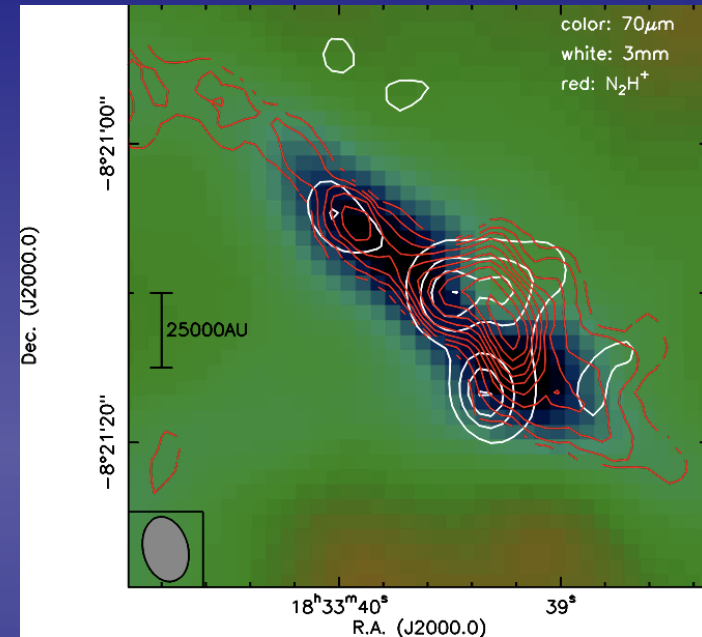
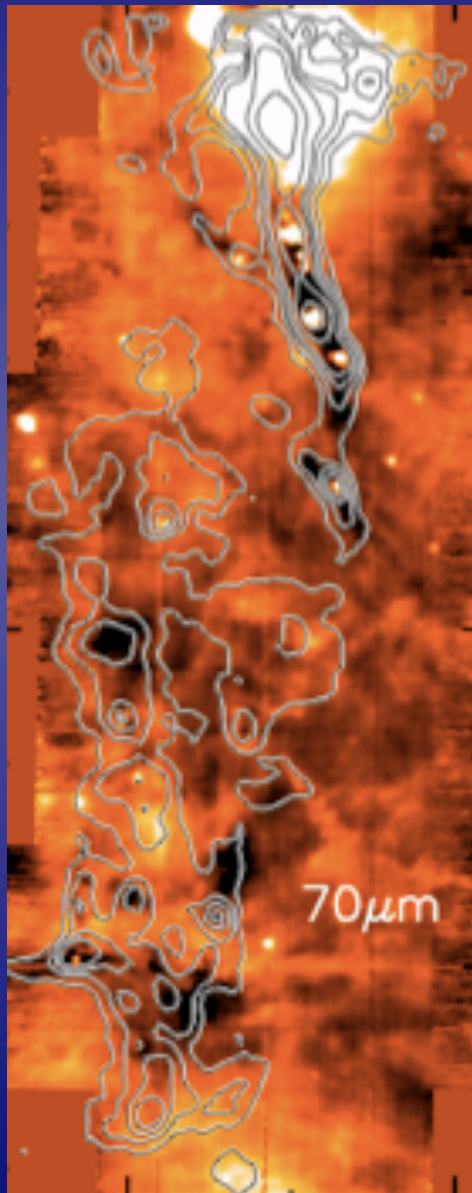


# Initial conditions for high-mass star formation

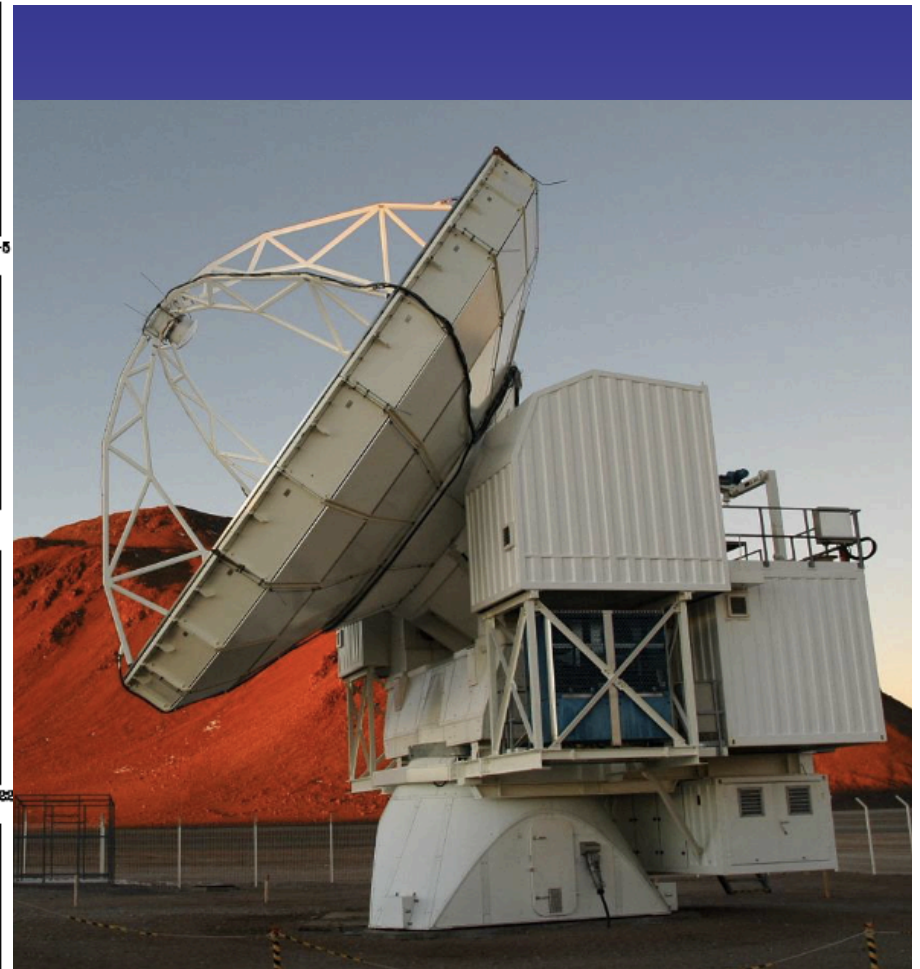
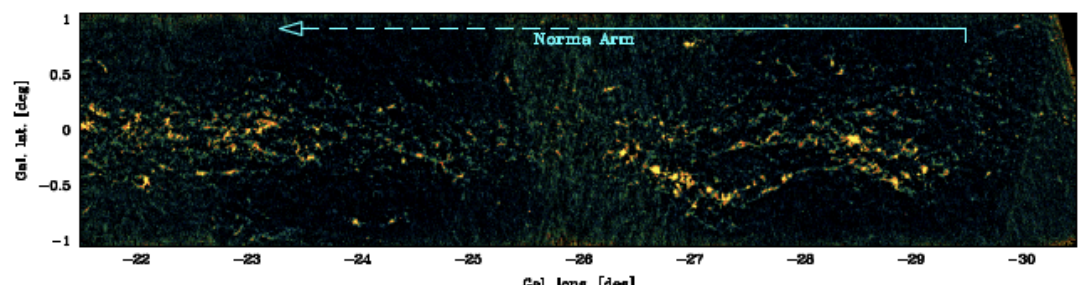
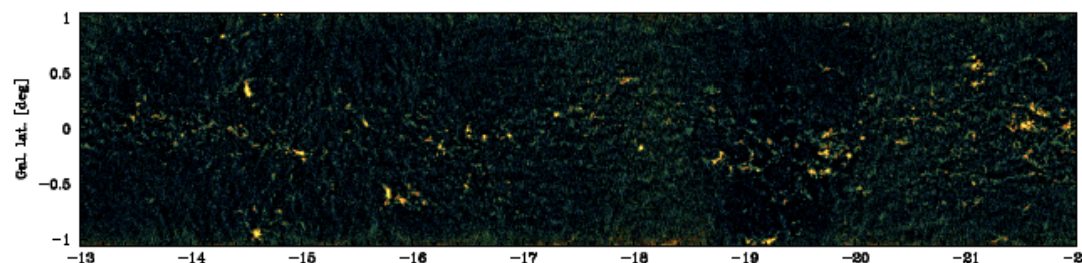
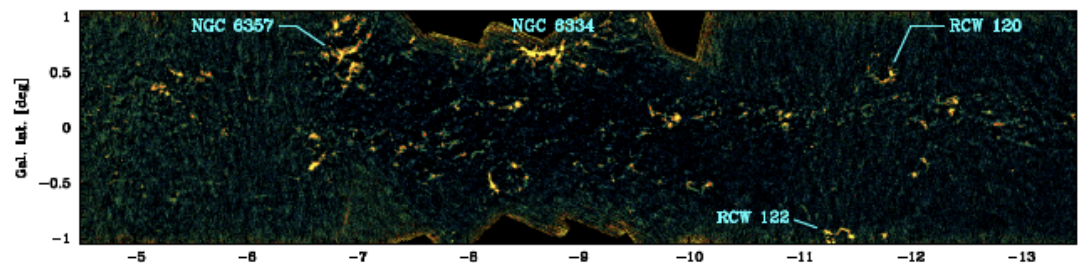
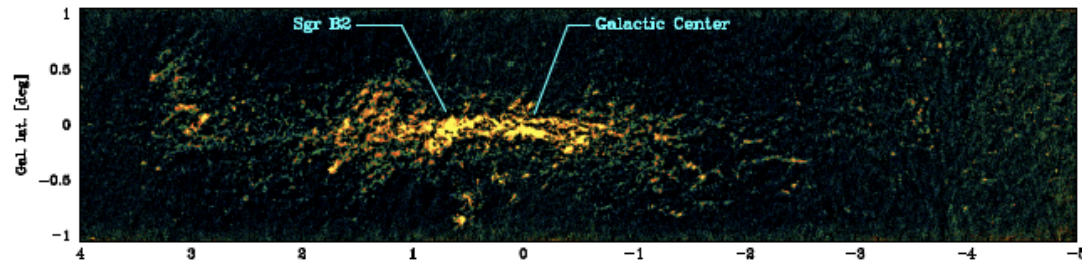
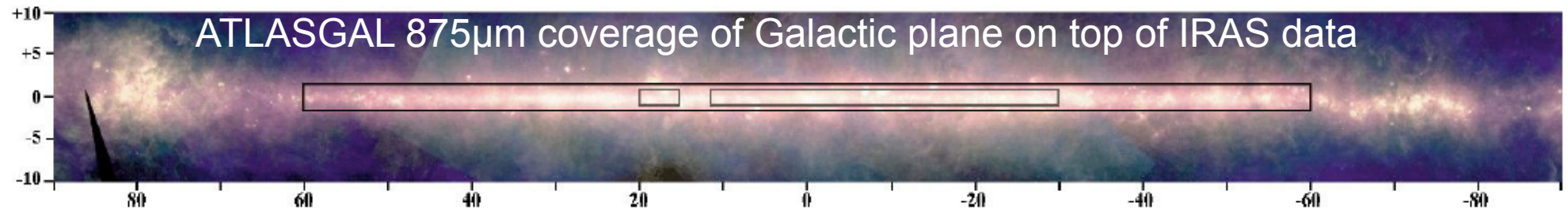
Henrik Beuther and the EPoS team (MPIA Heidelberg)



