

SEDIGISM - Structure, Excitation, and Dynamics of the Inner Galactic ISM

A survey of the Galactic Plane in $^{13}\text{CO}(2-1)$ with APEX

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Abstract

We have started a large observing program with APEX aimed at mapping the southern Galactic Plane in the J=2-1 rotational lines of ^{13}CO and C^{18}O . The goal of SEDIGISM is to cover 78 deg^2 ($-60^\circ \leq l \leq +18^\circ$, $|b| \leq 0.5^\circ$) with an rms of 0.5 K at 0.3 km/s resolution. Combined with the $^{12}\text{CO}(1-0)$, $^{13}\text{CO}(1-0)$ and $\text{C}^{18}\text{O}(1-0)$ data from the ThrUMMS survey, this dataset will allow us for the first time to produce a fully three-dimensional realisation of the excitation and optical depth conditions in the molecular ISM, from the largest scales down to $30''$ spatial resolution. We will also achieve a complete census of filamentary structures in the inner Galaxy, and investigate their formation mechanism. Here we show example high-resolution images and spectra, obtained during the first year of observations.

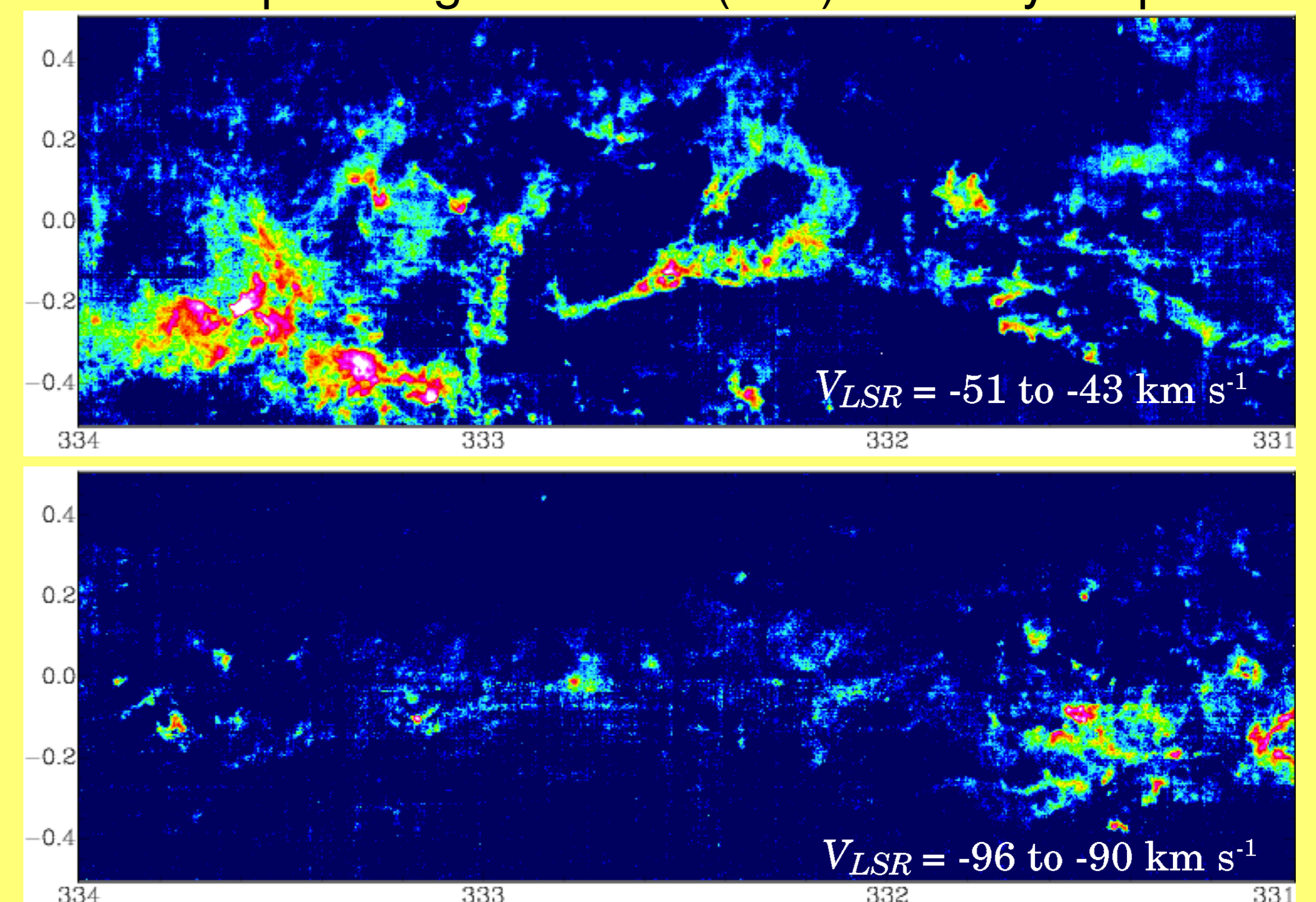
SEDIGISM: Observations



- $-60^\circ \leq l \leq +18^\circ$, $|b| \leq 0.5^\circ$ (78 deg^2)
- APEX Telescope: $\varnothing 12 \text{ m}$ @ Chajnantor
- APEX beam at 219 GHz = $28''$
- SHFI instrument + XFFTS : 4 GHz bandwidth, $\delta V = 0.1 \text{ km s}^{-1}$, covers 217 GHz to 221 GHz at once $\Rightarrow ^{13}\text{CO}(2-1)$ and $\text{C}^{18}\text{O}(2-1)$, but also $\text{SiO}(5-4)$, $\text{SO}(5-4)$, H_2CO , ...
- Scanning at $2''/\text{s}$, along GLon and GLat
- RMS $\sim 0.5 \text{ K}$ with $\delta V = 0.3 \text{ km s}^{-1}$

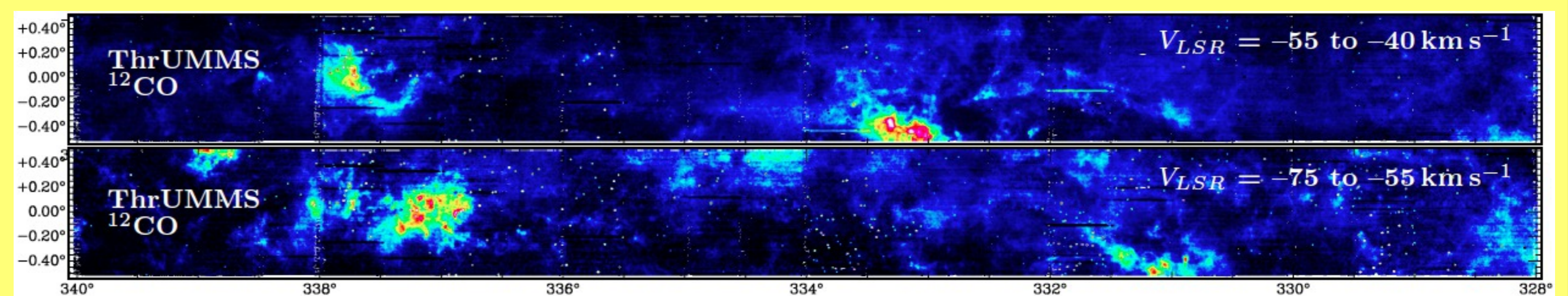
- Collaboration ESO + MPG + OSO + Chile
- 40% completed in 275 hours

Example integrated $^{13}\text{CO}(2-1)$ intensity maps



ThrUMMS: The Three-mm Ultimate Mopra Milky Way Survey

- $-60^\circ \leq l \leq 0^\circ$, $|b| \leq 1^\circ$ (120 deg^2), resolution $72''$
- $^{12}\text{CO}(1-0)$, $^{13}\text{CO}(1-0)$, $\text{C}^{18}\text{O}(1-0)$, $\text{CN}(1-0)$
- Velocity coverage 360 km/s, $\delta V = 0.3 \text{ km s}^{-1}$
- RMS $\sim 1.0 \text{ K}$

