Young massive evolved stars in the G23.3-0.3 complex

presented by

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Outline:

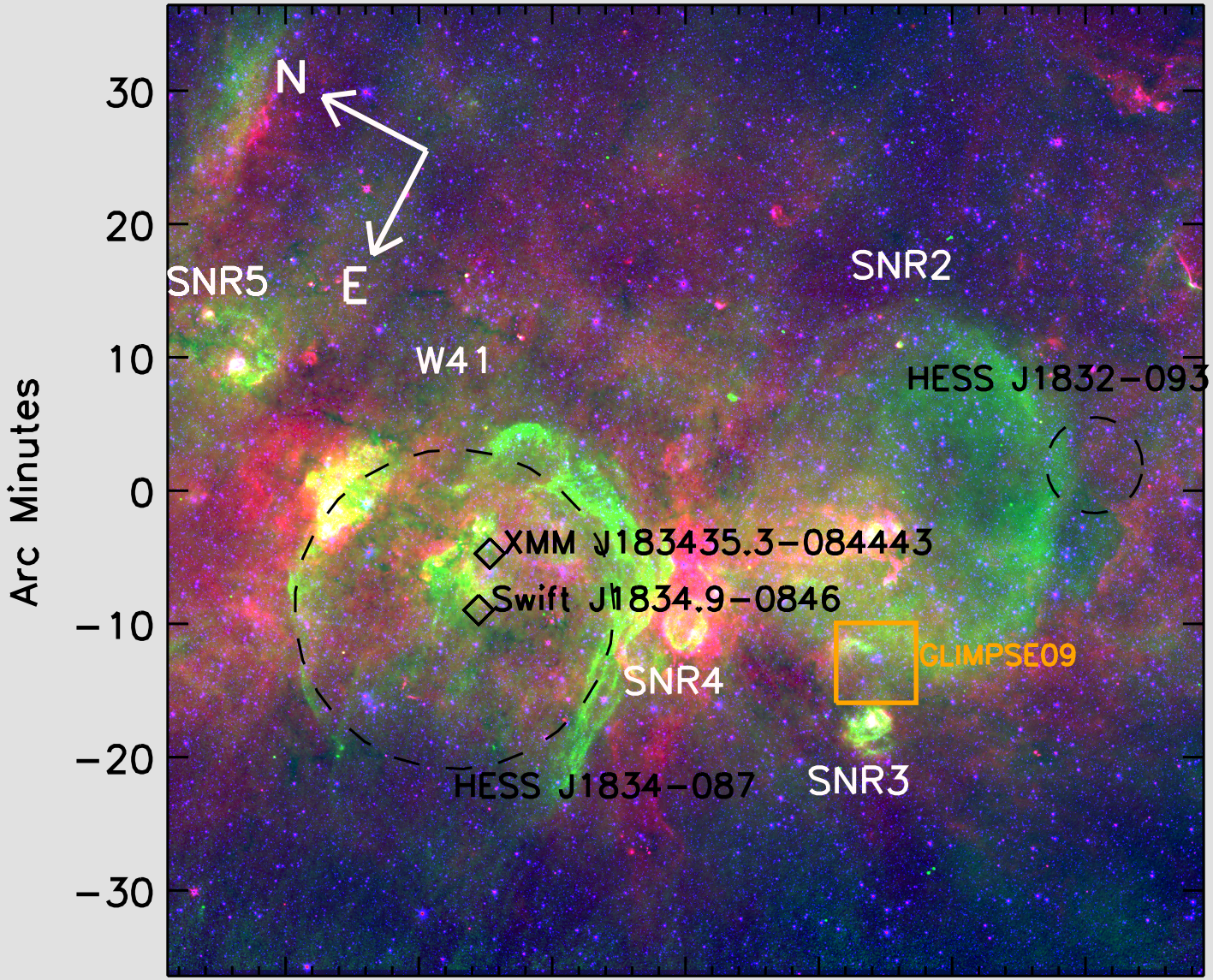
A. brief introduction to GMC G23.3-0.3, a beautiful star forming complex

