# A multi-wavelength survey of NGC 6823

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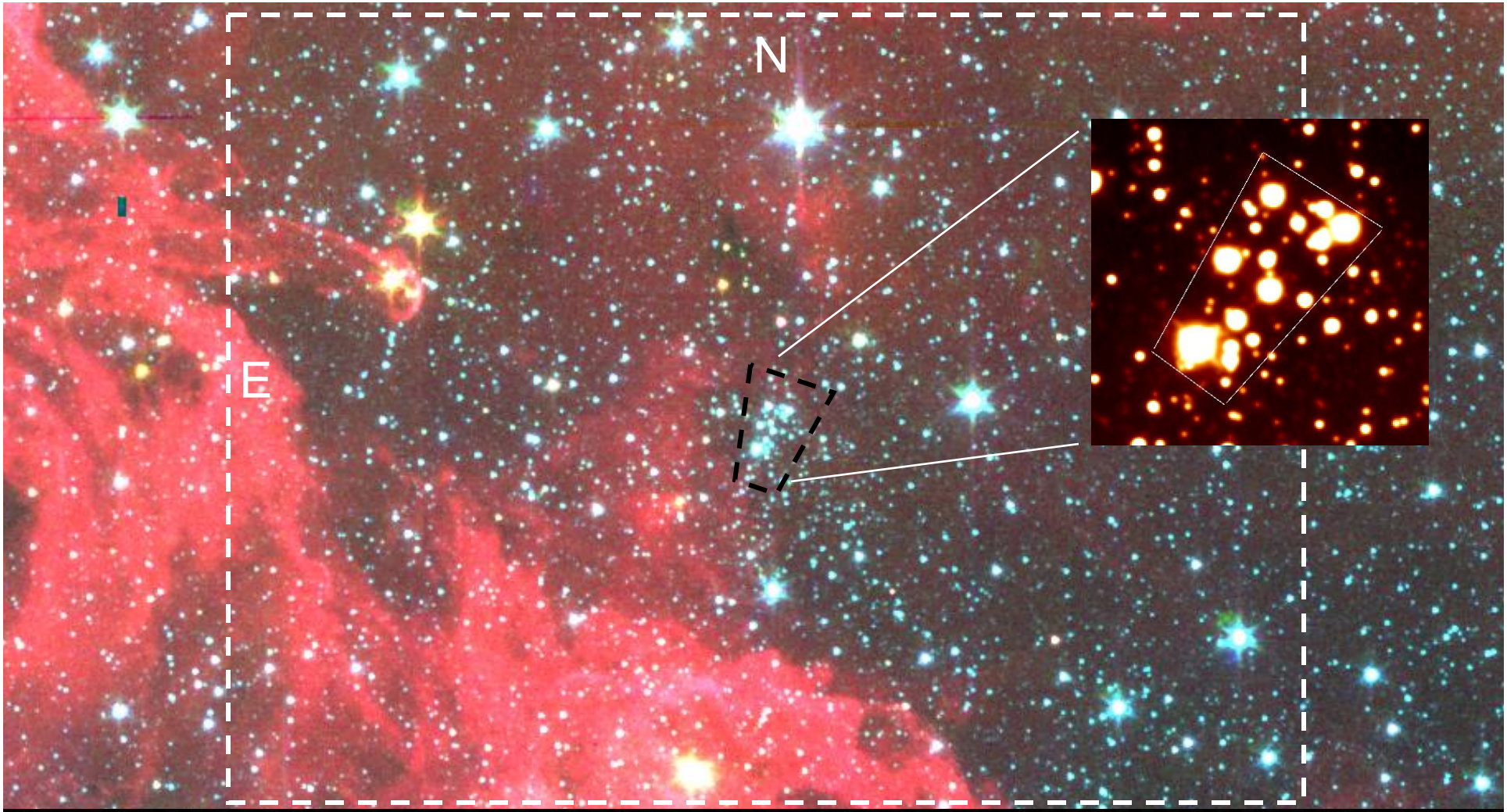
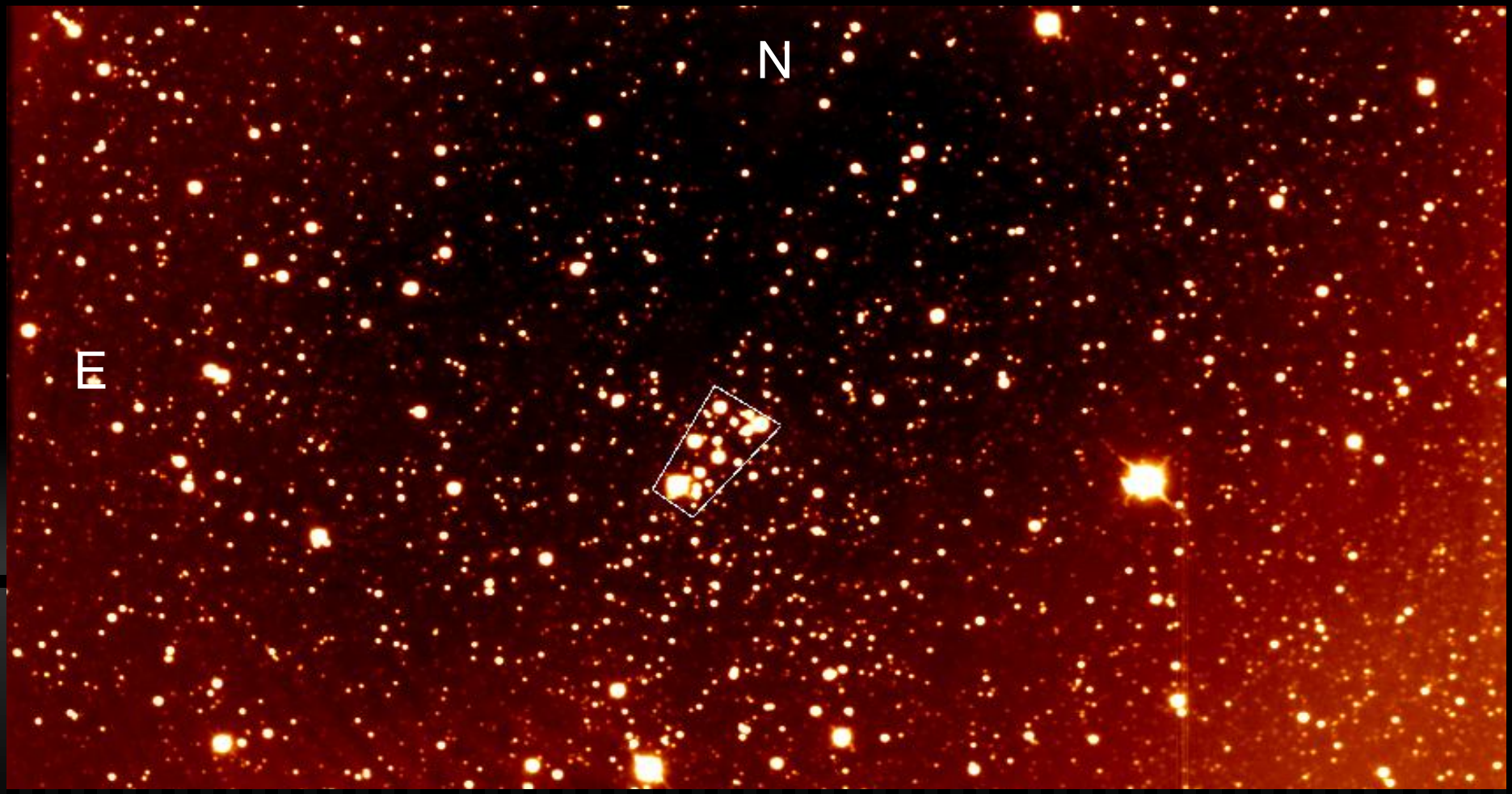
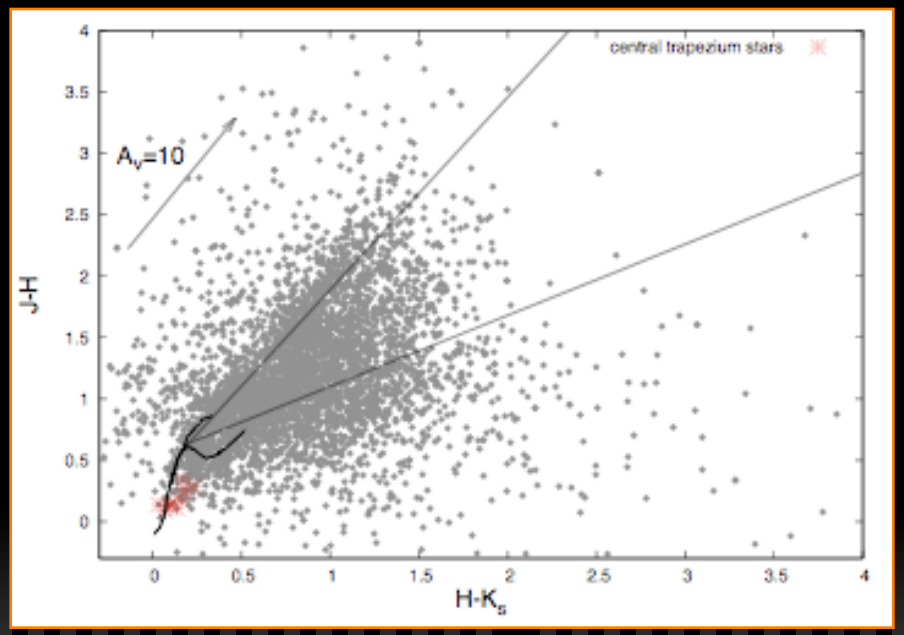
(IAC; CAB; LAOG; ASIAA)