- Time scales
- EPoS Introduction
- A prototypical high-mass clump
- Influence of environment



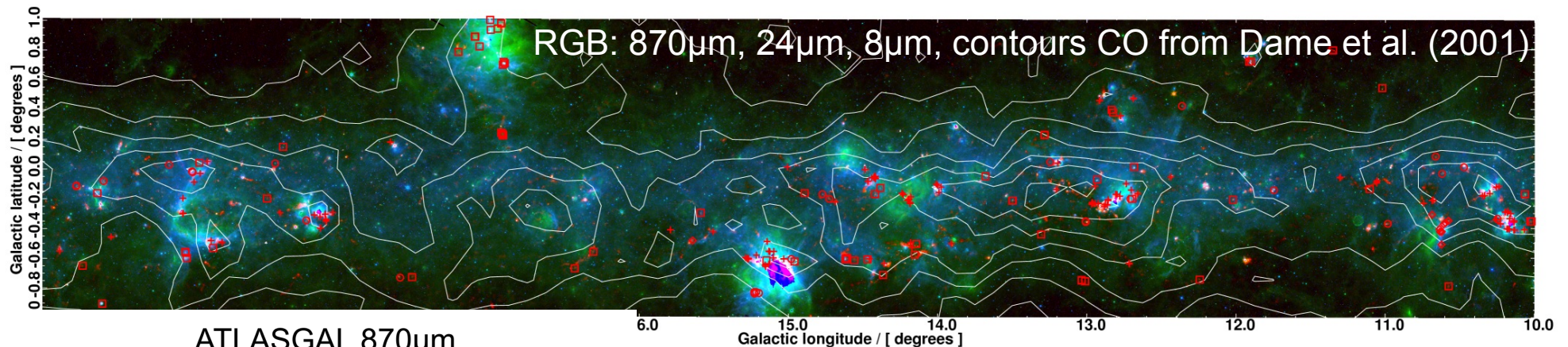
# The Milky Way as seen with ATLASGAL



*Schuller et al. 2009*



# Zooming into ATLASGAL



ATLASGAL 870 $\mu$ m

-> cold dust

searching peaks with clumpfind

CLUMPS

column density >  $1 \times 10^{23} \text{cm}^{-2}$

GLIMPSE catalog

-> YSO / class I

MIPSGAL 24 $\mu$ m

-> warm dust

starless clump  
candidates

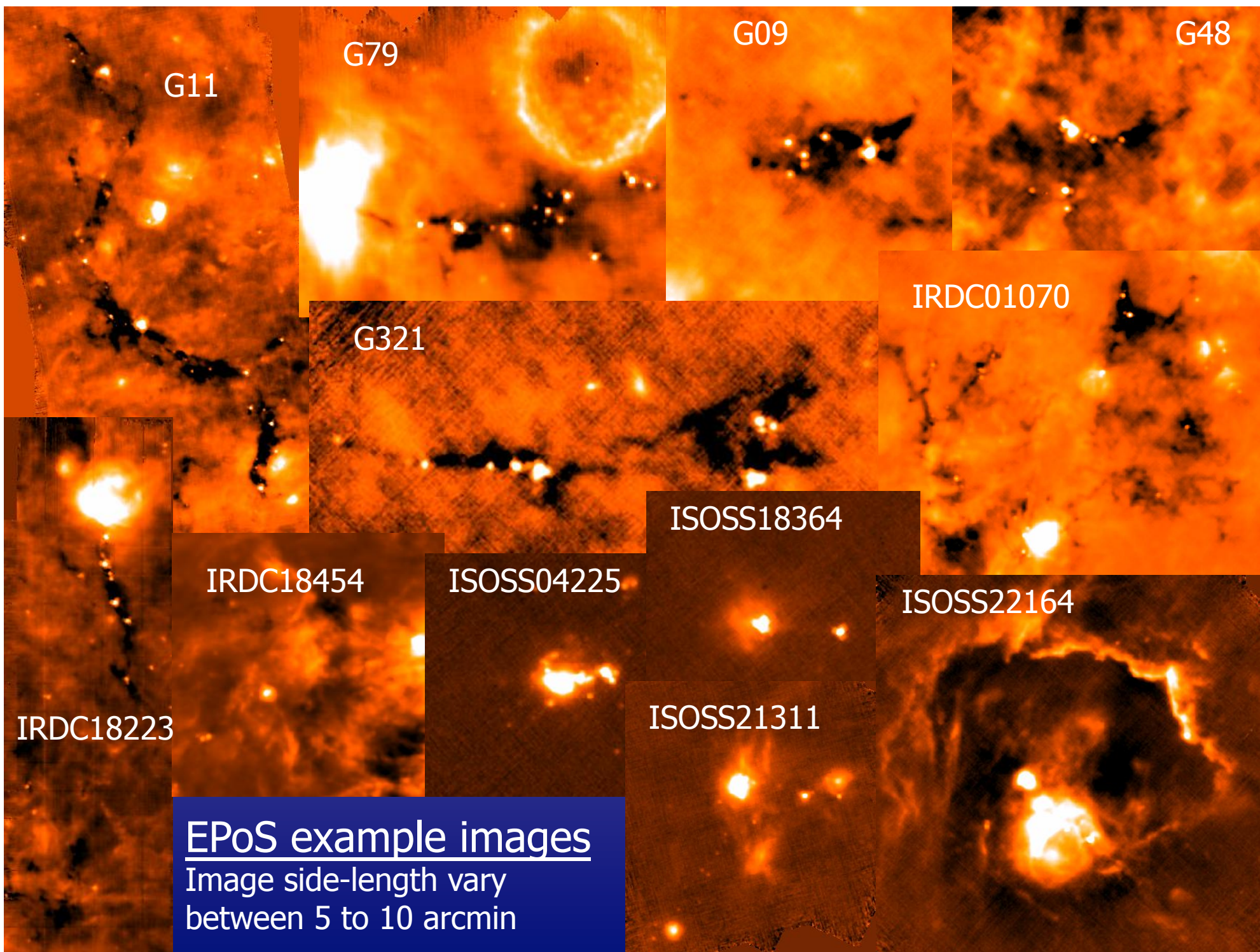
visual inspection of starless  
clump candidates

