

# Dwarf elliptical galaxies in the Cen A group

Marina Rejkuba

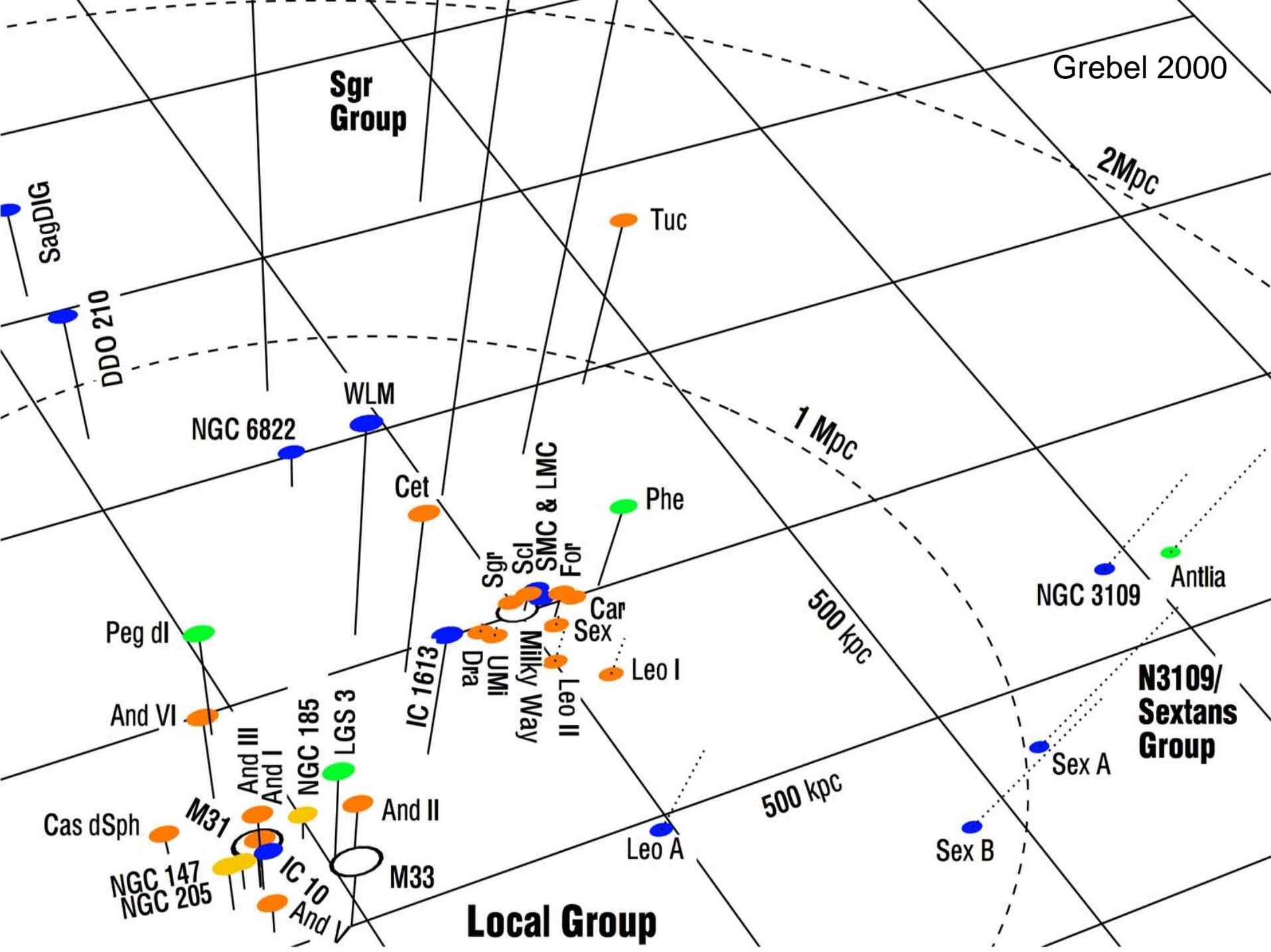
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Collaborators:

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# Overview

- Dwarf galaxies in the Local Group
  - dwarf Irregulars and dwarf elliptical galaxies
  - Tucana and Cetus dwarfs
- Cen A group
  - Overview of the observations
  - AM 1339-445 and AM 1343-452
    - Distances and metallicities
    - Evidence of extended star formation
    - Surface brightness