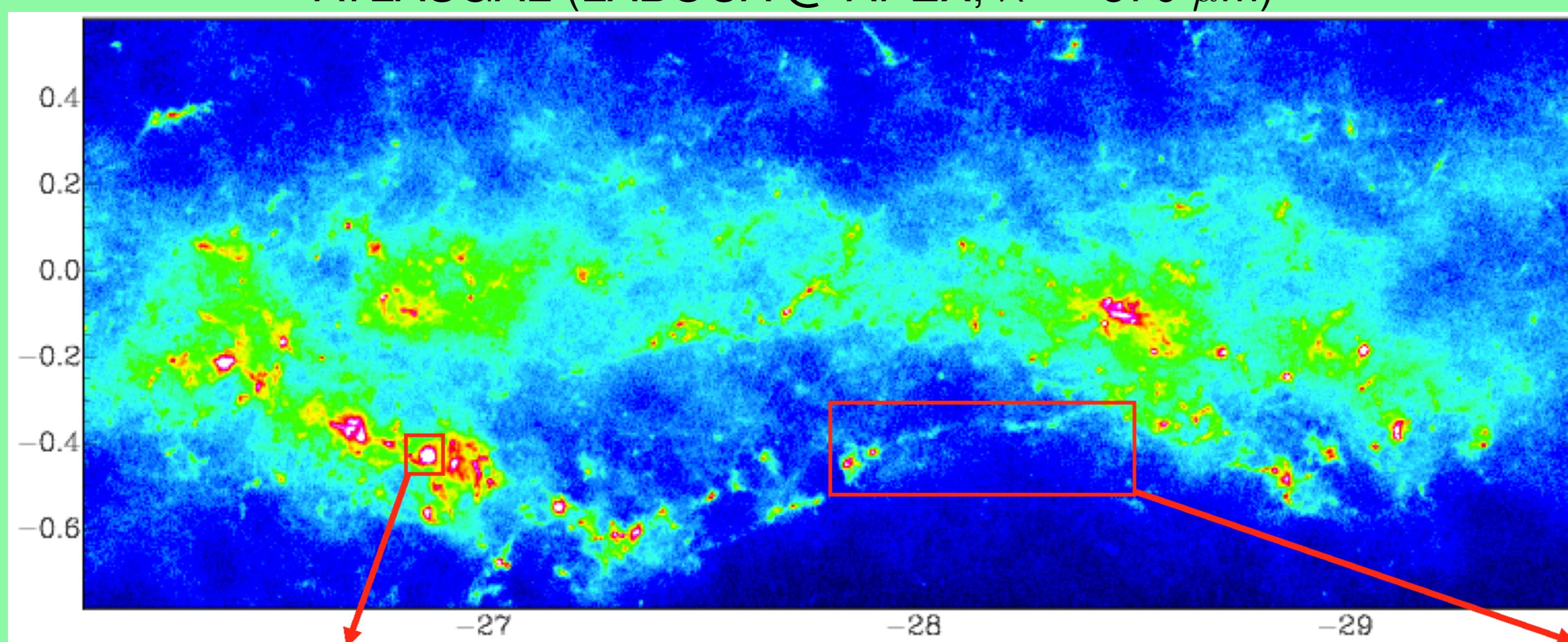


(Barnes, Muller et al., ApJ submitted)