B. Detected massive stars

C. Spatial and temporal distribution

Reference: Messineo at al. 2014 A&A 569, 20

The G23.3-0.3 giant molecular complex



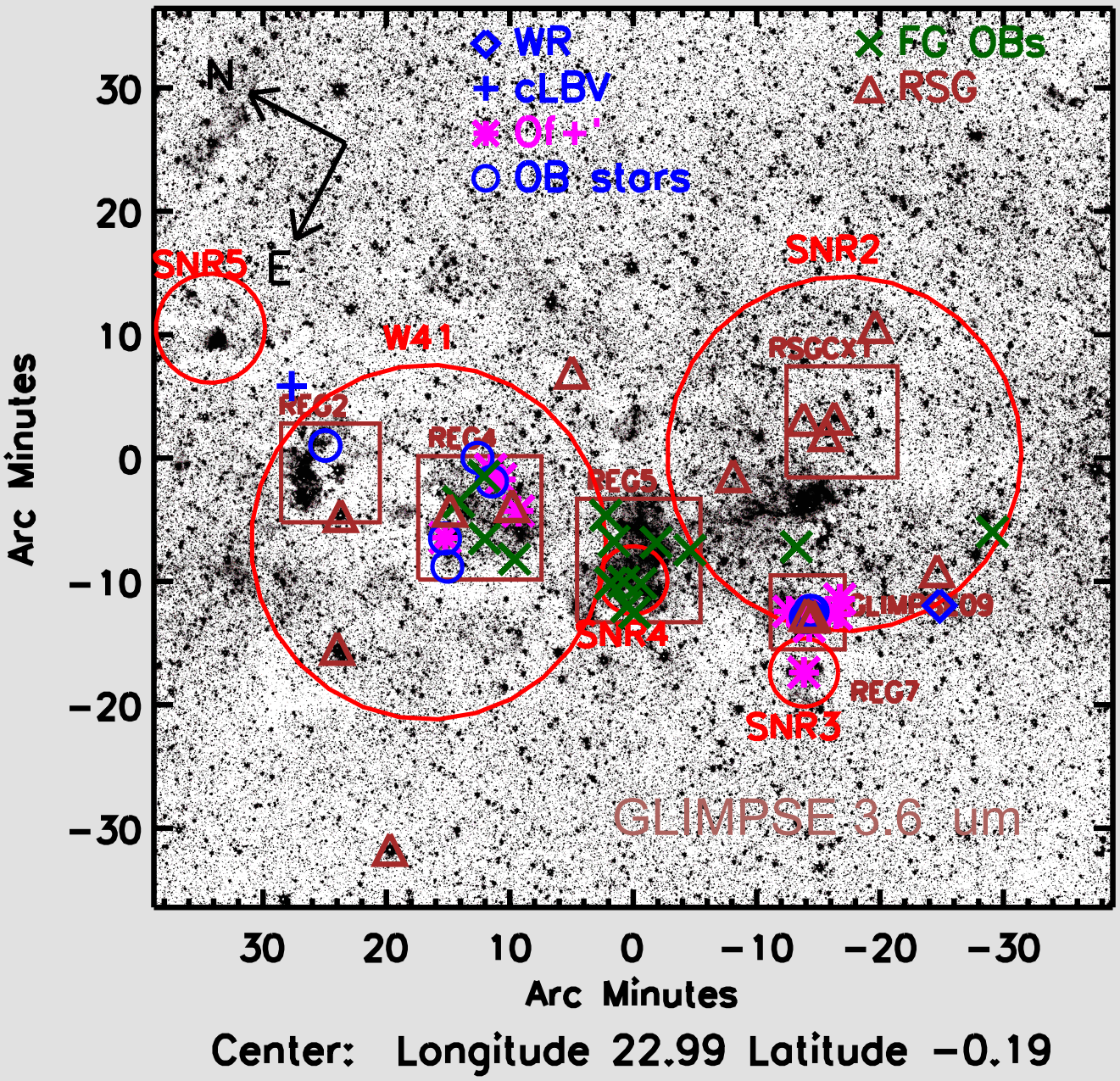
Center: Longitude 22.99 Latitude −0.19

Blue = 3.6 um GLIMPSE
Green = 20 cm MAGPIS
Red = 8 um GLIMPSE

SNRs from:
Green 1991
Helfand et al. 2006
1=W41
2=G22.7-0.2
3=G22.7583-0.4917
4=G22.9917-0.3583
5=G23.5667-0.0333
Albert et al 2006
Yang Su et al. 2014

High-energy
Aharonian et al. 2005
Laffon et al. 2011
Mukherjee et al. 2009
Kargaltsev et al. 2012

