Pre-main-sequence population and star formation in the cluster IC1805

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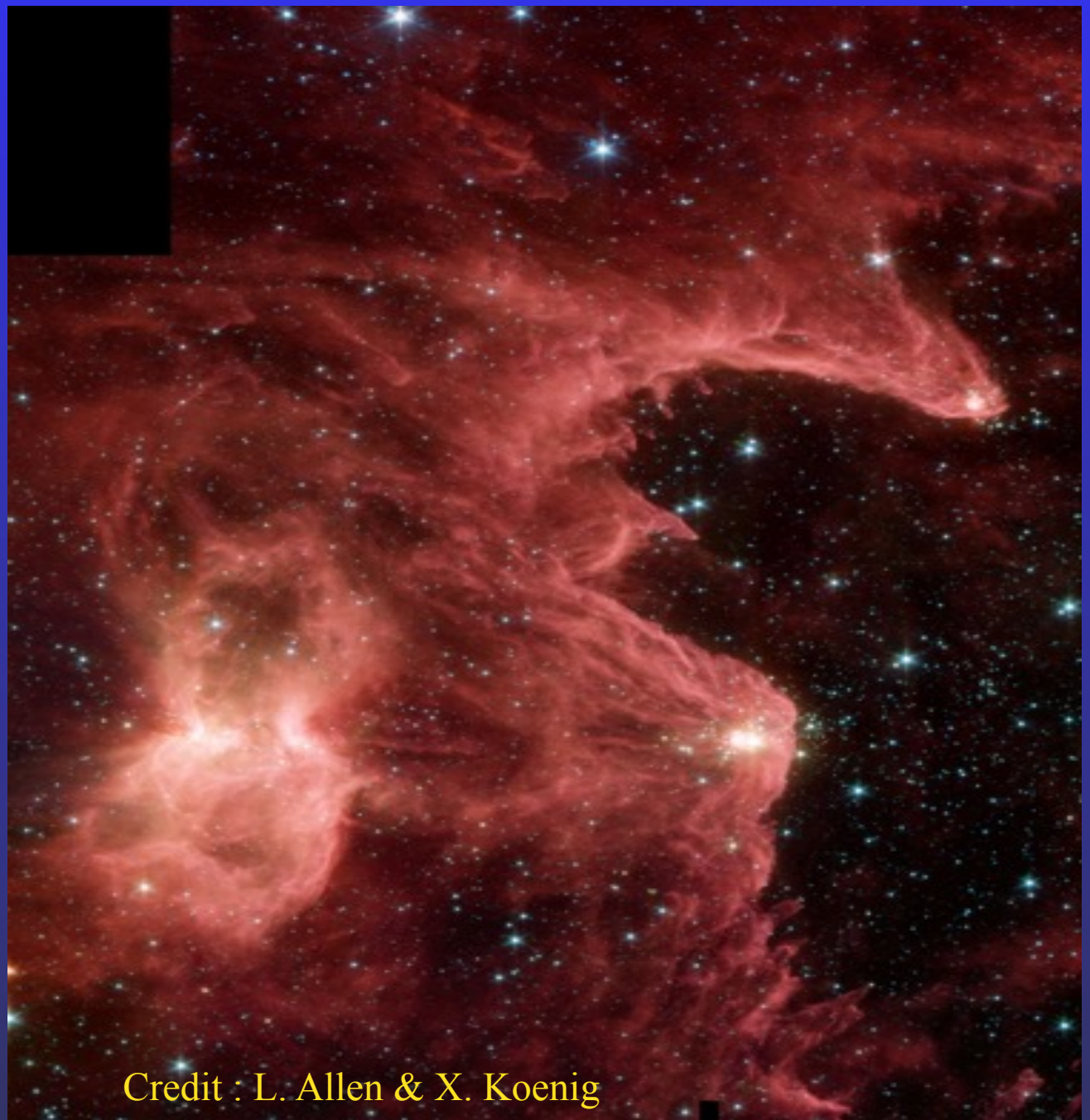
INTRODUCTION

http://www.ruppel.darkhorizon.com

- Most of the stars form in clusters or groups (Lada & Lada 2003).
- They share the same parental heritage but differ in mass and spectral types (SpT)
- Massive stars (>8 $M_{\odot}$, SpT earlier than B2) influence their vicinity

Influence of massive star on natal molecular cloud

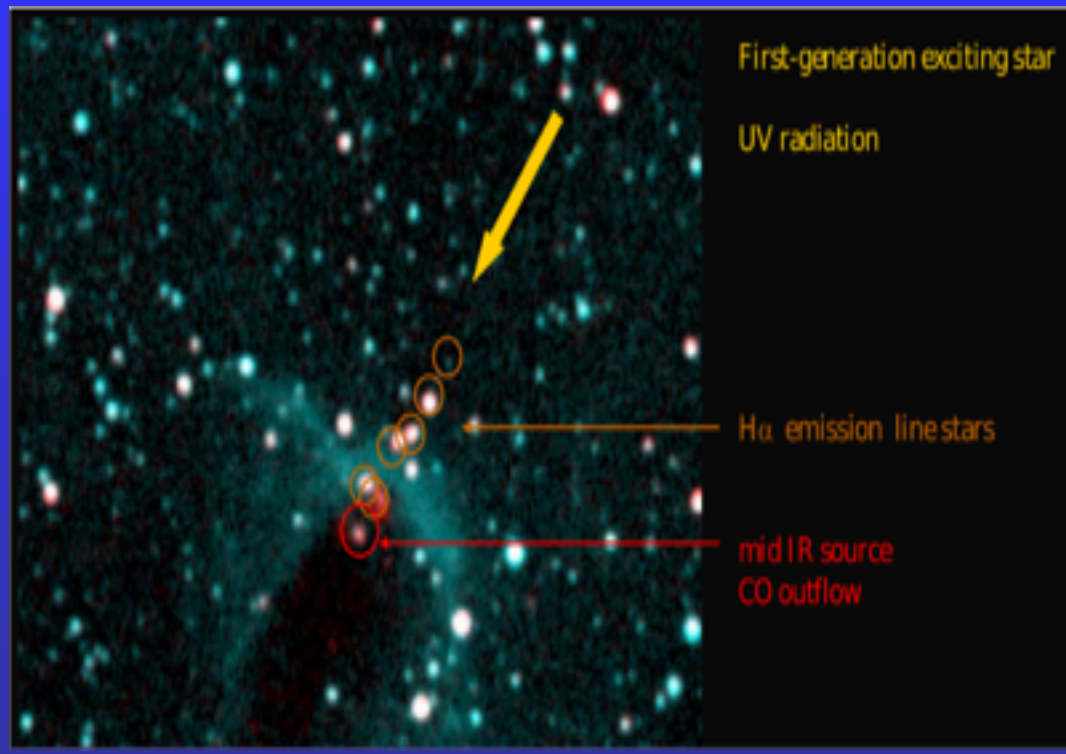


Credit : L. Allen & X. Koenig

Massive star

Radiation Driven Implosion (RDI)

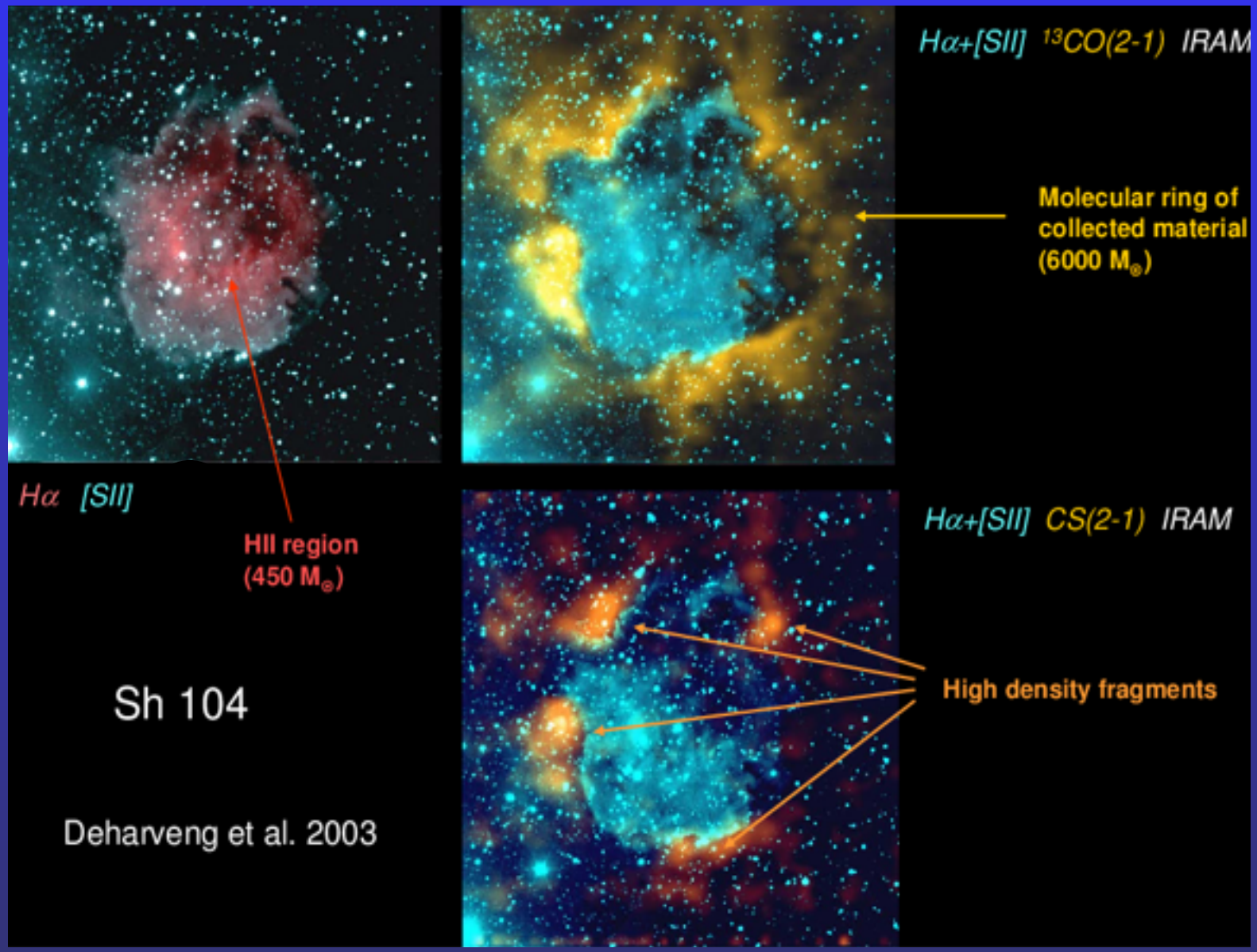
- H II region expands in an inhomogeneous medium
- Compression of pre-existing Dense clumps by ionization / shock front.
- Implosion can lead to the formation of a 'globule' surrounded by a dense ionized gas forming a 'bright rim'.
  (Bertoldi 1989, Lefloch & Lazareff 1994)