STARLESS CLUMPS

- In 20deg<sup>2</sup>, 210 out of 901 clumps starless  
→ about 25%, column density threshold  
>  $1 \times 10^{23} \text{cm}^{-2}$
- 14 >  $1000 M_{\text{sun}}$ , 3 >  $3000 M_{\text{sun}}$
- Lifetime estimate  $(6 \pm 5) \times 10^4 \text{yr}$

*Tackenberg et al. 2012*



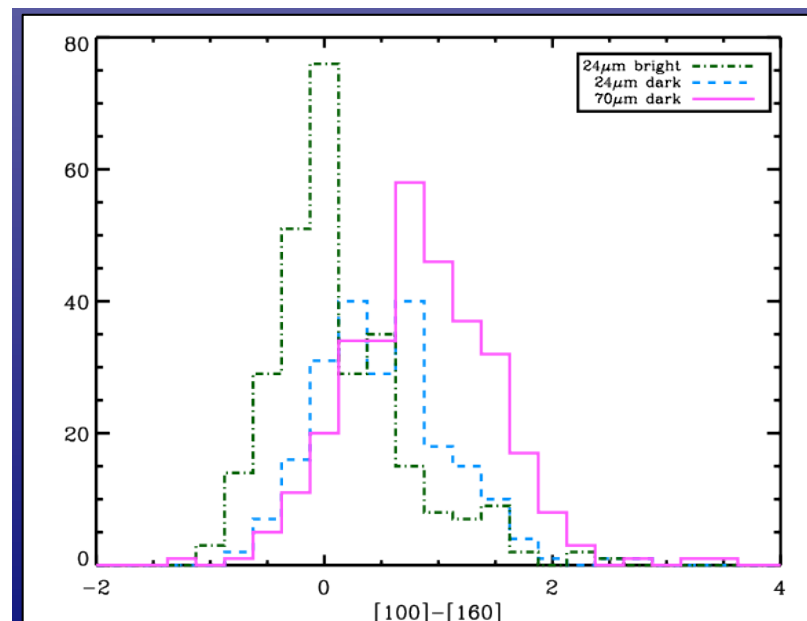
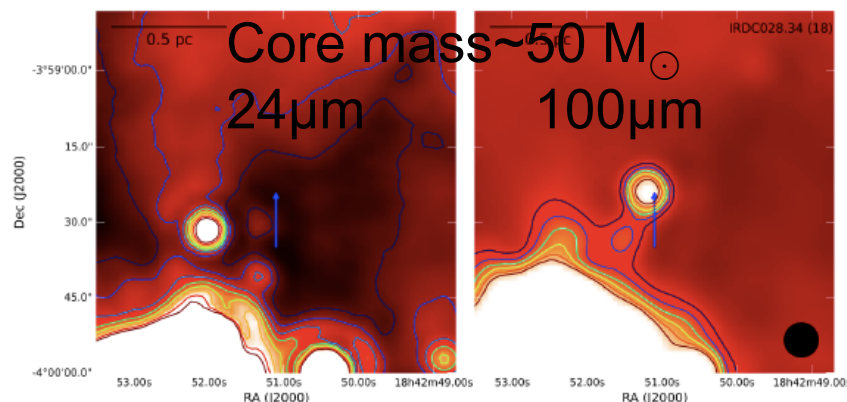
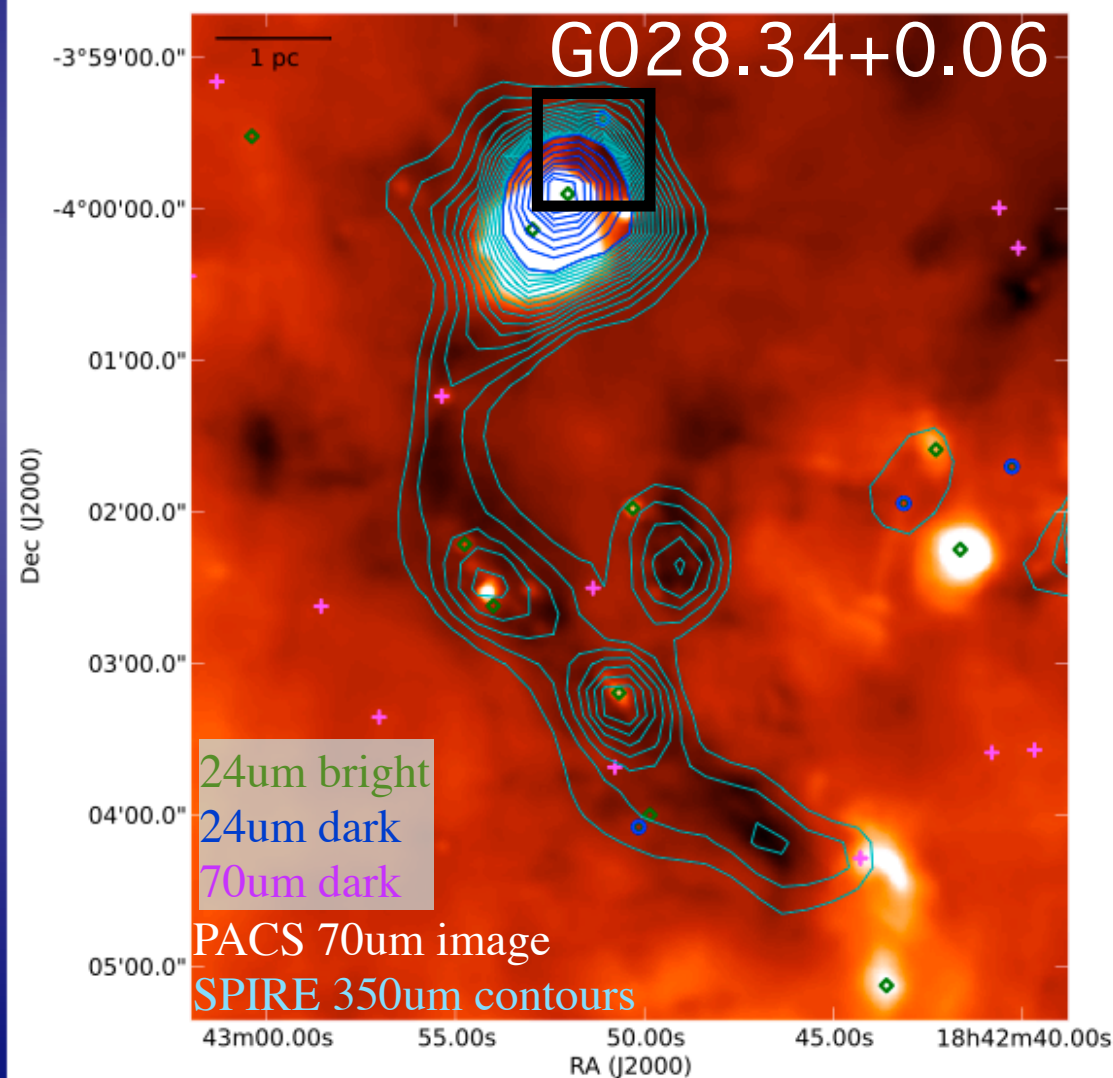




