EAGLE: Resolved Stellar Populations & simulations with Specsim

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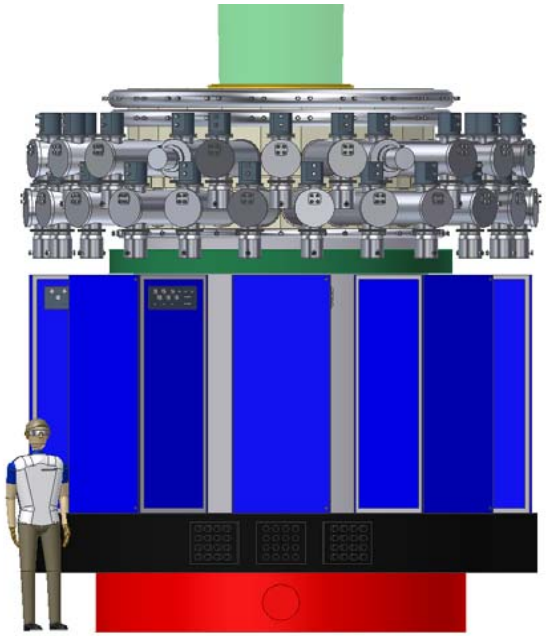
DRM Workshop, May 2008

EAGLE Science Requirements



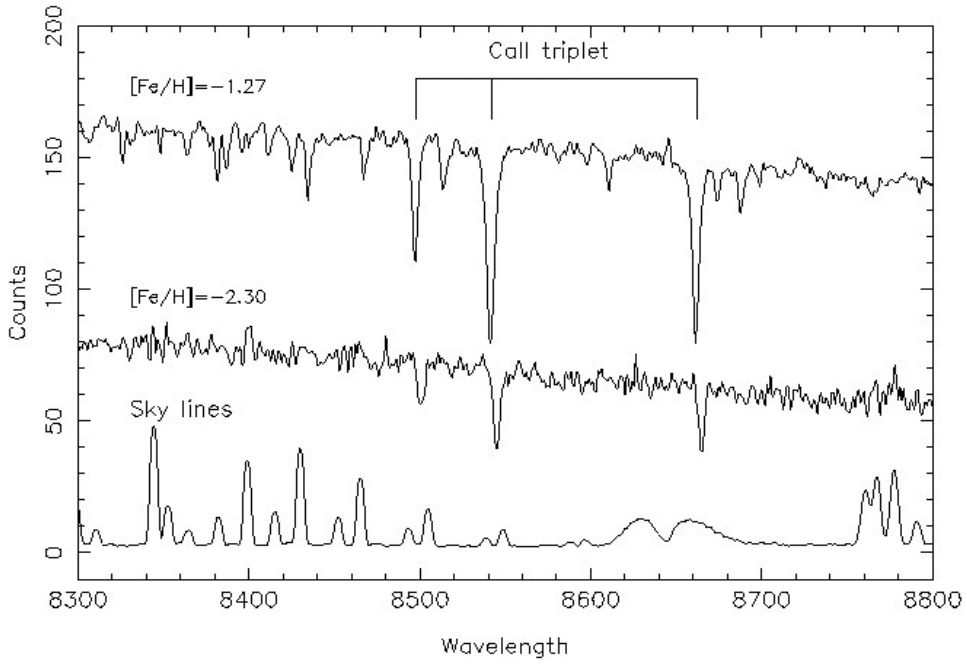
Parameter	Requirement
Patrol Field	5 arcmin diameter
IFU field-of-view	> 1.5 arcsec
Multiplex	> 20
Spatial Resolution	30%EE in 75mas (H-band)
Spectral resolution	4,000 & 10,000
Wavelength range	0.8-2.5 μm

More in Simon Morris' talk tomorrow…

Stellar Spectroscopy with EAGLE

- High-resolution (R~10,000) spectroscopy of the Calcium Triplet @ 860nm.

  → kinematics & metallicities



Tolstoy et al. (2001)