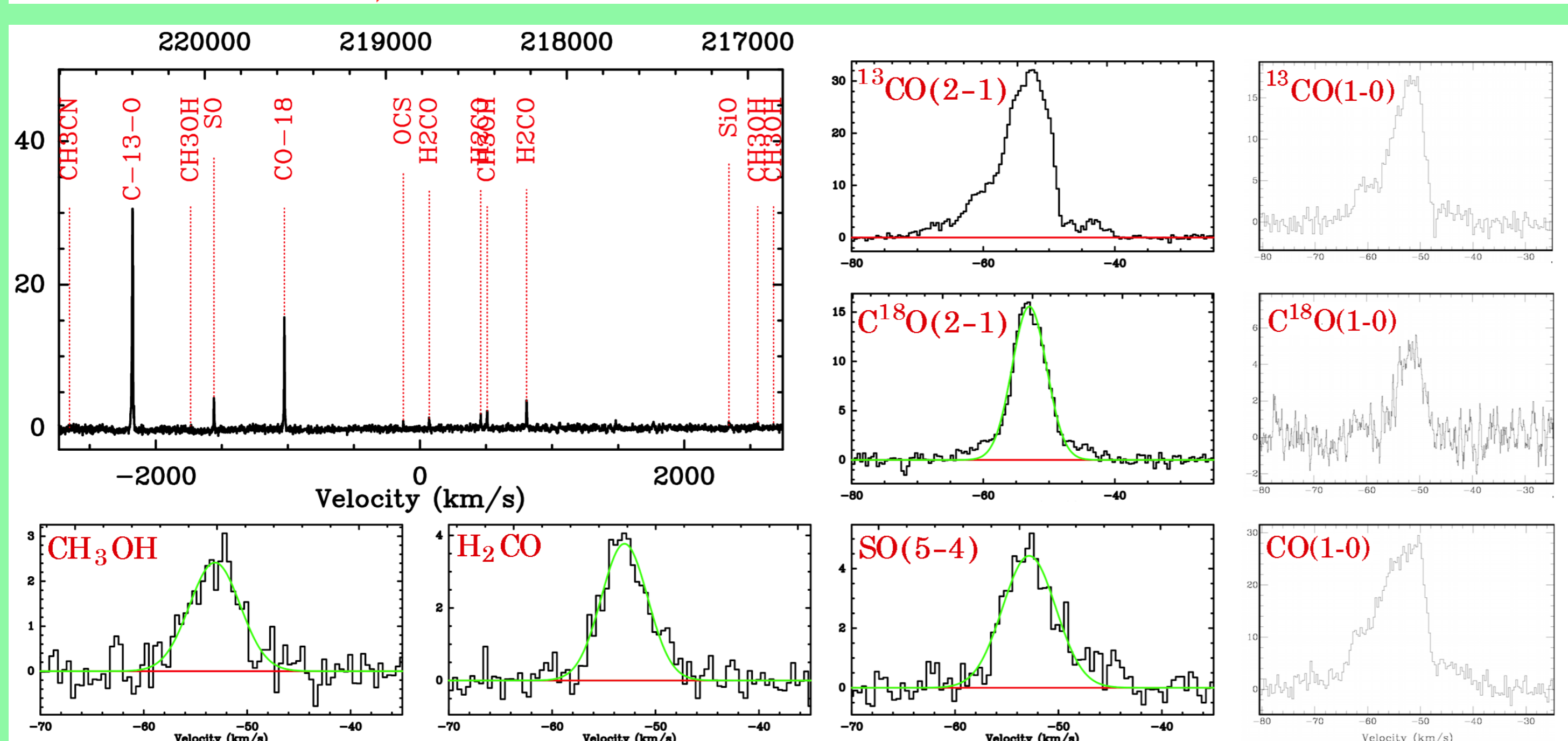