# EPoS: the early phases of star formation

Posters: S. Ragan (the sample)  
J. Tackenberg (kinematics)  
S. Bihr (NH<sub>3</sub> VLA follow-up)

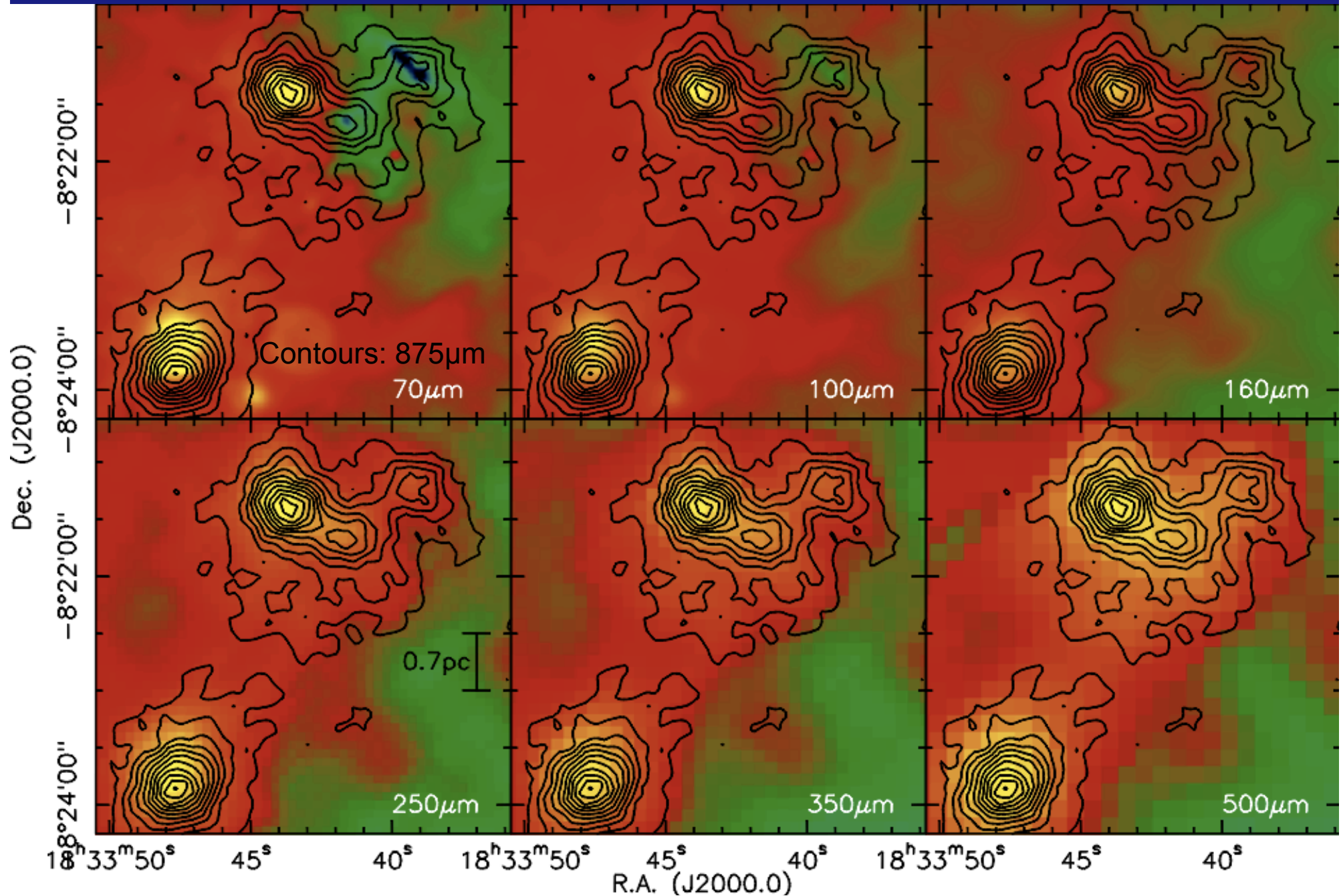
Low-mass SF: R. Launhardt  
M. Nielbock  
(T-structure of cores)



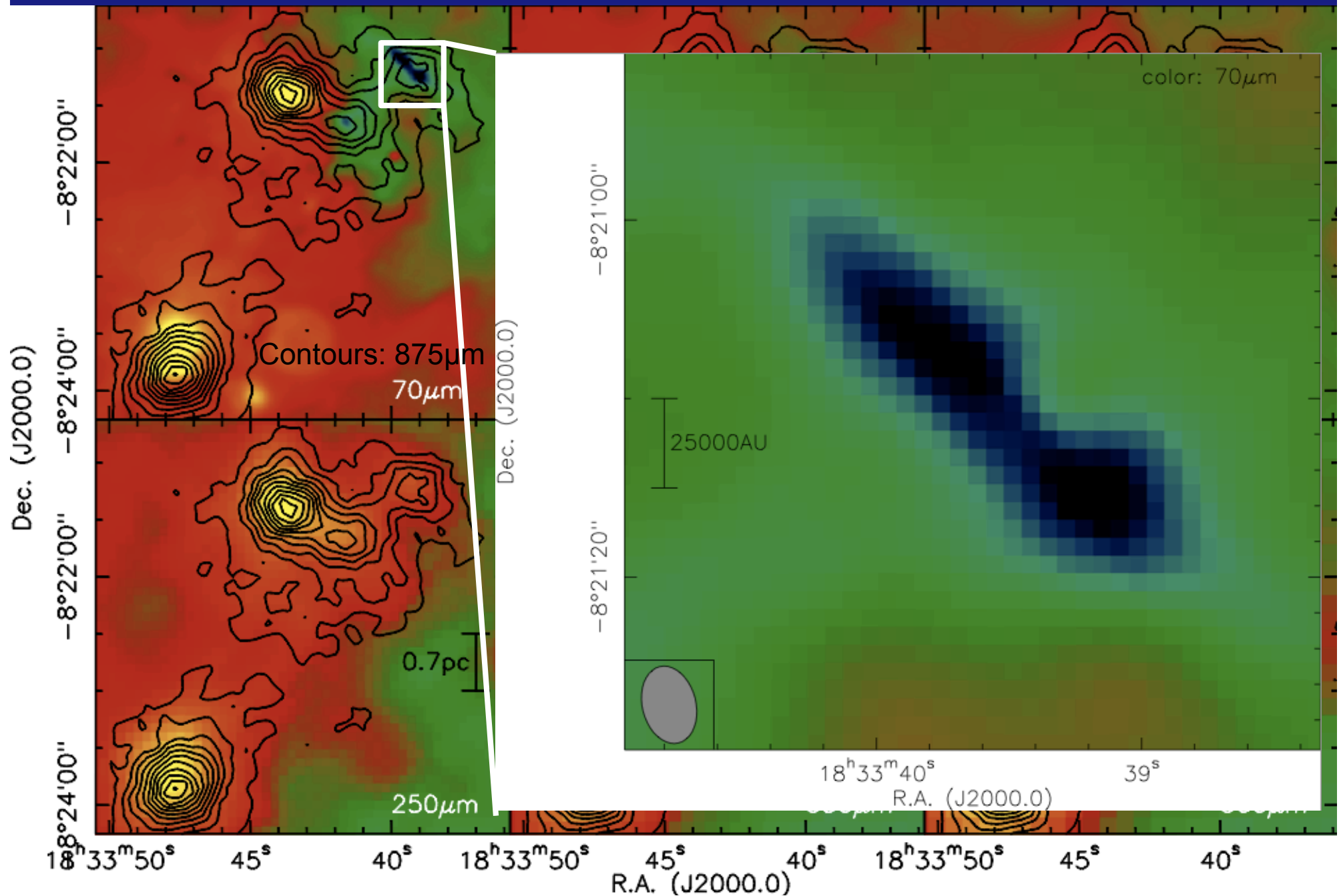
Ragan et al. (submitted)



