



# Study the atomic hydrogen of GMF with HISA

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the THOR team



**The  $\text{H I/OH/R}$  Recombination  
line survey of the Milky Way**

<http://www.mpia.de/thor>

**THOR**

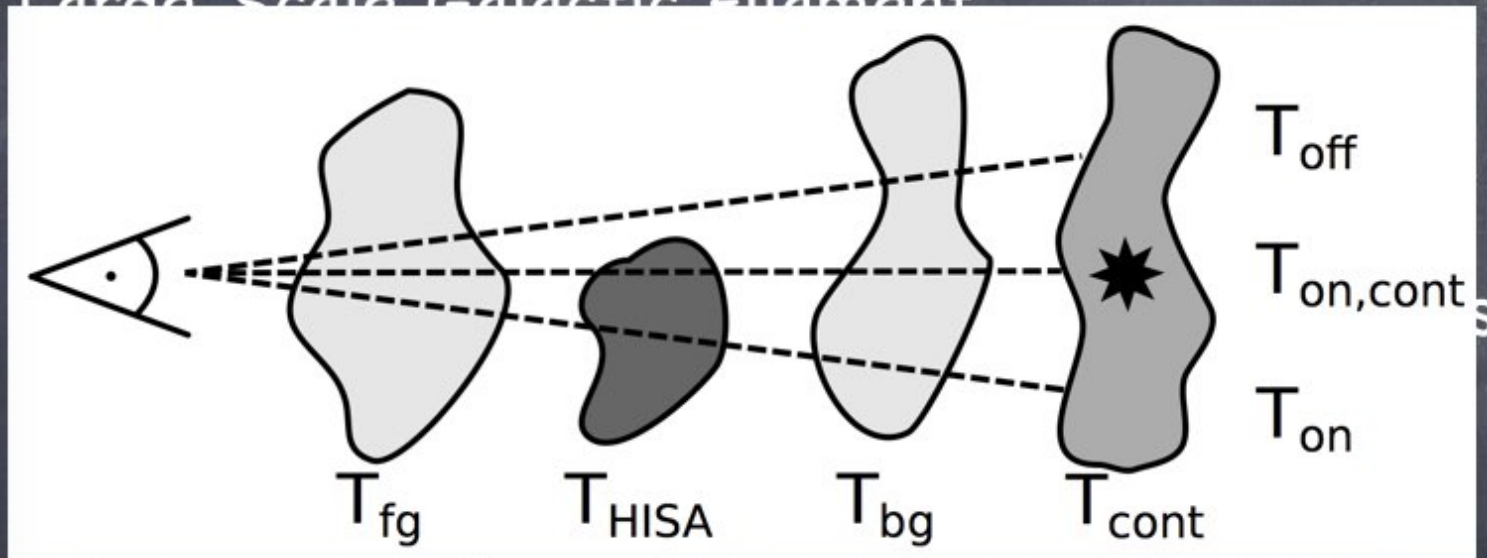
Max-Planck-Institute for Astronomy

# Background and motivation

- Large-Scale Galactic Filament
- HI  $\leq$  THOR (VAL C-array, Beuther+16) + VGPS (VLA D-array + GBT)
- HISA – HI self absorption (Gibson+00; Kavars+03; Li+03)

# Background and motivation

- Large Scale Galactic Filament



Trace CNM,  $T_s \sim 10-50K$

# Background and motivation

- Large-Scale Galactic Filament
- HI  $\leq$  THOR (VAL C-array, Beuther+16) + VGPS (VLA D-array + GBT)
- HISA – HI self absorption (Gibson+00; Kavars+03; Li+03)
- PDF of N to study the MCs (e.g., Kainulainen+09, 14; Sadavoy+14; Stutz+15; Schneider+15)
  - Log-normal: turbulent
  - Power-law: gravity