Sugitani et al. (1995)

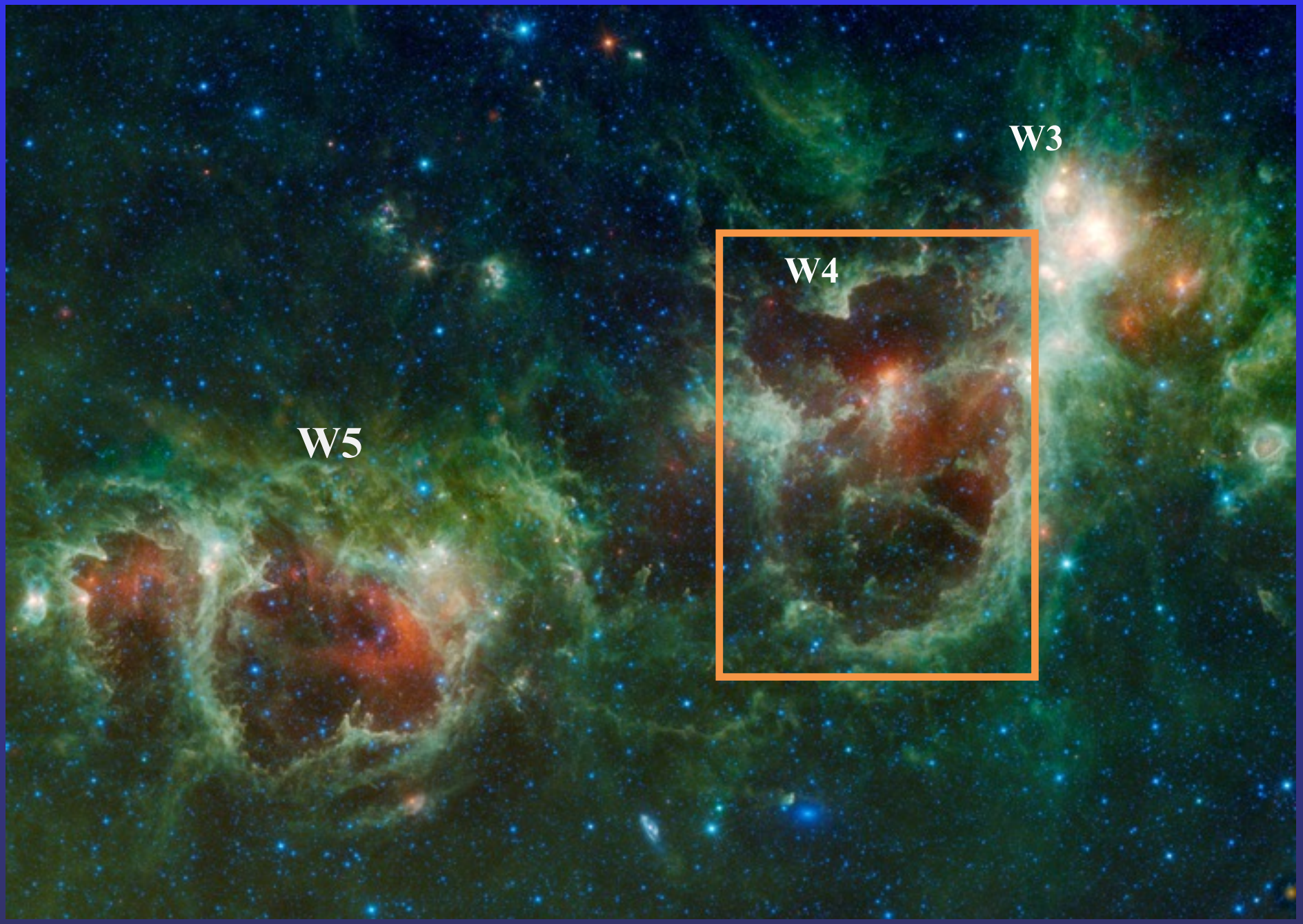
Observational signatures : Asymmetric distribution of YSOs
Example: Bright-rimmed clouds which are located at the periphery of HII regions.

Collect and Collapse

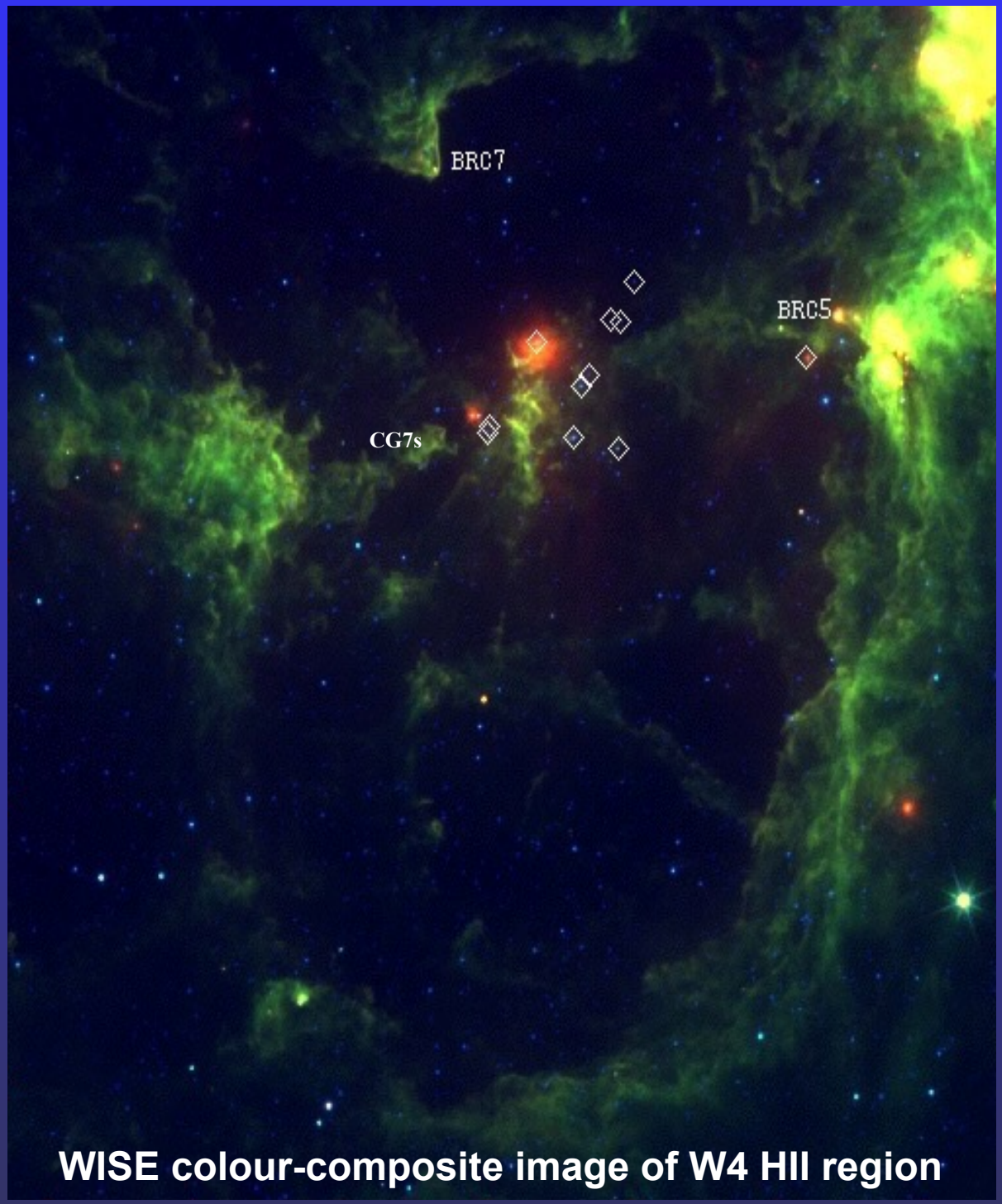


Observational Signatures : Massive condensations or young stars at the periphery of HII region.