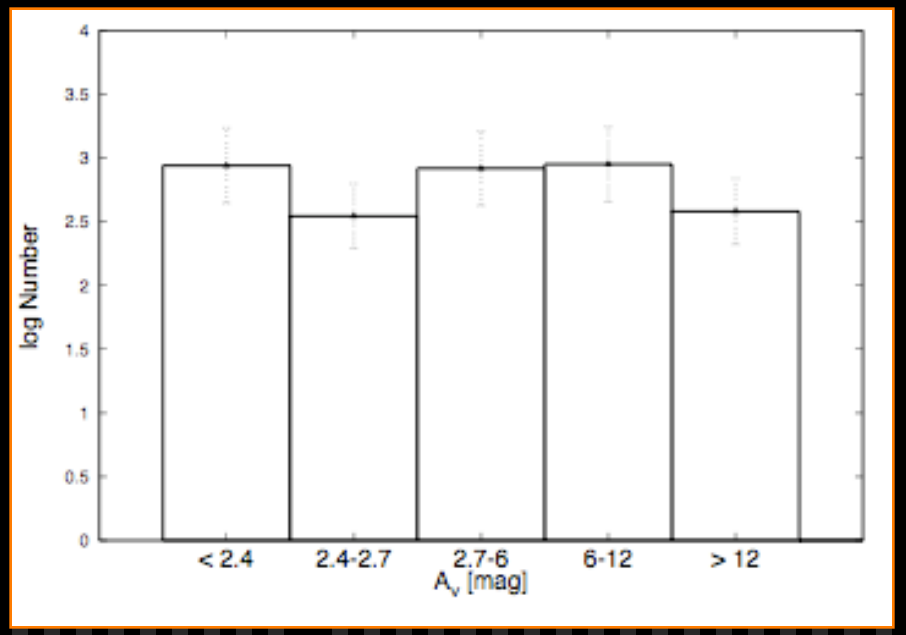




- core of the Vulpecula OB association, ~2 kpc (Guetter 1992; Massey et al. 1995)
- contains a central trapezium of bright OB stars
- surrounded by reflection nebula NGC 6820, contains pillar-like structures VulP11, VulP12 (Turner 1979; Chapin et al. 2008)
- previous surveys targeted high-mass population, identified ~100 O- B- and A-type stars (Massey et al. 1995; Shi & Hu 1999)




- deep optical and NIR survey to detect low-mass population
- Optical VRI observations obtained with WHT/WFC
- Near-infrared $JHK_s$ obtained with CTIO/ISPI
- Spitzer/IRAC archival data from GLIMPSE survey
- sensitivity I~21mag => M~0.05Msun




- Large spread in NIR colors, survey has revealed large population of low-mass stars
- some very red sources with (H-Ks)>2
- central trapezium stars have SpT between O7V and B1V, colors consistent with early-type main-seq stars
- Av estimates obtained by dereddening to the CTTS locus
- Flat Av distribution, wide range in Av bet ~2 and 20 mag

• Classification of the observed SED by measuring the 2-8mu slope (Wilking et al. 2001; Gutermuth et al. 2008)

• 73% are Class III sources, 4% Class I, 23% Class II systems

• ~90% of Class III sources lie above the birthline -> possible field contaminants