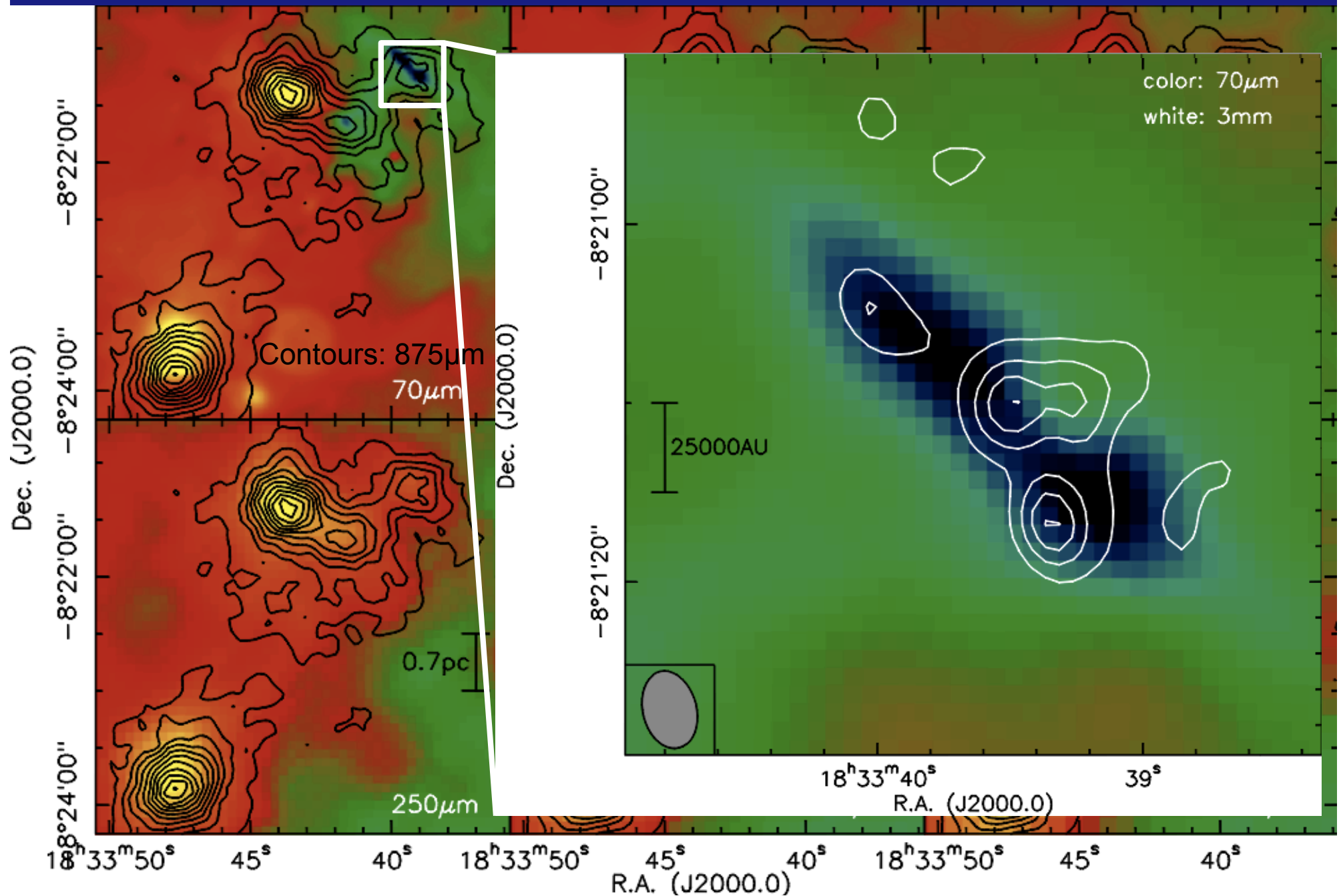
# A very massive starless clump in IRDC18310-4