W4 HII Region and Cluster IC 1805



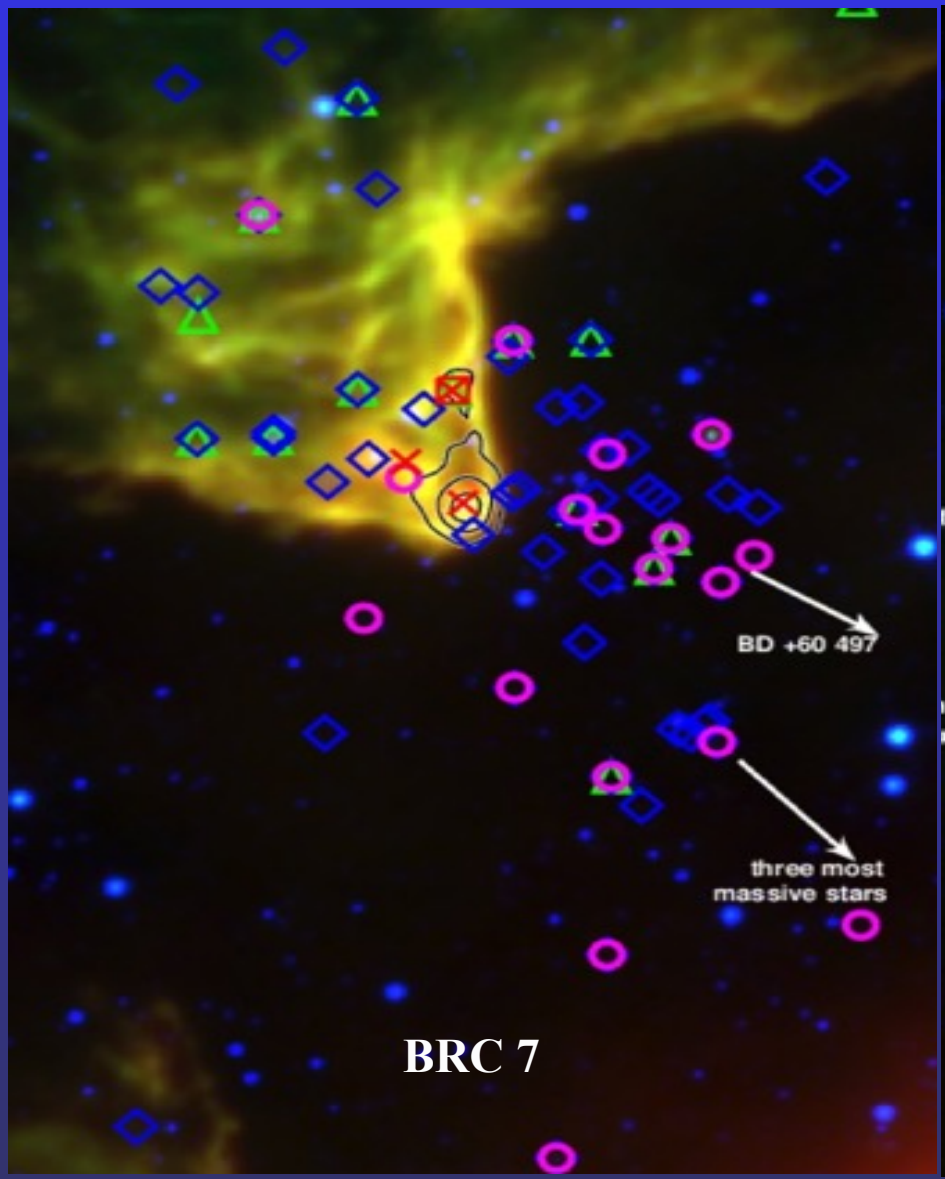
W4 HII region

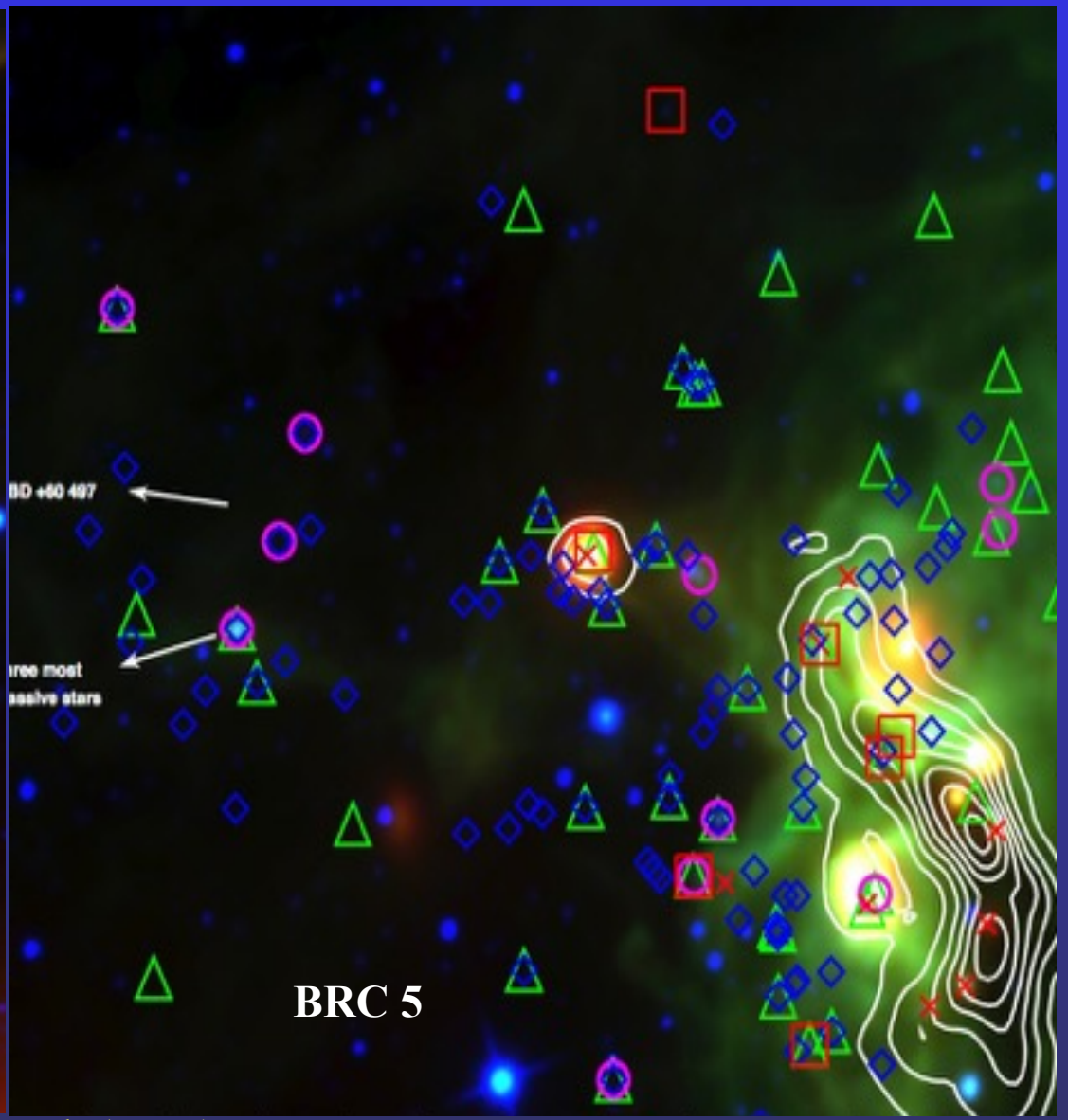


WISE colour-composite image of W4 HII region

- Excited by the massive stars of young open cluster IC 1805
- Dozens of massive stars (Massey et al. 1995)
- Consists of many globules and bright-rimmed clouds
- BRC 5 and BRC 7 possess IRAS sources just inside their rims