## Selection Criteria

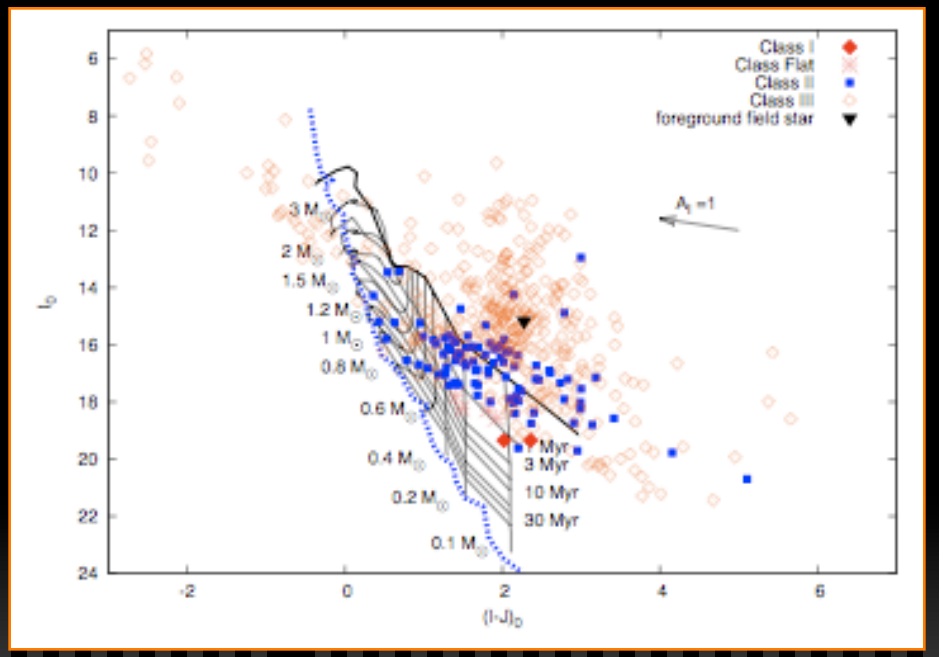
• The central trapezium stars have mean Av= 2.57±0.03mag (Guetter 1992), have 95% cluster membership probability (Erickson 1971).

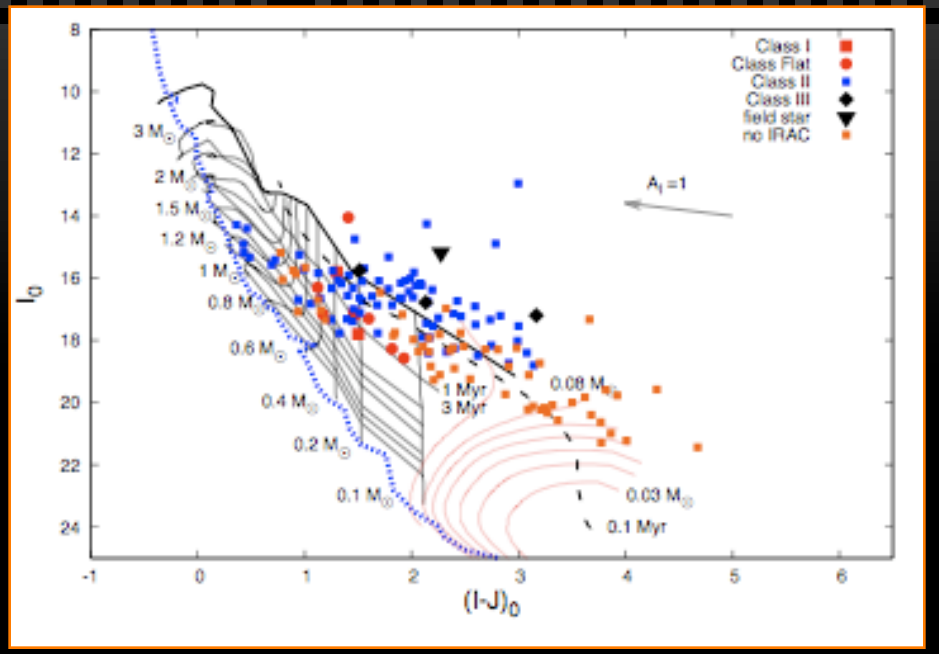
• Selected only those Class III sources with Av within 5-σ of central trapezium stars

• Selected all Class I//II systems -> high extinction levels could be due to surrounding circumstellar material

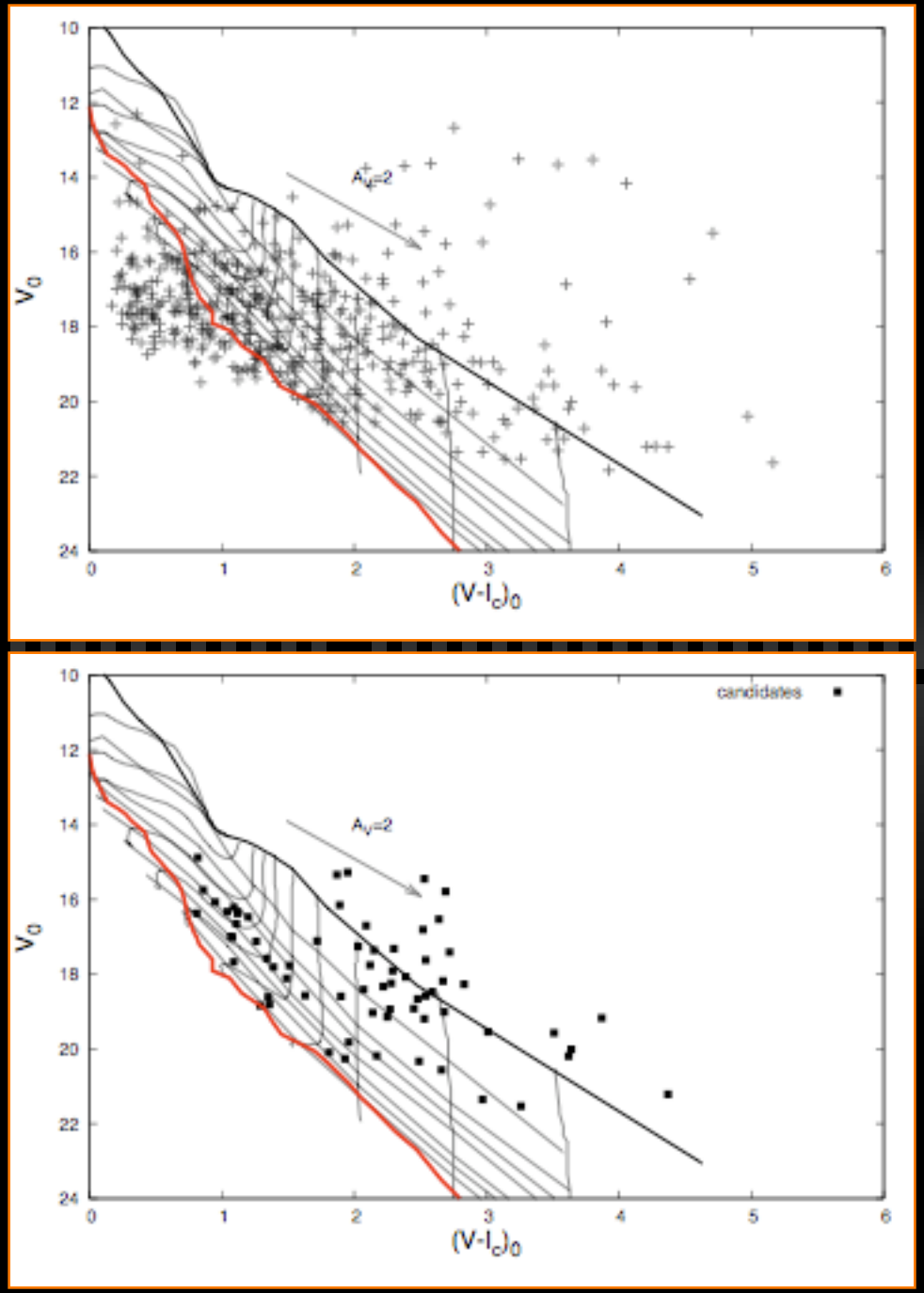
• Final candidate sample (172 objects) has 62% Class II systems, 4% are Class I, 34% are Class III, ***a much cleaned cmd for candidate sample***