**Sgr Group**

Grebel 2000

2Mpc

SagDIG

DDO 210

Tuc

NGC 6822

WLM

1 Mpc

Cet

Phe

NGC 3109

Antlia

Peg dl

Sgr  
Sci  
SMC & LMC  
For

500 kpc

**N3109/  
Sextans Group**

And VI

IC 1613

Milky Way

Car

Dra

UMi

Leo I

Leo II

Sex

Leo I

500 kpc

Sex A

Cas dSph

M31

And III

And I

NGC 185

LGS 3

And II

NGC 147

NGC 205

IC 10

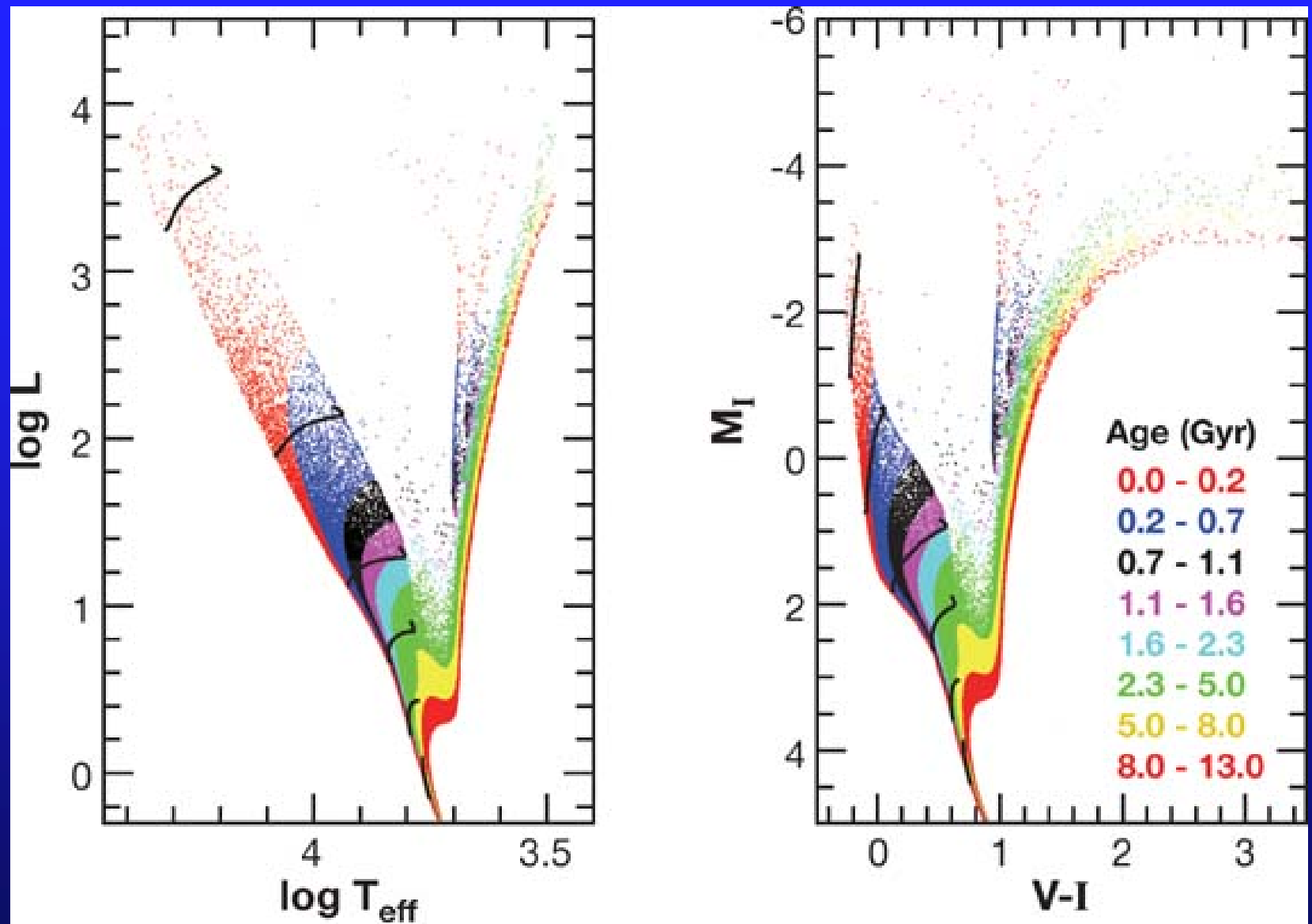
And V

M33

Leo A

Sex B

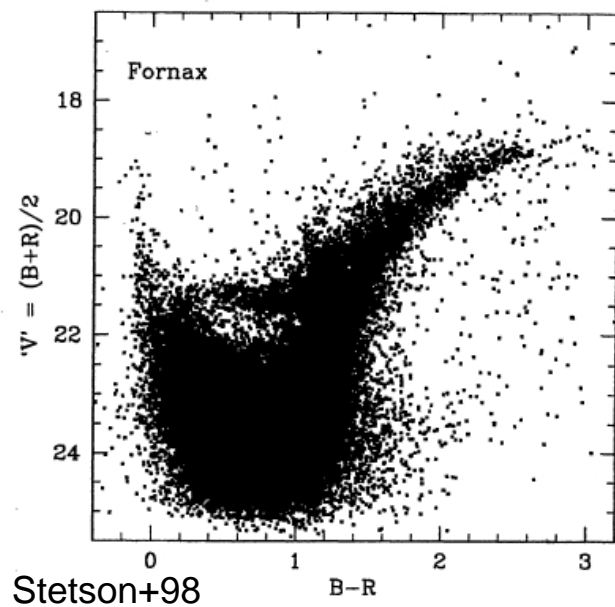
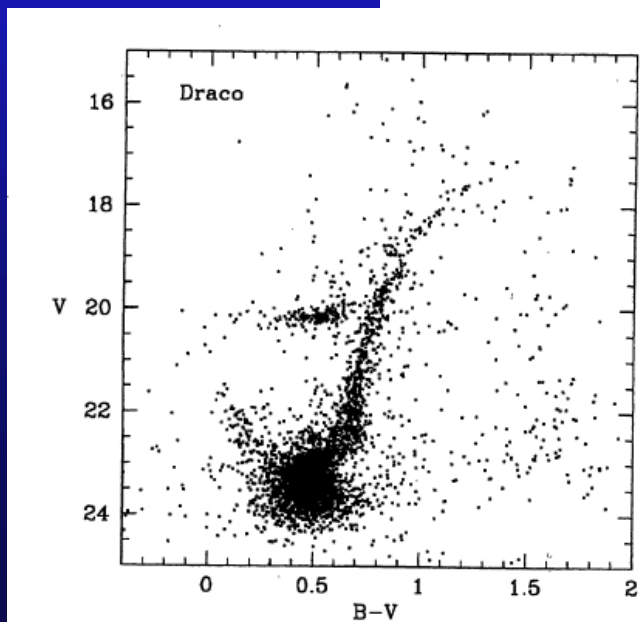
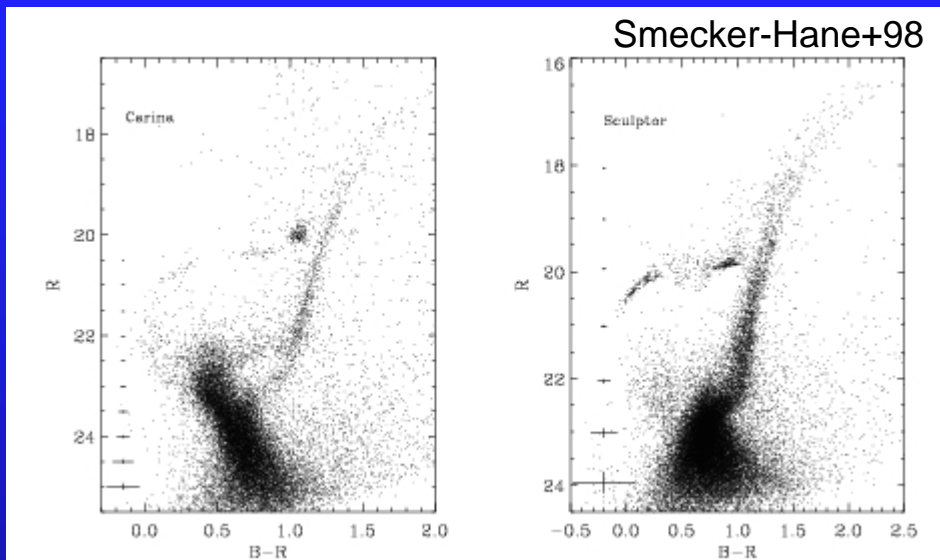
**Local Group**