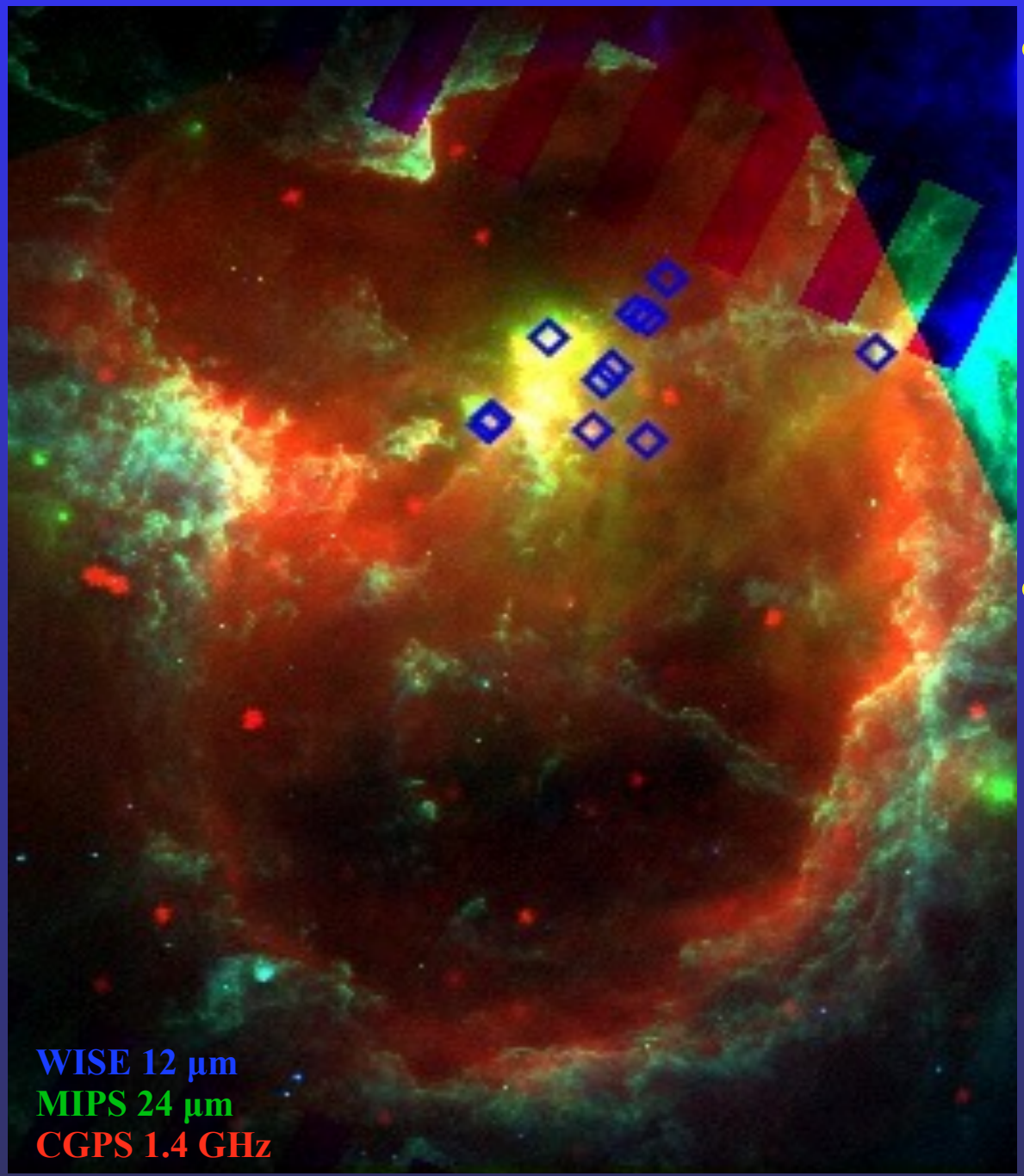
Age gradients in BRC 7 & BRC 5





Panwar et al. (2014)

W4 HII Region and Cluster IC 1805



- Well known high-mass and intermediate-mass population but low-mass stellar population is poorly studied.

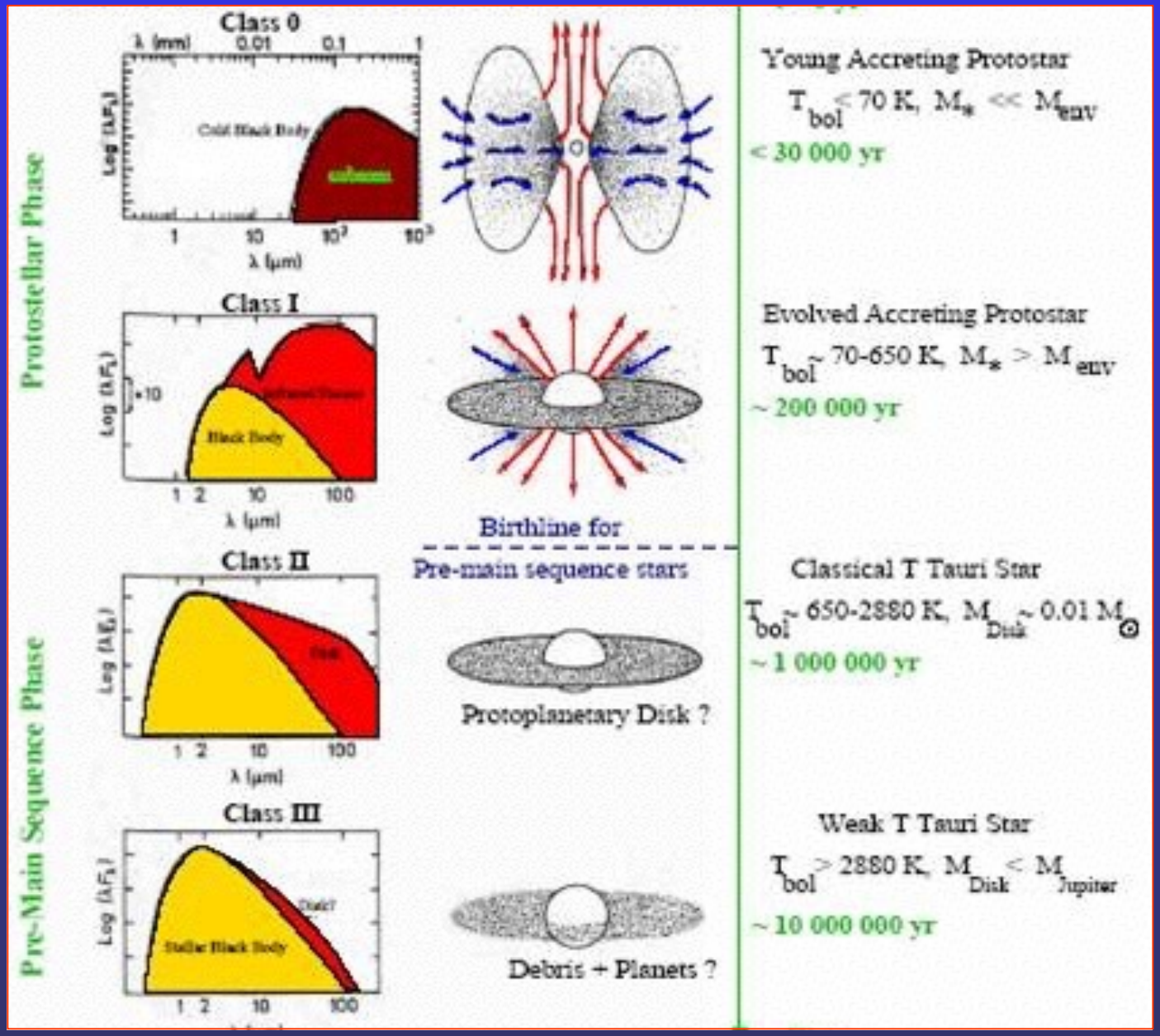
- Our aim : to unravel the low-mass stellar population using Spitzer-IRAC/MIPS, 2MASS JHK; V,R observations from CFHT archive

Why low-mass young stars identification is important?

Census of young low mass stars in star forming regions can be used to

- **Trace the recent star formation sites**
- **Study the star formation history of the region,**
- **Influence of massive stars on subsequent star formation and evolution of circumstellar disks**

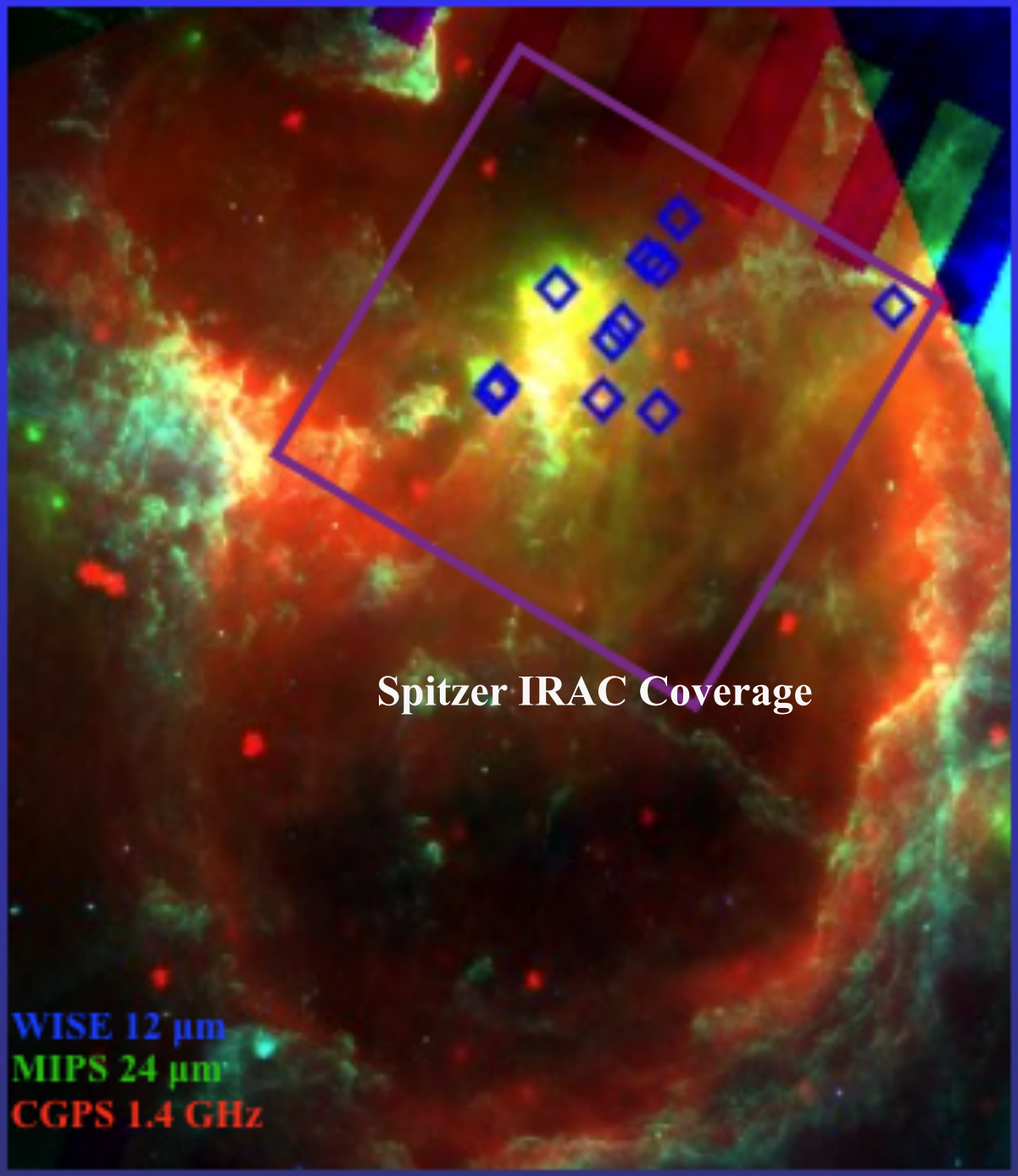
Young stellar objects (YSOs)