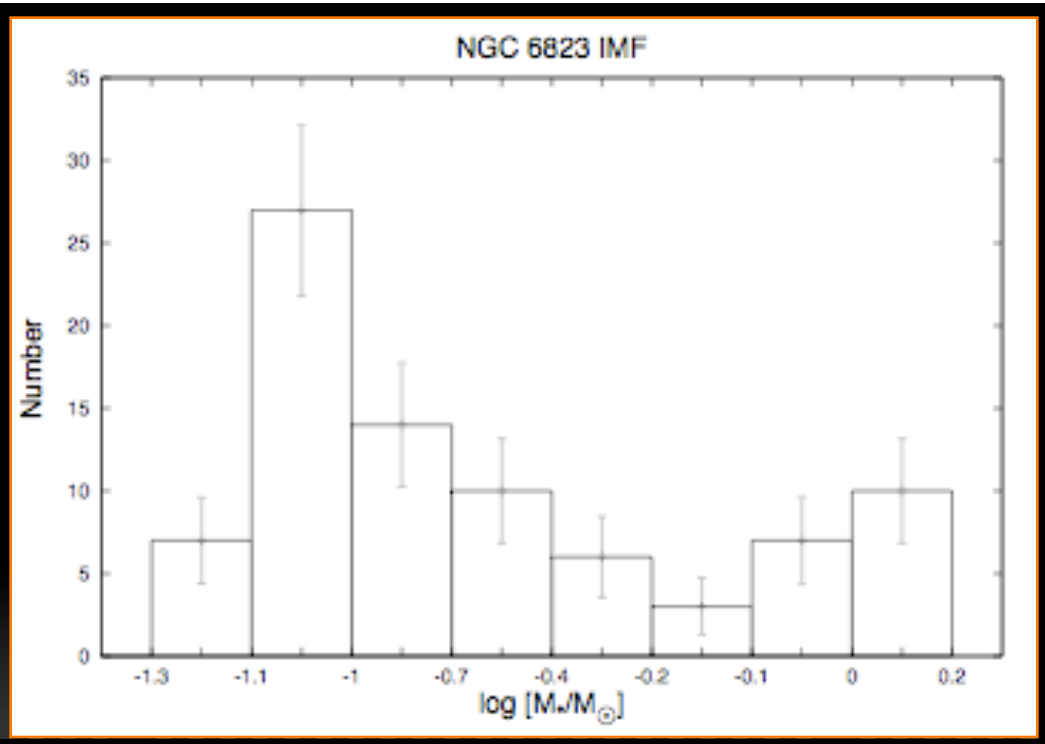
• 58% candidates have Av within the 5-σ range, 36% have higher Av bet ~3-12 mag



