



DRM prominent science case S5 ELT-SWG, ESO Garching, 30 May 2007



Centers of Massive Clusters

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examples

questions

answers



ELT-observations

requirements



ELT instrument

The VLT and powers of 10: young clusters home and away

Hans Zinnecker

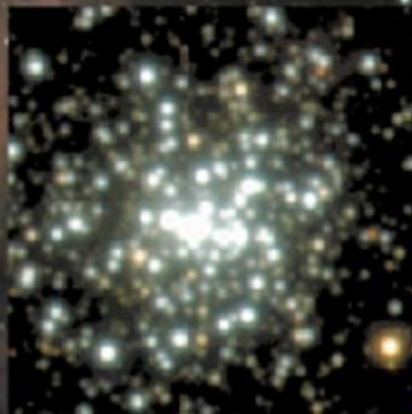
Astrophysikalisches Institut, Potsdam, Germany

Abstract. The purpose of this short paper is to remind the European star formation community, and more specifically the European young star clusters community, of the great potential of the VLT and to encourage the young European astronomers to make more and better use of it. Three classical examples of very young star clusters at 500 pc, 6.5 kpc, and 55 kpc (the Orion Nebula Cluster, NGC 3603 in the Carina arm, and R136 in the LMC) are chosen to illustrate the resolving power of the VLT in direct imaging mode, adaptive optics mode, and interferometric mode. The VLT with its high spatial resolution modes can be used as an astronomical microscope, as it were, with a zoom factor of 10 to 100.