GMF38.1-32.4a

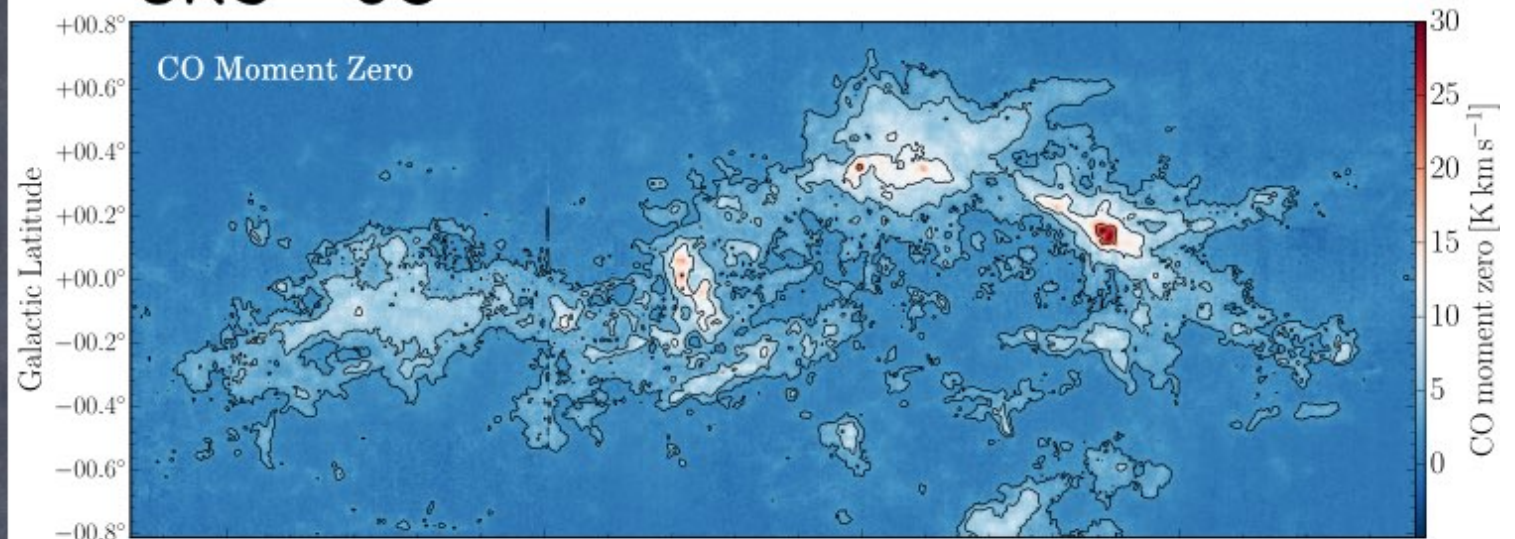
$V_{\text{lsr}}$ : 50~60 km/s

d: 3.3~3.7kpc

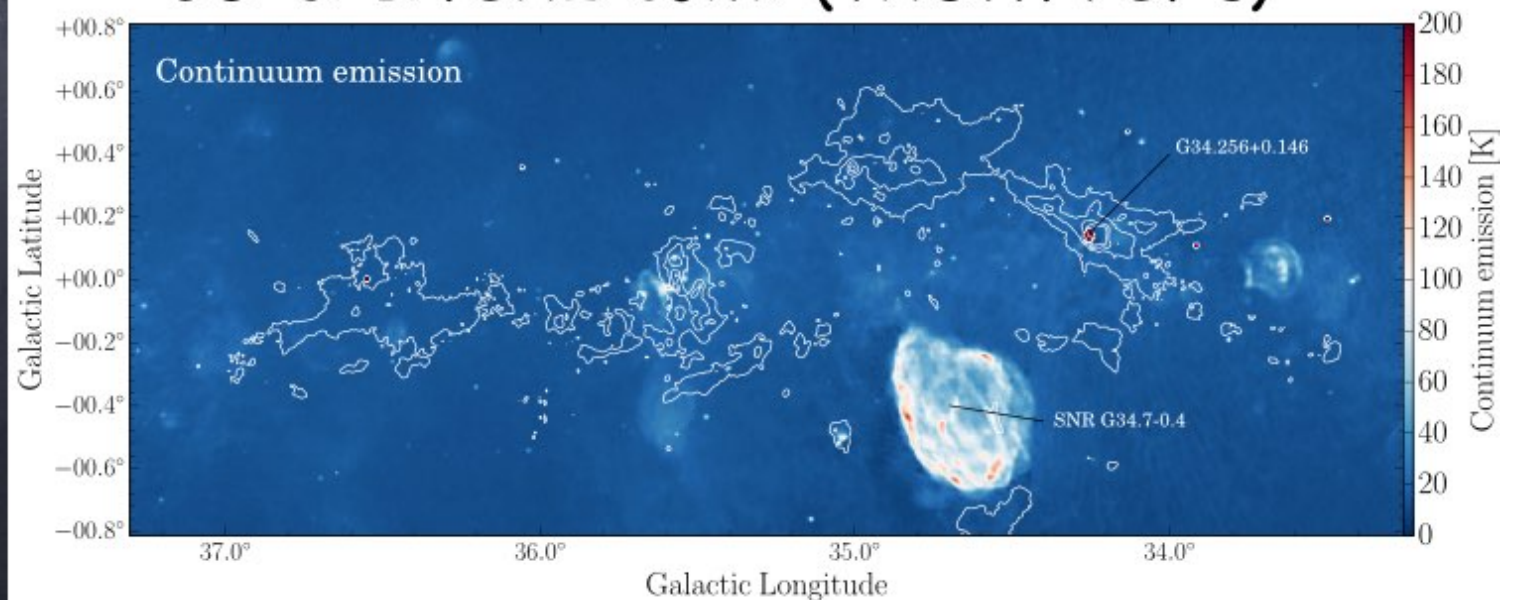
234pc,  $7.0 \times 10^5 M_{\odot}$