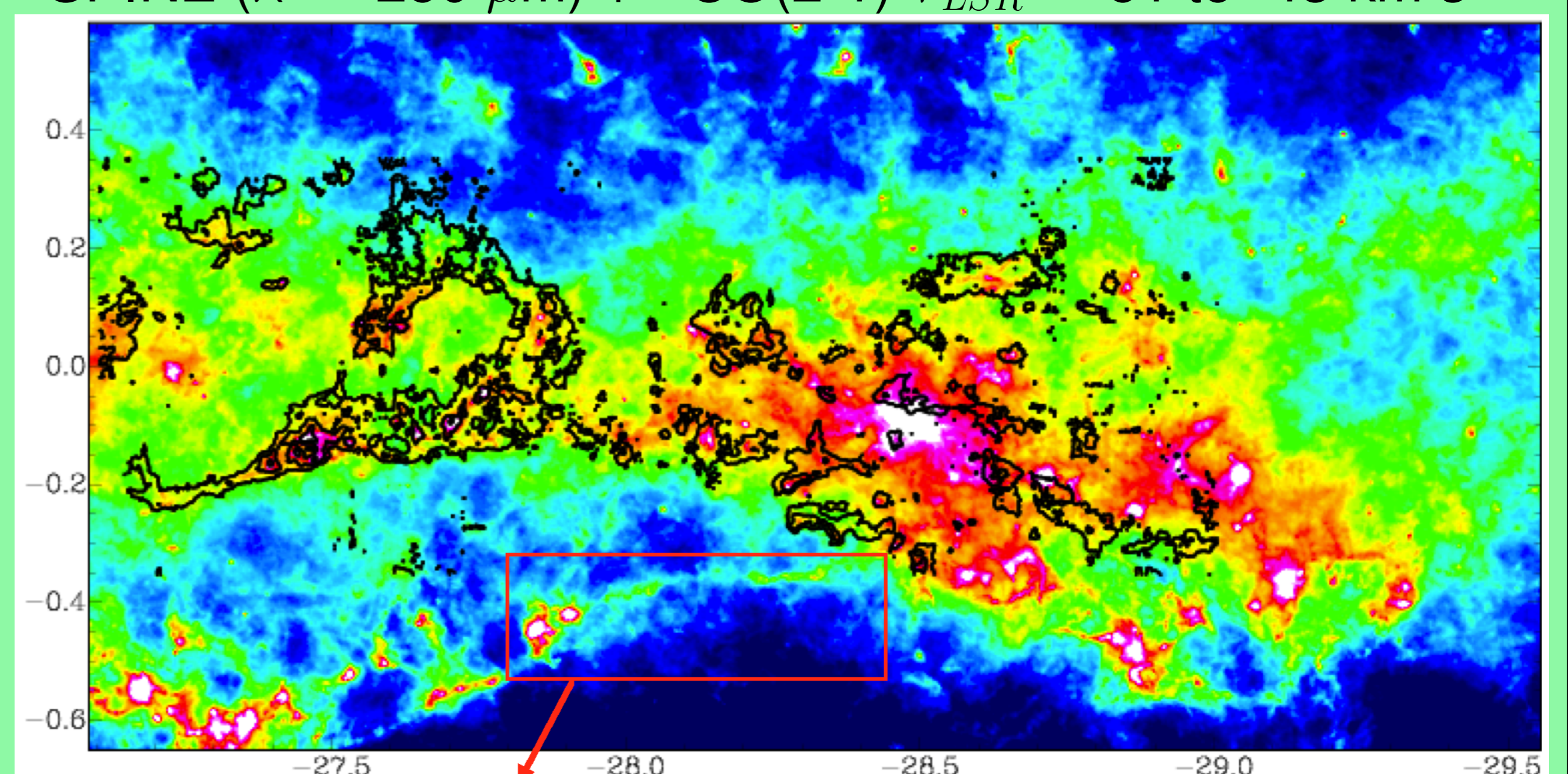
Key science topics