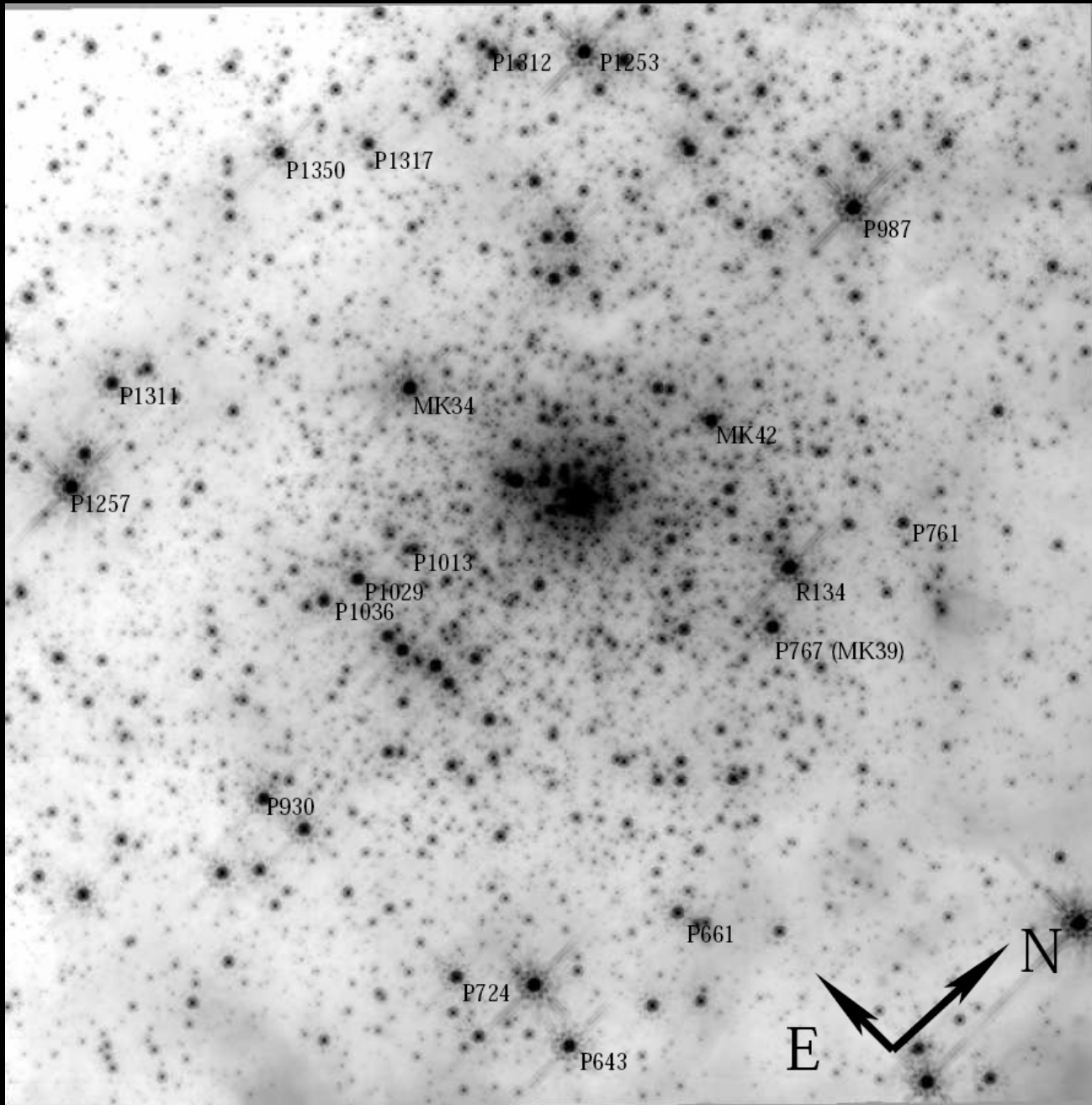
NGC 3603

VLT/ISAAC JHK

FOV 3.4' x 3.4'



Brandl et al. 1999



R 136 (NGC 2070)

HST/NICMOS image

FOV 15 pc x 15 pc

Andersen et al. 2007



R136 cluster

HST
optical/IR image

FOV ~ 30'' x 30''

Zinnecker 2004



Westerlund 1 cluster

NTT/SOFI JHK image

FOV $\sim 4 \times 4$ arcmin

Brandner et al. 2007

ELT Near-Infrared and Thermal-Infrared Studies of Massive Star Formation: Direct imaging and integral field spectroscopy of ultracompact HII regions

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Abstract. In this contribution, we show how a future ELT (> 25 m diameter) helps to understand the formation and early dynamical evolution of massive stars embedded in dust-enshrouded very compact HII regions. We describe how to exploit the ELT's near- and mid-IR enhanced sensitivity and high angular resolution to peer through huge amounts of dust extinction, taking direct nearly diffraction-limited images & doing IFU spectroscopy. Together with ALMA, an ELT will be a powerful observing platform to reveal one of the most hidden secrets of stellar astrophysics: the origin of massive stars.

Centers of dense protoclusters

$$A_V = 200 \text{ mag}$$

$$A_K = 20 \text{ mag}$$

ELT can penetrate the dust,
see the massive stars:
measure number density,
proper motions,
extinction

Galactic Center NIR images
show

dozens of OB stars:

did they form in situ and how?
(two counter-rotating disks)

are there any low-mass stars?
(diffuse X-ray emission)