Stellar Spectroscopy with EAGLE

- High-resolution (R~10,000) spectroscopy of the Calcium Triplet @ 860nm.
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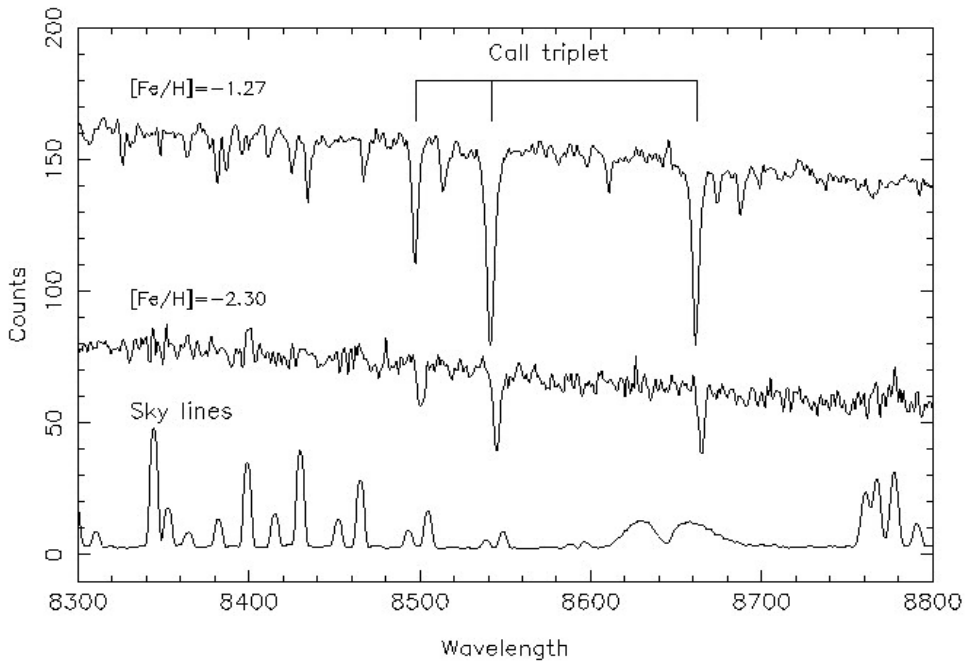
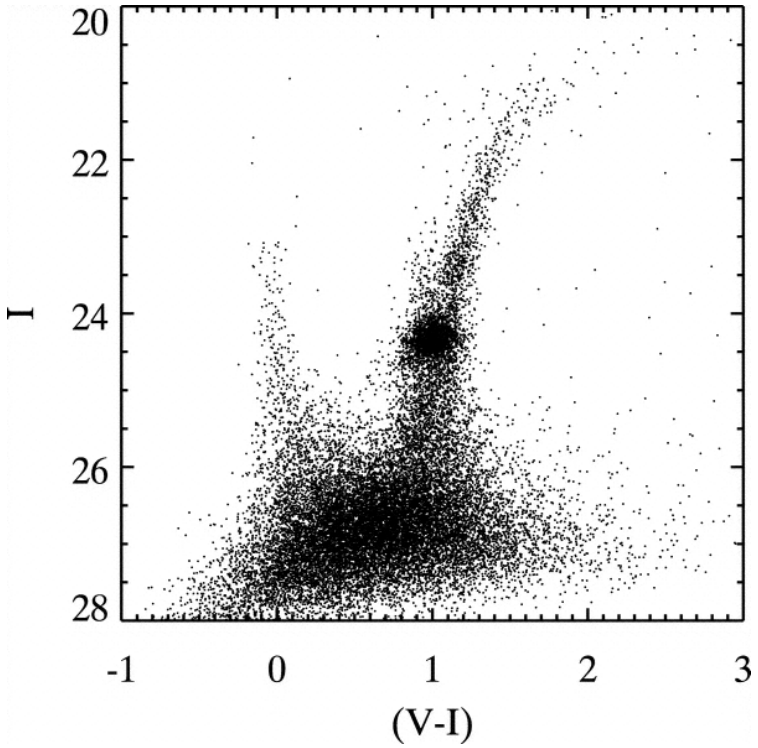


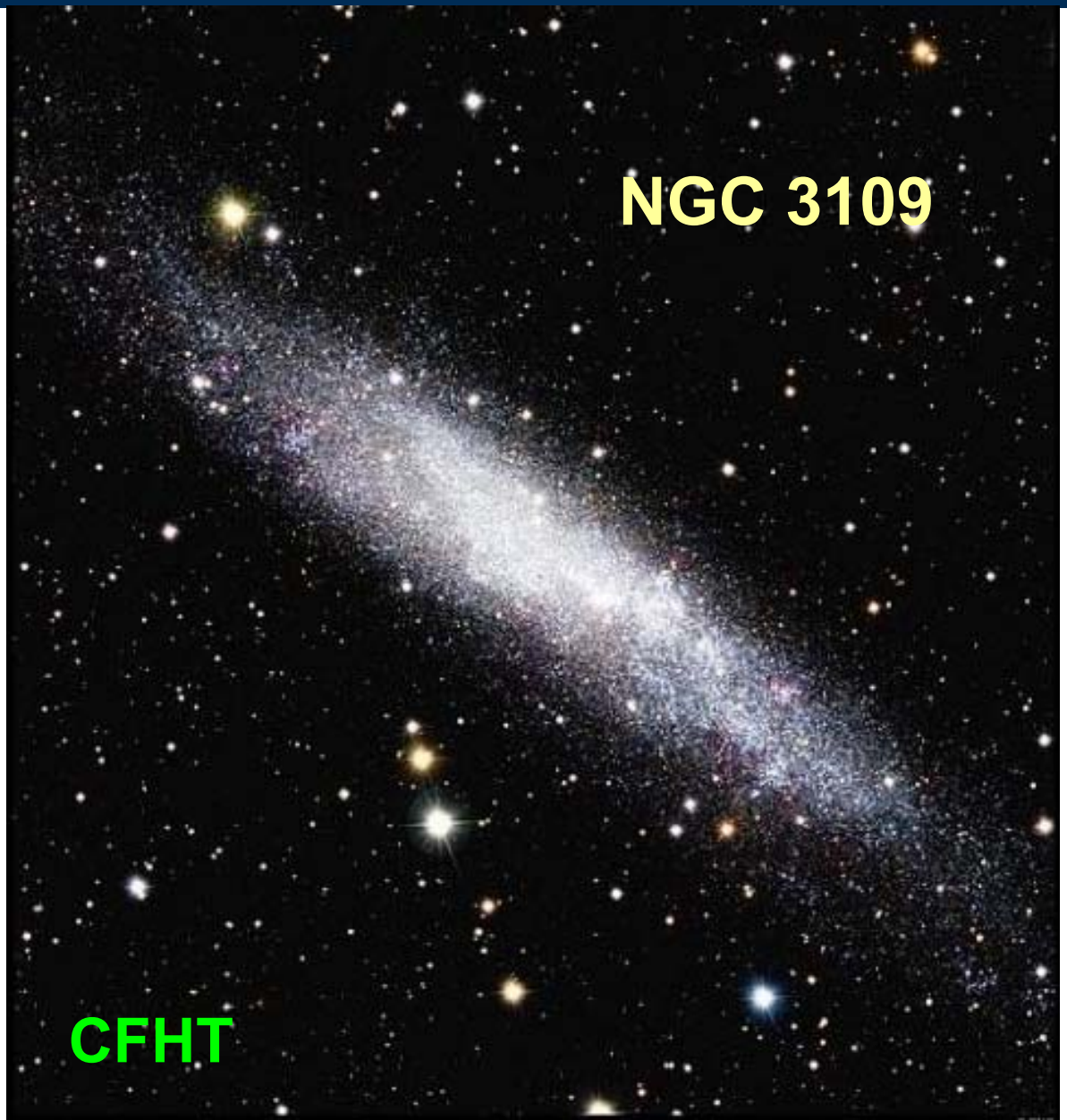
Tolstoy et al. (2001)