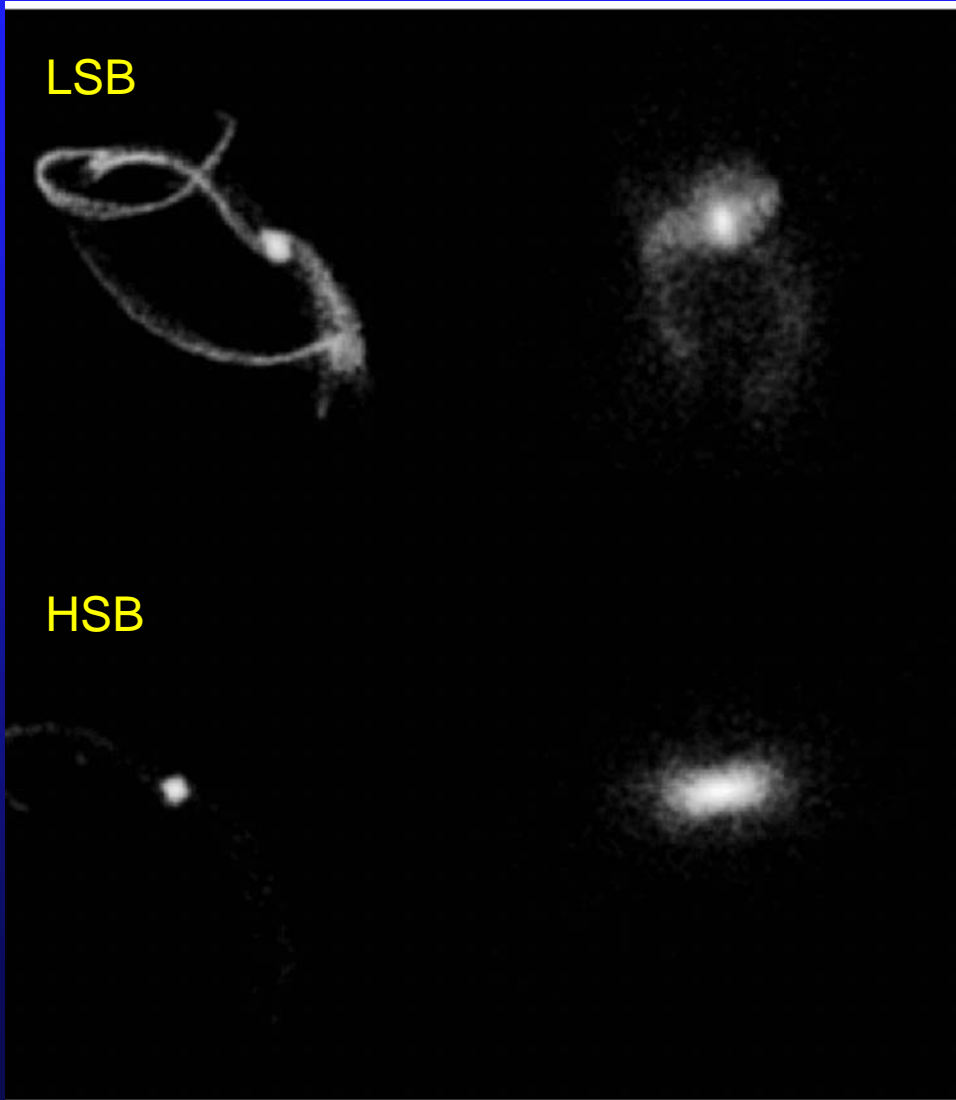
Gallart, C et al. 2005

Annu. Rev. Astron. Astrophys. 43: 387–434

# Diversity of Star Formation Histories



# From dlrr to dSph/dE galaxy



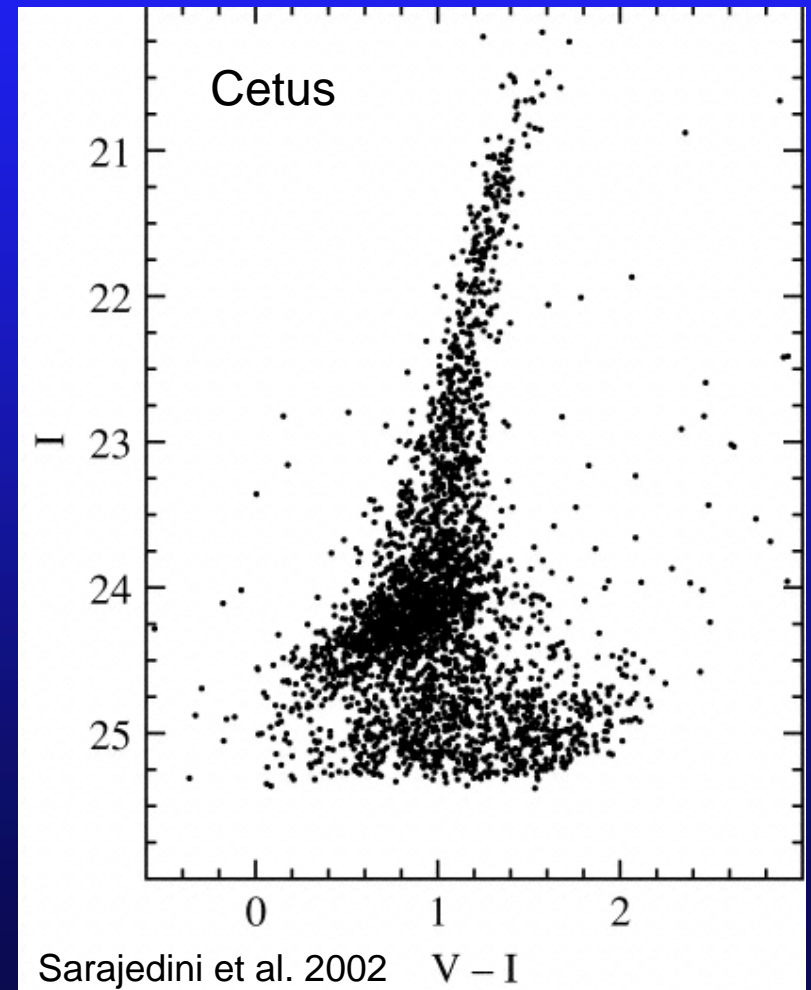
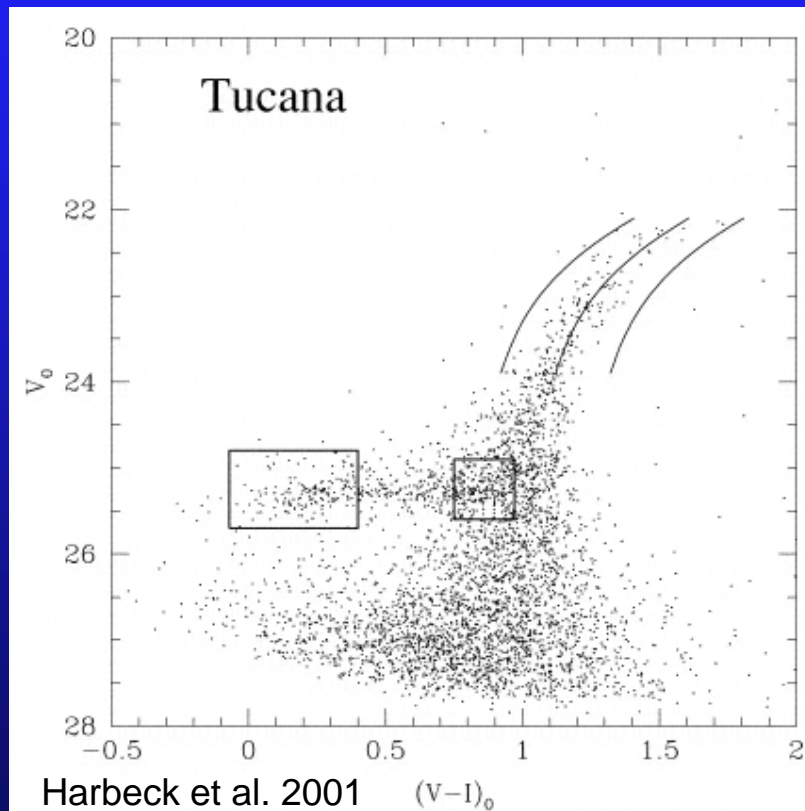
Milky Way halo:  
fixed potential of a truncated  
isothermal sphere with  
 $M=4 \times 10^{12} M_{\odot}$   
 $R=400$  kpc

Orbital periods: 3-4 Gyr

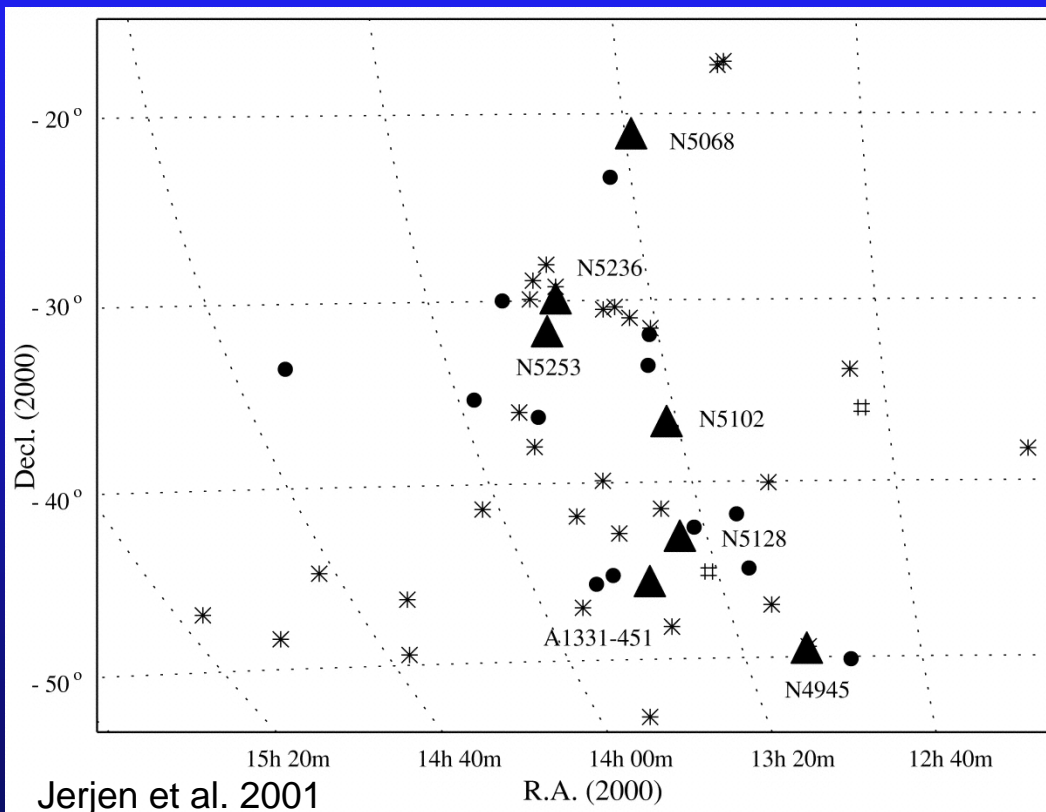
Direct tidal heating coupled with  
the buckling of the bar due to  
bending instabilities transmute  
the small disks into spheroids  
supported by velocity dispersion  
instead of rotation.

Mayer et al. 2001

# Tucana and Cetus



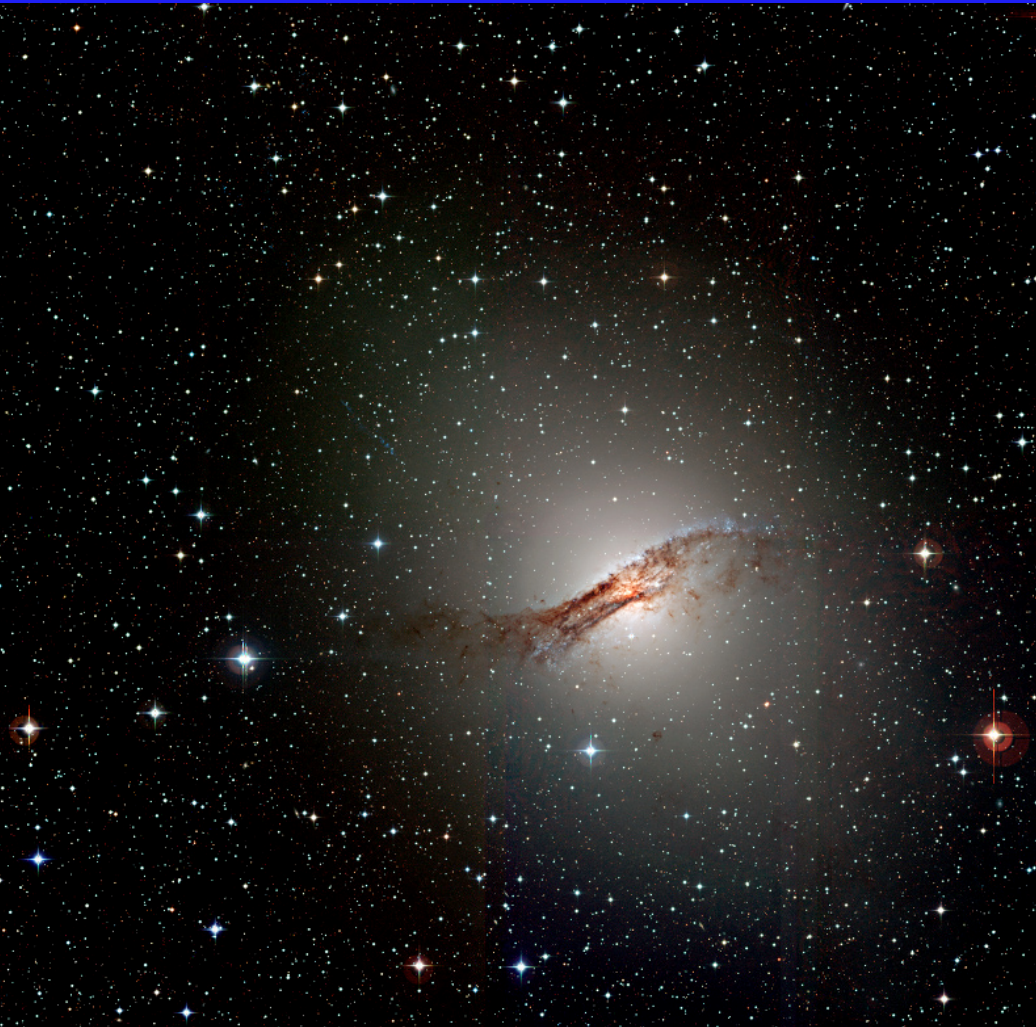
# The Centaurus A group



- Higher density environment
- Larger number of giant galaxies
- Higher number of close encounters
- $D \sim 4$  Mpc



