

# Future Submillimeter Galactic Surveys

*Unprecedented Data Sets for  
Characterizing Star Formation*

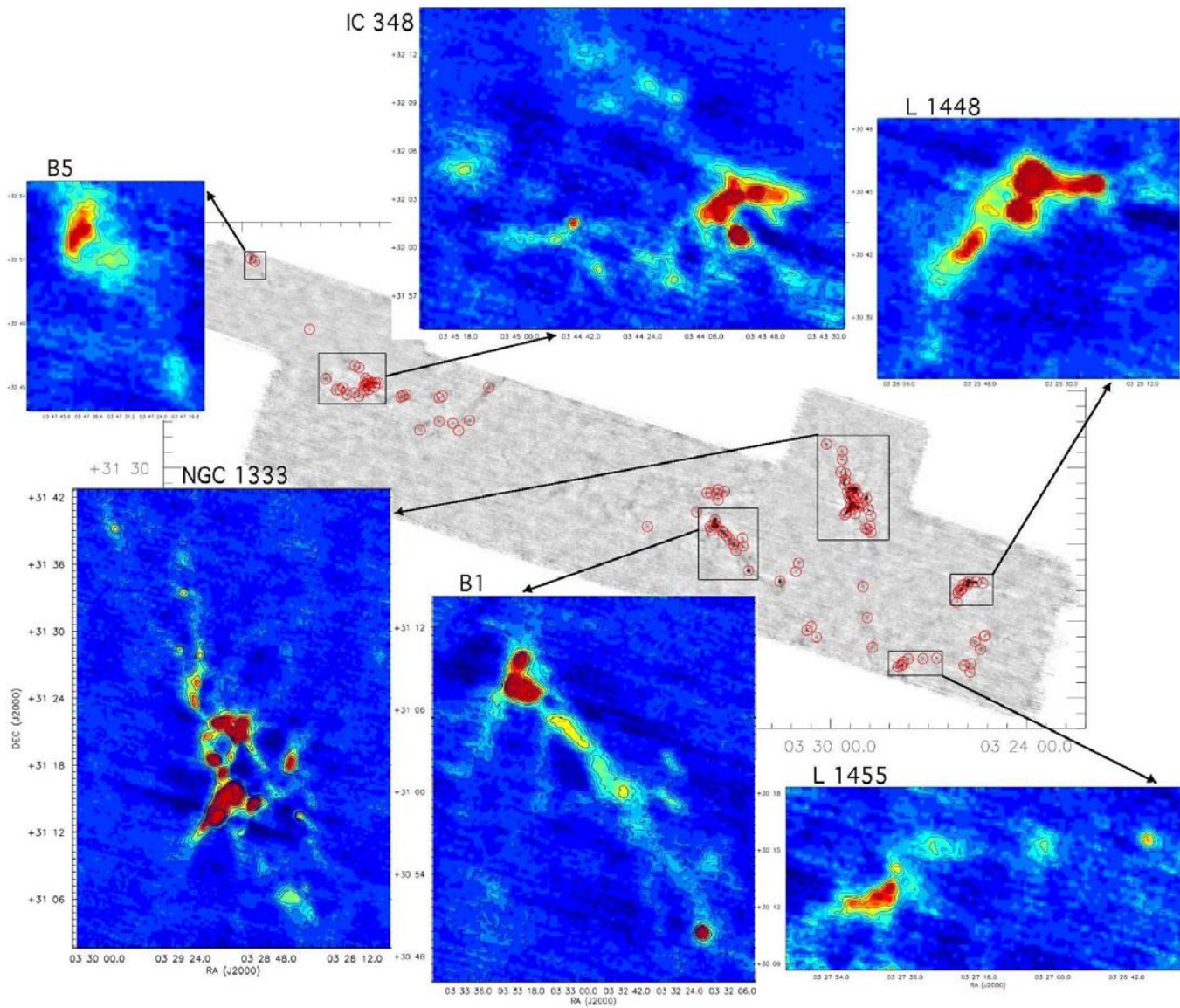
Jason Glenn  
University of Colorado

# Fundamental Questions About Star Formation on the Galactic Scale

1. How do molecular clouds form from the diffuse ISM & how do dense star-forming cores form within clouds?
2. How is star formation triggered?
3. To what extent does star formation self-regulate?