ACS photometry in M33



Barker et al. (2007)

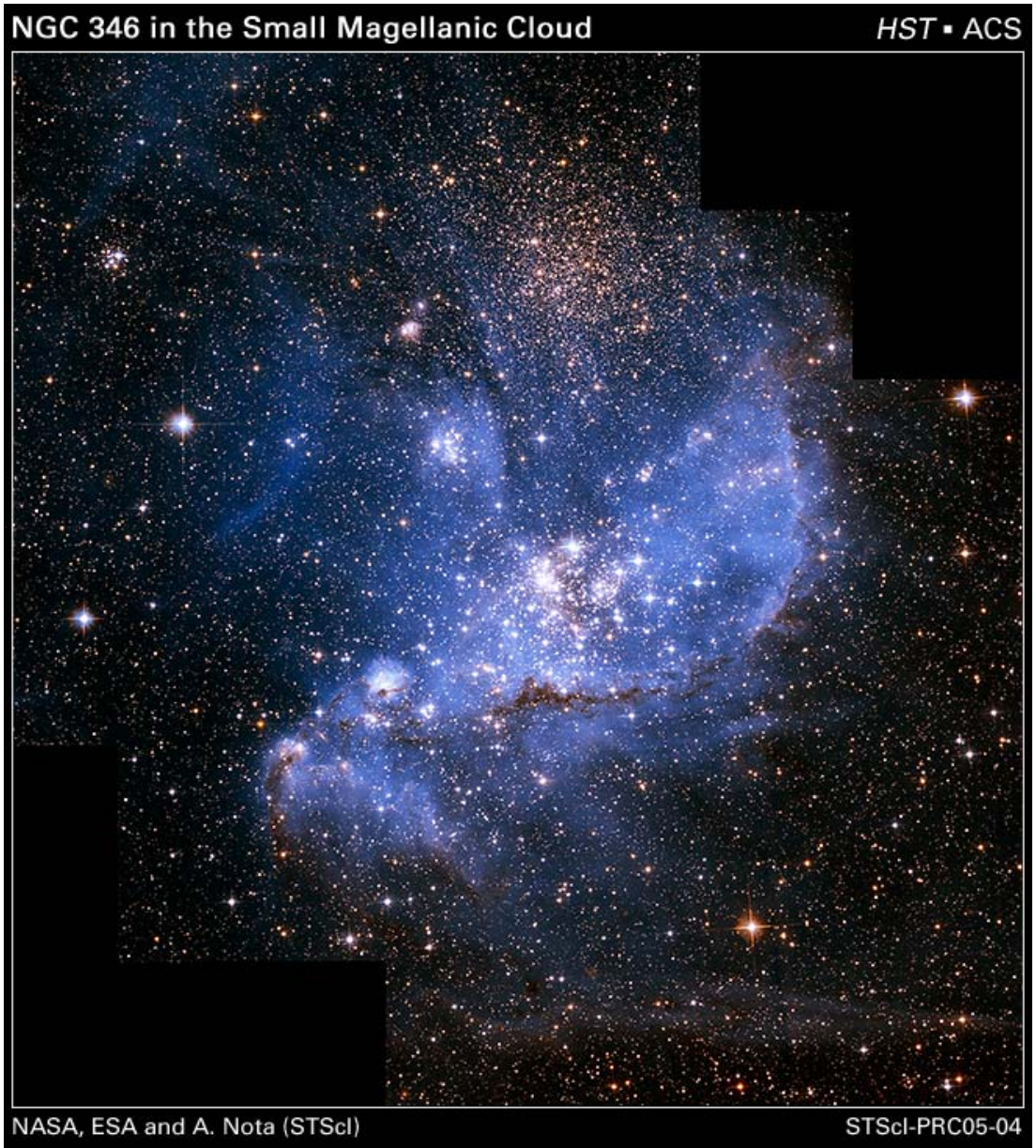
Stellar Spectroscopy with EAGLE



DM = 25.54

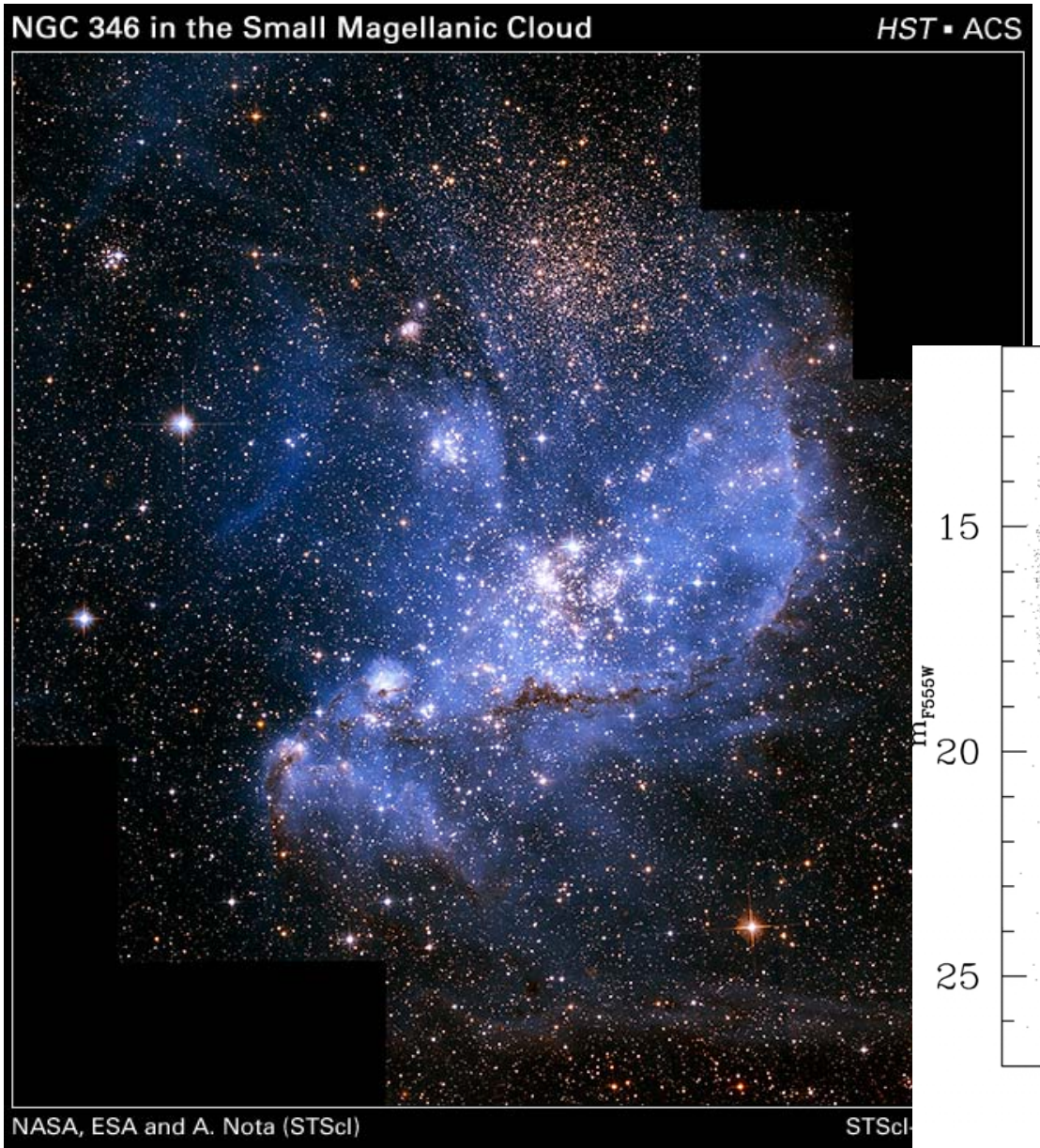
d = 1.3 Mpc

Cluster template

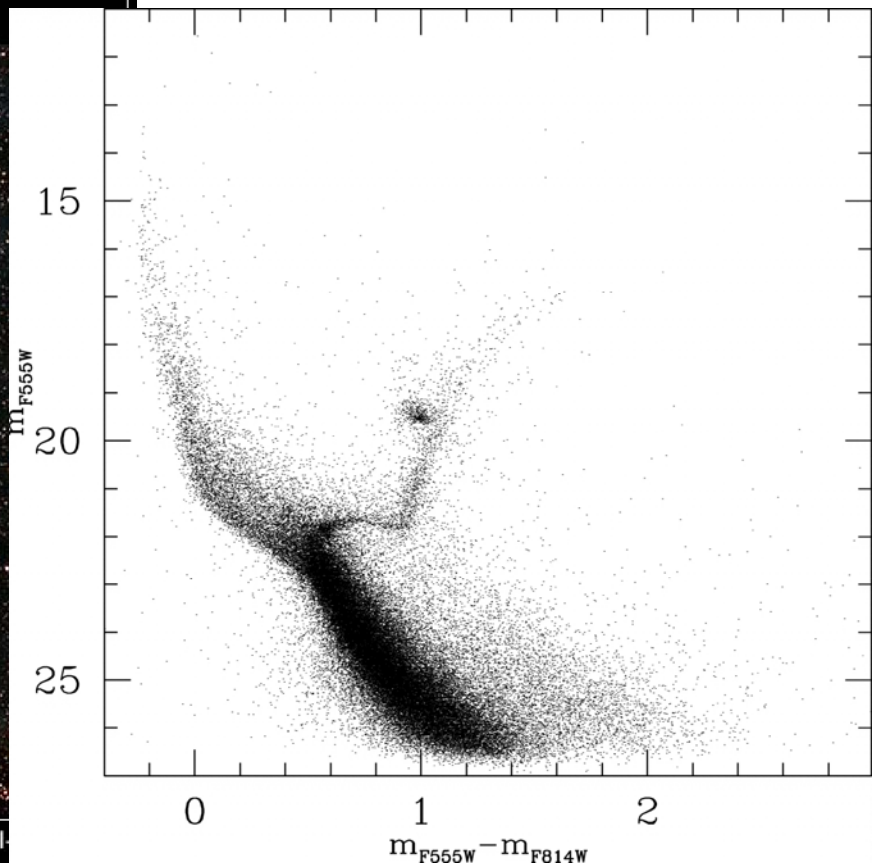


- **NGC346: Largest HII region in the SMC**