# NGC 5128 = Centaurus A



Centaurus A  
(MPG/ESO 2.2-m + WFI)

- The dominant galaxy
- The nearest gE/S0pec
- Recent merger
- Radio galaxy with jets
- AGN + Supermassive BH  $\sim 9 \times 10^7 M_{\odot}$
- Young stars in halo
- Old and metal-rich stars in the halo
- $\sim 10-15\%$  intermediate-age
  - Long period variables
- $M \sim 5 \times 10^{11} M_{\odot}$  at 80kpc

# The observations

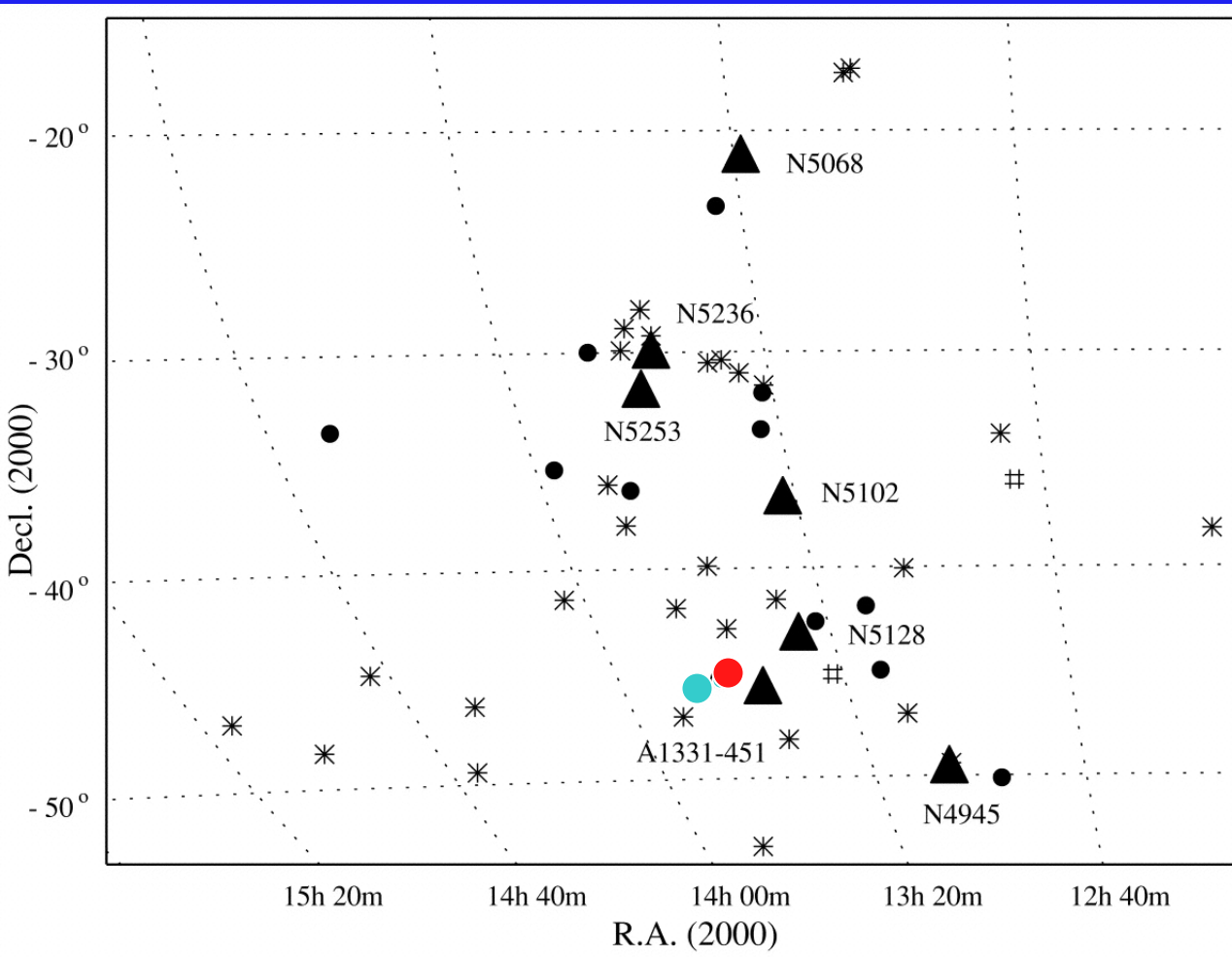
ISAAC@VLT imaging:  
35 min Js + 2 x 39 min Ks

SAMPLE: 14 dE galaxies in  
Cen A group



- ESO219-010 (28.34 SBF)
- ESO269-066 (27.75 SBF)
- ESO384-016 (27.85 SBF)
- AM1320-230 ---
- AM1339-445 (27.77 RGB; 27.87 SBF)
- AM1343-452 (27.92 RGB; 27.99 SBF)
- UGCA365 (~28.3 morphology)
- CenA-dE1 (~27.8 morphology)
- CenA-dE2 (~28.3 morphology)
- CenA-dE3 (~27.8 morphology)
- CenA-dE4 (~28.3 morphology)
- CenA-dE5 ----
- SGC1319.1-4216 (~27.8 morphology)
- Cen8 (~28.3 morphology)

# AM 1339-445 and AM 1343-452

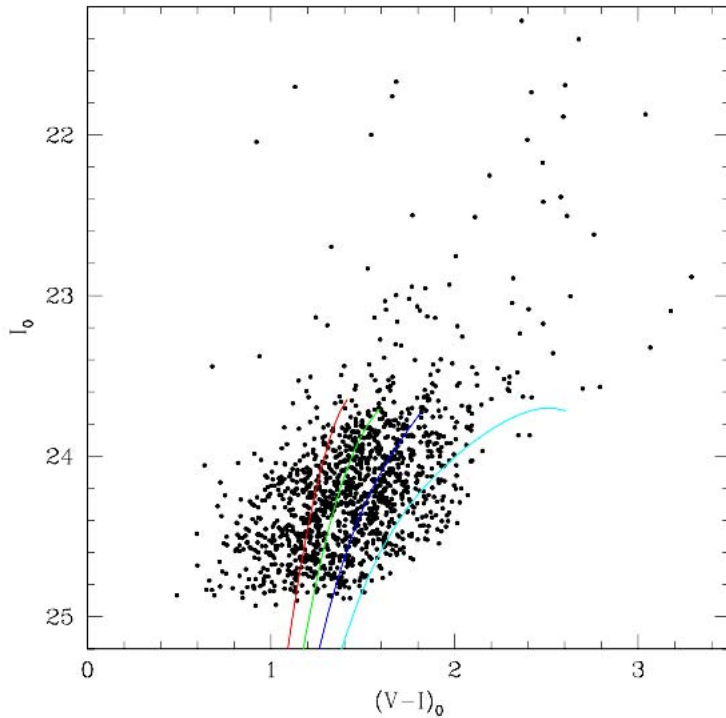


- Membership in Cen A group (Jerjen et al. 2001)
- SBF distance (Jerjen+01)
- RGBT distance (Karachentsev+2002)
- Outlying satellites of Cen A
  - 390 and 320 kpc
- $M_B = -11.9, -10.8$
- $(B-R)_0 = 1.38, 1.35$
- Available WFPC2 HST data
- Low reddening
- $E(B-V) = 0.111, 0.121$