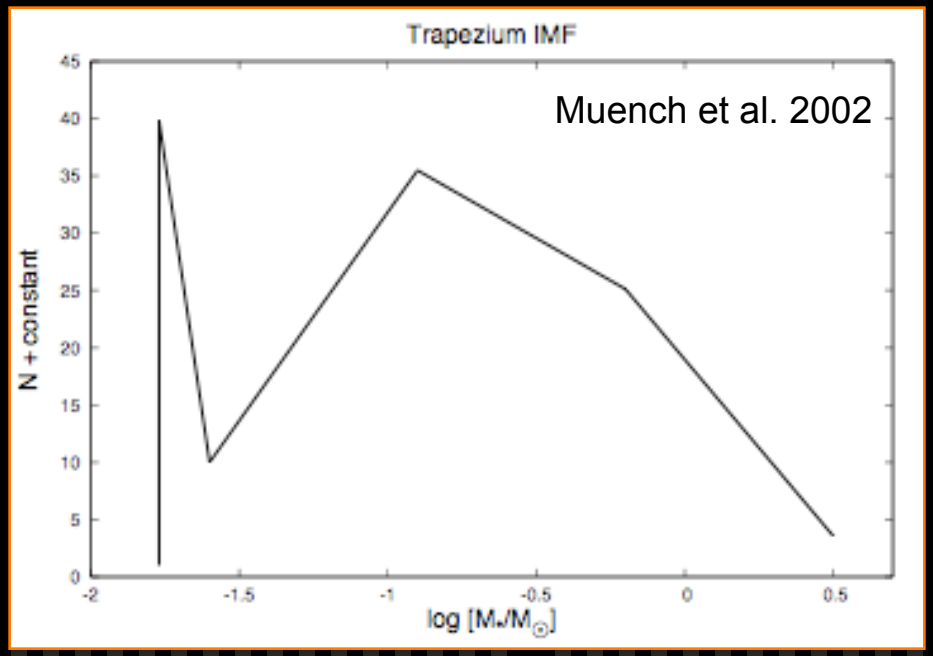



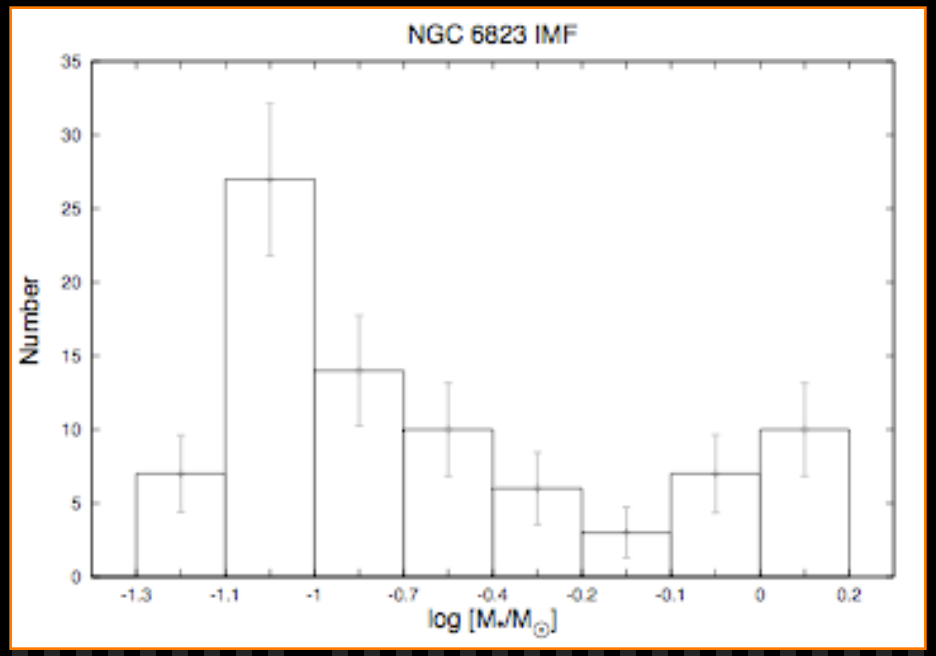
- dereddened V/V-I cmd
- V-band detections for 21% of the full sample
- selection criteria has rejected stars below the ZAMS, and a number of sources above the birthline, provides a cleaner cmd
- shows a PMS population with ages from <1Myr to >5Myr






- peak in mass function for 0.08-0.1 Msun bin
- sharp drop across the substellar boundary
- decrease towards higher masses: slope of the mass function $(dN/d\log M)=M^{\Gamma}$ is -0.96 between 0.08 and 0.7 Msun
- rises bet 0.7-1.5 Msun: slope = 2.03
- break in IMF at ~0.7Msun, may be a bimodal dist with a secondary peak at ~2Msun




Comparison with ONC: central trapezium of OB stars, high and low-mass population

- Peak in Trapezium IMF ~0.2 Msun
- Flat slope (-0.15) bet 0.1-0.6 Msun
- Sharp drop towards higher masses

slope = -1.2 for $M_* > 0.6$Msun

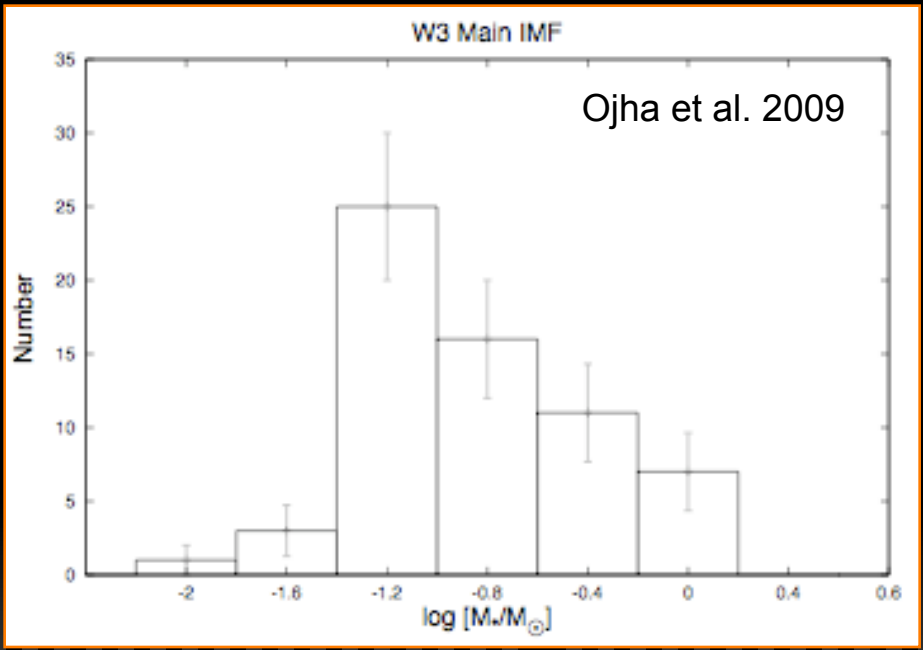
- stellar surface density ~4000 $pc^2$

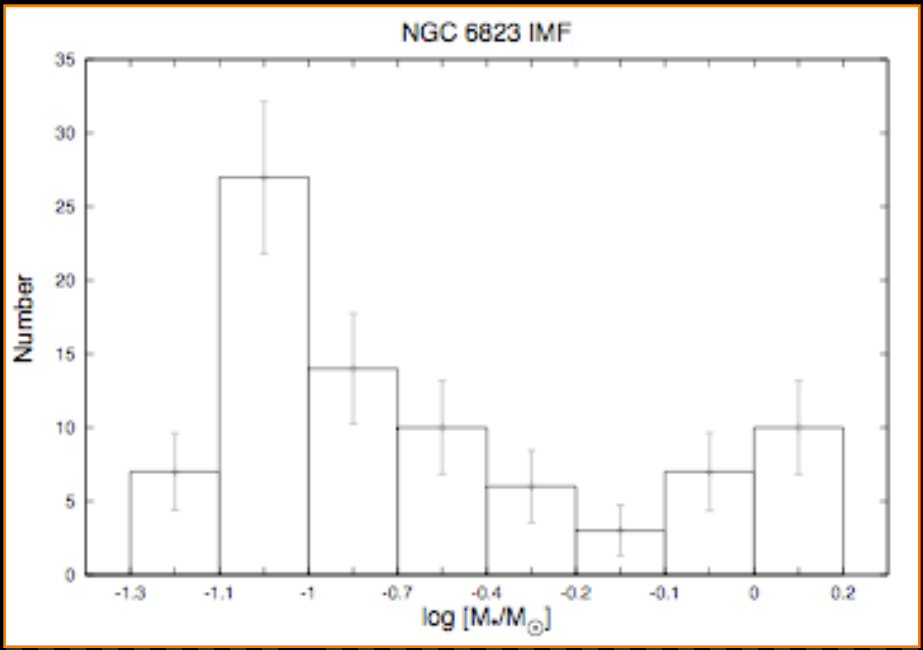
(Muench et al. 2002)