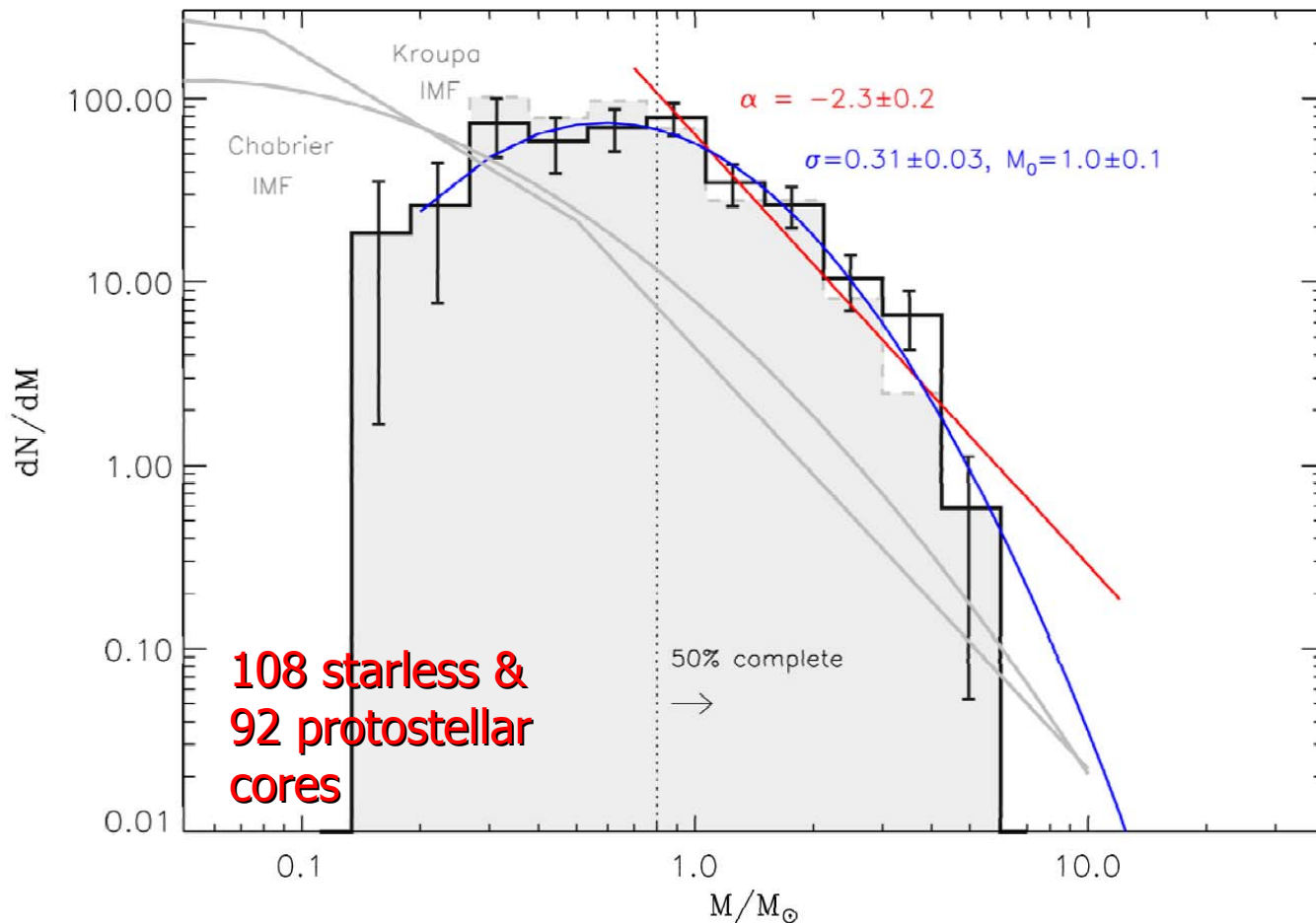
*Addressing these questions will only be possible with large, multi-wavelength surveys.*