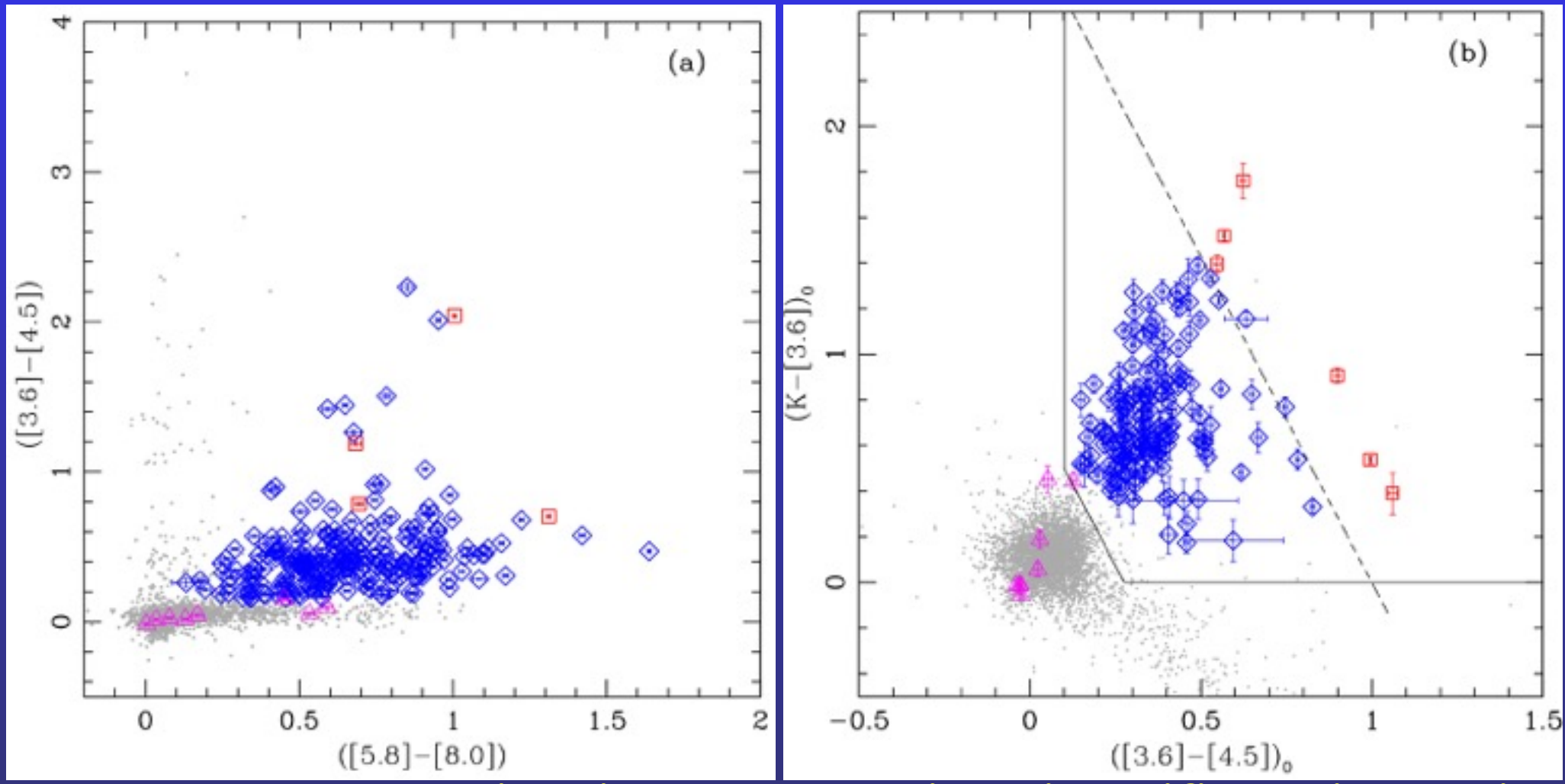
YSOs Identification

- IR observations using existing ground based and Space based facilities

W4 HII Region and Cluster IC 1805

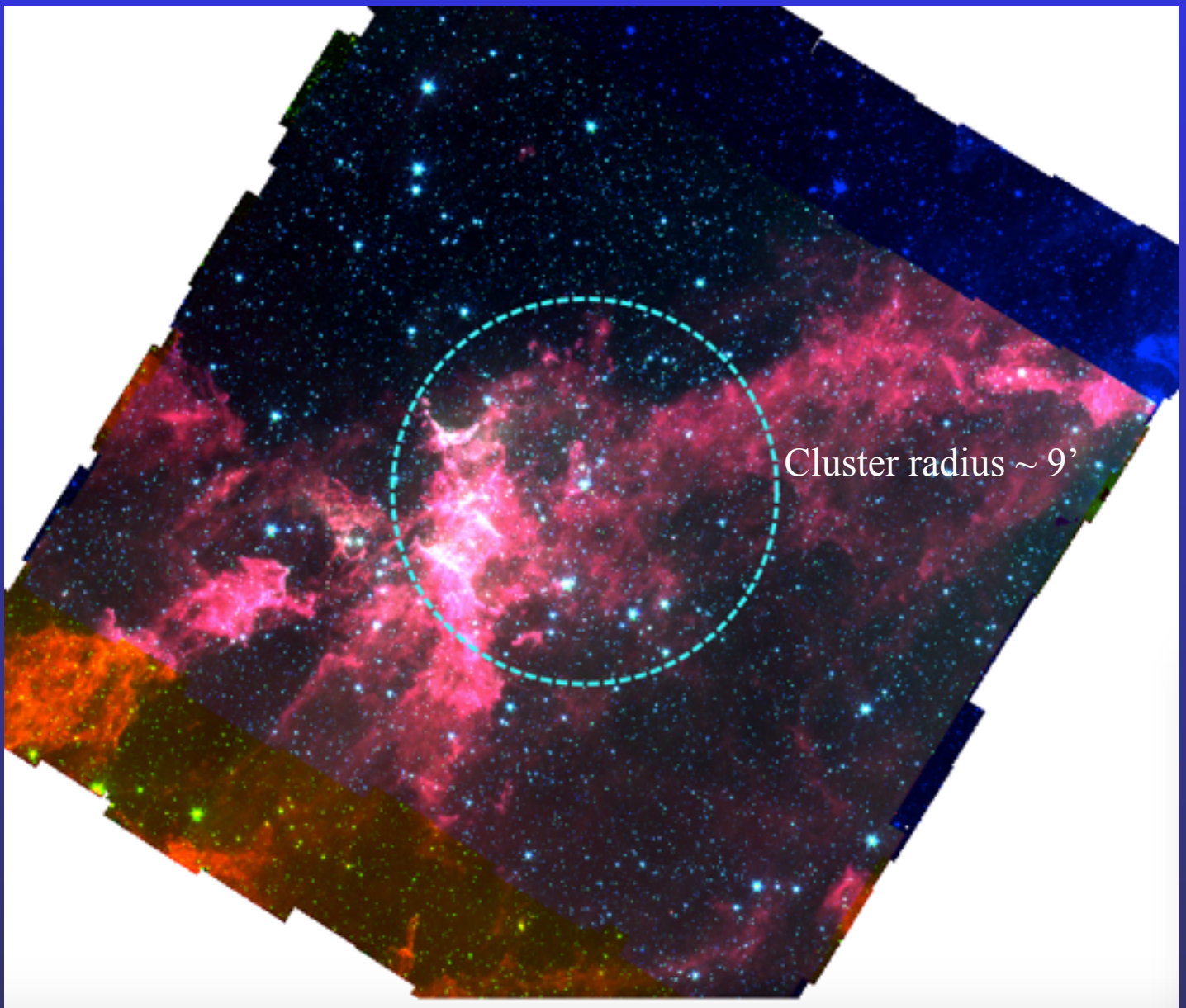


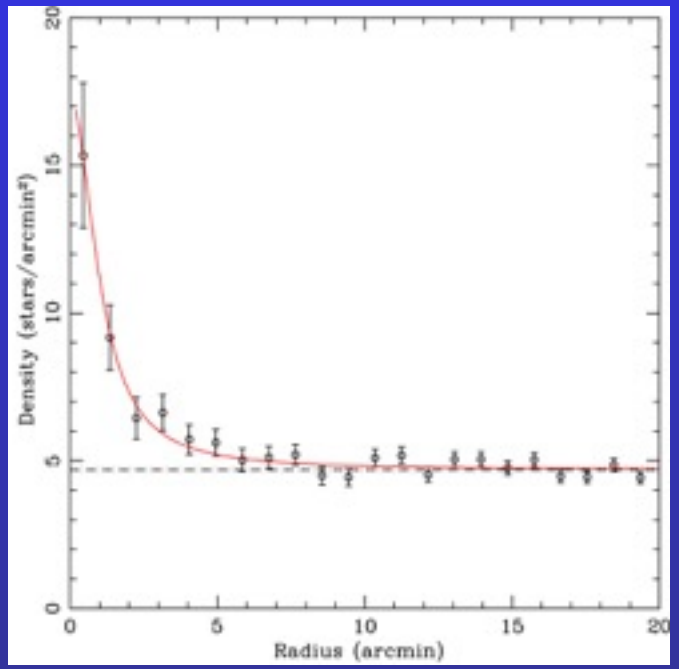
2MASS / IRAC color-color diagrams



Low-mass stars with circumstellar disks identified using various 2MASS/IRAC/MIPS color-color criteria
(Gutermuth et al. 2007)

W4 HII Region and Cluster IC 1805





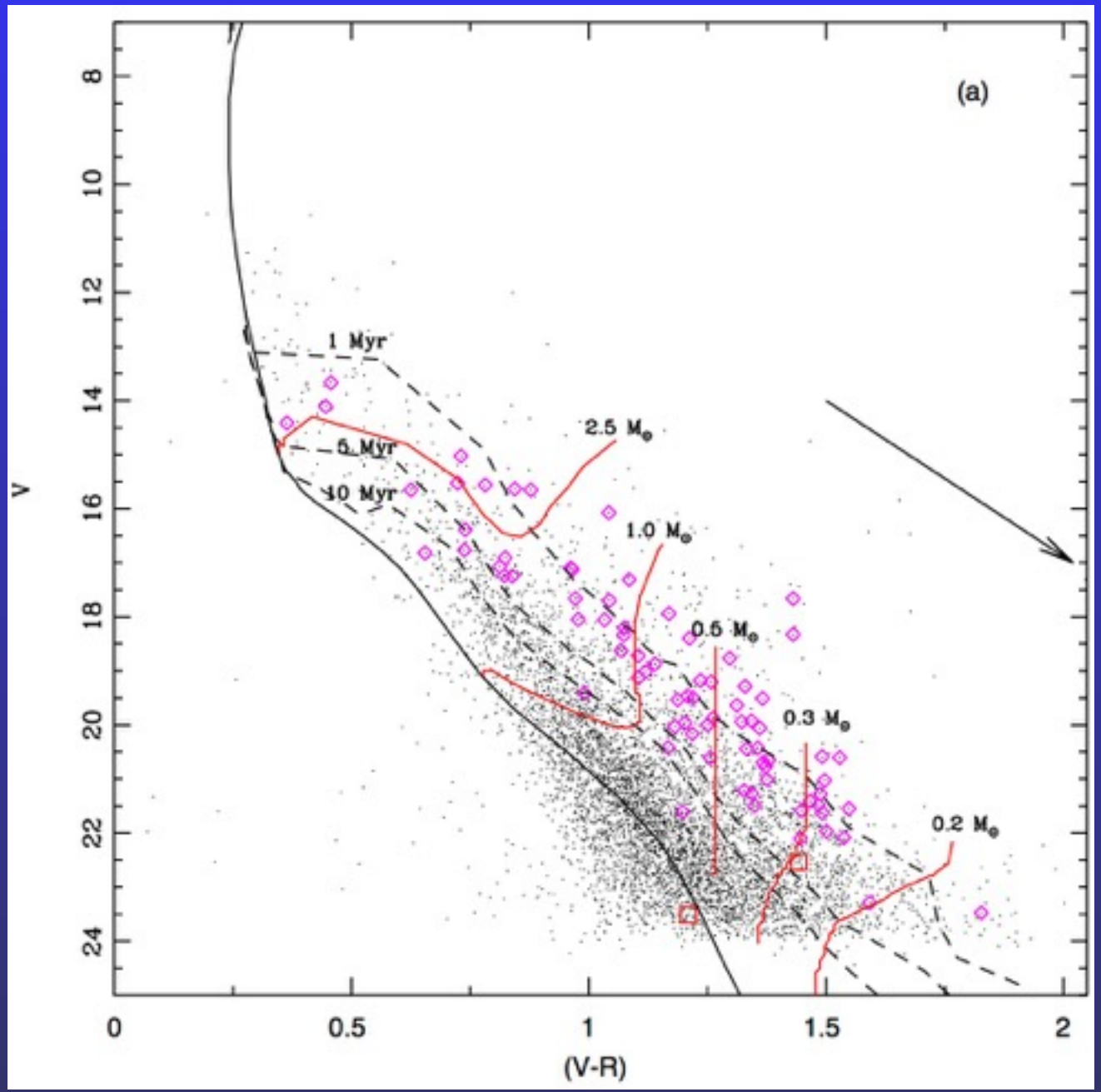
YSOs Identification