Cluster template



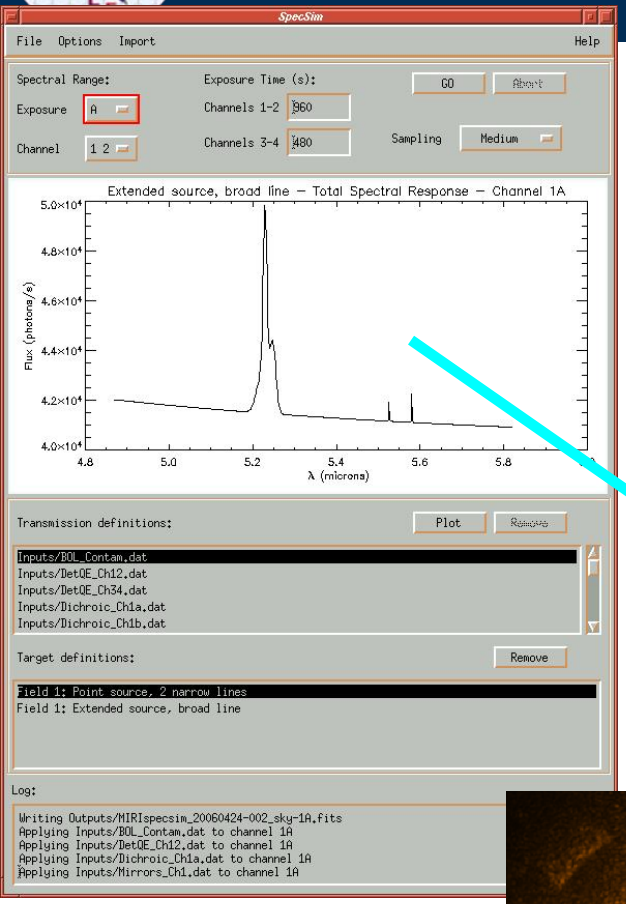
- **NGC346: Largest HII region in the SMC**
- **Scale population to 1.3 Mpc**



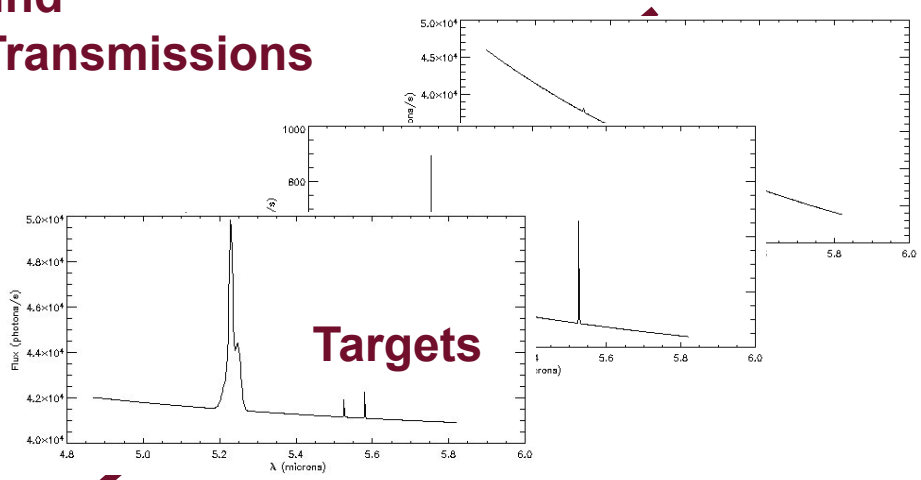
Specsim

- **Spectral simulator developed to model observations with JWST-MIRI**
- **Now adapted for use with the E-ELT**