# A very massive starless clump in IRDC18310-4

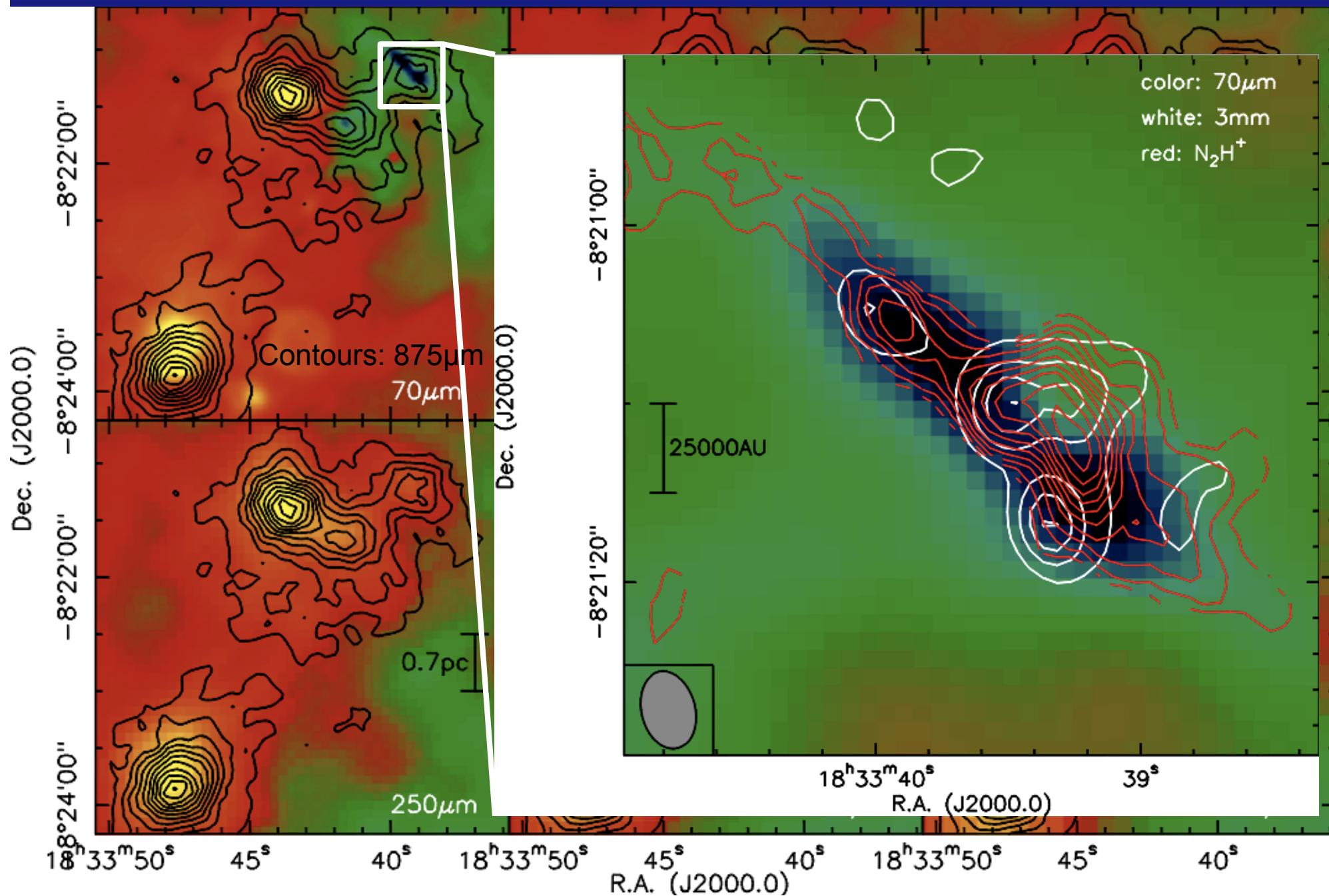


# A very massive starless clump in IRDC18310-4

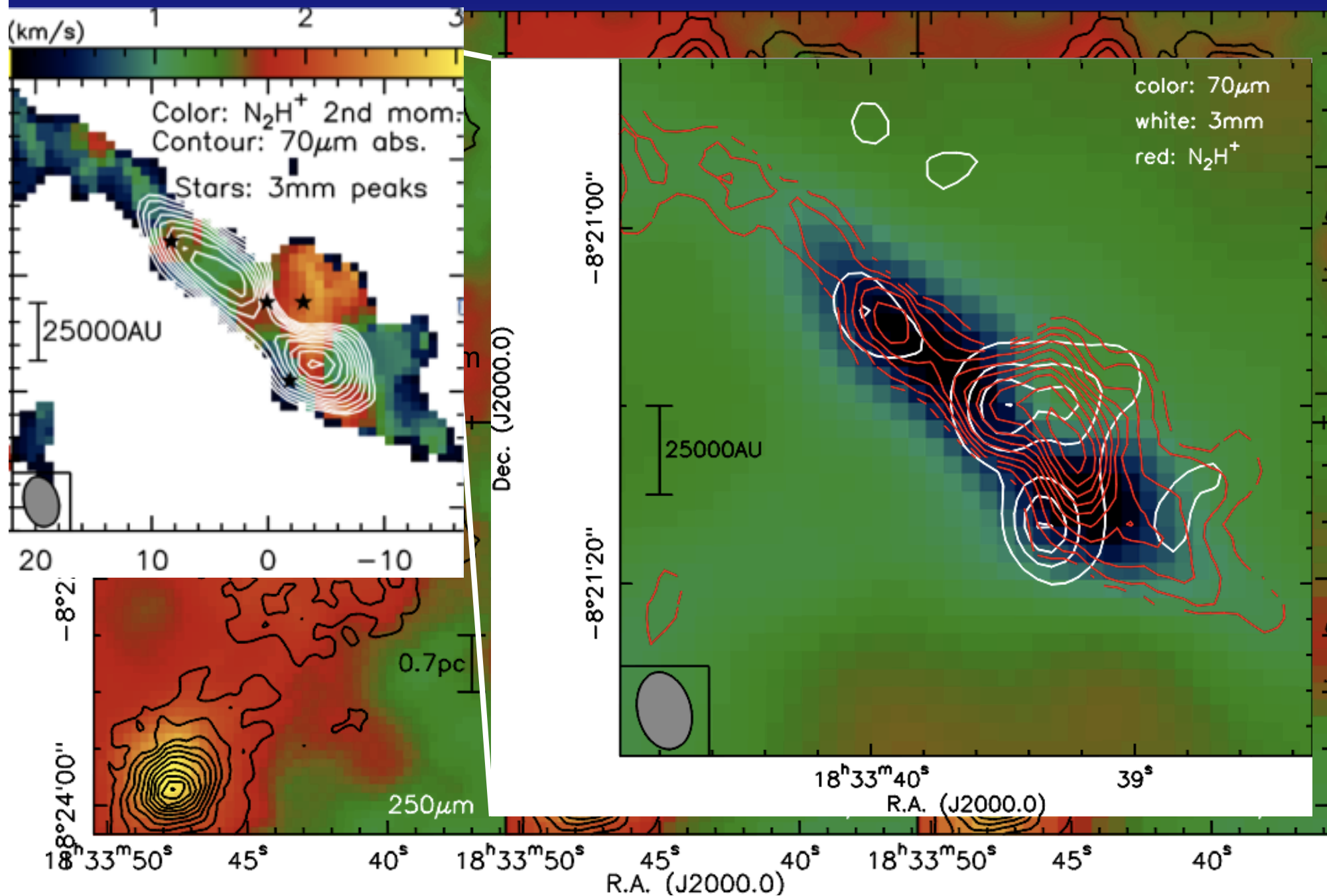




# A very massive starless clump in IRDC18310-4

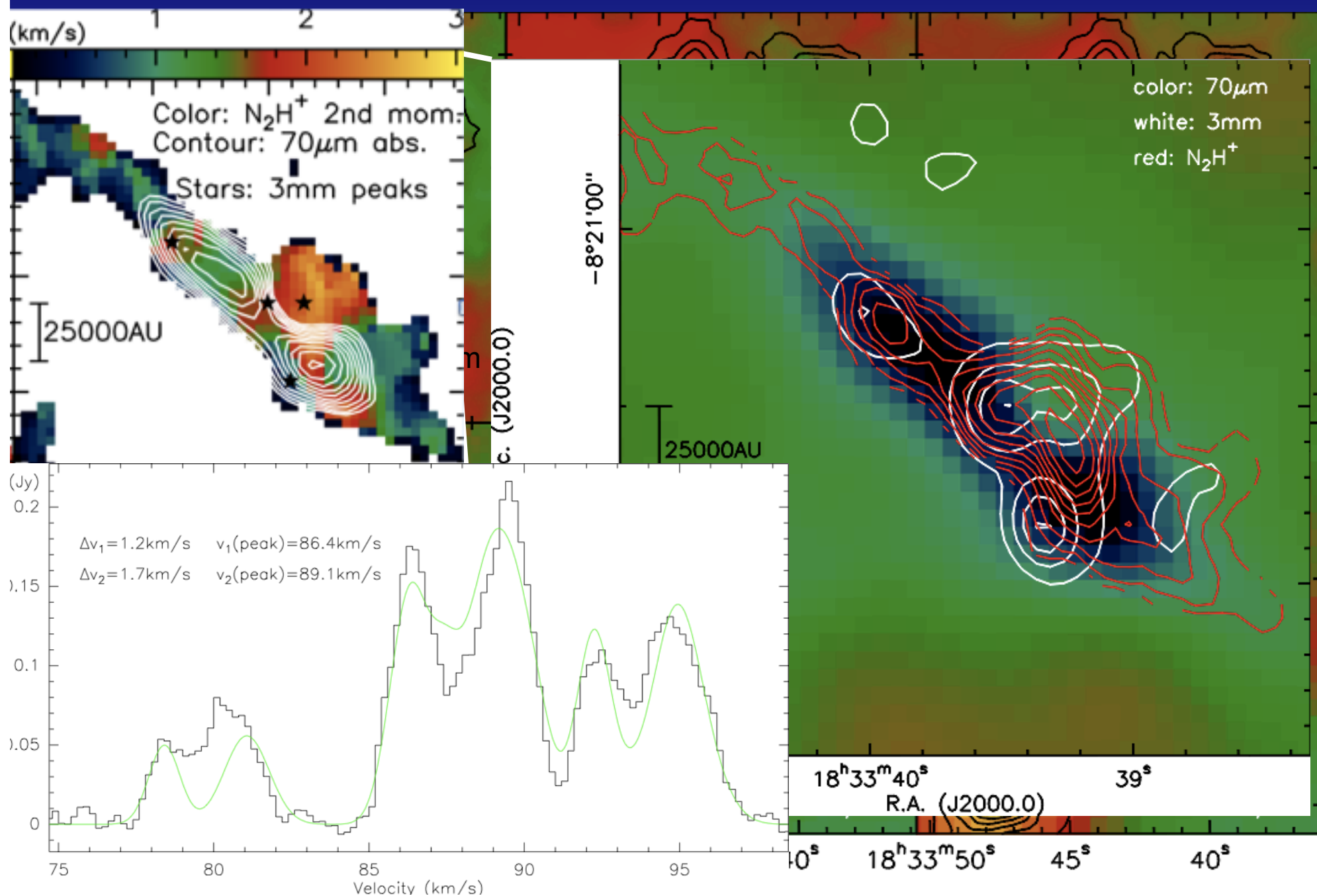


# A very massive starless clump in IRDC18310-4

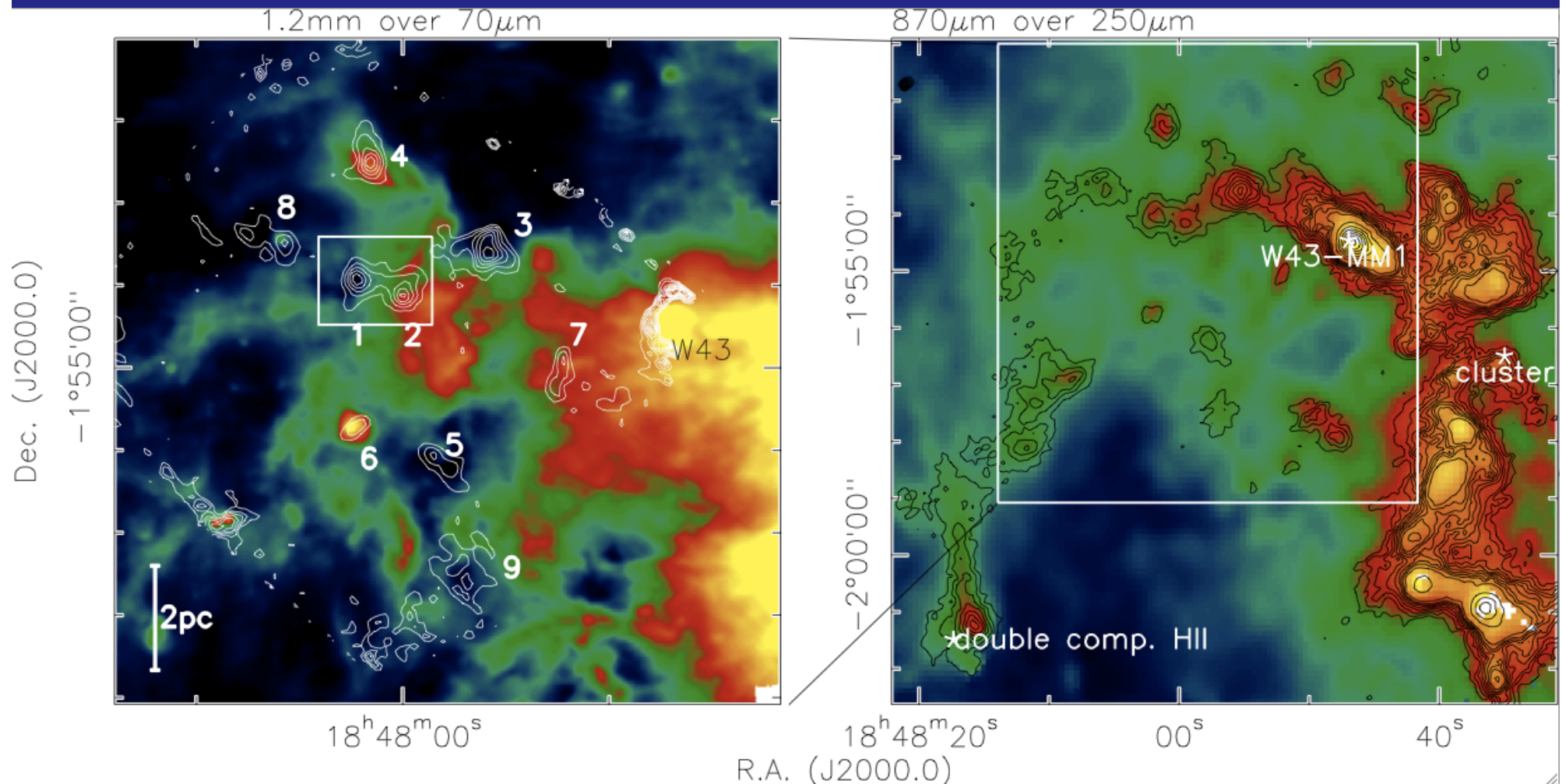