Ragan+14

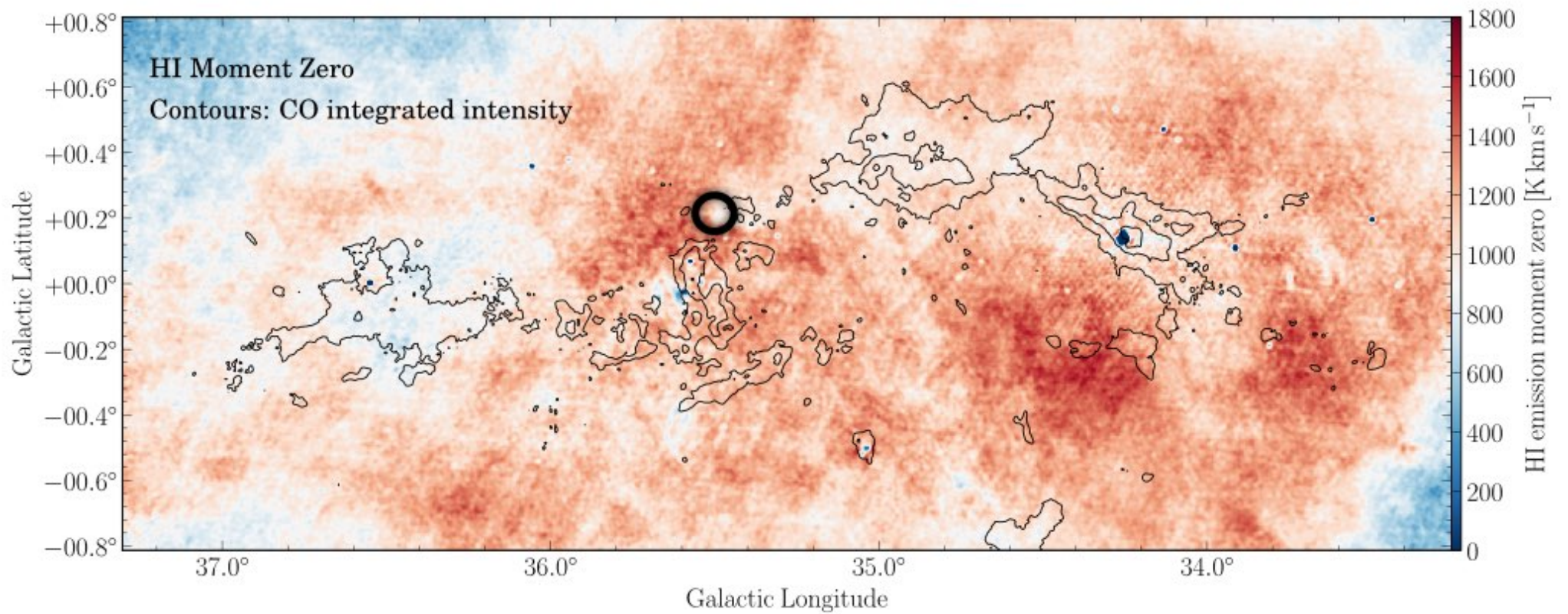
## GRS $^{13}\text{CO}$



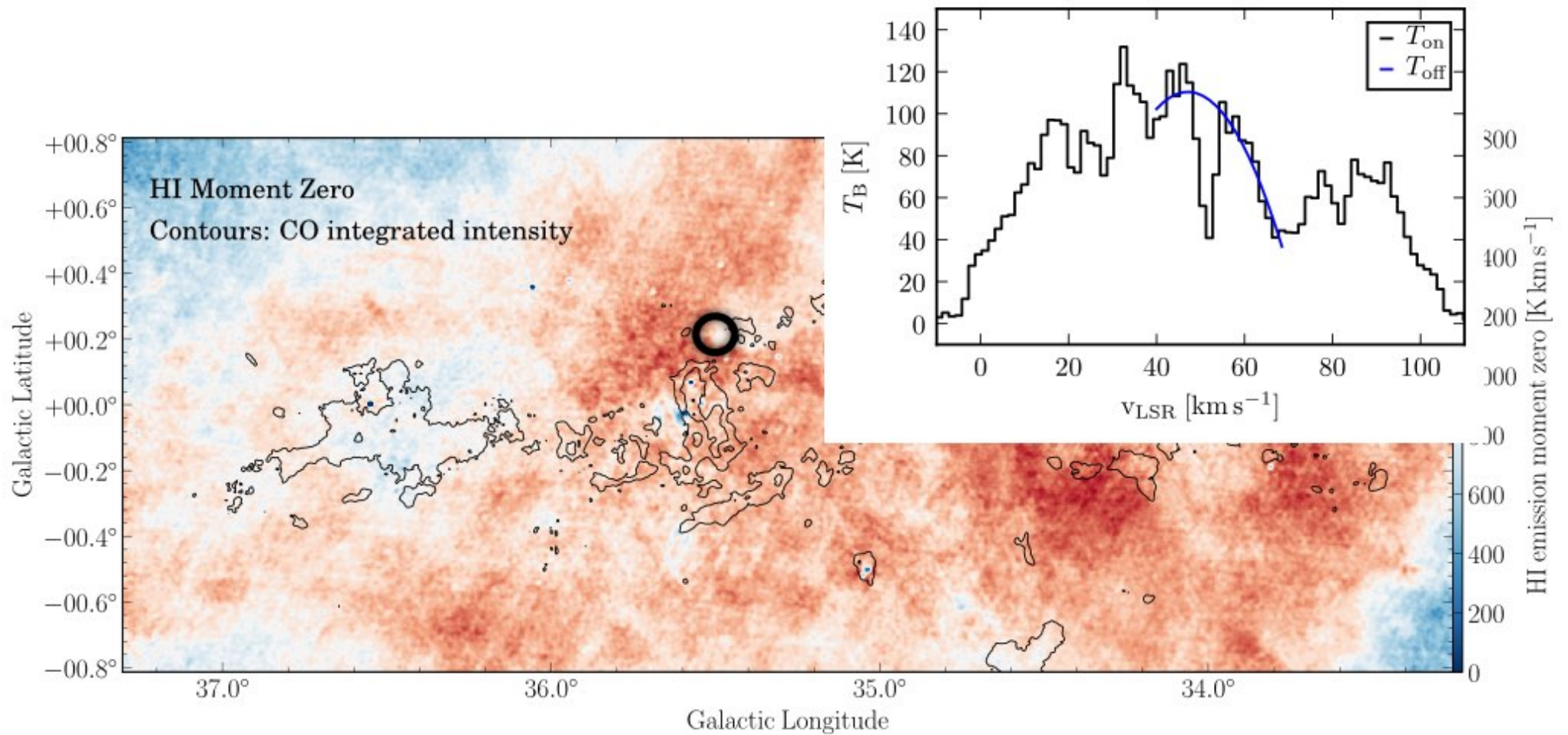
## $^{13}\text{CO}$ & 1.4GHz cont. (THOR+VGPS)