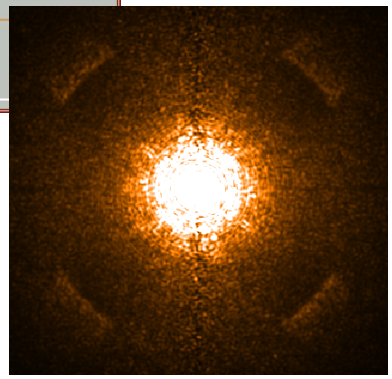
Specsim



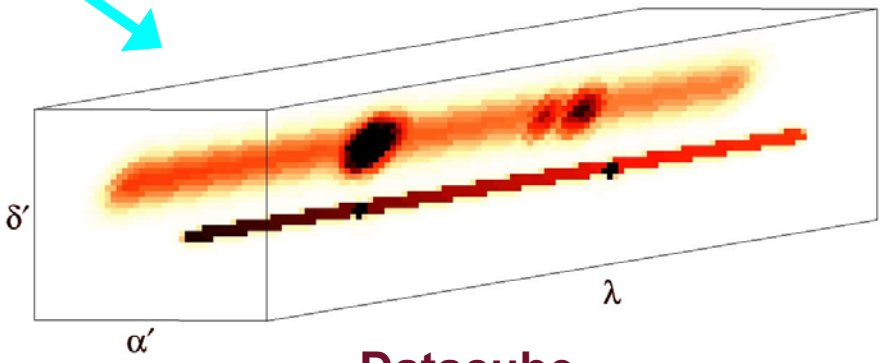
Sky Background
AtmosphericTransmissions



Targets

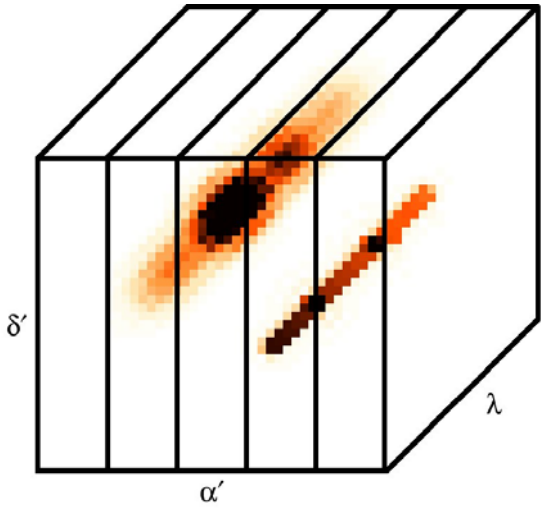


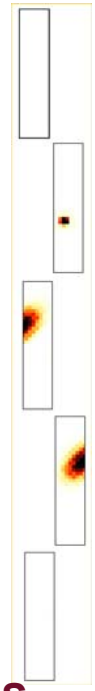
PSF