Questions

photometry - dynamic range

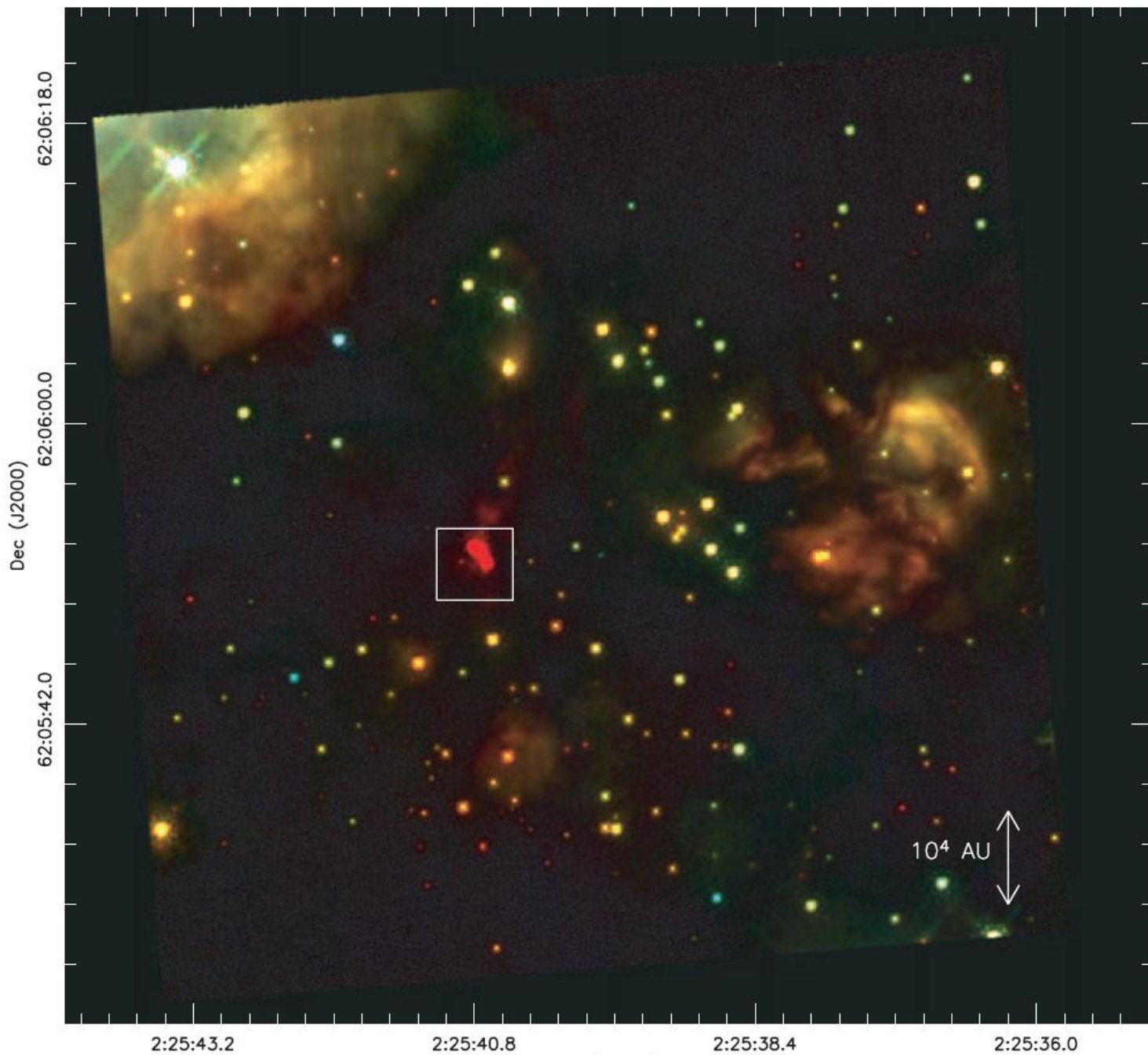
astrometry - proper motions

stellar density in UCHII regions

global collapse vs fragmentation