# WFPC2 HST data: optical CMDs

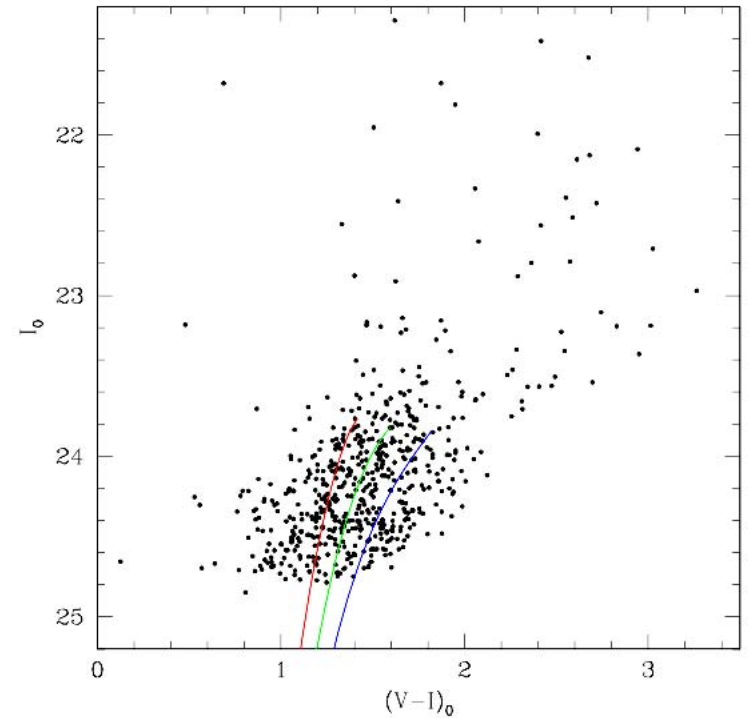
AM 1339-445

$\langle[\text{Fe}/\text{H}]\rangle = -1.4 \pm 0.2 \text{ dex}$   
 $(m-M) = 27.74 \pm 0.20$



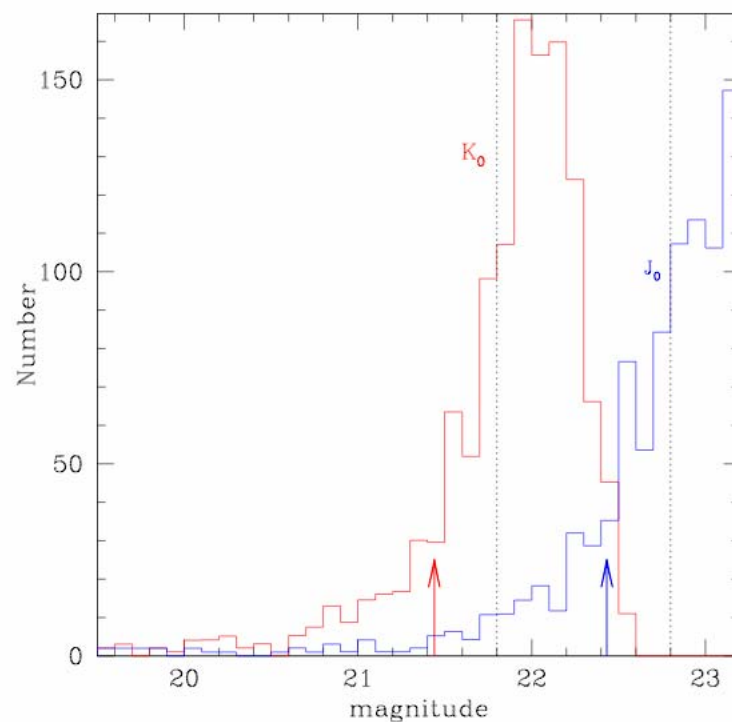
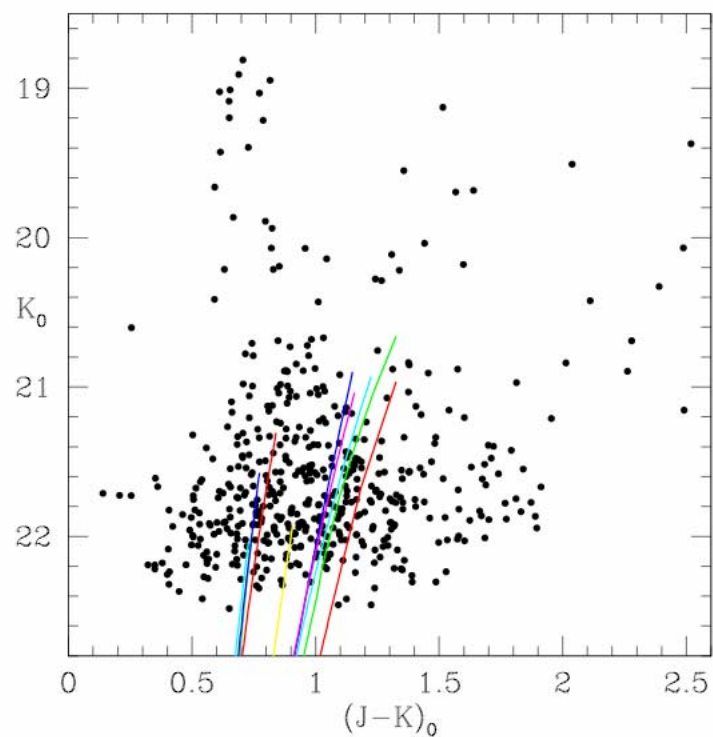
AM 1343-452

$\langle[\text{Fe}/\text{H}]\rangle = -1.6 \pm 0.2 \text{ dex}$   
 $(m-M) = 27.86 \pm 0.20$



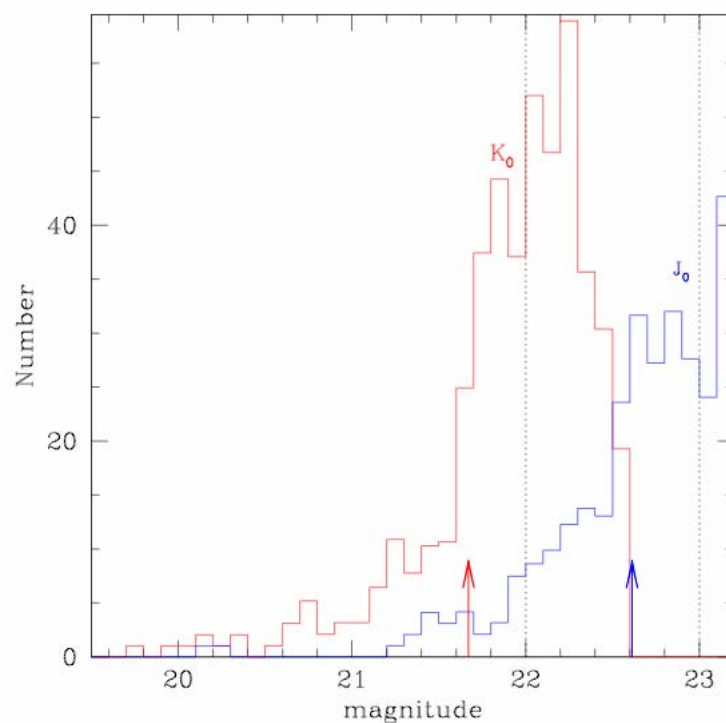
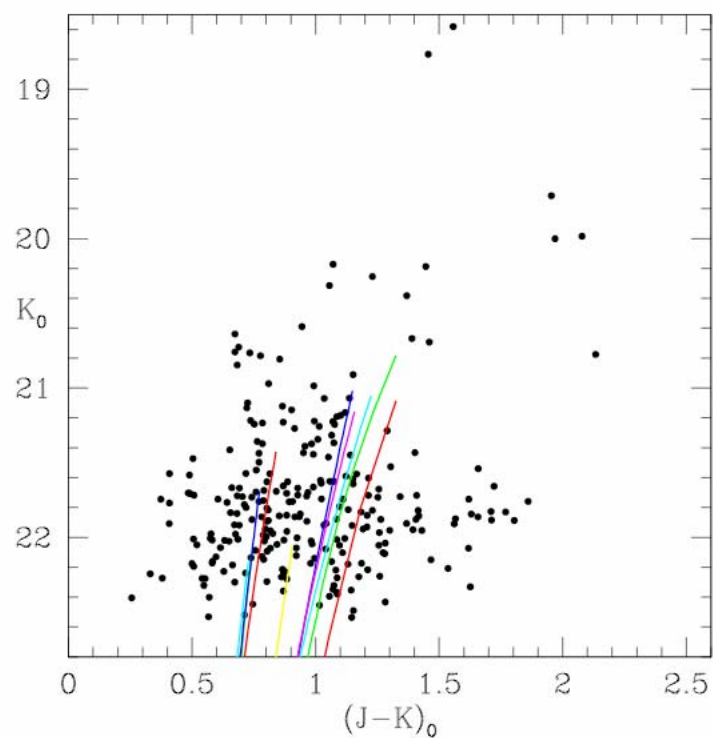
# AM 1339-445 Near-IR CMD and LF