- Peak in IMF ~0.1 Msun
- slope = -0.96 bet ~0.1-0.7 Msun
- Rise towards higher masses

slope = 2.0 for $M_*$ bet ~0.7-1.5 Msun

- stellar surface density ~1000 $pc^2$



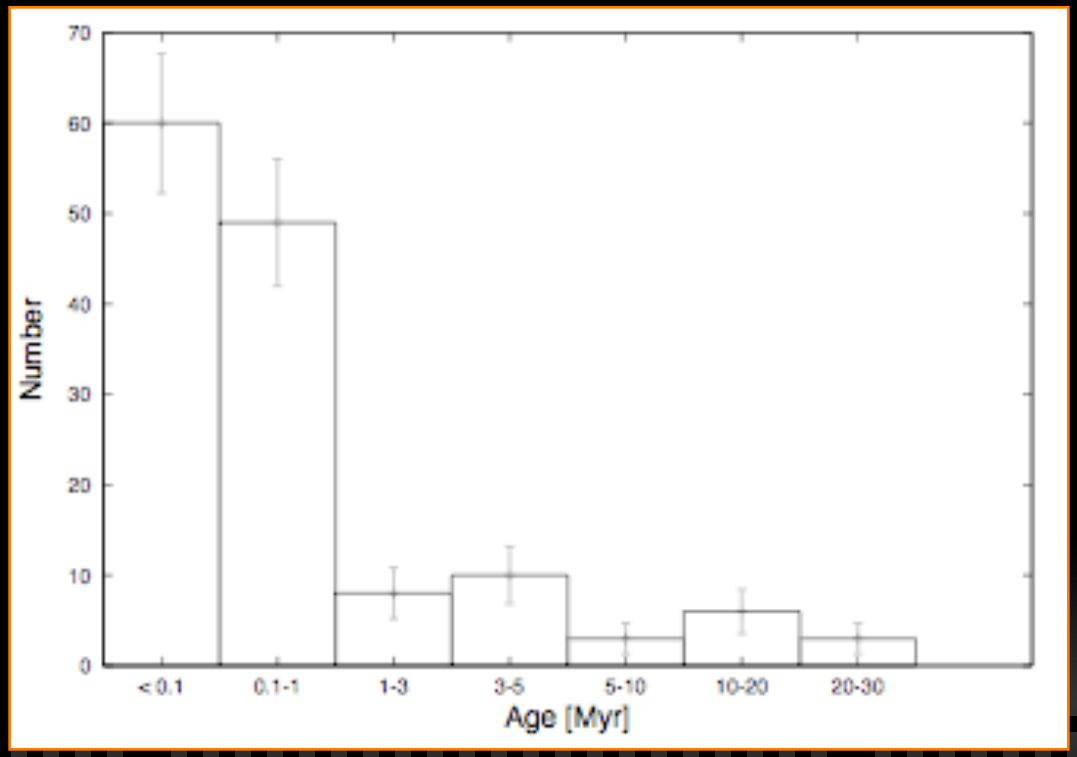




Comparison with W3 Main region: lies at ~2kpc, contains objects such as H II regions and a very low-mass stellar population

- Peak in IMF ~0.04 Msun
- slope = -1.0 bet ~0.04-1 Msun
- stellar surface density ~800 $pc^2$

- Peak in IMF ~0.08 Msun
- slope = -0.96 bet ~0.1-0.7 Msun
- stellar surface density ~1000 $pc^2$

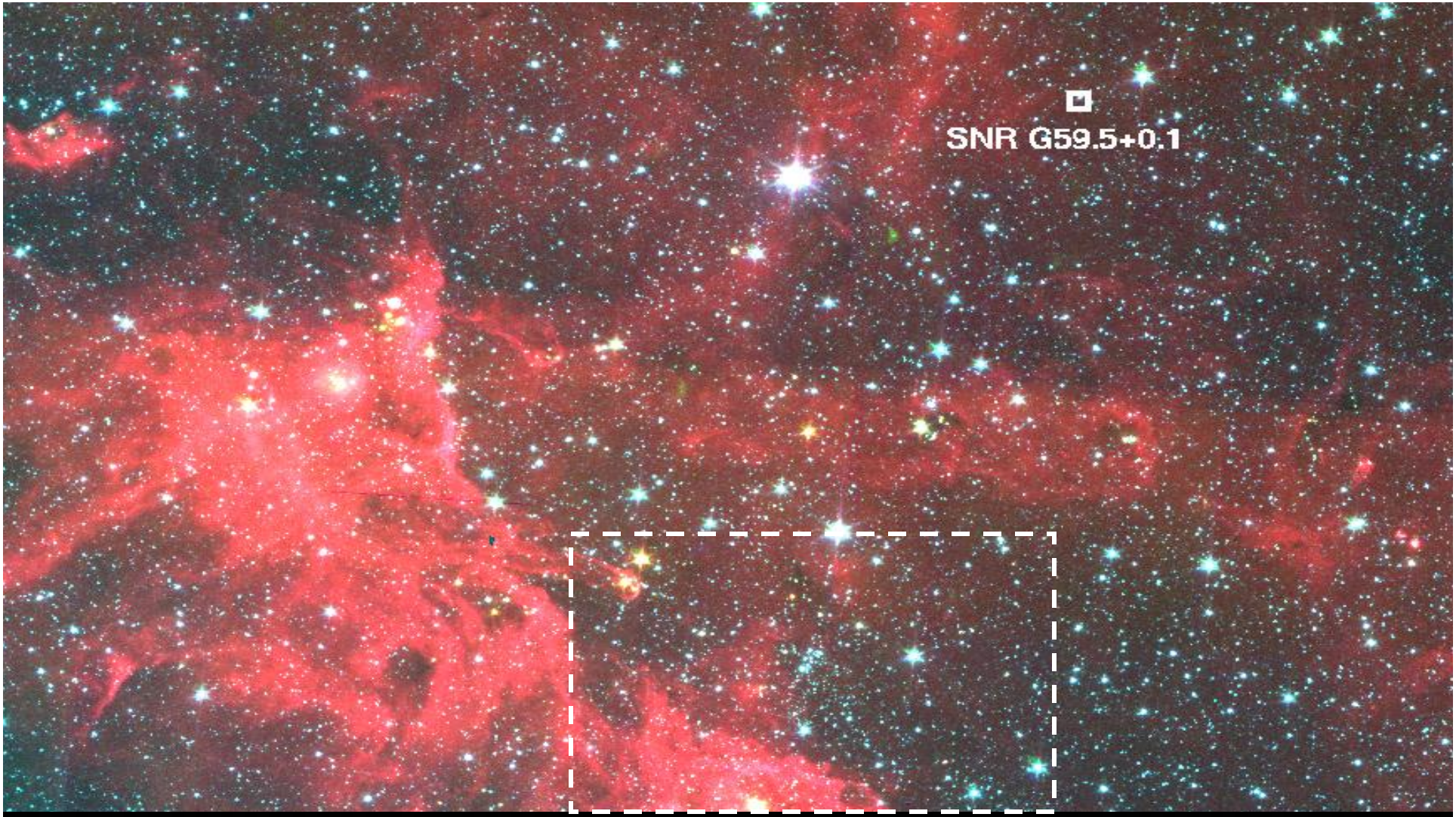
IMF similar for the less dense clusters, possible dependence on star-formation environment