- IR observations using existing ground based and Space based facilities

- X-ray Observations : YSOs are known to emit X-rays at levels that can range many orders of magnitude above main sequence stars (Preibisch et al. 2005; Feigelson et al. 2007). Thus, X-ray observations can efficiently identify YSOs in molecular clouds

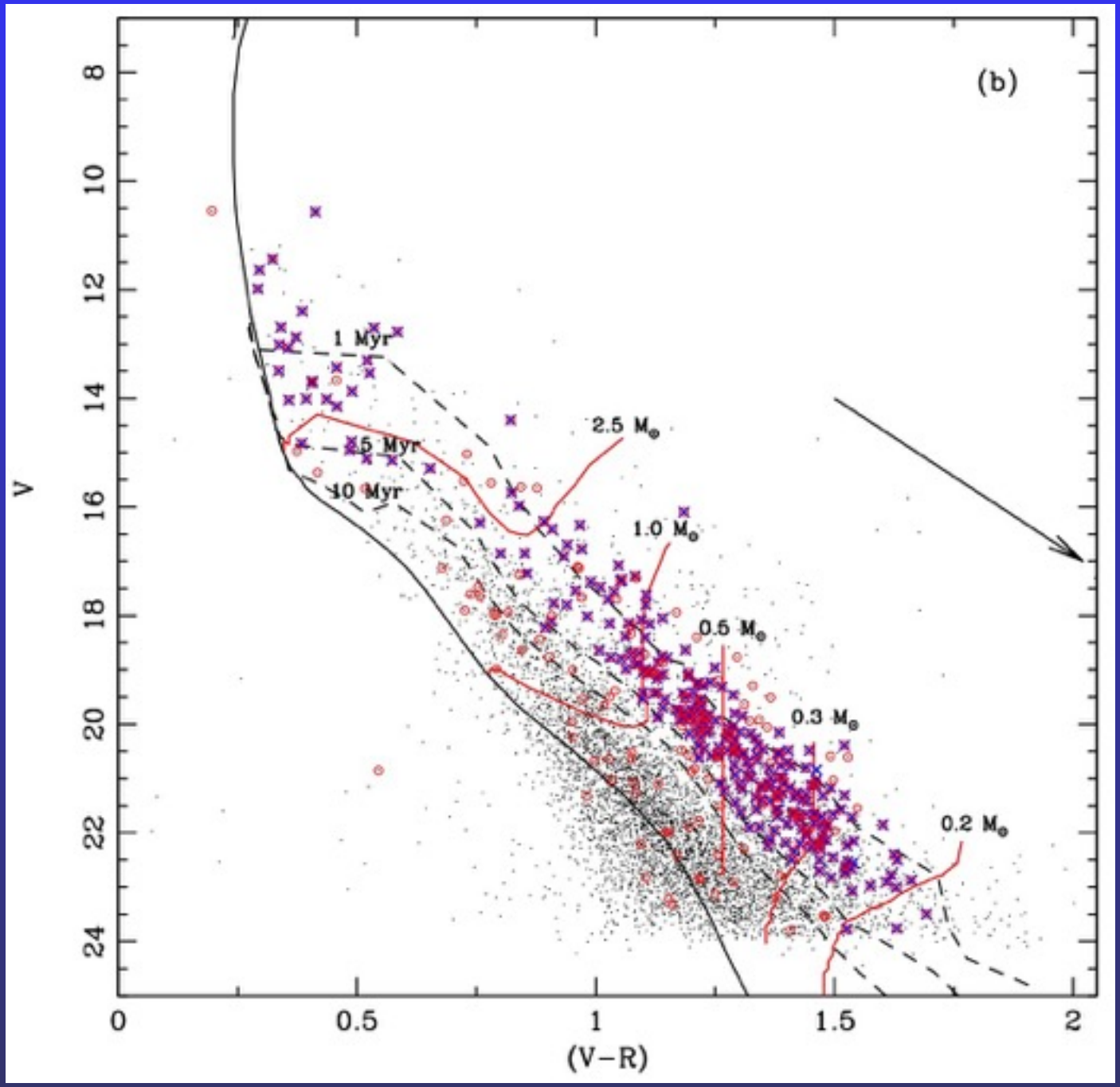
- Observations at visible wavelengths

Age/ Mass of the Class I/II sources in the Cluster IC 1805 : color-magnitude diagram(CMD)