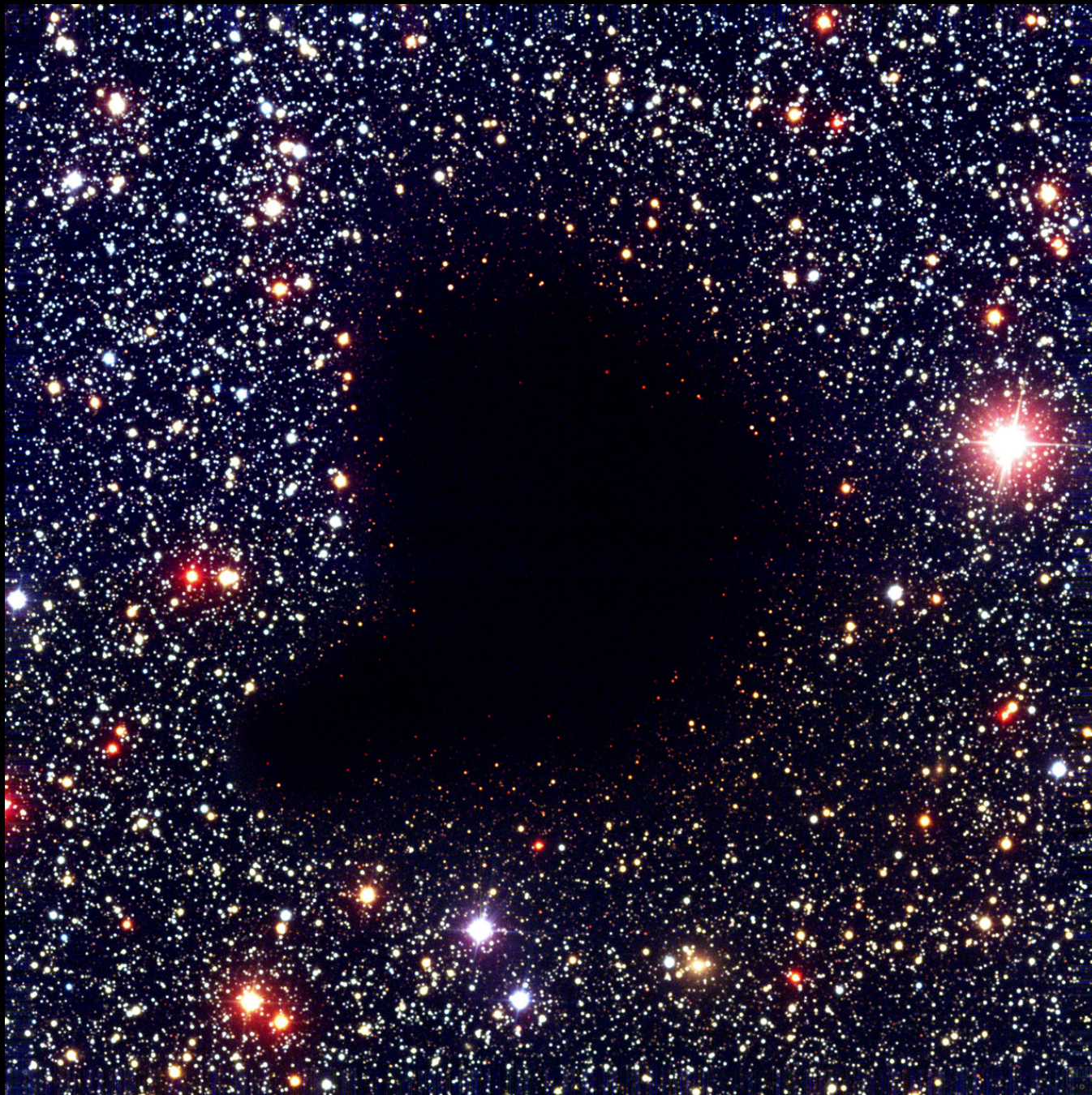
stellar mass segregation at birth

top-heavy IMF in Galactic Center



W3 IRS5 region

Megeath, Wilson
& Corbin 2005