A K-band spectroscopic survey



40 new OB stars

Likely in the cloud:
12 O I-III stars (11 OfI+)
7 B stars
1 cLBV
10 cRSGs

Plus 1 WC8 by Mauerhan et al. 2011

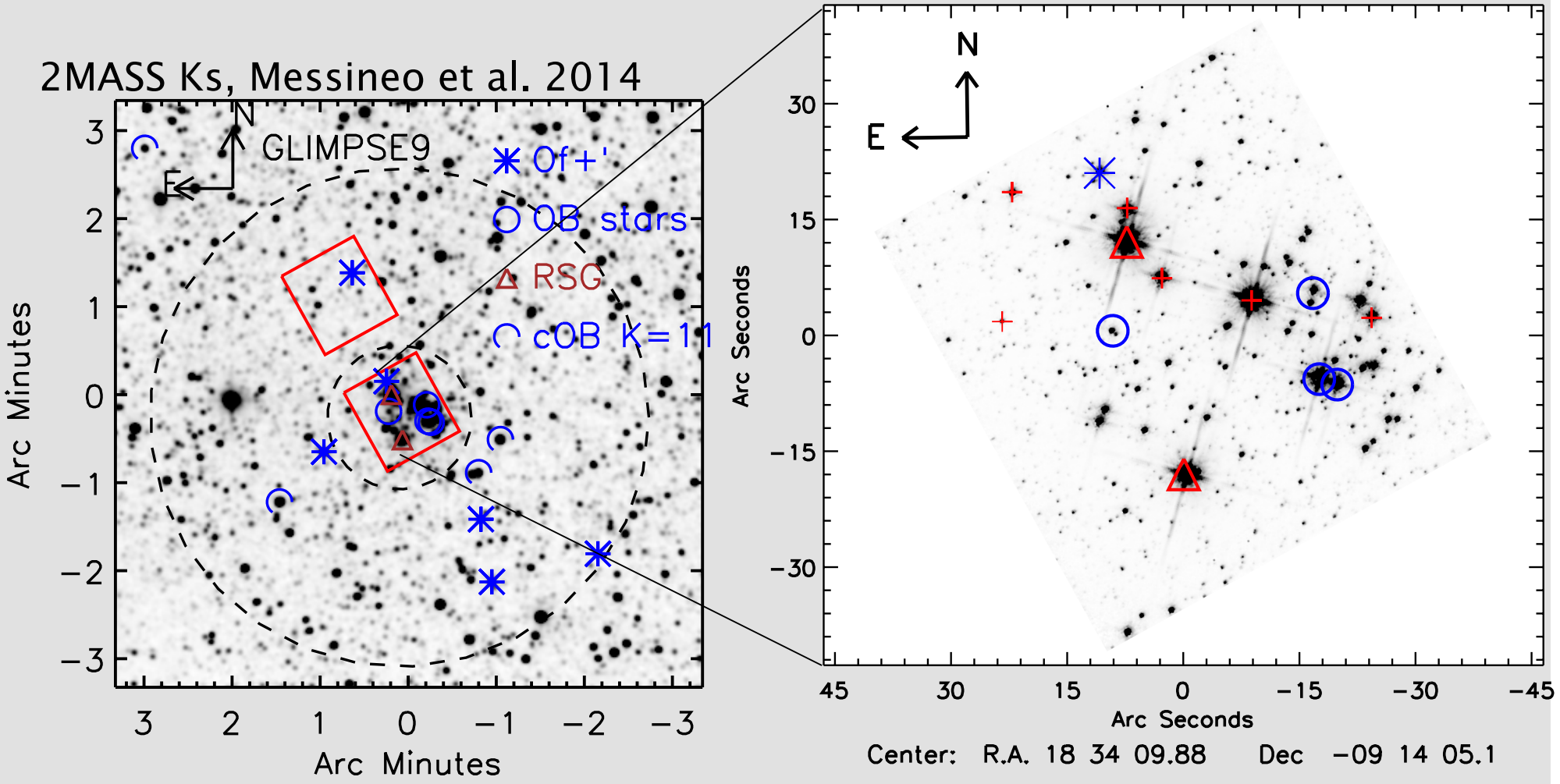
Spectrophotometric distance

Spec	Nstar	Aks	Mk	DM
O4-6 I	1	1.34	-5.16	13.73
O6-7 I	4	1.73	-5.28	13.48
O7-8.5 I	1	1.62	-5.39	13.65
O9-9.5 I	1	1.68	-5.39	12.89
O6-7 III	3	1.67	-4.84	13.69
O7-8.5 III	1	1.75	-4.66	13.31
O9-9.5 III	1	1.37	-4.47	13.68
B0-3 I	2	1.57	-6.27	13.25