# Results from the Bolocam c2d Survey



Perseus  
molecular  
cloud complex  
(Bolocam,  $\lambda =$   
1.1 mm;  
Enoch, et al.  
2006)

# Perseus, Rho Ophiuchus, & Serpens: Bolocam + *Spitzer*

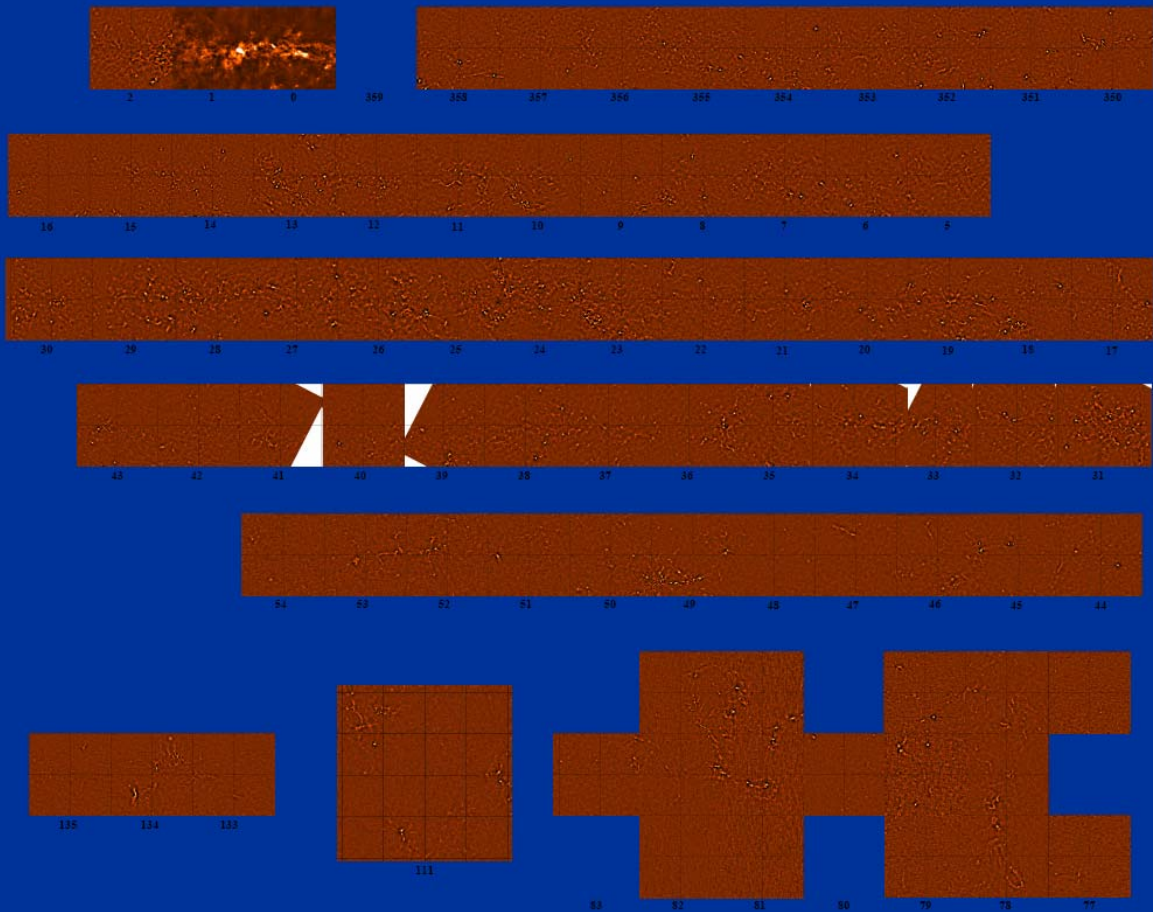


Tantalizing results that require large, deeper surveys to address further:

- MF similar power law to IMF
- $\geq 25\%$  core-to-star efficiency
- Can (magnetic) turbulent fragmentation explain the core mass function?