# A very massive starless clump in IRDC18310-4

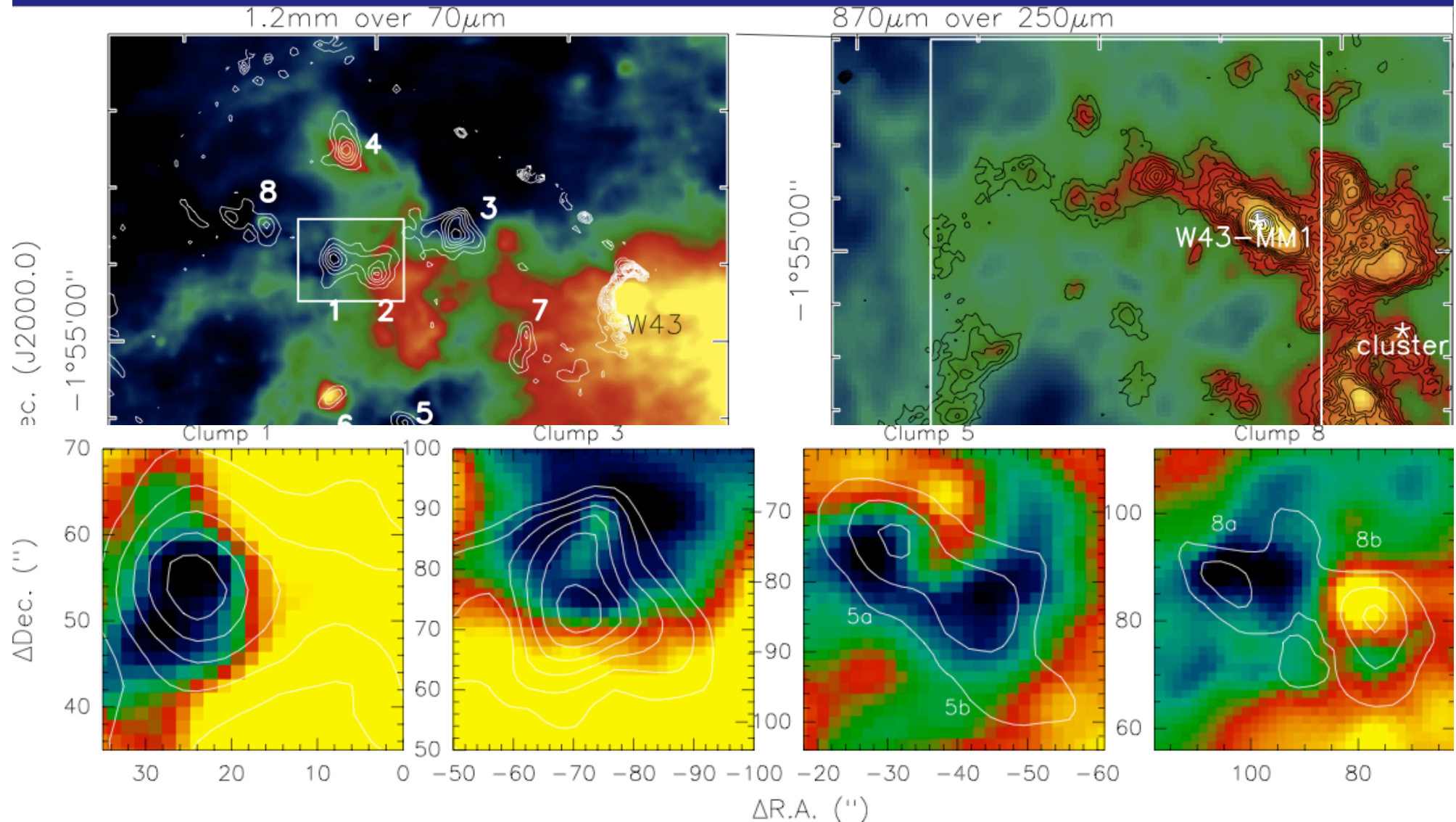


# Quiescent cores near the mini-starburst W43

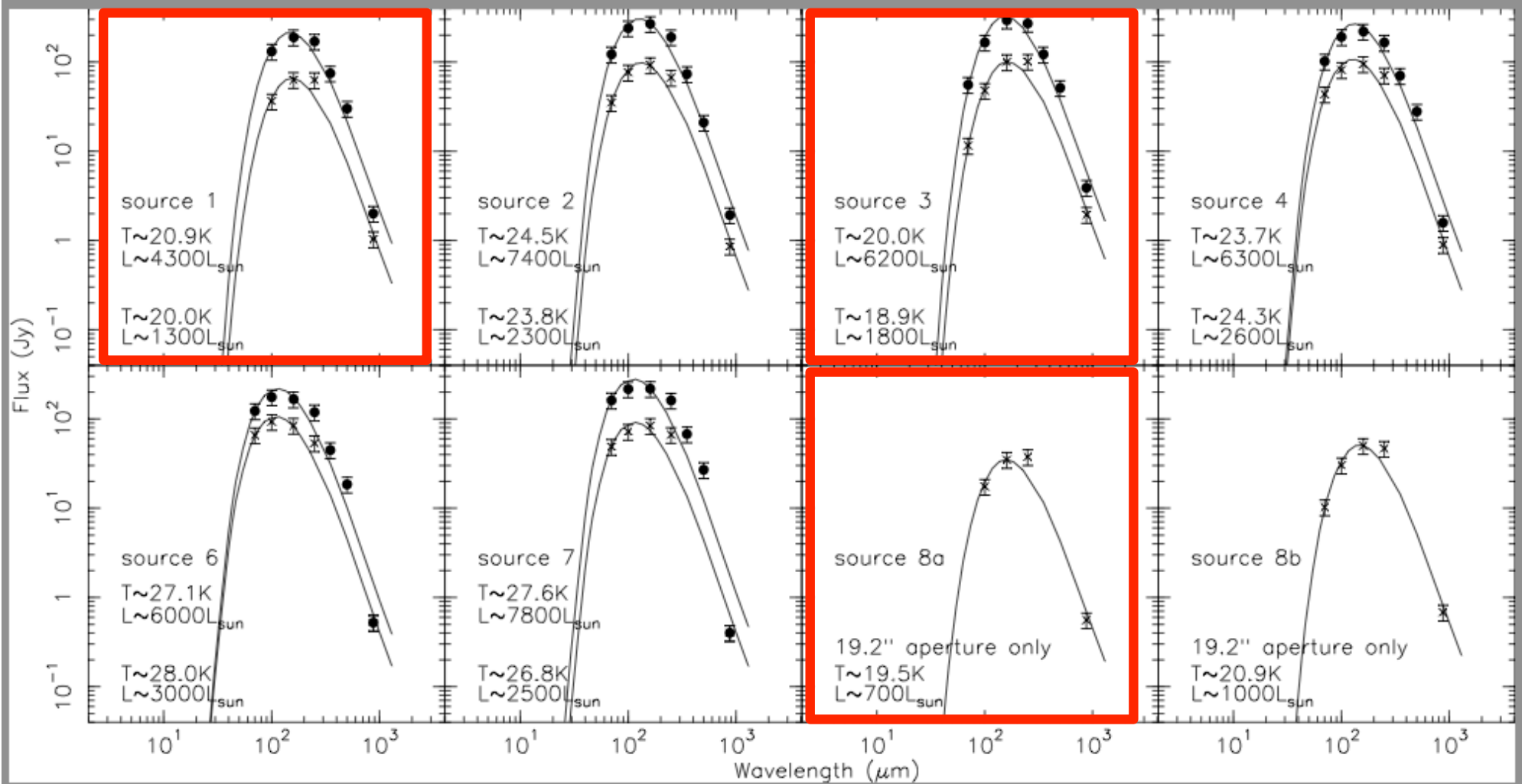




# Quiescent cores near the mini-starburst W43

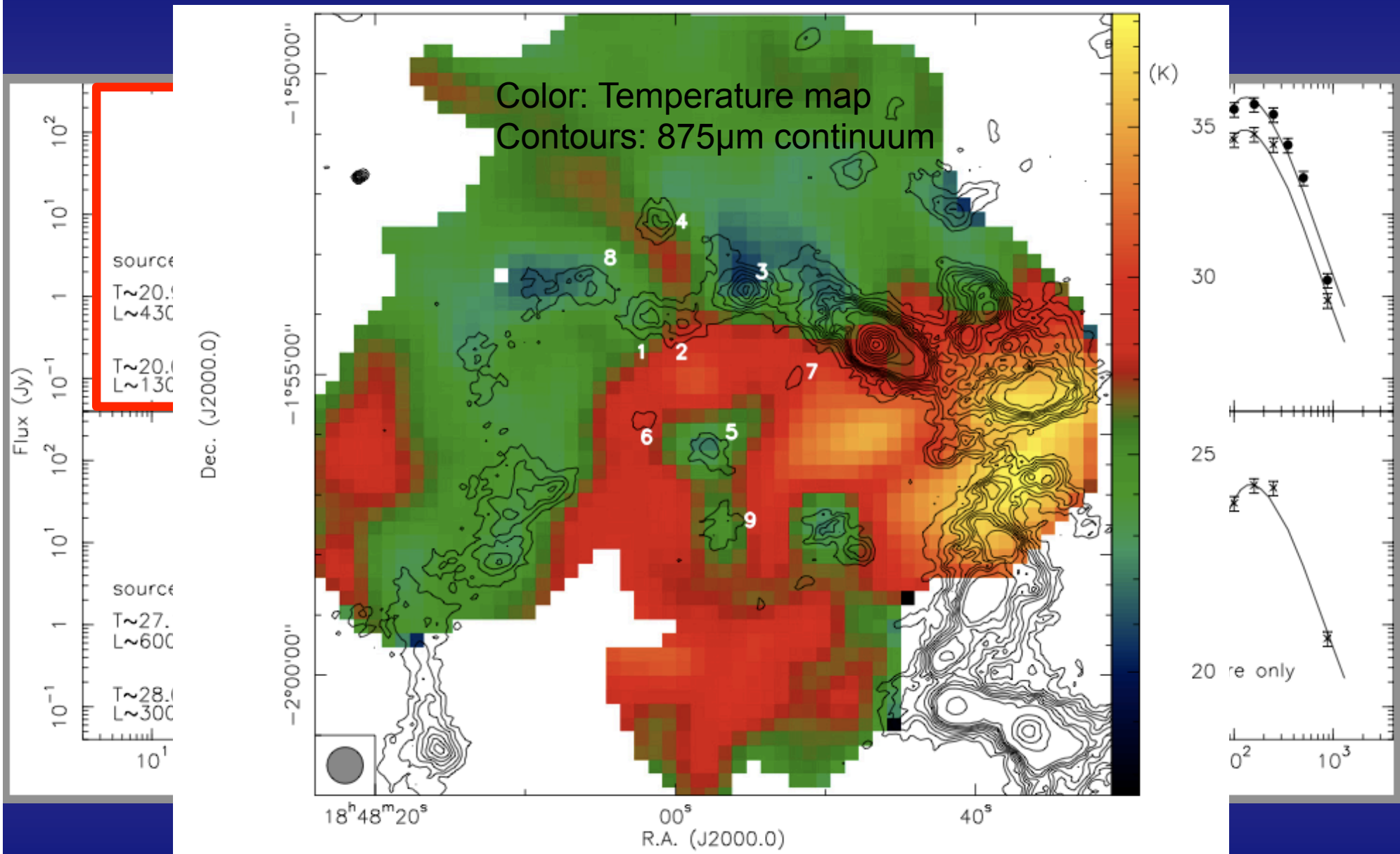


# Spectral energy distributions



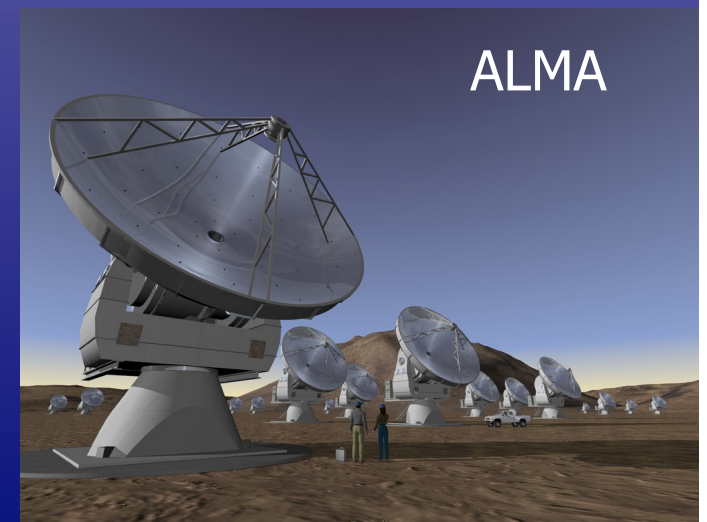


# Spectral energy distributions



# Summary and Outlook

- Starless clump time scale on the order of  $6 \times 10^4 \text{yr}$
- Herschel starts to unravel the earliest formation stages.
- We identify a new type of population  $\rightarrow$  very young!
- Influence of nearby regions is significant!
- High-mass starless gas clumps truly exist!



- Lots to come in the field with Herschel/SOFIA, IRAM, and now also ALMA.