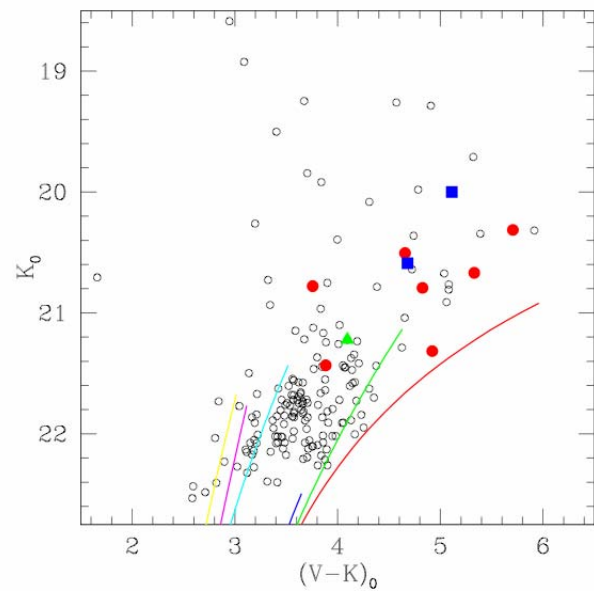
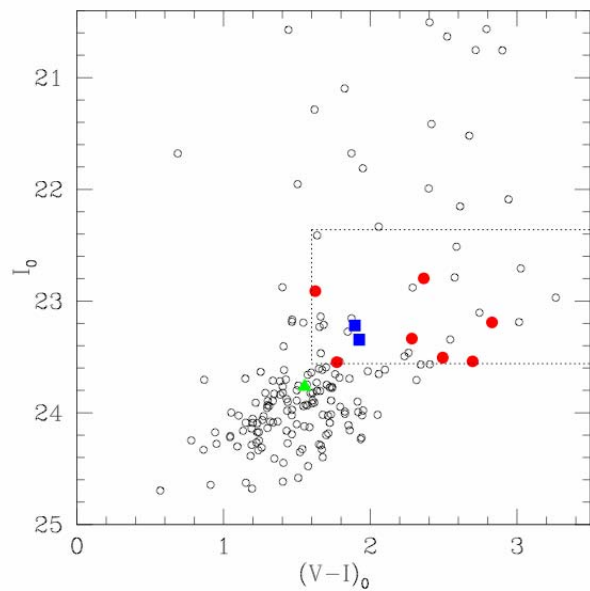
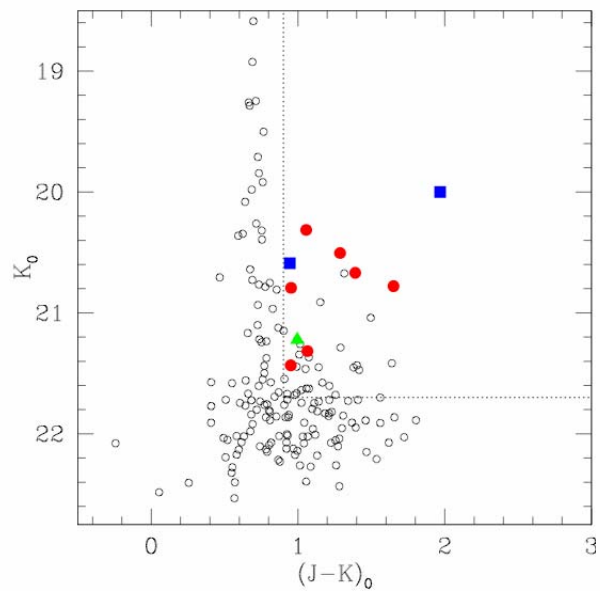
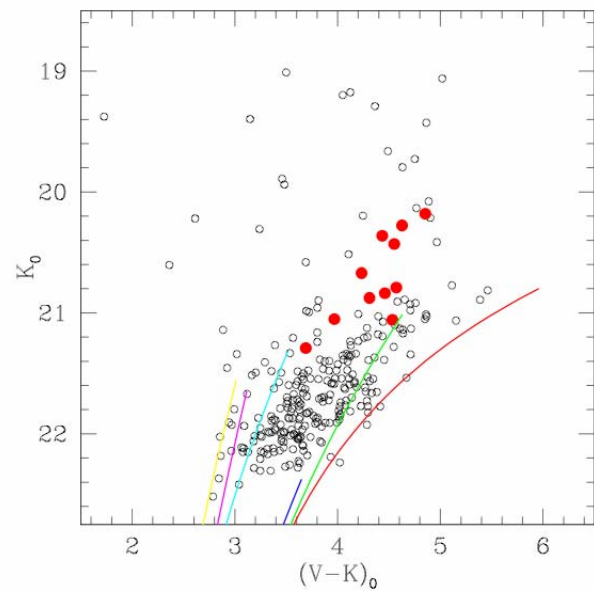
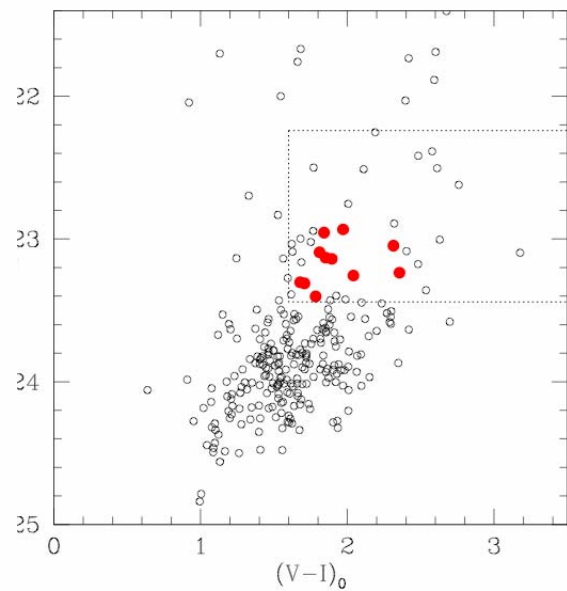
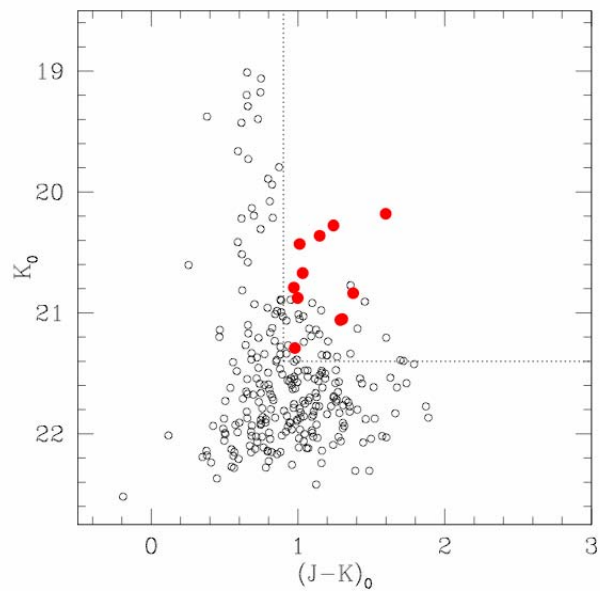
- $\langle[\text{Fe}/\text{H}]\rangle = -1.4$  dex
- $M_K^{\text{(TRGB)}}$  vs.  $[\text{Fe}/\text{H}]$  and  $M_J^{\text{(TRGB)}}$  vs.  $[\text{Fe}/\text{H}]$  from Valenti et al. 2004



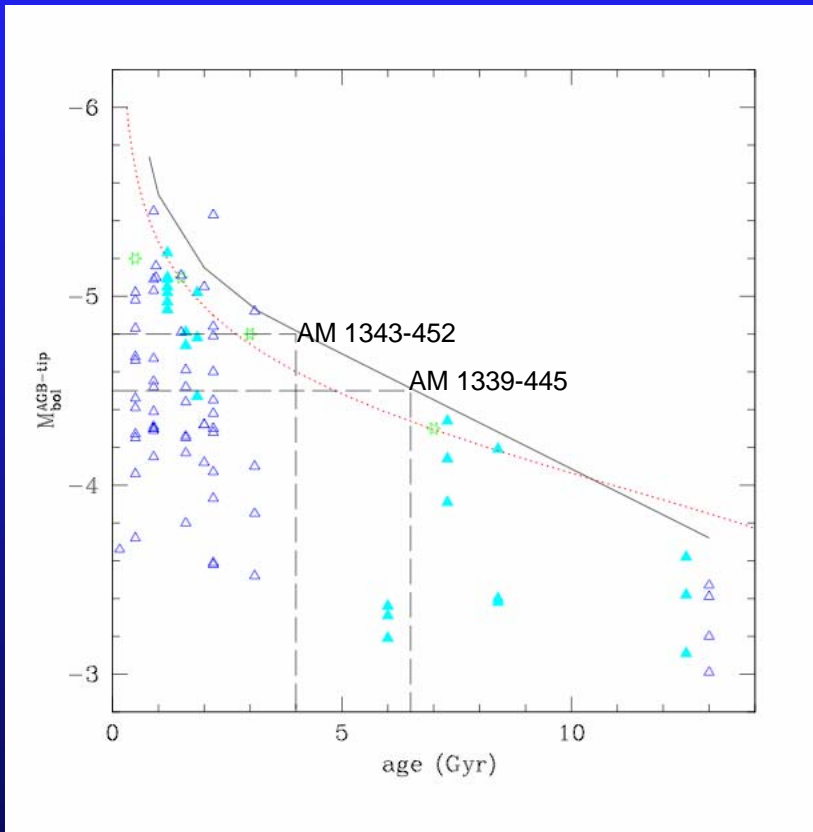
# AM 1343-452 Near-IR CMD and LF

- $\langle[\text{Fe}/\text{H}]\rangle = -1.6$  dex
- $M_K^{(\text{TRGB})}$  vs.  $[\text{Fe}/\text{H}]$  and  $M_J^{(\text{TRGB})}$  vs.  $[\text{Fe}/\text{H}]$  from Valenti et al. 2004