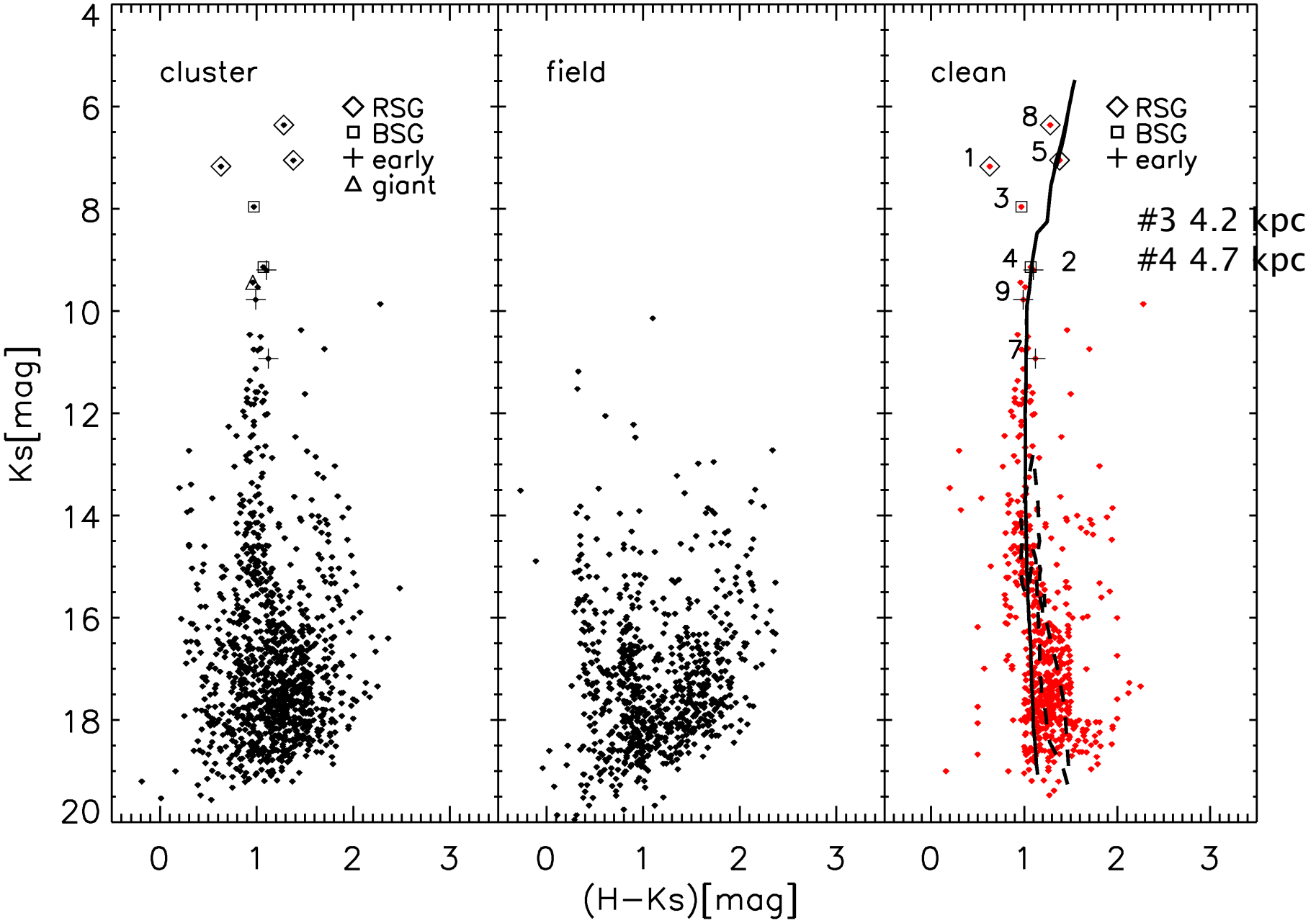
Region/component	Method	DM	References
70.5-82.5	Gas Kinematic	13.19 -- 13.39	Reid et al. 2009 Messineo et al. 2014
G23.01-0.41	Parallax of masers	13.31 pm 0.17	Brunthaler et al. 2009

GLIMPSE9 and surrounding (SNR G22.7-0.2 South)

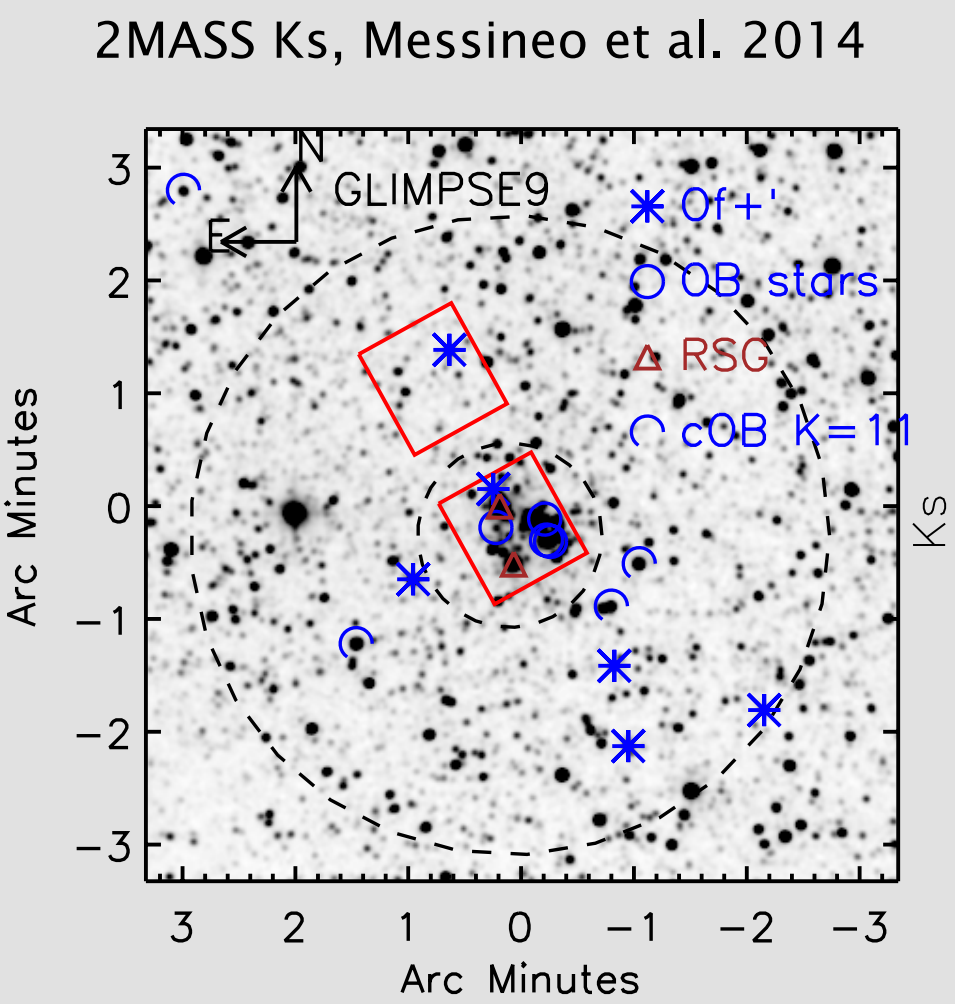
HST/NICMOS F160W, F222M
f.o.v. = 51.5”x51.5”; pixel scale = 0.2“
exptime = 19.94s, 55.94s
(Messineo et al. 2010).