– Large scale Galactic structure

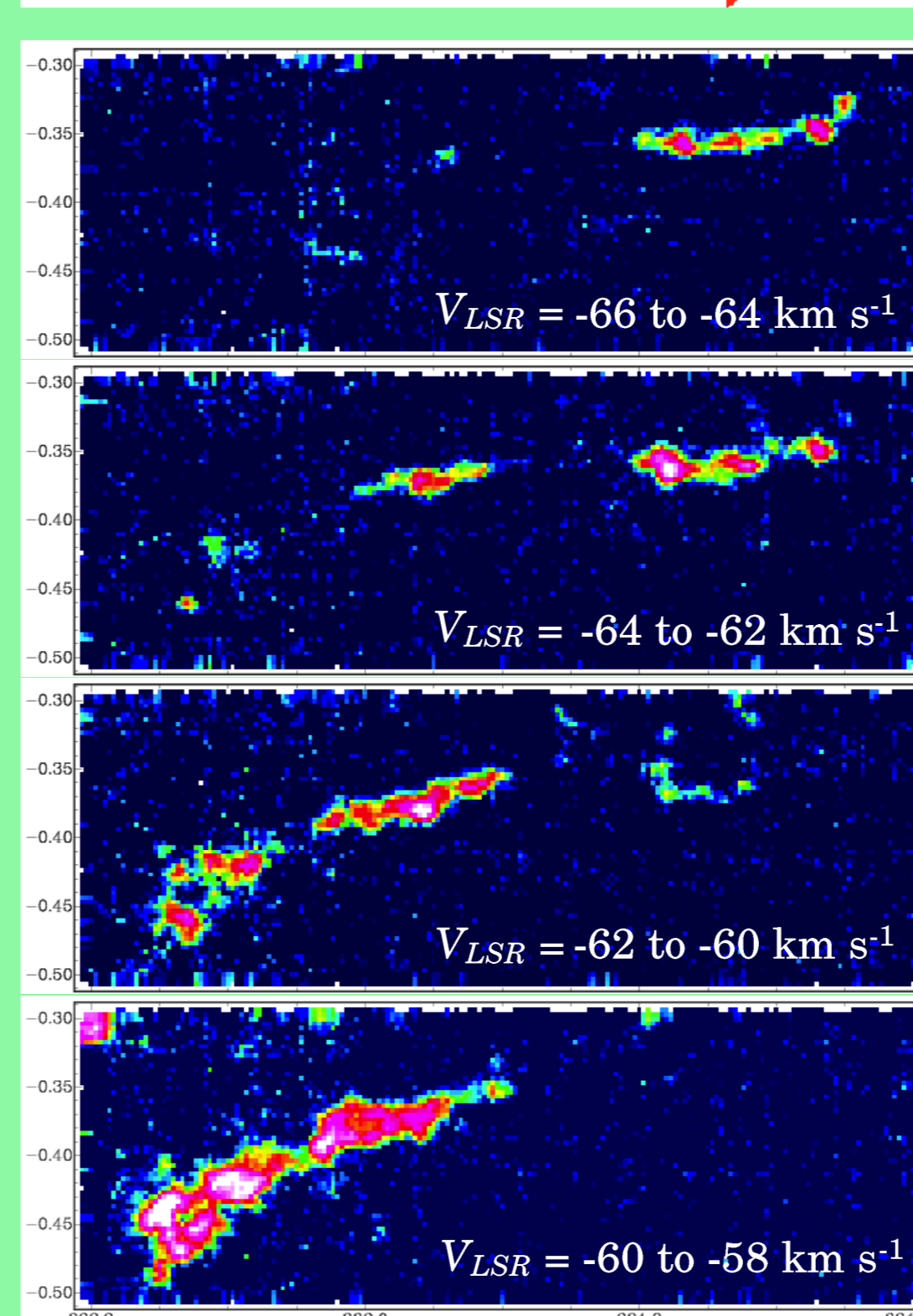
ATLASGAL (LABOCA @ APEX, $\lambda = 870 \mu\text{m}$)



SPIRE ($\lambda = 250 \mu\text{m}$) + $^{13}\text{CO}(2-1)$ $V_{LSR} = -51 \text{ to } -43 \text{ km s}^{-1}$



Integrated $^{13}\text{CO}(2-1)$ emission



- Excitation
- Filaments
- Kinematics
- Dynamics
- and more...

- Chemistry
- Physics: density, temperature, shocks, outflows...