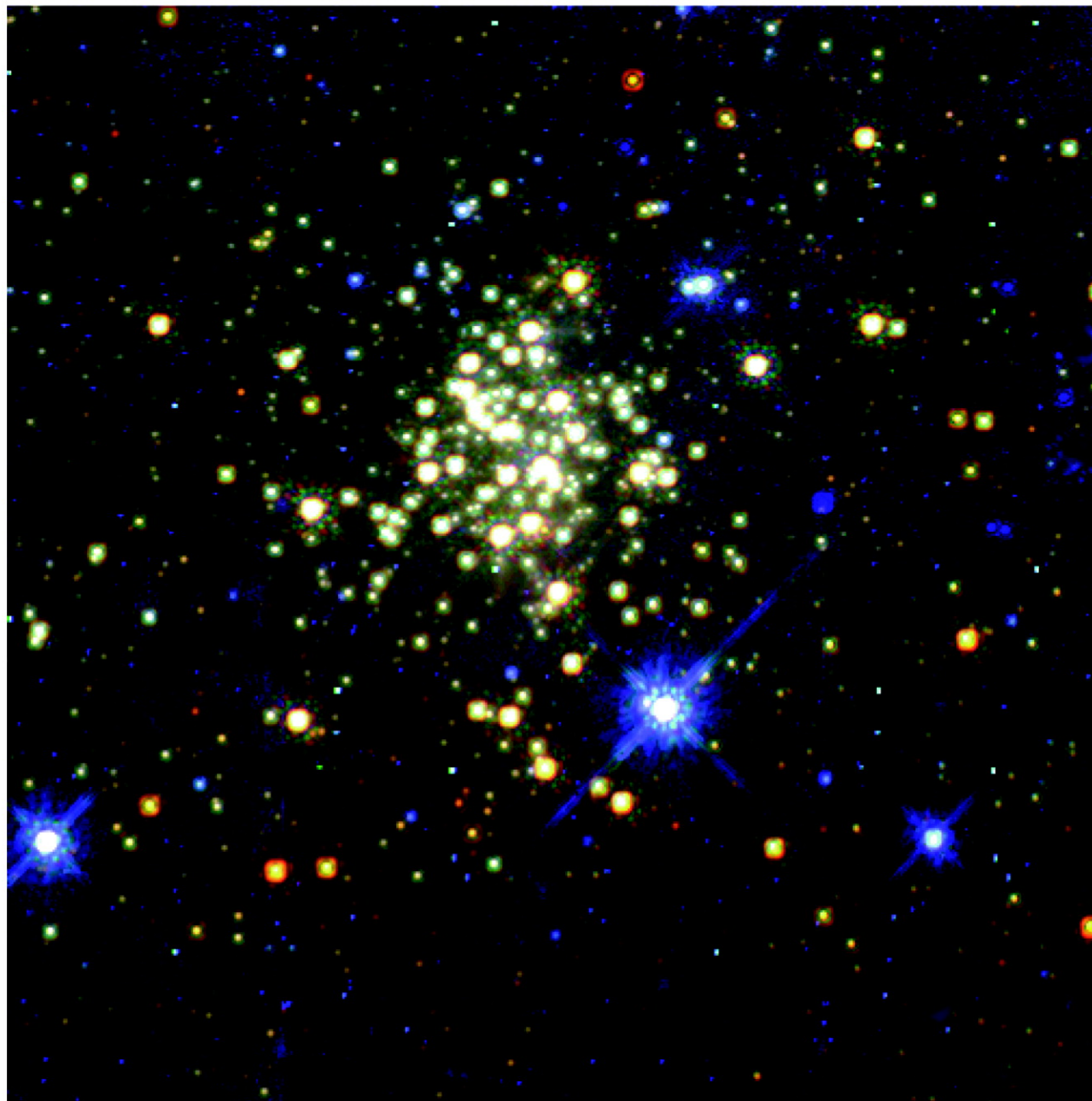


B 68 dark cloud

credit: J. Alves, ESO



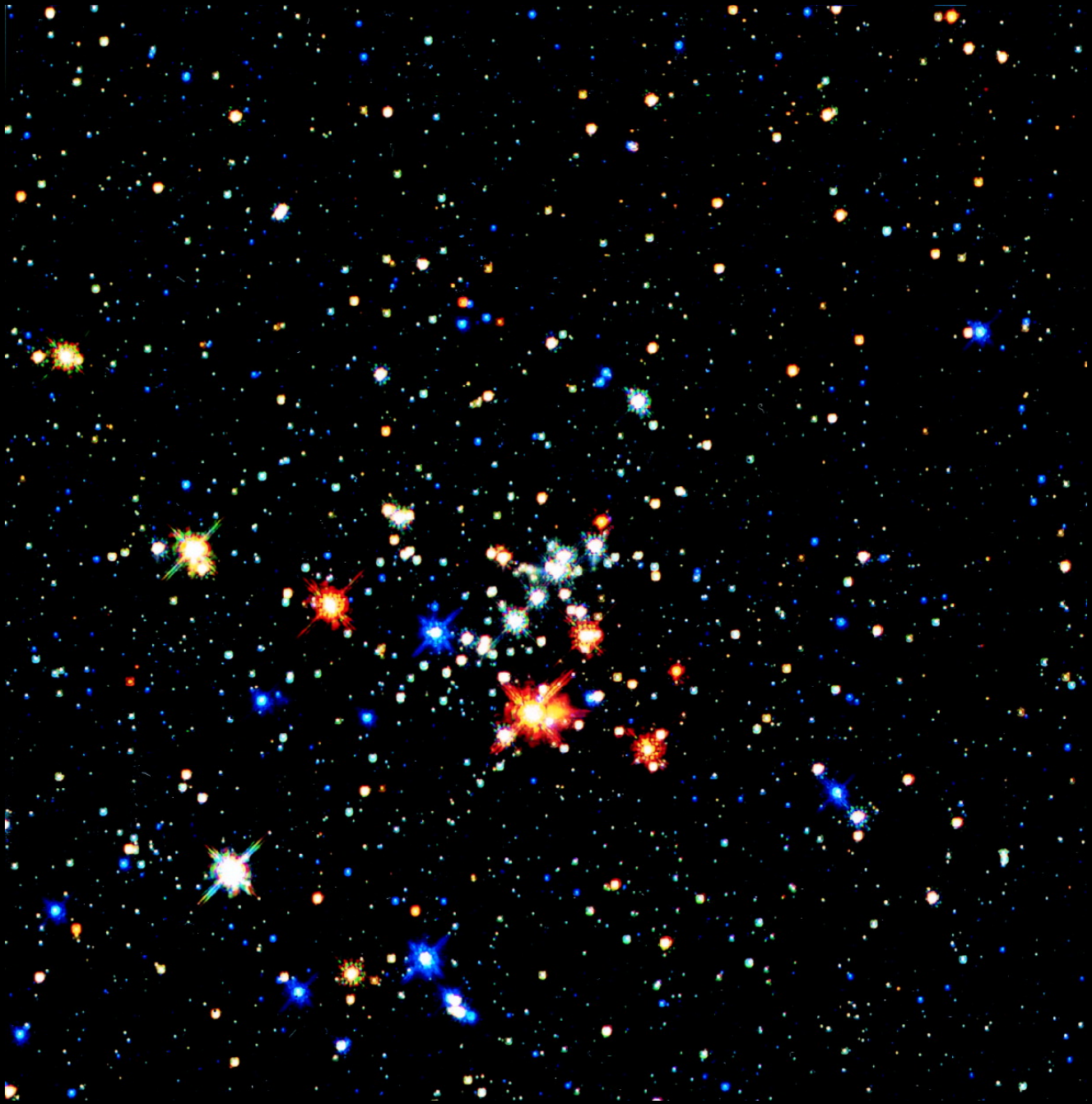
Looking Through the Dark Cloud B68 (NTT + SOFI)