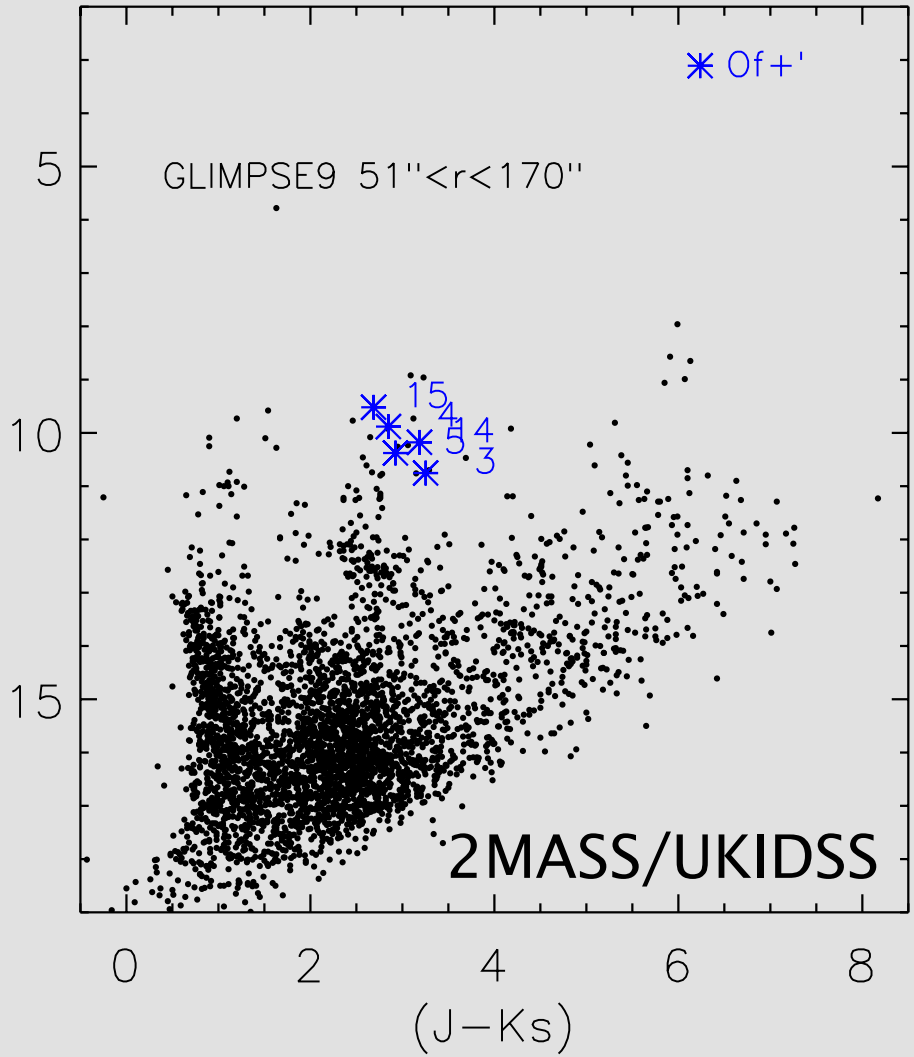


Age = 6-30 Myr (presence of RSGs) Ak = 1.6 ± 0.3 mag



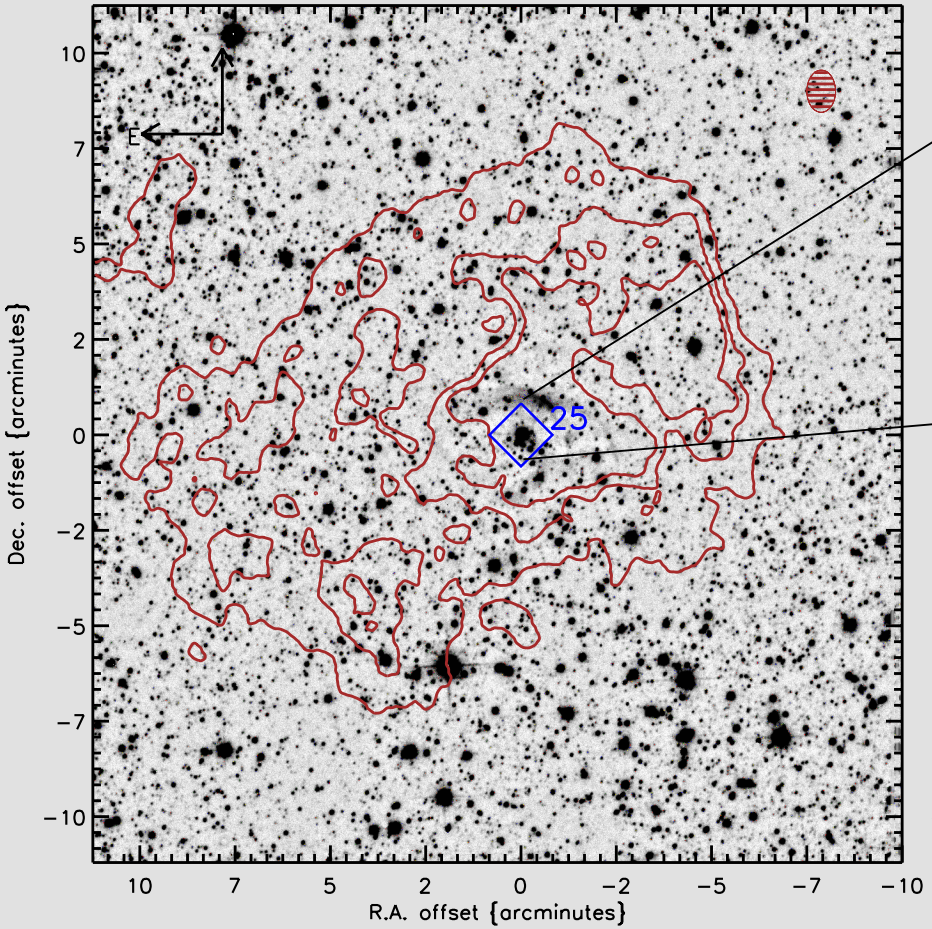