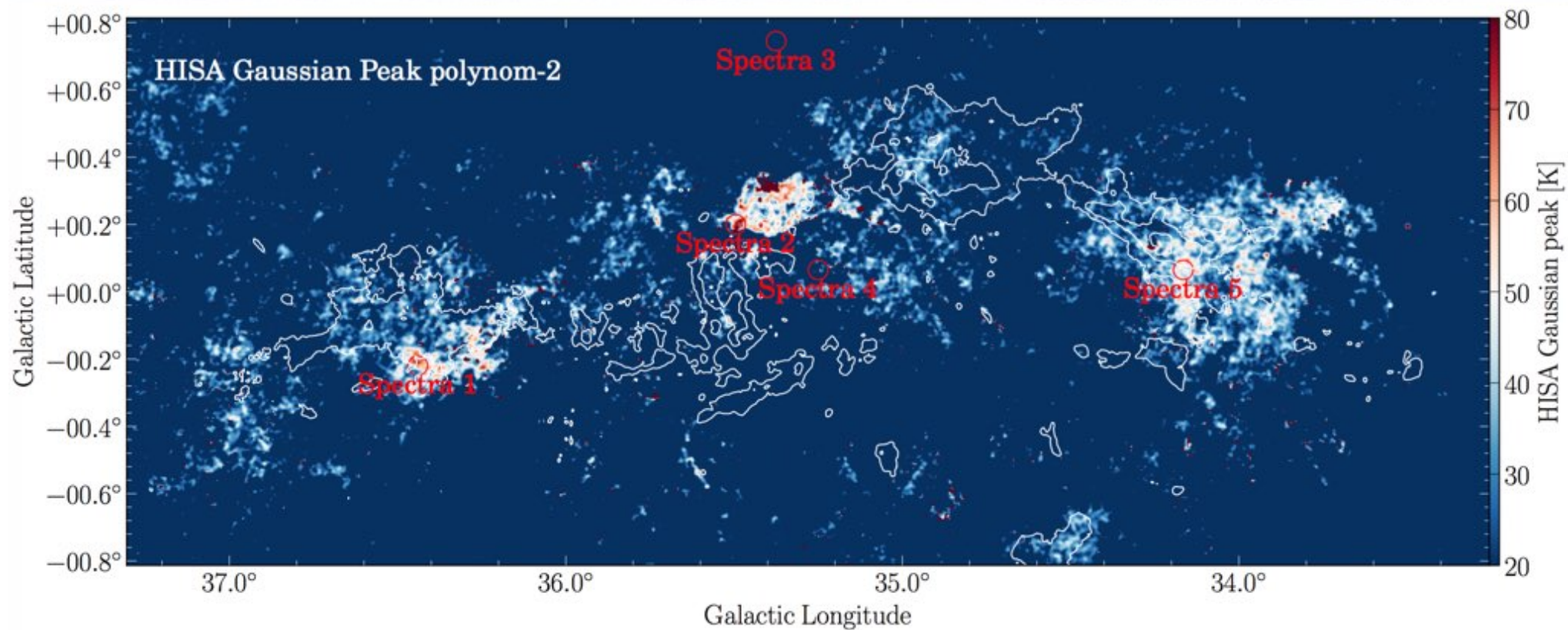
# HI vs CO



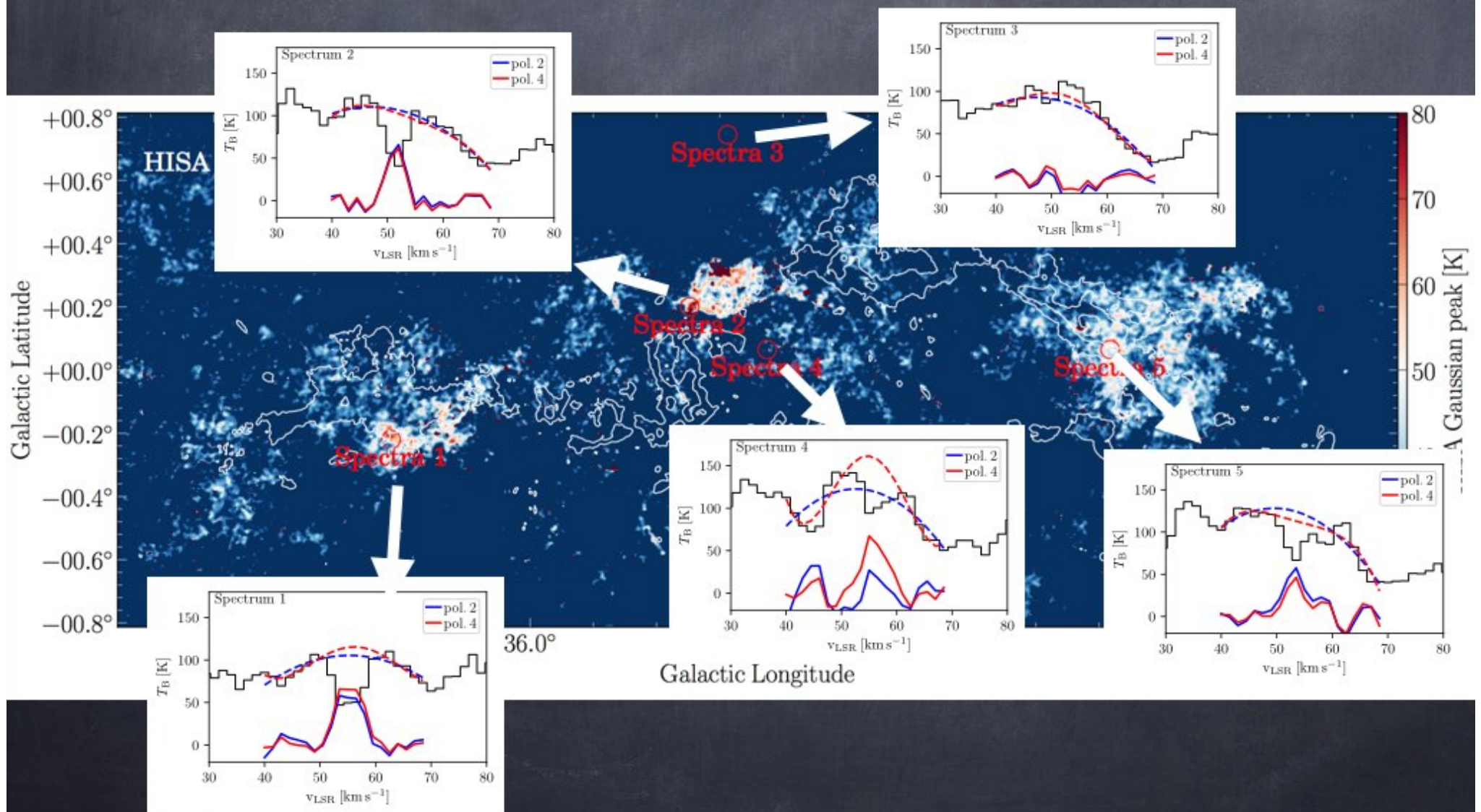
# HI vs CO



# HISA Peak