Enoch et al., in prep.; Enoch et al. 2006, Young et al. 2007, Enoch et al. 2007

# Bolocam CSO Galactic Plane Survey



$-10^\circ \leq l \leq 90^\circ$ ,  $b \pm 0.5^\circ$ ,  
W3/4/5, Perseus Arm, Cyg-X:  
150° sq.

•  $20 \text{ mJy} \leq \text{rms} \leq 50 \text{ mJy}$   
( $10 M_{\text{solar}} @ 2 \text{ kpc}, 5\sigma, 20 \text{ K}$ )

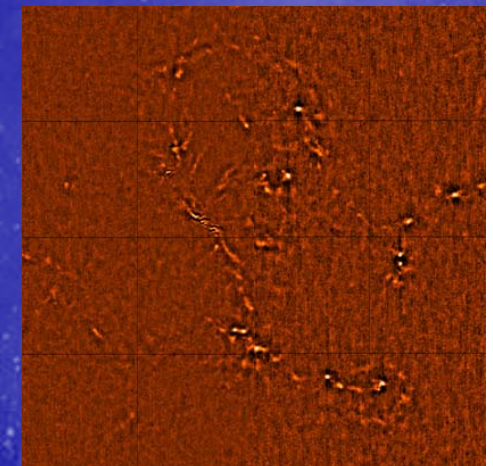
• Data

– 1<sup>st</sup> release summer '08

– Maps

– Catalogs

Structure  
coherent  
over 2°!



Aguirre, Bally, Bradley, Chamberlin, Cyganowski, Drosback,  
Evans, Ginsburg, Glenn, Harvey, Nordhaus, Rosolowsky,  
Walawender, Williams (see Poster 089.25)

# Long-Term Future Surveys

(See Wayne Holland's presentation for SCUBA-2, Herschel, & APEX plans)

Census of Galactic star formation:

- Potentially
  - 1,000 protostars down to  $0.1 M_{\text{solar}}$  in Perseus + Rho Oph + Serpens
  - >10,000 sources in the Plane
- Multicolor: T, L, M
- Spectroscopy of dense gas tracers
  
- LMT: excellent sensitivity,  $5''$  resolution
- CCAT
- ALMA essential for connecting cores, outflows, & disks

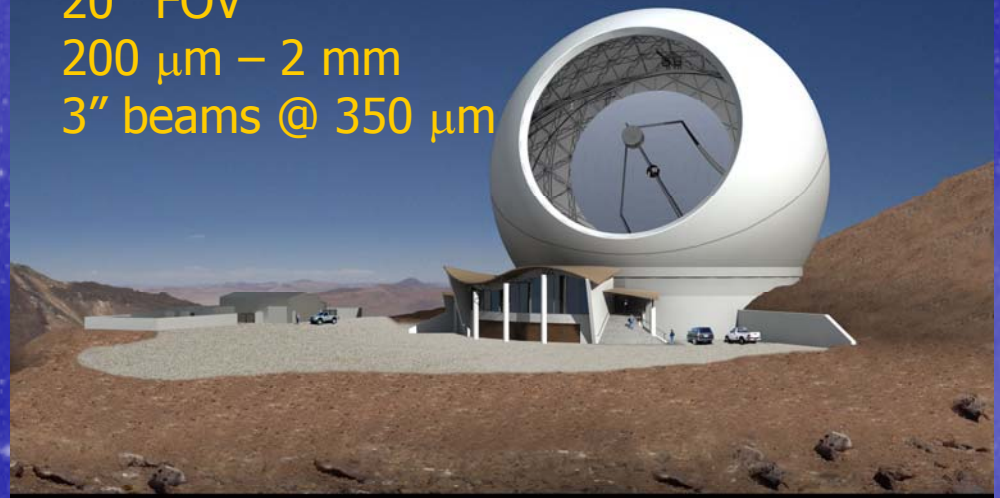
## The Cornell Caltech Atacama Telescope