GLIMPSE9 and surrounding (SNR G22.7-0.2 South)



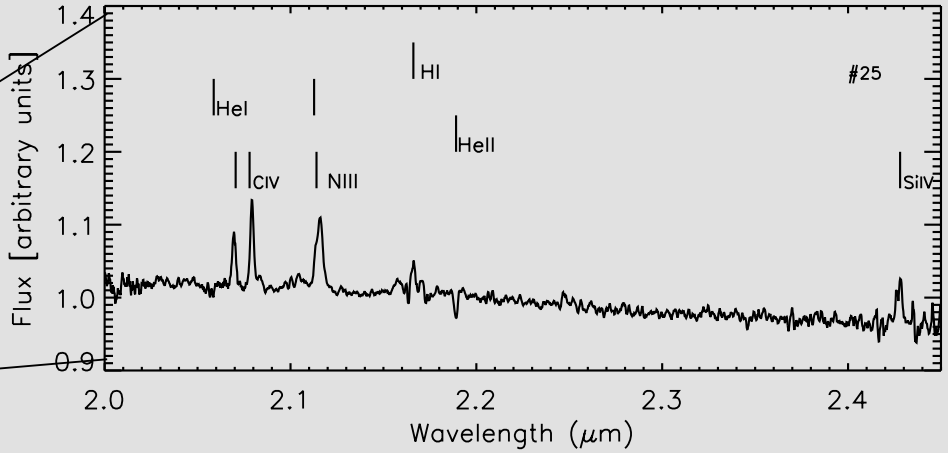


Star #25 in cSNR3-G22.7583-0.4917 (Helfand et al. 2006)
[BDS2003]117 (Bica et al. 2003)