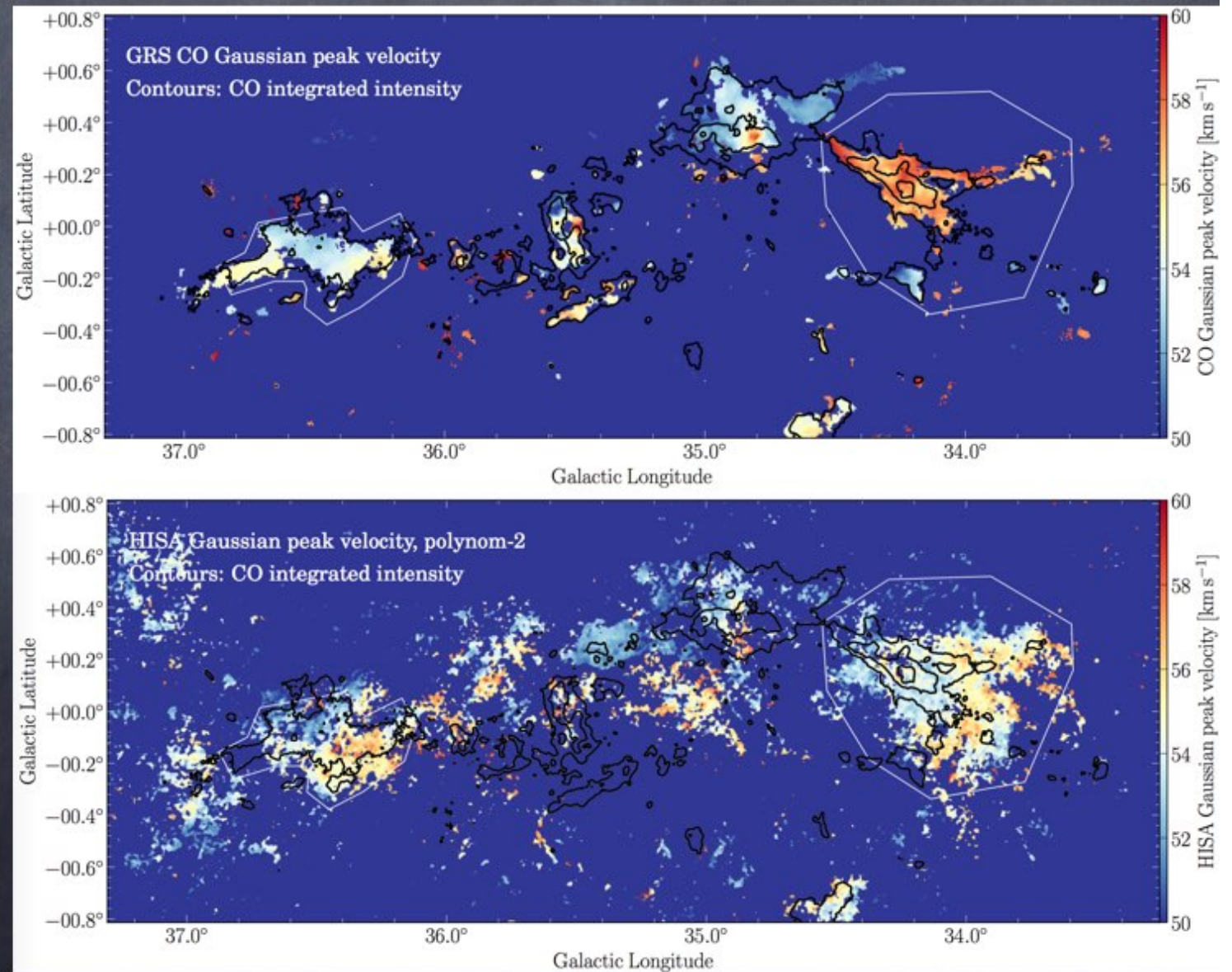


# HISA Peak



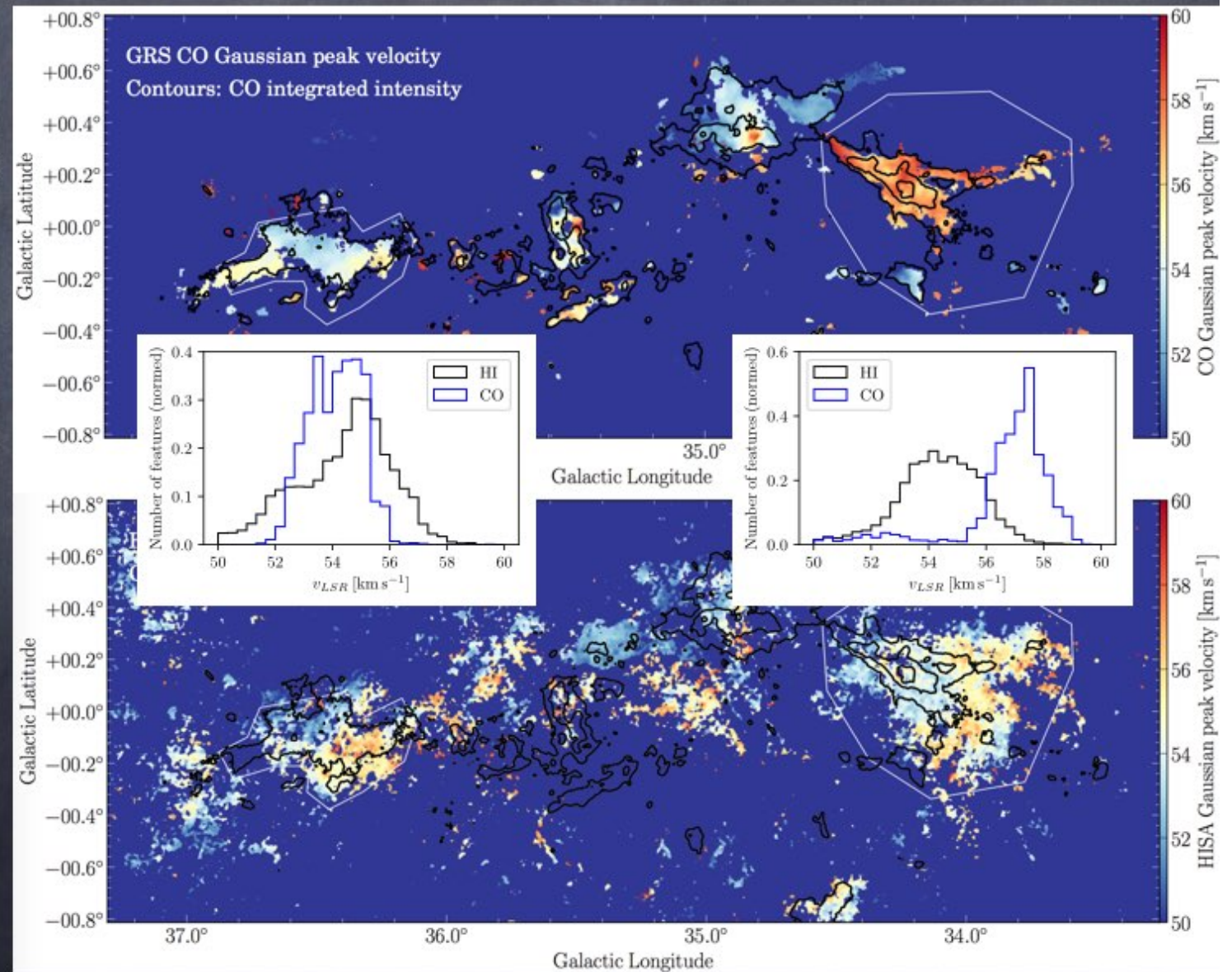
# HISA - peak velocity

Kinematics:  
Peak velocity