~2013

20' FOV

200  $\mu\text{m}$  – 2 mm

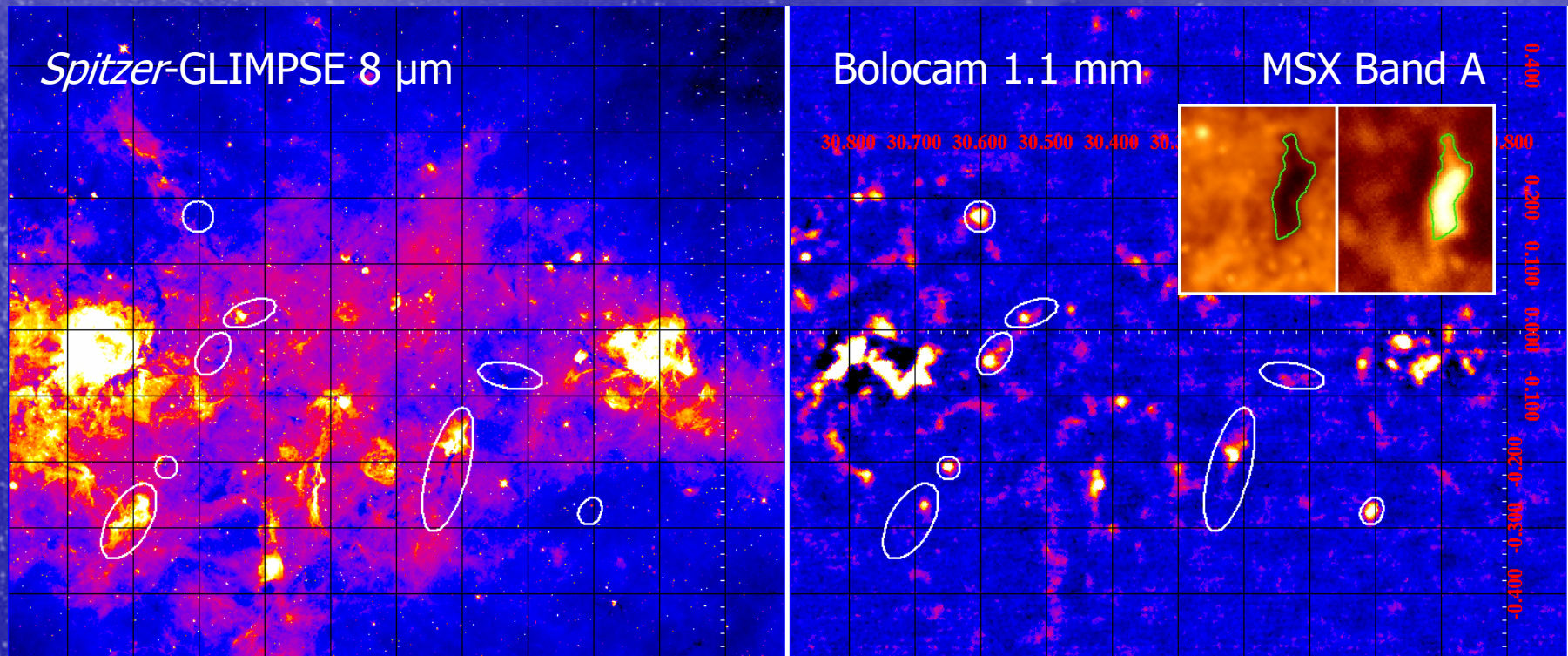
3" beams @ 350  $\mu\text{m}$



Cornell Caltech Atacama Telescope  
Cerro Chajnantor, Chile

# Distances and Context

- Distances are crucial for measuring luminosities and masses
  - Spectroscopy combined with the Galactic rotation curve
    - Near-far ambiguity inside the solar circle – use associations
    - High-density tracers are required (e.g., CS & NH<sub>3</sub>)
- Multiwavelength imaging is crucial for context



# Conclusions

1. Imminent & future sub/millimeter surveys are poised to characterize star formation on scales from cores to kiloparsecs.
2. It is *essential* that multi- $\lambda$  surveys be combined for context (and to measure distances!) → coordinated efforts between telescopes