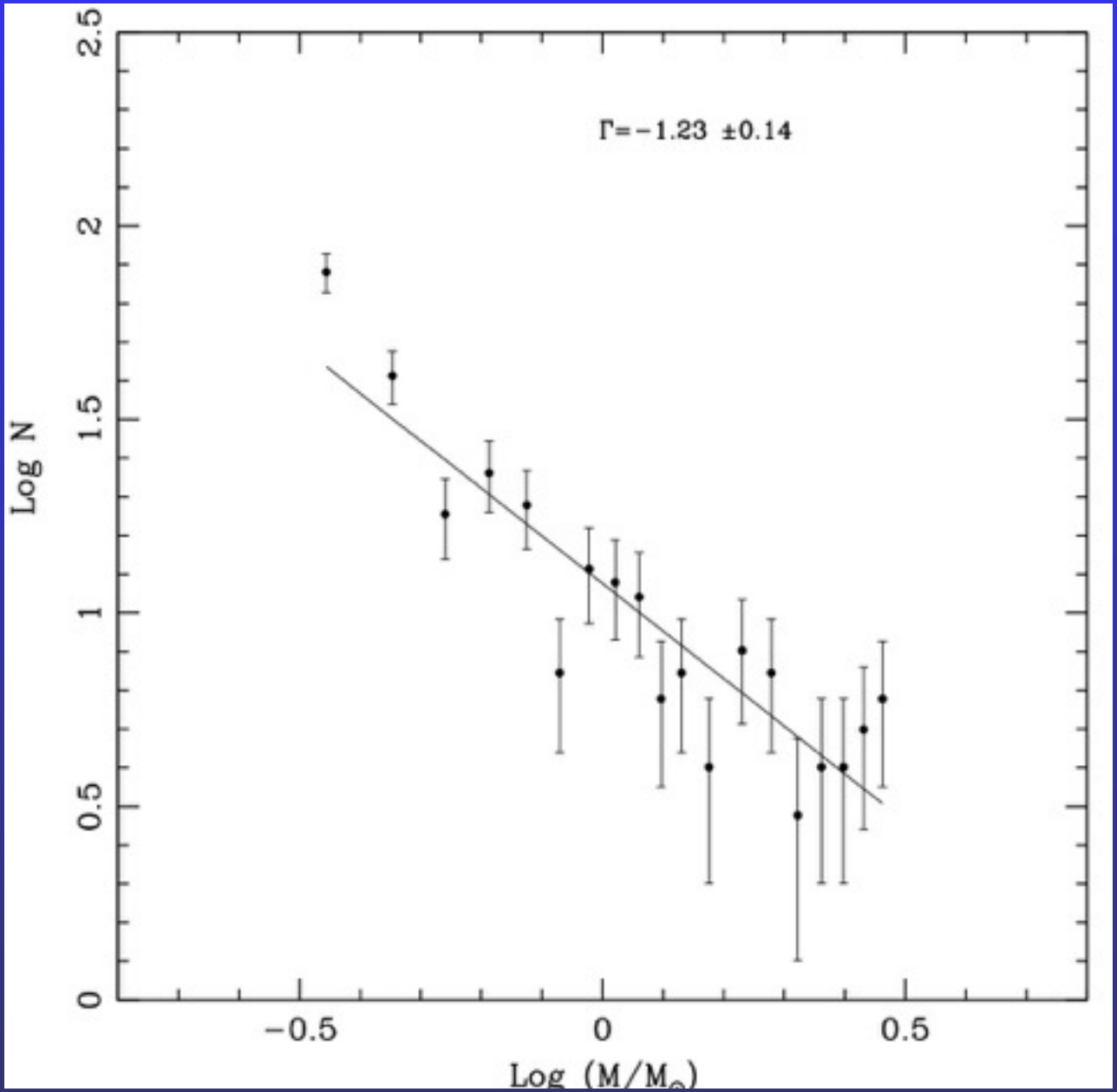
distance : 2 Kpc
E(B-V) : 0.7 mag

Class III sources in the cluster IC 1805



- X-ray sources from Townsley et al. (2014)