# HISA – peak velocity

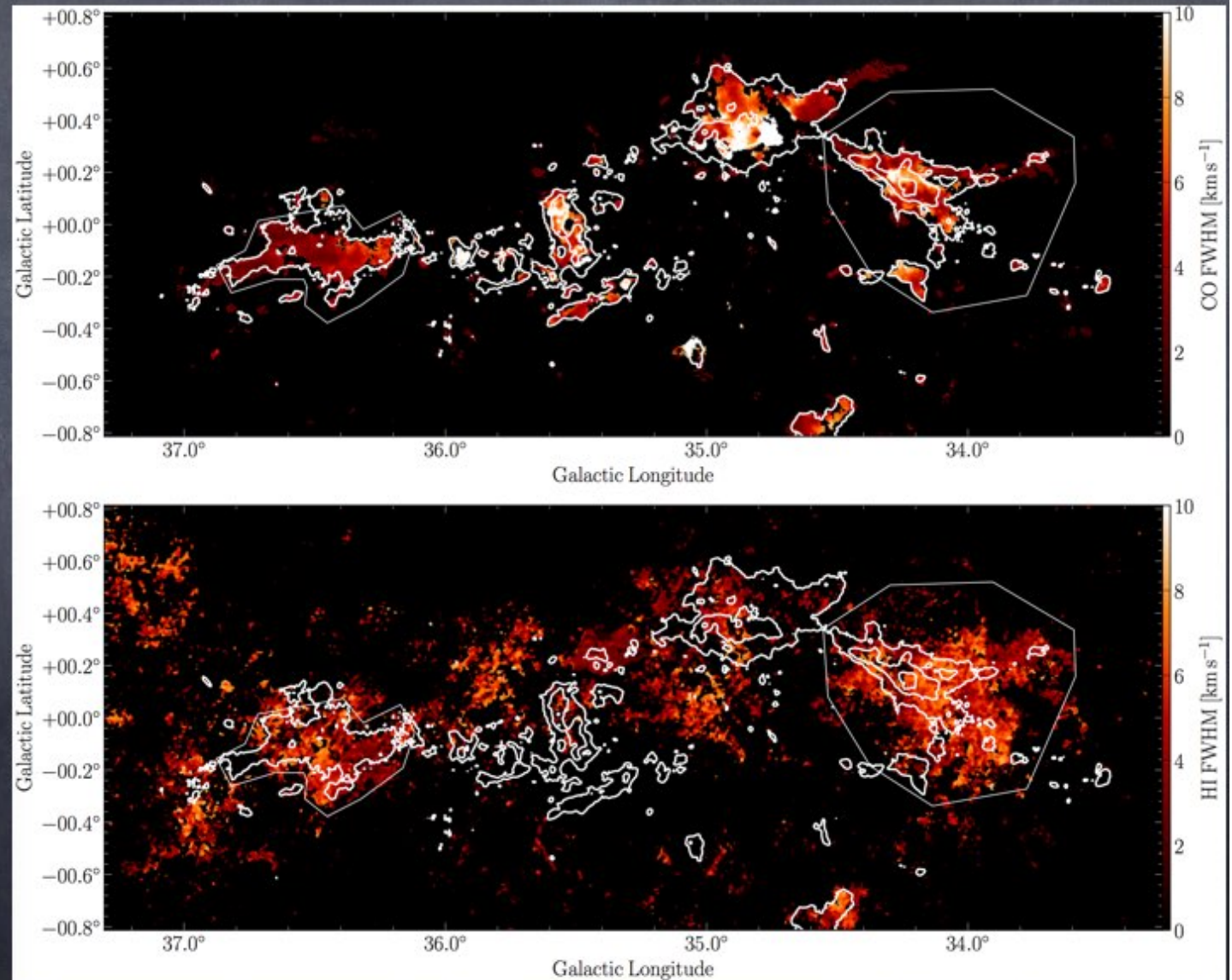
Kinematics:  
Peak velocity



# HISA – velocity FWHM

Kinematics:

Velocity FWHM

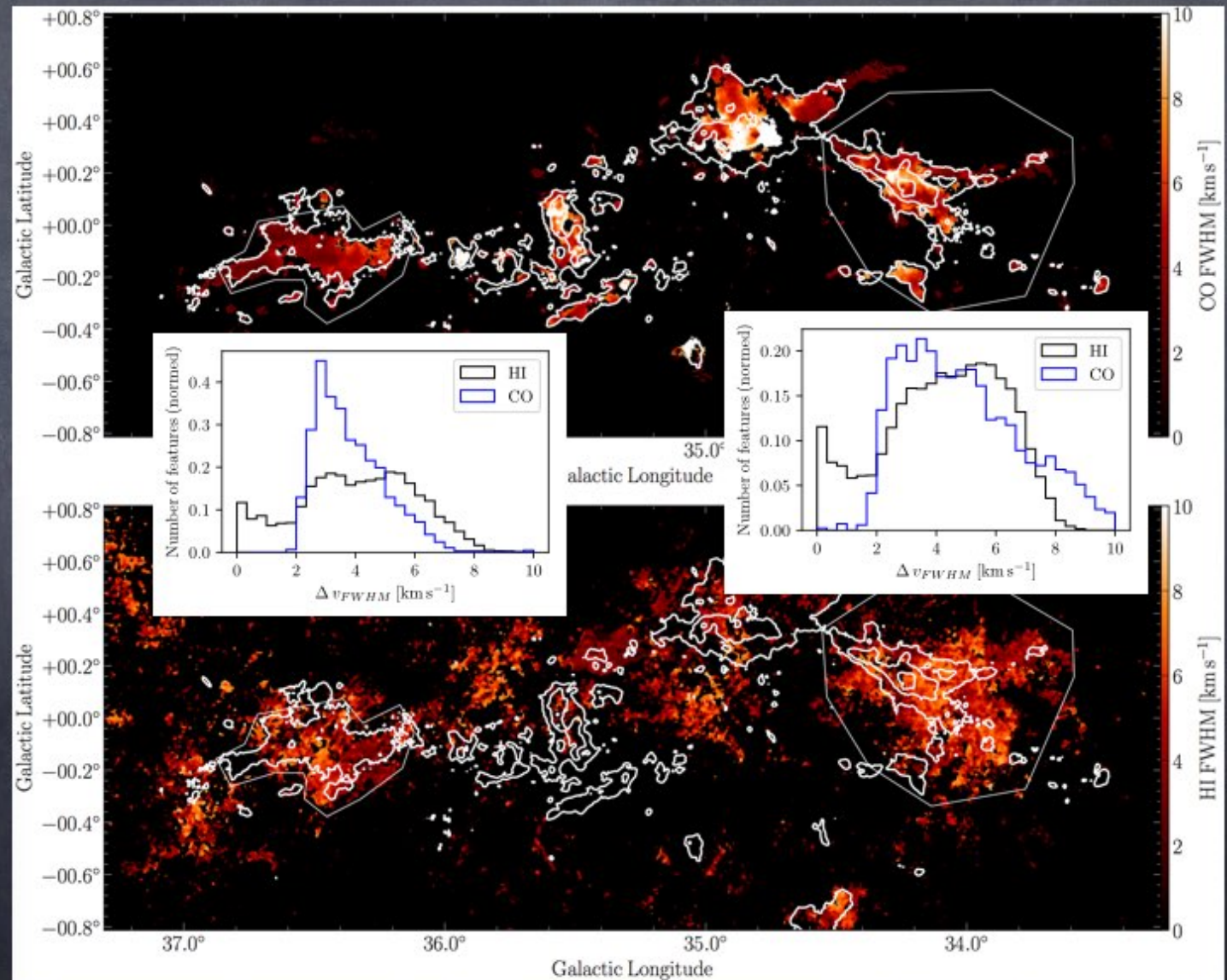


# HISA – velocity FWHM

Kinematics:

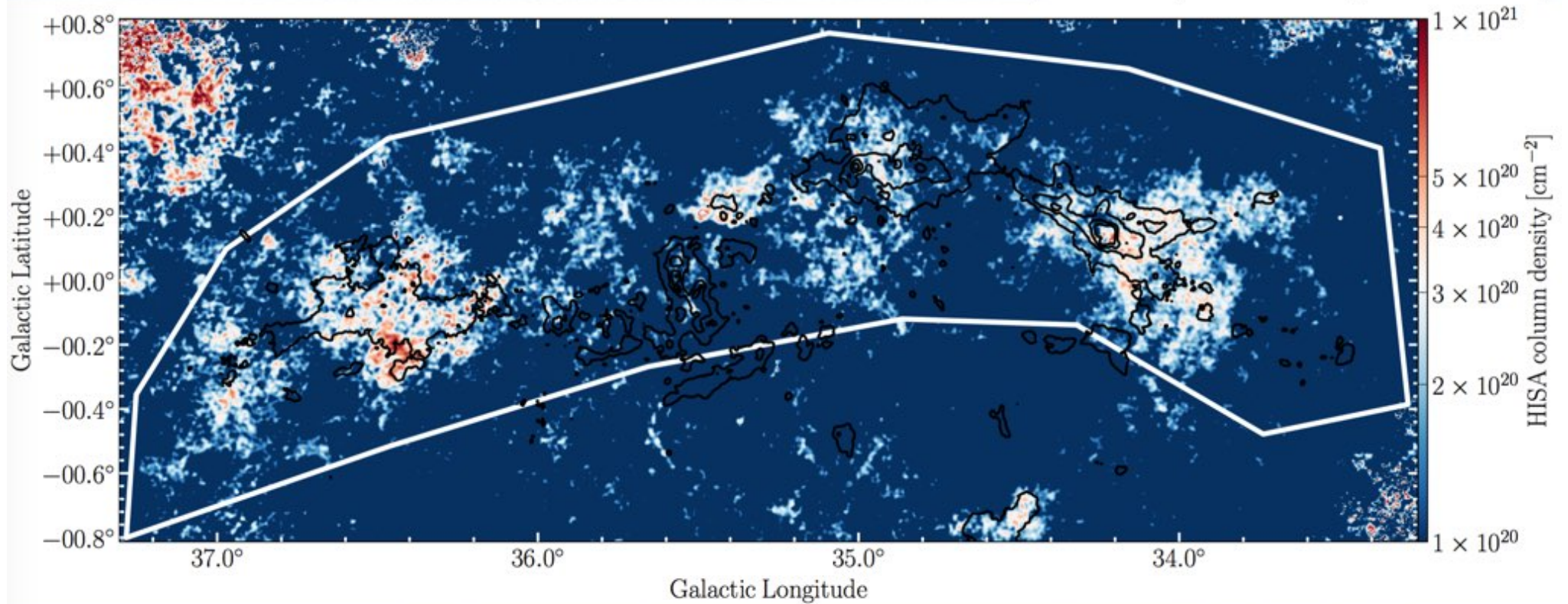
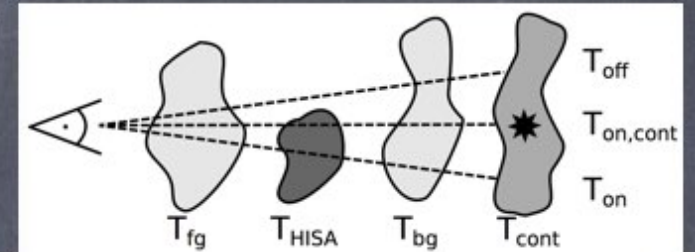
Velocity FWHM