Arches cluster

Color composite image
F205W (*red*),
F160W (*green*),
and F110W (*blue*)

Figer et al. 1999



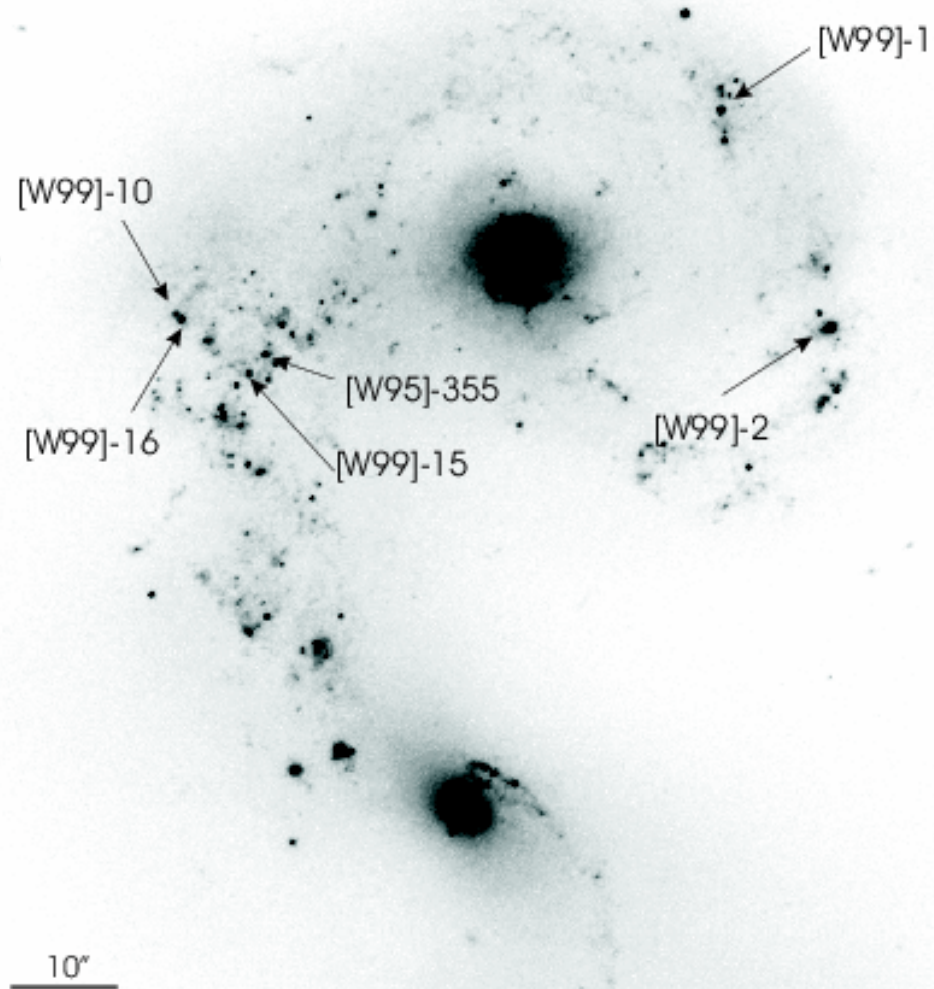
Quintuplet cluster

Color composite image
F205W (*red*),
F160W (*green*),
and F110W (*blue*)

Figer et al. 1999

NGC 4038/4039

ISAAC Ks-band image



Mengel et al. 2002

Conclusion

The centers of massive clusters is all about

RESOLUTION, RESOLUTION, RESOLUTION !!!

we need near-IR AO simulations

with „cloud-shine“ (Foster & Goodman 2006)