UKIDSS K, MAGPIS 20cm, 0.2”/pix

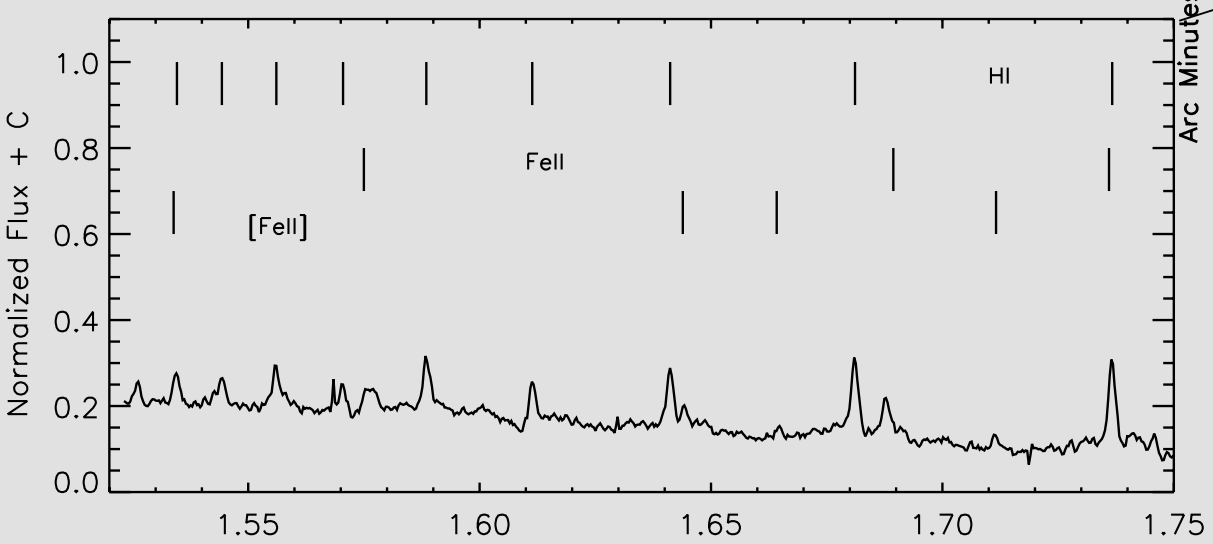


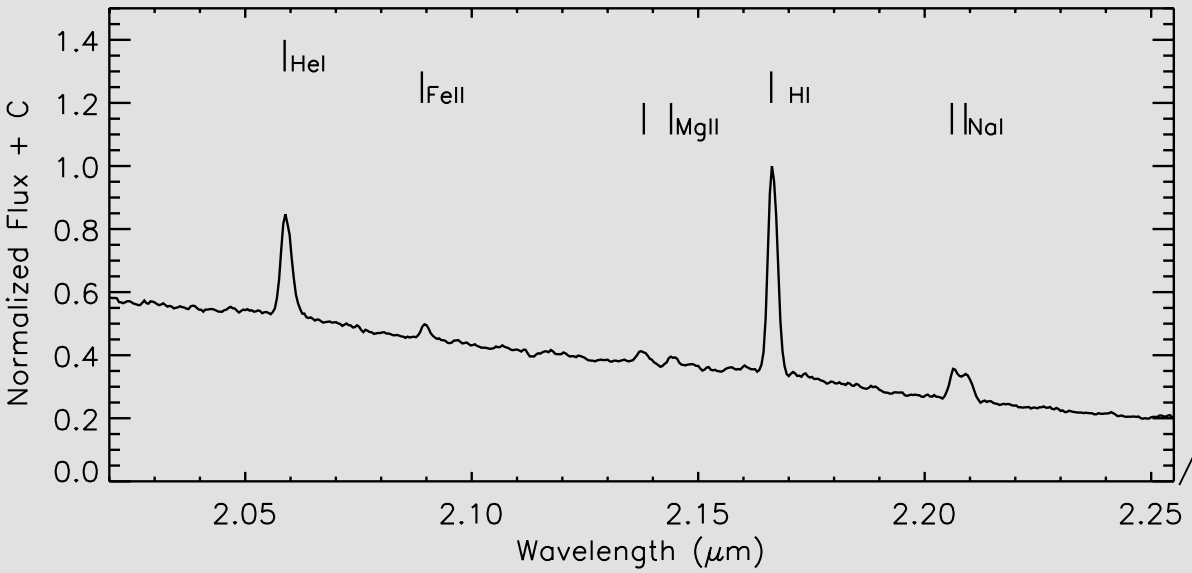
ESO-SINFONI

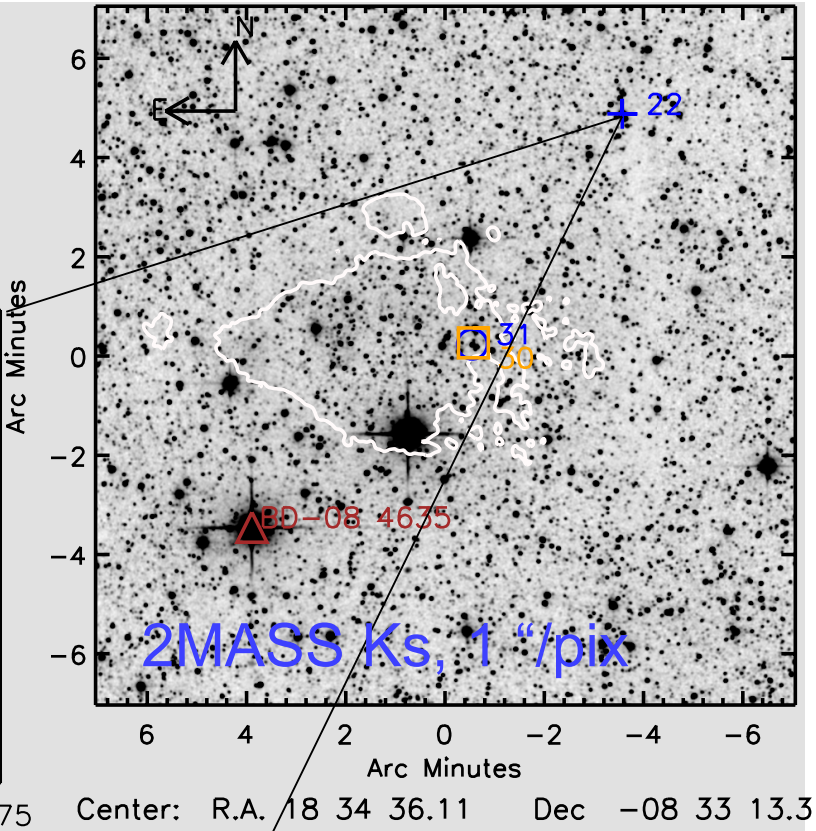


O4-6f+
Teff = 38500 K
K = 9.9 mag
Aks = 1.34 mag
Dist = 4.6 kpc
Mbol= -9.14 mag
logLum= 5.55 mag (28-36 Msun)