• Age distribution for NGC 6823 shows accelerated star formation activity in the last ~1 Myr, with a large 87% fraction of candidate members lying at ages of ~0.1-1 Myr

• tail of older stars, with ages ~3-30 Myr

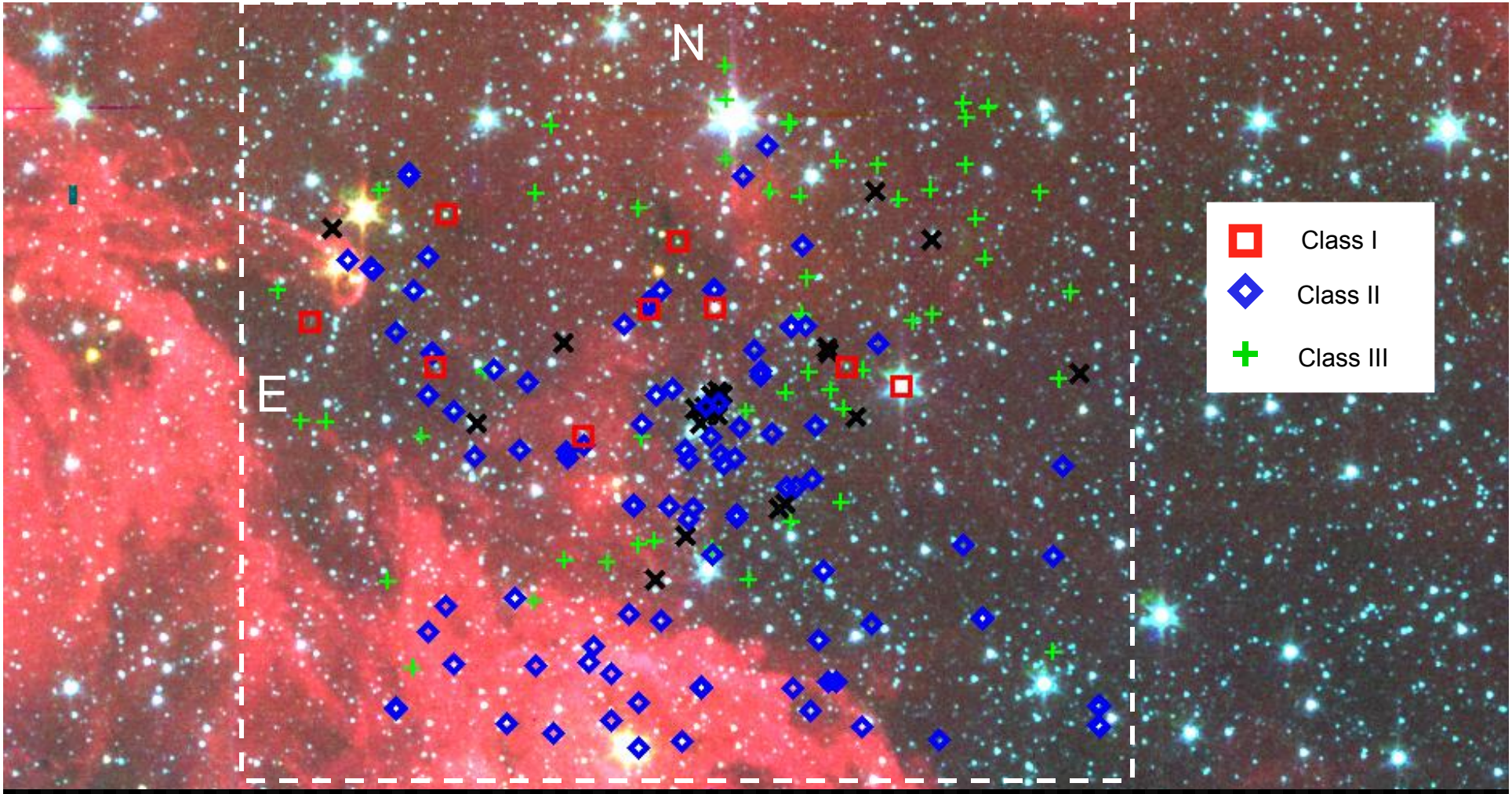
• Two epochs of star formation? one concentrated at ~$10^6$ yr and the other lasting for about $10^7$ yr