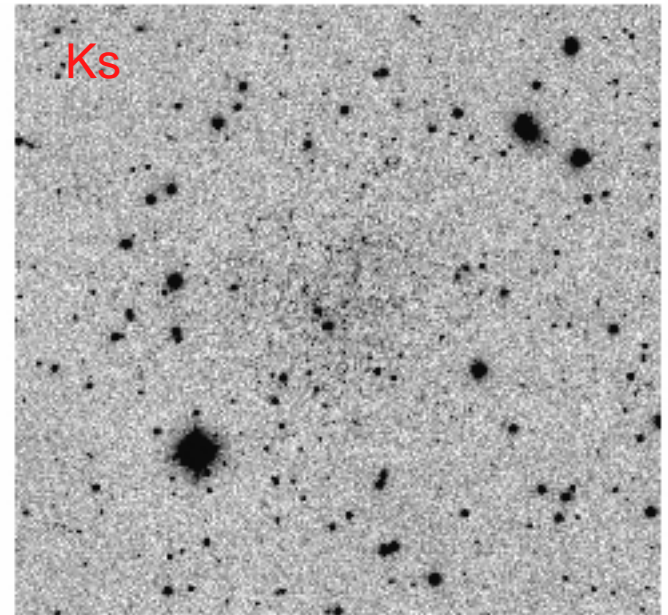
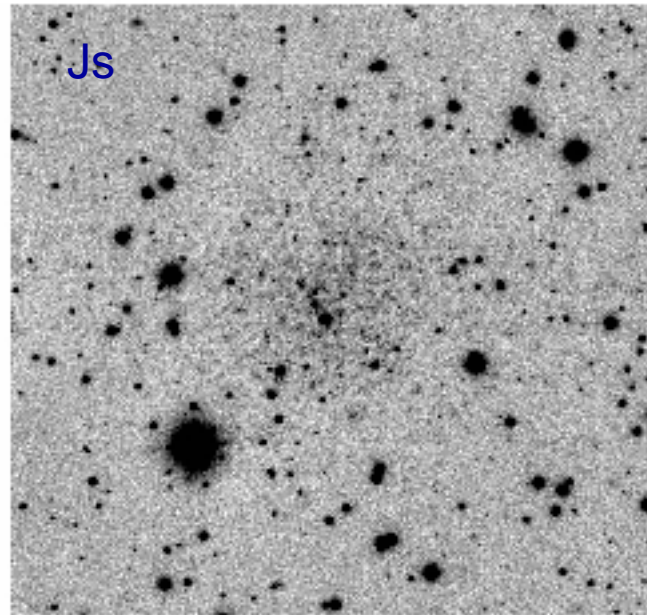
# AGB tip vs. age



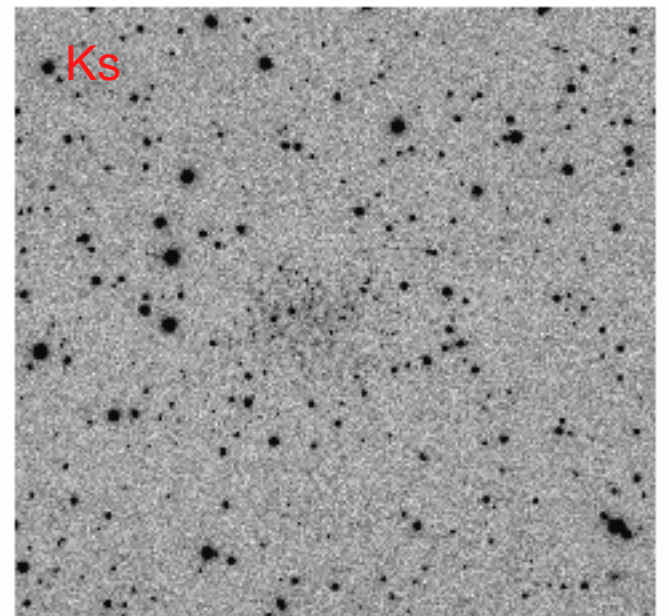
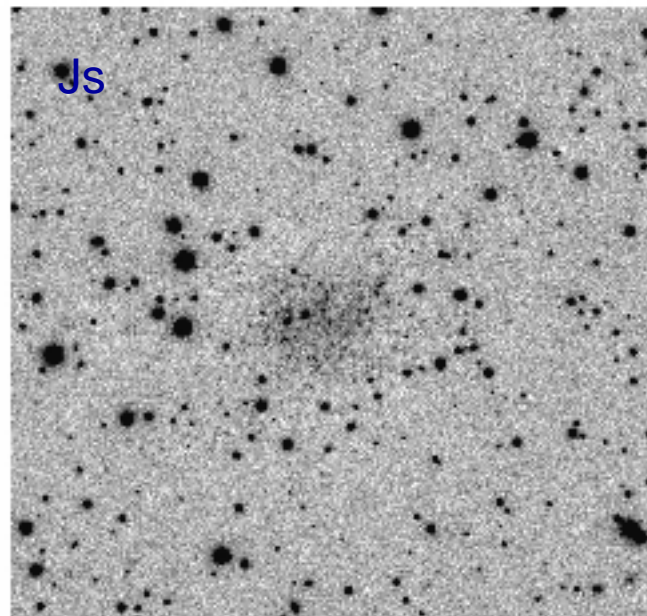
- Empirical relation based on the LMC and SMC cluster data
- MW companions: Fornax, Leol, Carina & Leoll
- The last significant star formation events:  
AM1339-445:  $6.5 \pm 1$  Gyr  
AM1343-452:  $4 \pm 1$  Gyr
- What fraction of stars belong to intermediate-age population:
  - from number ratio of upper-AGB/TRGB giants  
 $\sim 15\%$



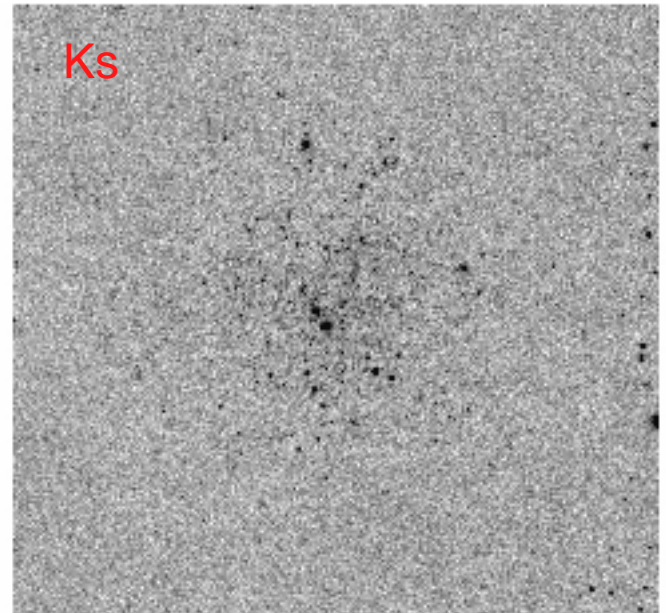
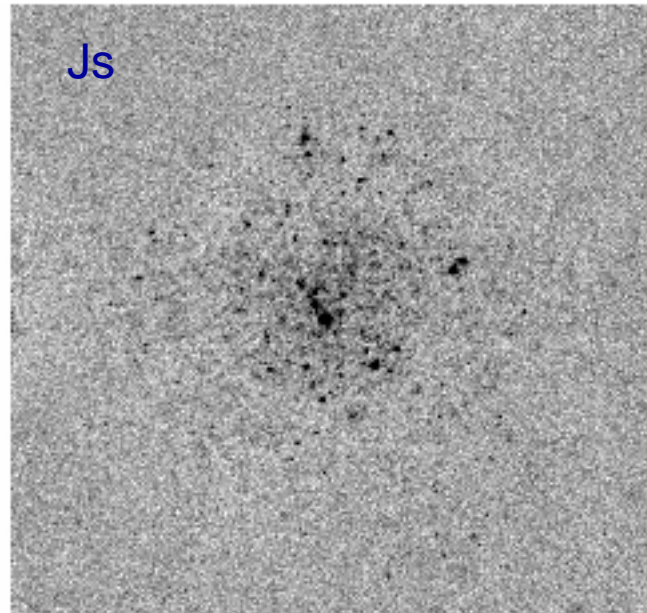
AM 1339-445