HI  $C_s \sqrt{8 \ln(2)}$   
 $\sim 1.35 \text{ km/s at } 40 \text{ K}$



# HISA – Column density

Assuming  $T_s=40\text{K}$ ,  $T_{\text{bg}}$  dominate (90%)

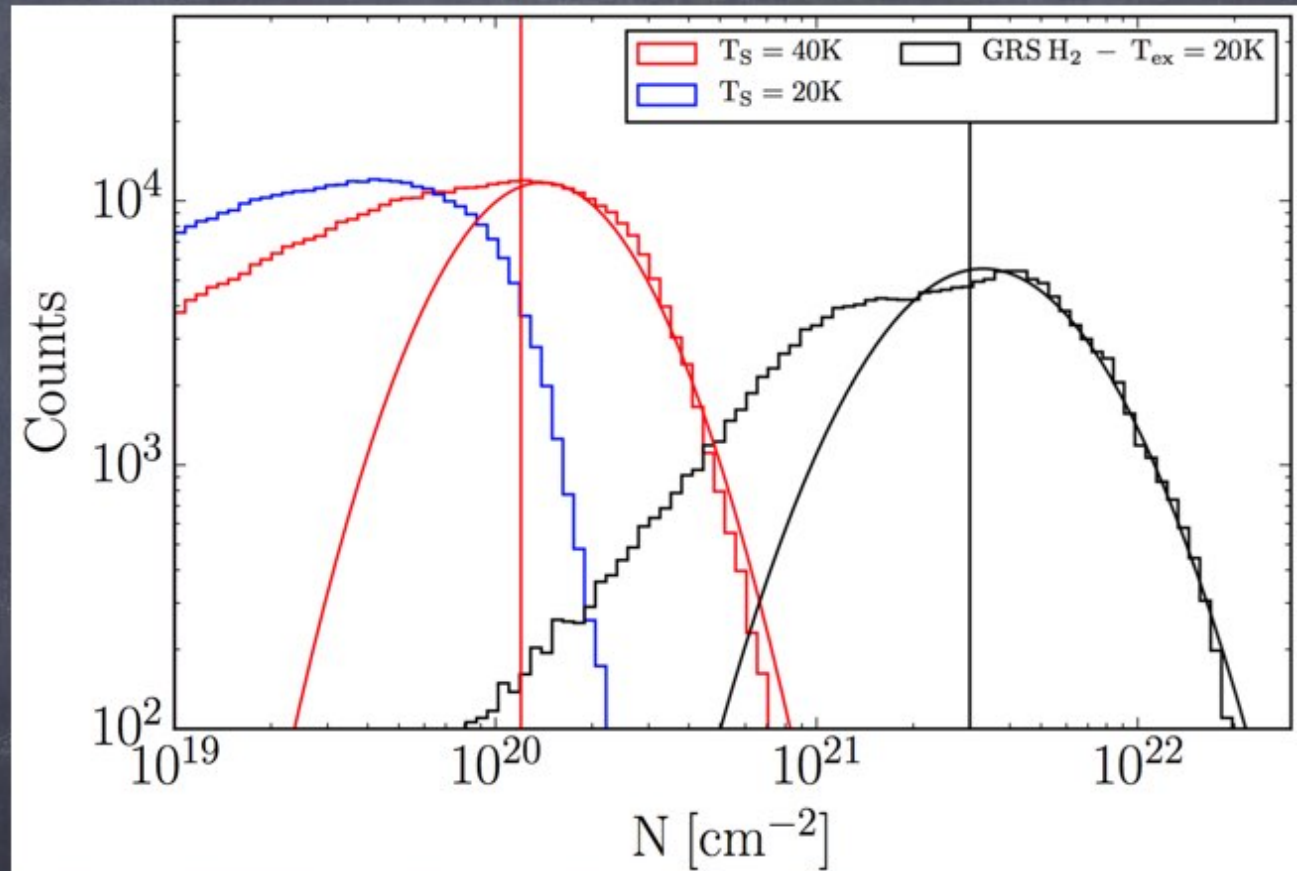


# HISA

Column density,  $T_S=40\text{K}$

HI closed contour:

$$1.2 \times 10^{20} \text{cm}^{-2} \sim 1 M_{\odot} / \text{pc}^{-2}$$



Log-normal, turbulent dominates. By comparing to the simulations we can constrain the turbulent driving scales.

# Summary

- HISA from GMF38, polynomial fit.
- HISA is spatially correlated with CO emission
- $V_{\text{peak}} \sim 4$  km/s offset from the CO in the right subregion, might be tracing different evolutionary stages
- HISA PDF log-normal.
- More filaments will be studied, stay tuned.