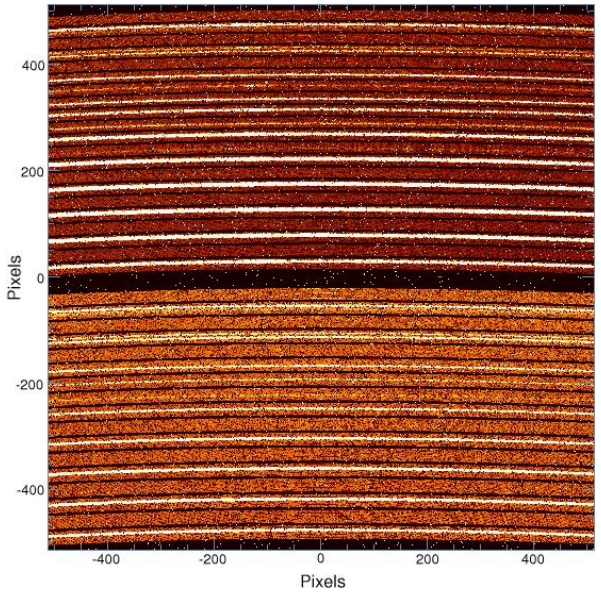


Datacube

Specsim



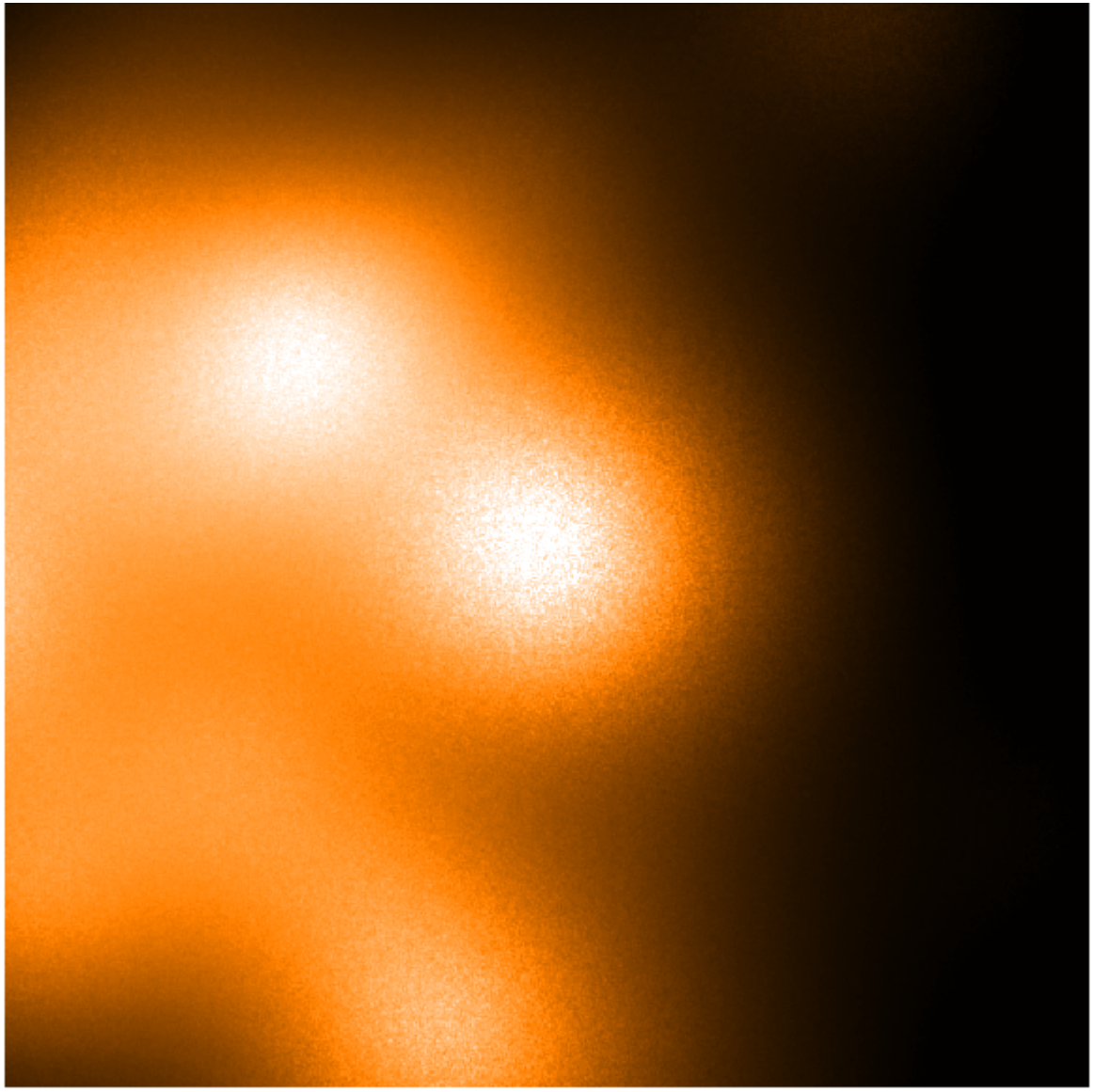




Transmission Functions

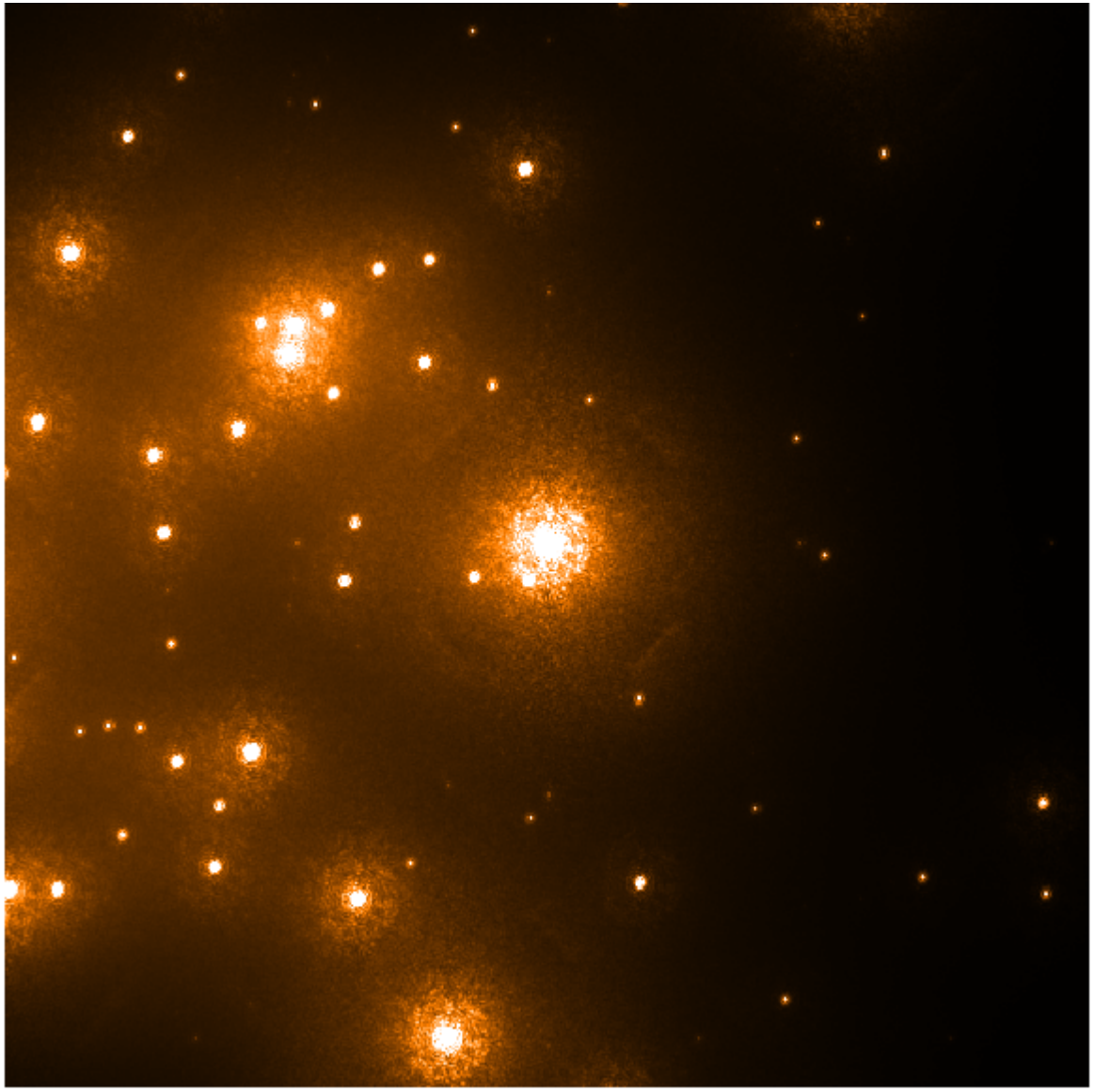
Cosmic Rays
Noise
Exposure Time

I-band Sky-cube Images: GLAO



- 1.6x1.6 arcsec