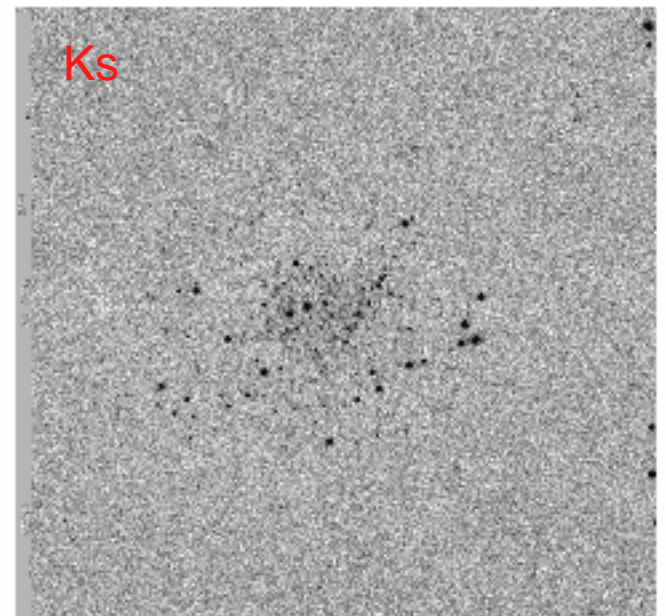
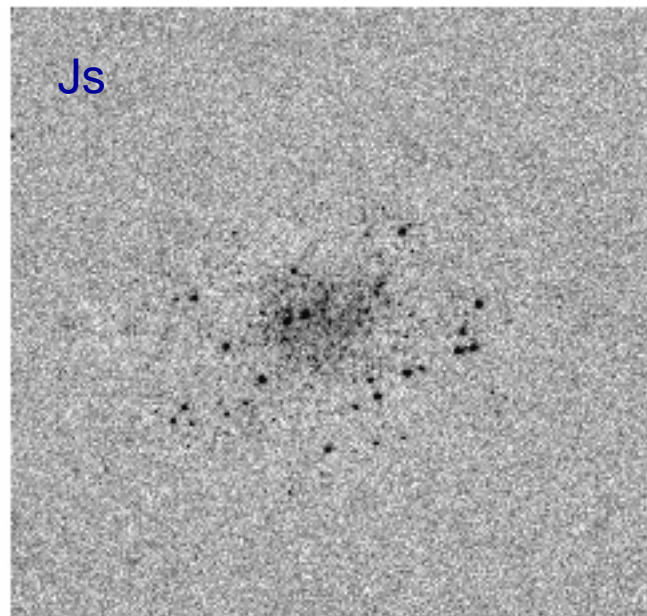
AM 1343-452



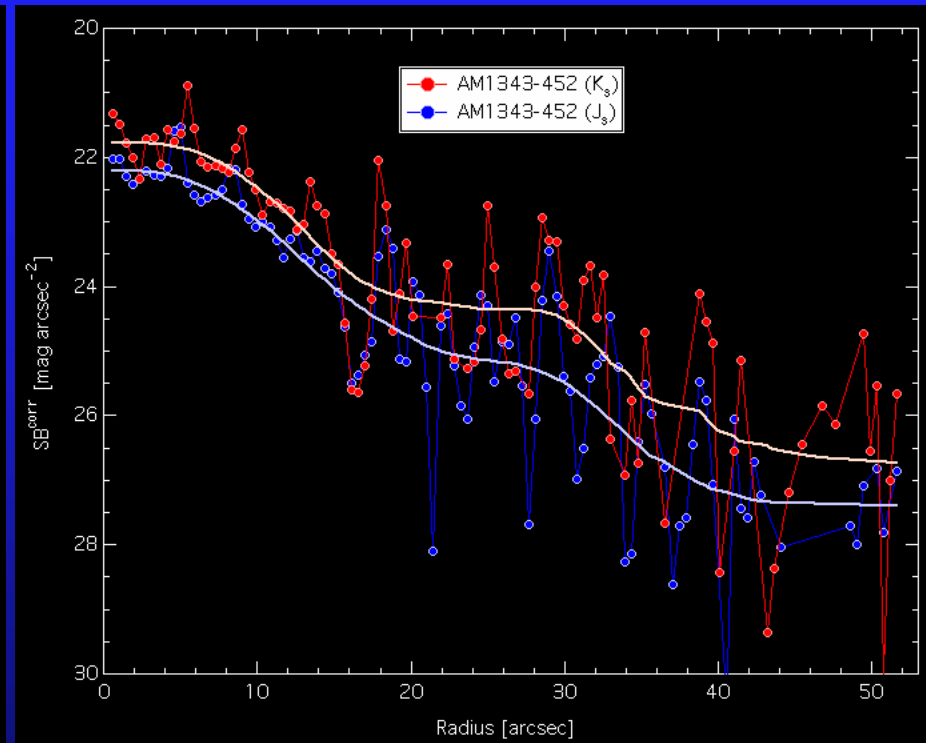
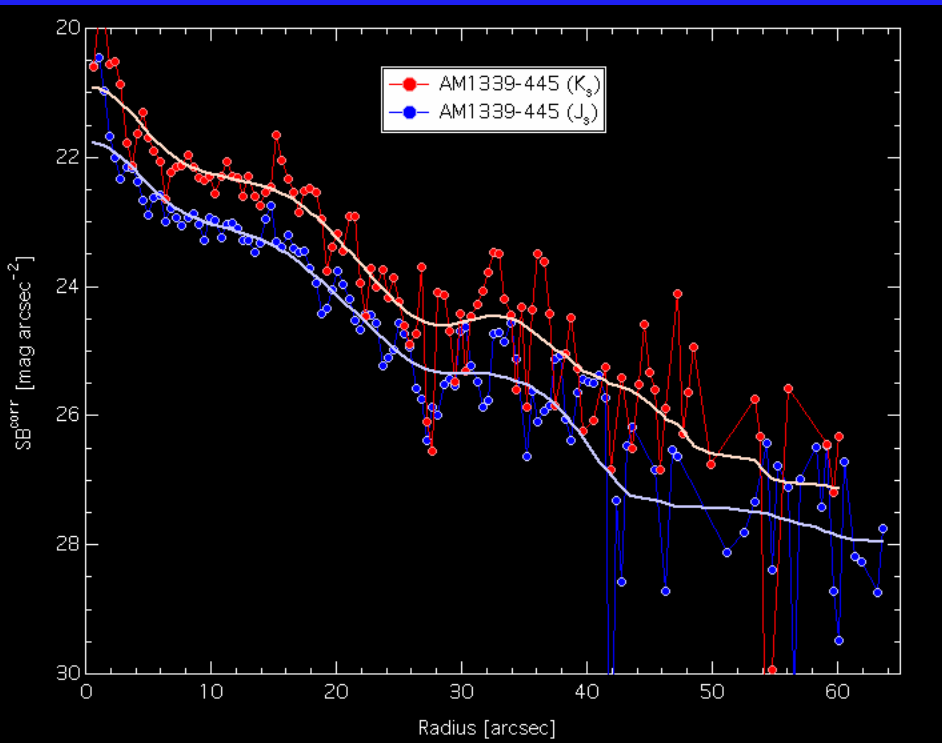
AM 1339-445



AM 1343-452



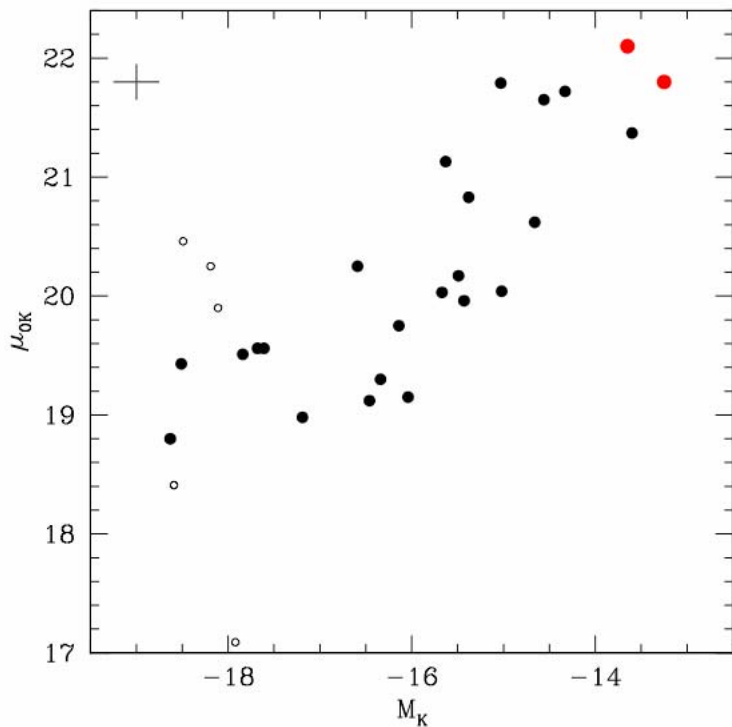
# Surface brightness profiles



	$m_{\text{tot}}(\text{mag})$	$R_{\text{eff}}(\text{''})$	$SB_{\text{eff}}$
$J_s$	14.97(0.35)	14.87	22.83
$K_s$	14.09(0.37)	15.50	22.04

	$m_{\text{tot}}(\text{mag})$	$R_{\text{eff}}(\text{''})$	$SB_{\text{eff}}$
$J_s$	15.13(0.39)	12.74	22.65
$K_s$	14.61(0.40)	12.87	22.15

# Luminosity vs. surface brightness and color



Vaduvescu et al. 2005