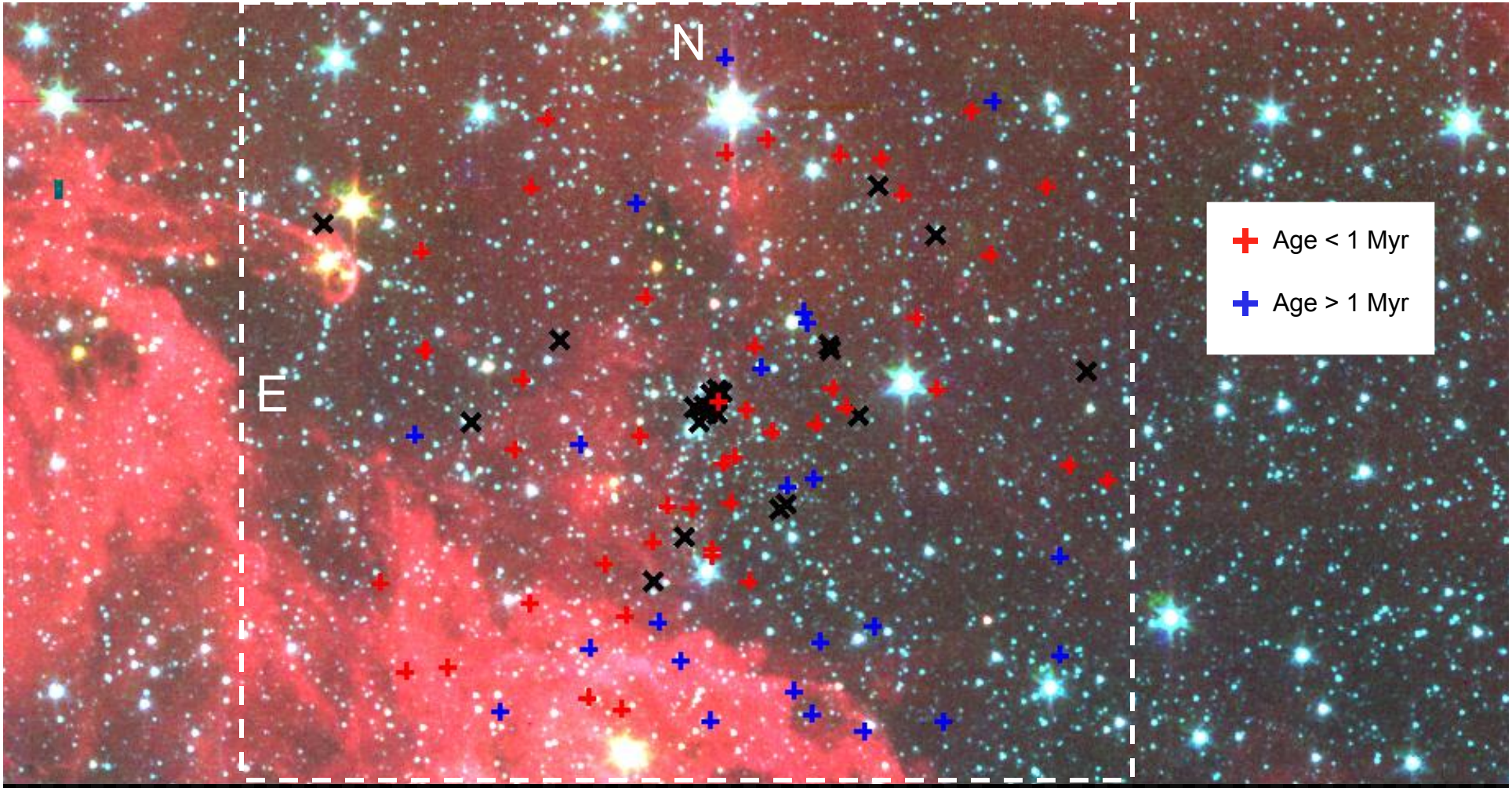

• Taylor et al. (1992) detected a supernova remnant, SNR G59.5+0.1, in the direction of the Vulpecula OB association

• SNR located ~11pc from the central trapezium

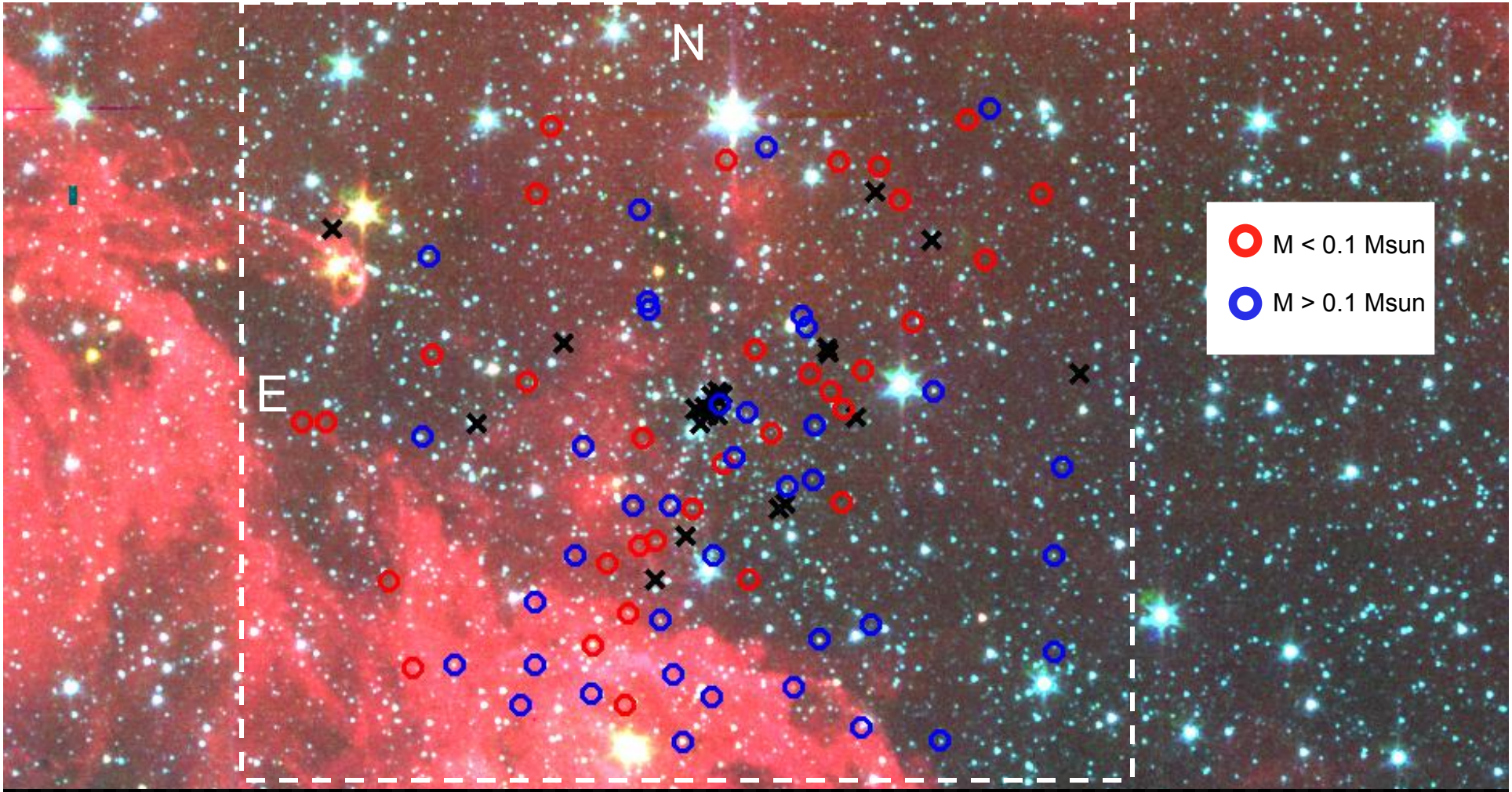
• shock waves from the explosion may have dispersed into the molecular cloud in the last ~1 Myr, and triggered the strong star formation activity that we witness in the present epoch -> small age spread of ~0.1-1 Myr




- clustering of Class II sources close to the trapezium, and high extinction region in the south-east
- Class III sources mainly located in the low-extinction region in the north-west
- star-formation is not concentrated at the center, spread to outer regions




- no particular clustering of younger sources
- most of the older objects located in the southern region (remnant of previous episode of SF?)




• Most of the higher mass objects lie in the southern region, and are also the older objects among the candidate sample

- NGC 6823 has seen a recent burst of star formation activity in the last ~1 Myr
- Wide range in ages and masses
- Survey has been deep enough to detect the low-mass and substellar population in NGC 6823