- GLAO PSF
[Miska LeLouarn/ESO]
- 5xLGS @r = 3 arcmin

I-band Sky-cube Images: LTAO

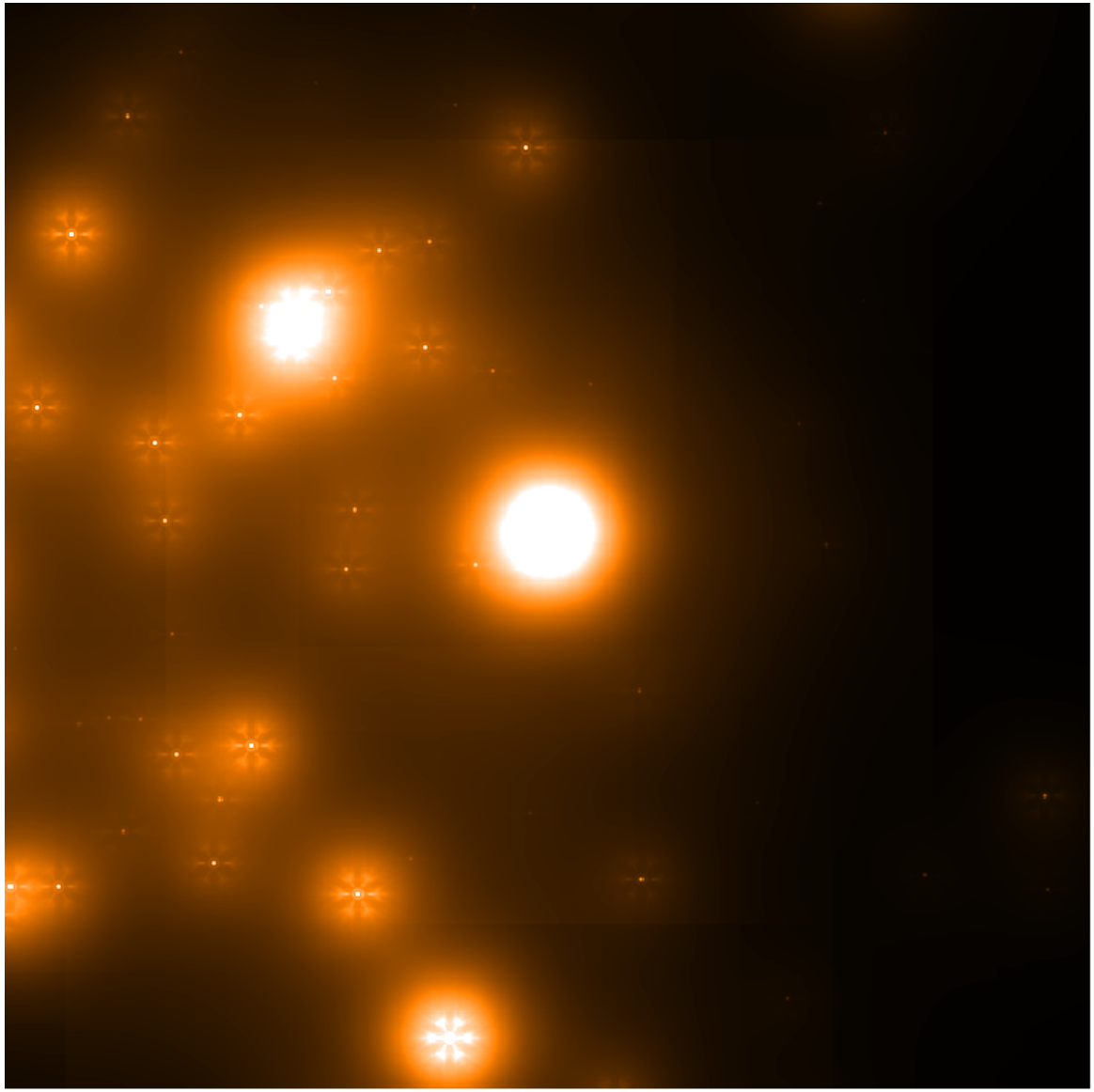


- 1.6x1.6 arcsec

- LTAO PSF
[Miska LeLouarn/ESO]

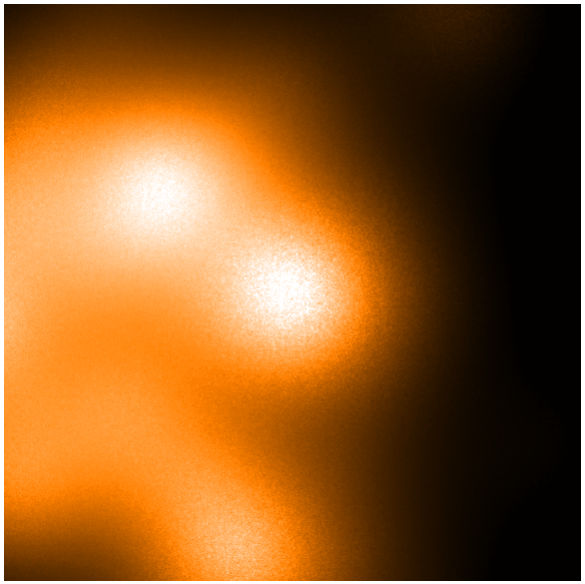
- 5xLGS @r = 45 arcsec
