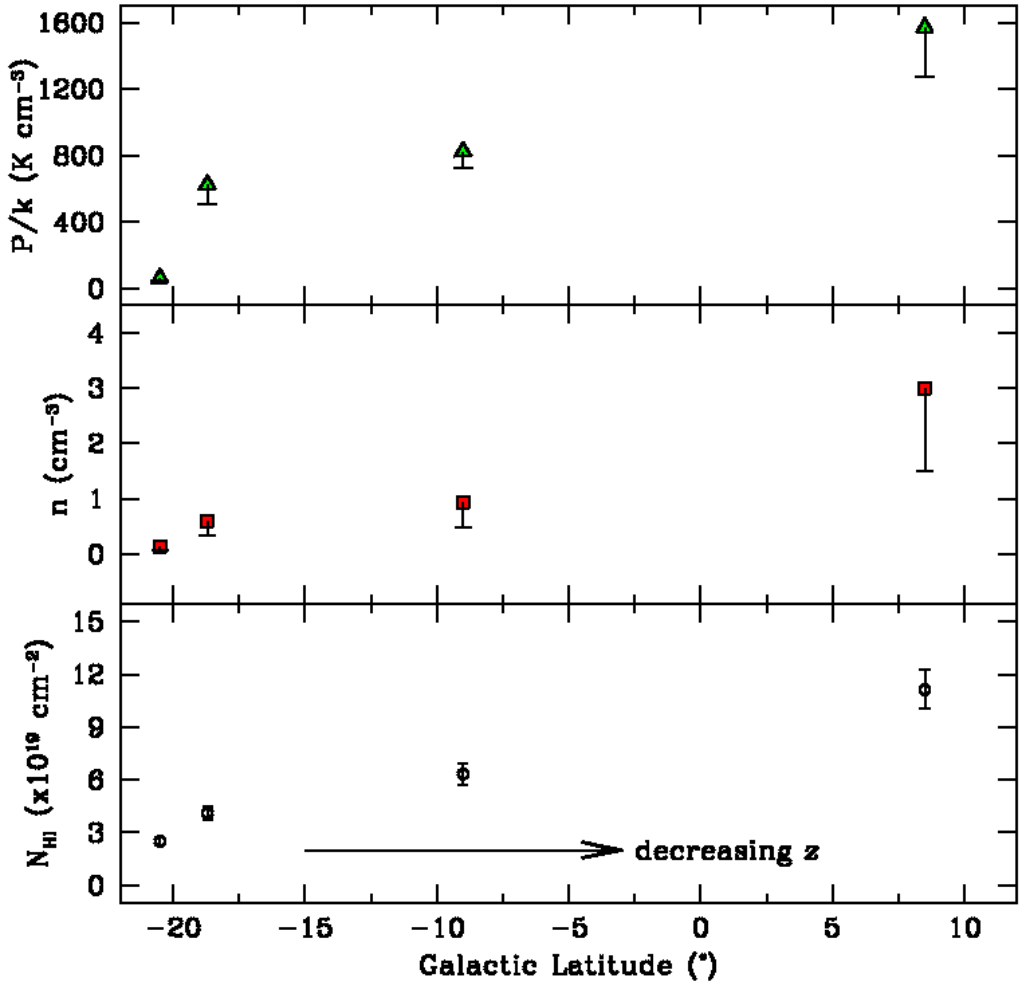
HVC phase diagram



Filled: 25kpc
Non-filled: 50 pc

Wolfire et al. (1995)
Stable two-phase medium: $P_{min} < P < P_{max}$

Halo Environment as a Function of Galactic Latitude



- Assuming hydrostatic equilibrium:

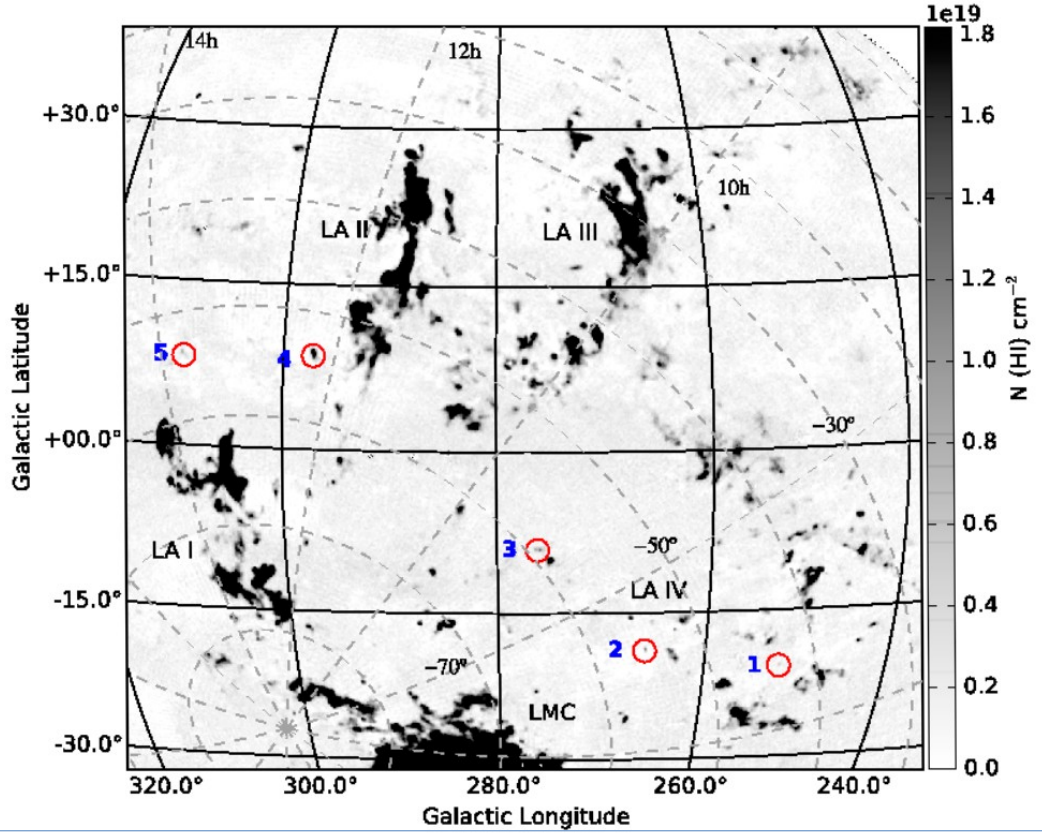
  thermal P = external halo thermal P

- Galactic latitude proxy of z

- Clouds reside in a denser halo environment at higher Galactic latitude

In short

Decreasing z
Denser



- First possible evidence of distance gradient in the LA region using compact HI clouds
- Evidence LA I (Venzmer et al. 2013)

GASKAP:
Milky Way disk + Magellanic System

- PIs: J. Dickey + N. McClure-Griffiths
- 21 cm line + three 18 cm lines of OH molecule
- HI absorption and emission
- Magellanic System: 13020 sq deg
- resolution (~30 arcsec), velocity line width (1 km/s)

GASKAP: Magellanic System

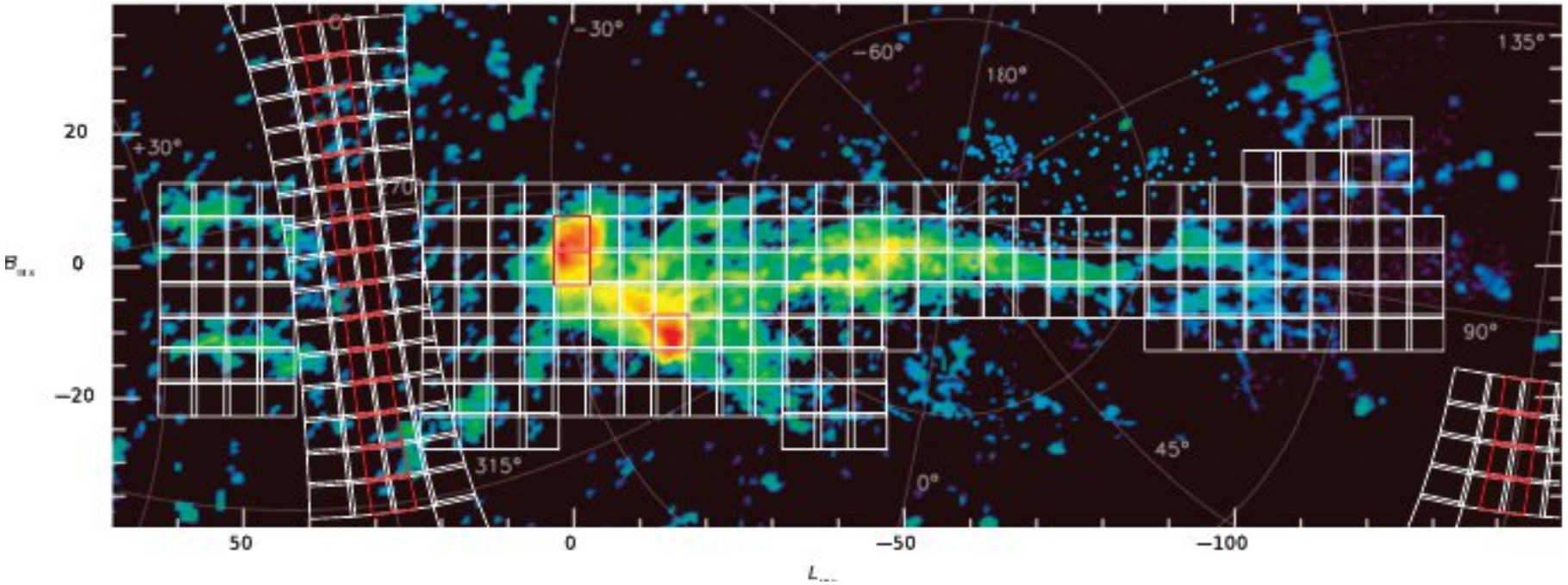


Figure: The GASKAP MS survey area with axes labeled in MS coordinates and Hi column densities from the LAB survey in the background (Nidever et al. 2010). The white squares represent ASKAP pointings with the shorter integration time (12.5 h), while the red squares are pointings that will be observed for either 50 or 200 h.

Benefit: All HVCs in ONE go (good brightness sensitivity).

GASKAP update

- Commissioning data: LMC 1 field (18 kHz bandwidth)
- Community busy week (Dec 2016): processing on coarse resolution data
- To do list:
  - Obtaining narrow-band data ASAP
  - Quality control: bandpass, stability of the receiver gains and calibration
  - Commissioning data + single-dish data (combining)