B supergiant, cLBV, ESO-SofI







Teff = ~14000K
Ks = 7.63 mag
Aks = 1.13 mag
Dist= ~4.6 pm kpc
Mbol= -7.90 mag
Log L/Lsun= 5.06

Summary: G23.3-0.3

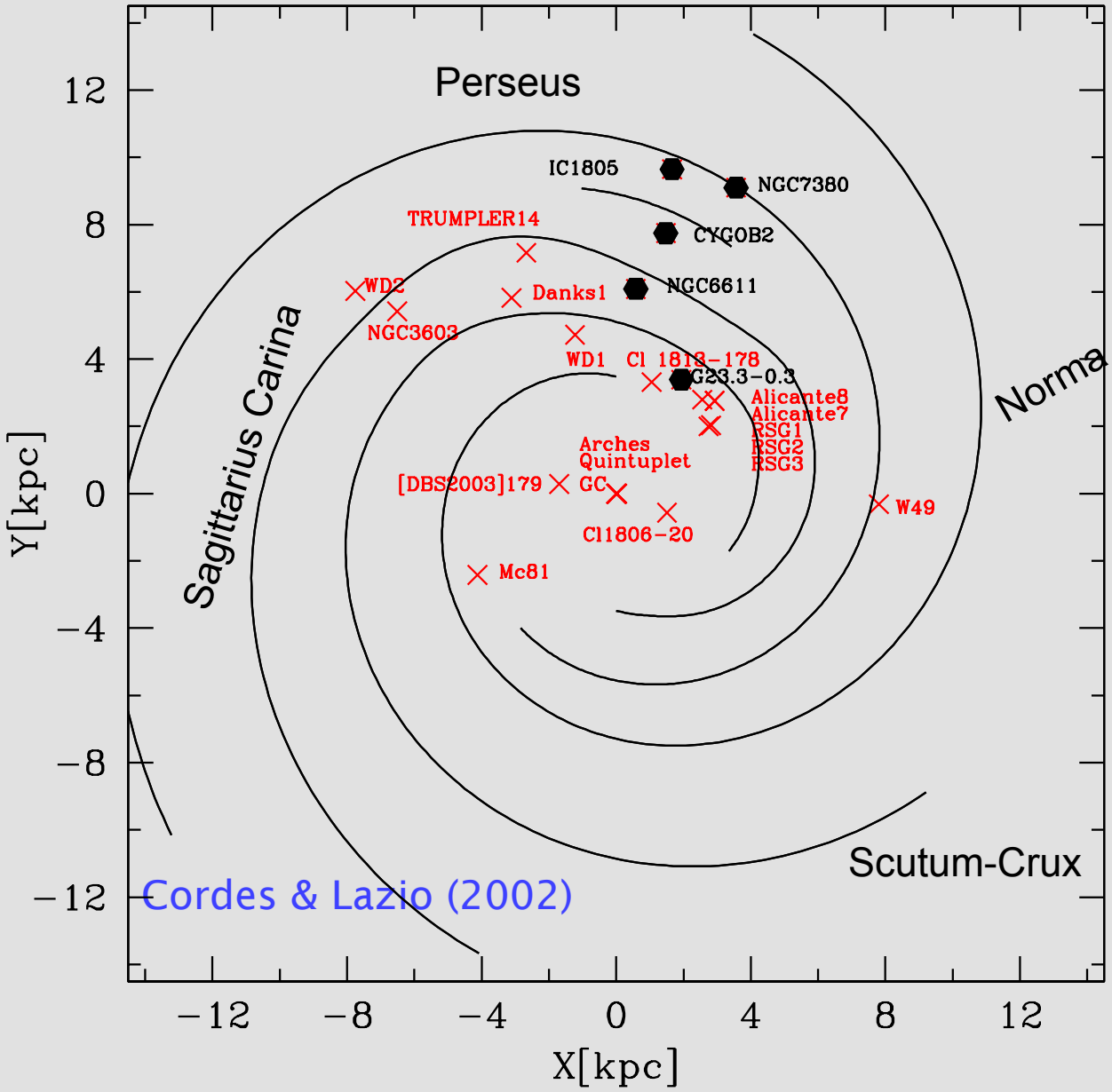
- The combination of radio and infrared data allow us to detect the parental GMC, which appears rich in HII regions and SNRs.

- Detected eleven massive Of+ stars with ages of 5-8 Myr.
  Detected ten cRSGs with ages of 15-30 Myr.
  G23.3-0.3 has had one of the longest history of star formation known.

- A cLBV is found isolated (we need a coronograph for Ks=7 mag).

- Massive stars are detected in the core of SNR W41, of SNR G22.7-0.2, and of G22.7583-0.4917.

- The GLIMPSE9 region on the GMC-SNR G22.7-0.2 interaction shows several massive stars (25-50 Msun) sparse on a 8pc wide area
  (IMF of a large area. Proper motions)

- With similar studies of other clusters and giant HII regions we will be able to shed light on the initial masses of the supernova progenitors, and therefore on the fate of massive stars.

Galactic location of the G23.3-0.3 complex