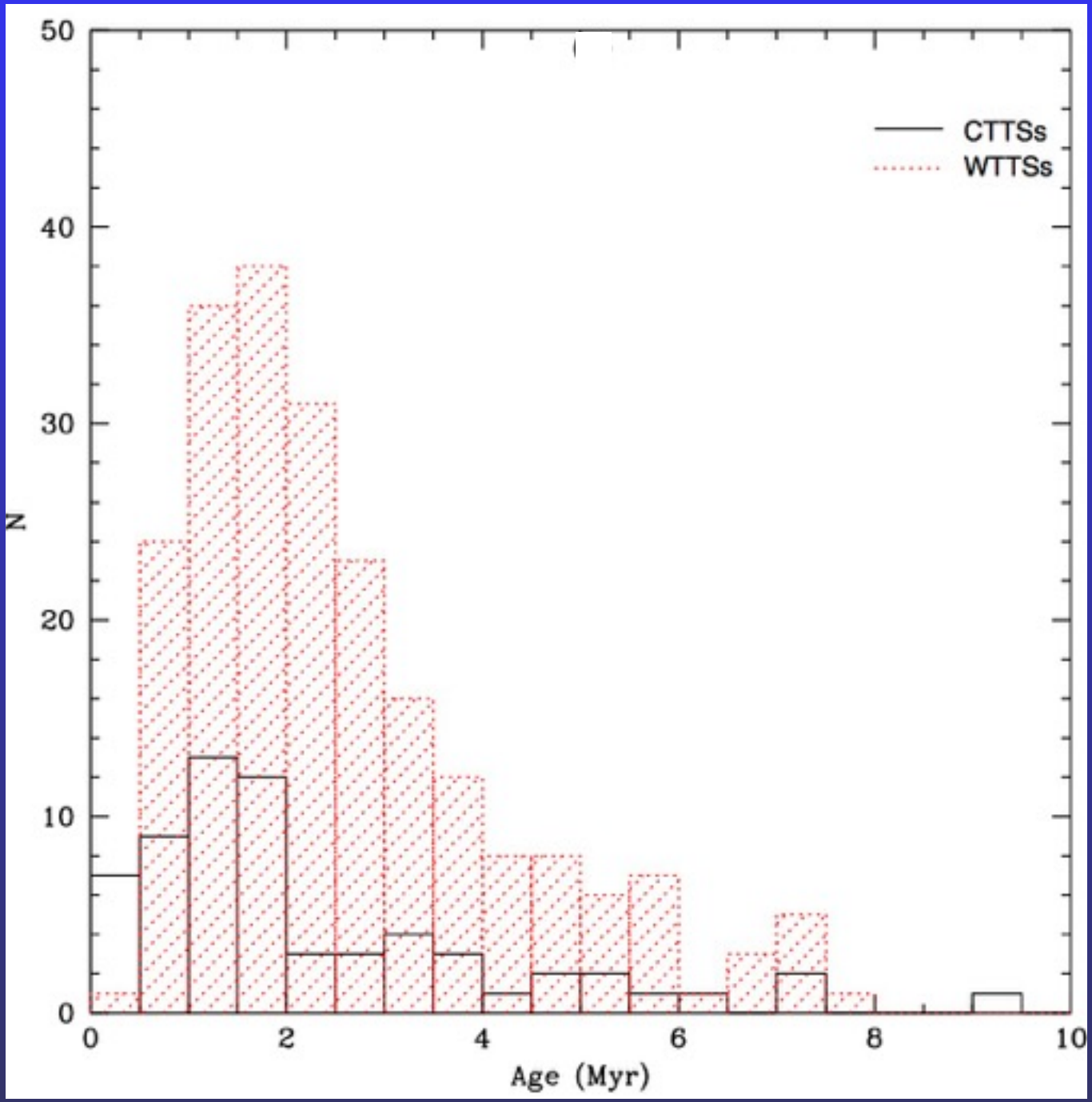
Mass Function of the YSOs



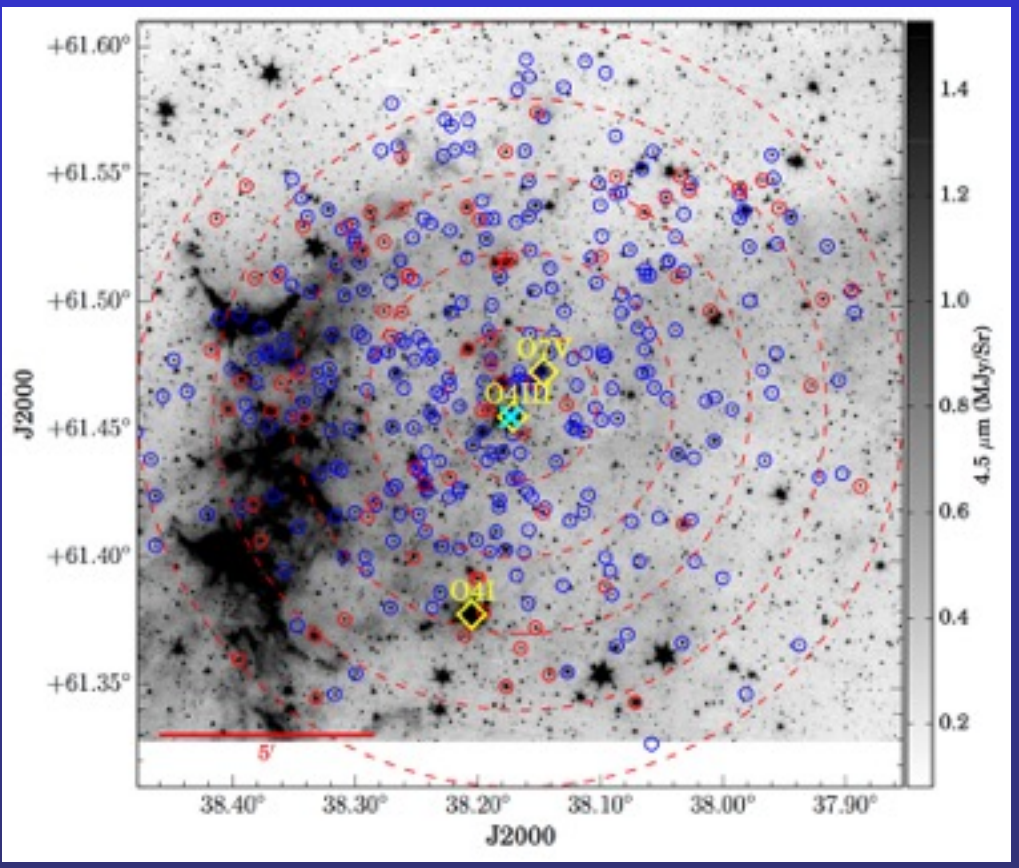
Mass range : 0.3 - 2.5 Msun

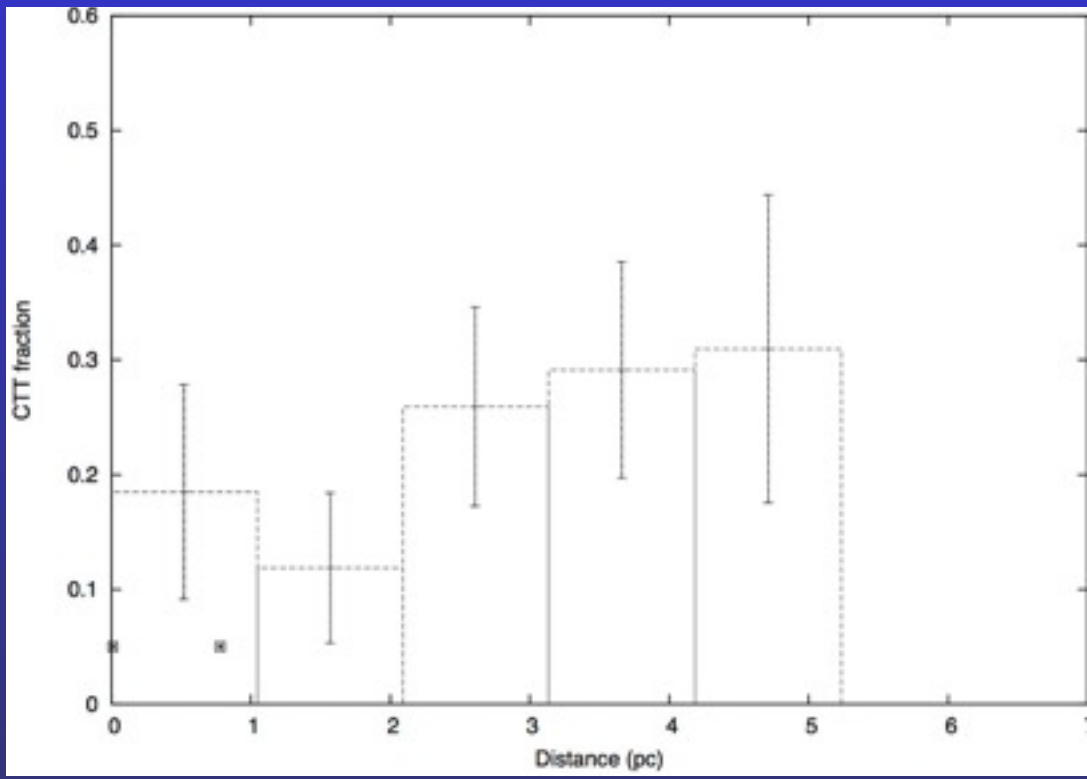
- for stars in the mass range 2.5 -30 M⊙ : Γ=-1.38 +/- 0.19 (Ninkov et al. 1995)
- for stars >10 M⊙ : Γ=-1.3 +/- 0.2 (Massey et al. 1995)

Disk evolution of YSOs in the cluster

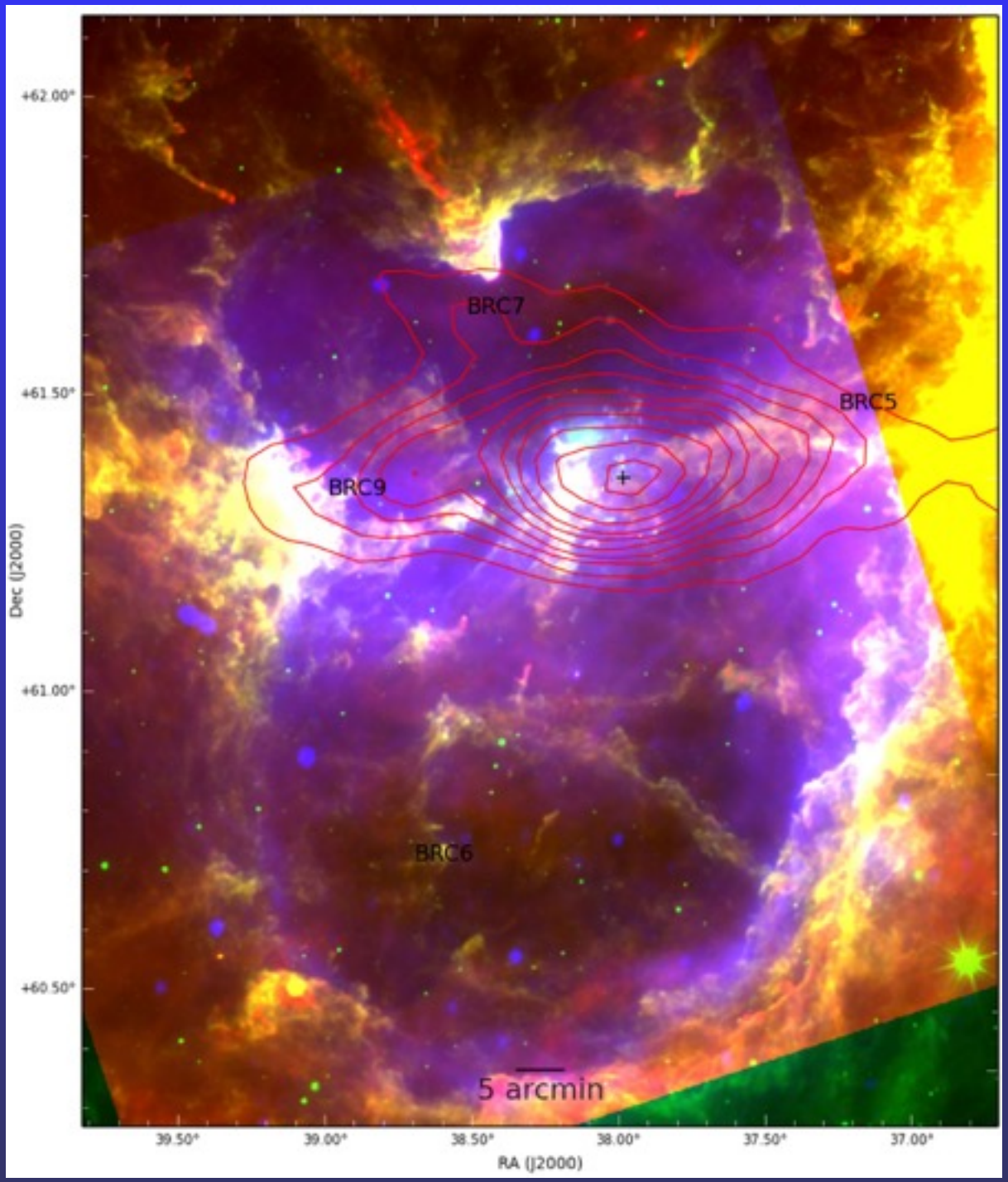


Disk fraction variation in the cluster





Surface density distribution of the YSOs in the region



Summary

- The cluster radius is estimated as 9 arcmin (~5 pc).
- We identified and characterised ~380 low-mass young stars using various 2MASS/IRAC/MIPS color-color criteria and x-ray data.
- The age and mass of the identified YSO candidates are in the range of .1 -5 Myr and 0.3 - 2.5 Msun, respectively.
- Mass function slope of our YSO sample is close to the Salpeter value.
- Diskless sources are relatively older compared to the disk bearing sources.
- Surface density distribution of the YSO candidates suggests that IC 1805 could have formed in a filamentary cloud.

Collaborators

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Thanks