- 1xLGS @centre

I-band Sky-cube Images: MOAO

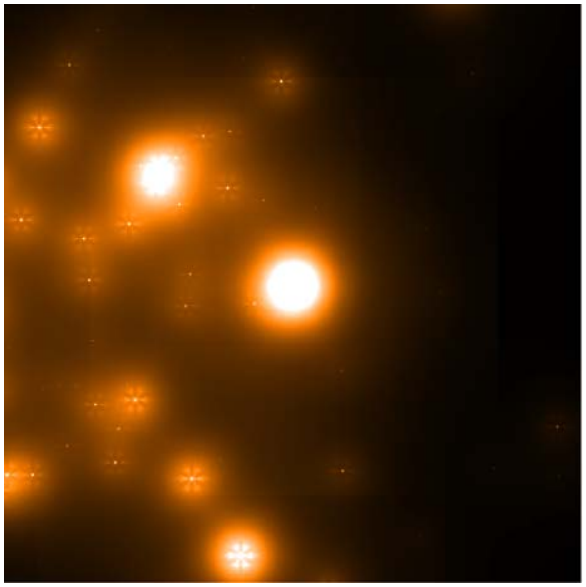


- 1.6x1.6 arcsec
- MOAO PSF
[ONERA, Paris]
- 6xLGS @r = 3.4 arcmin

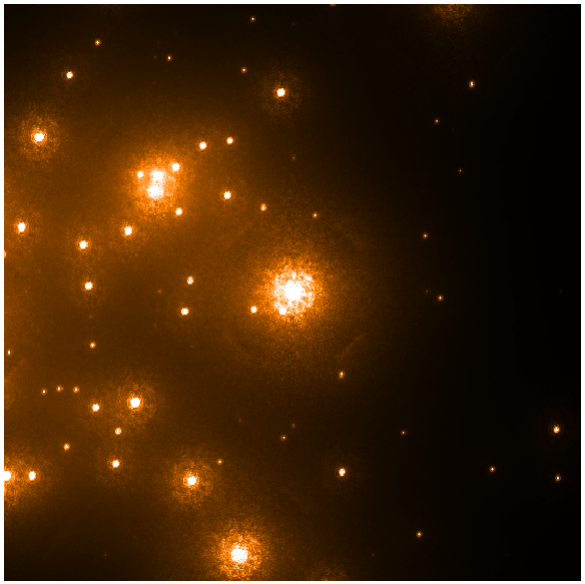
I-band Sky-cube Images



GLAO

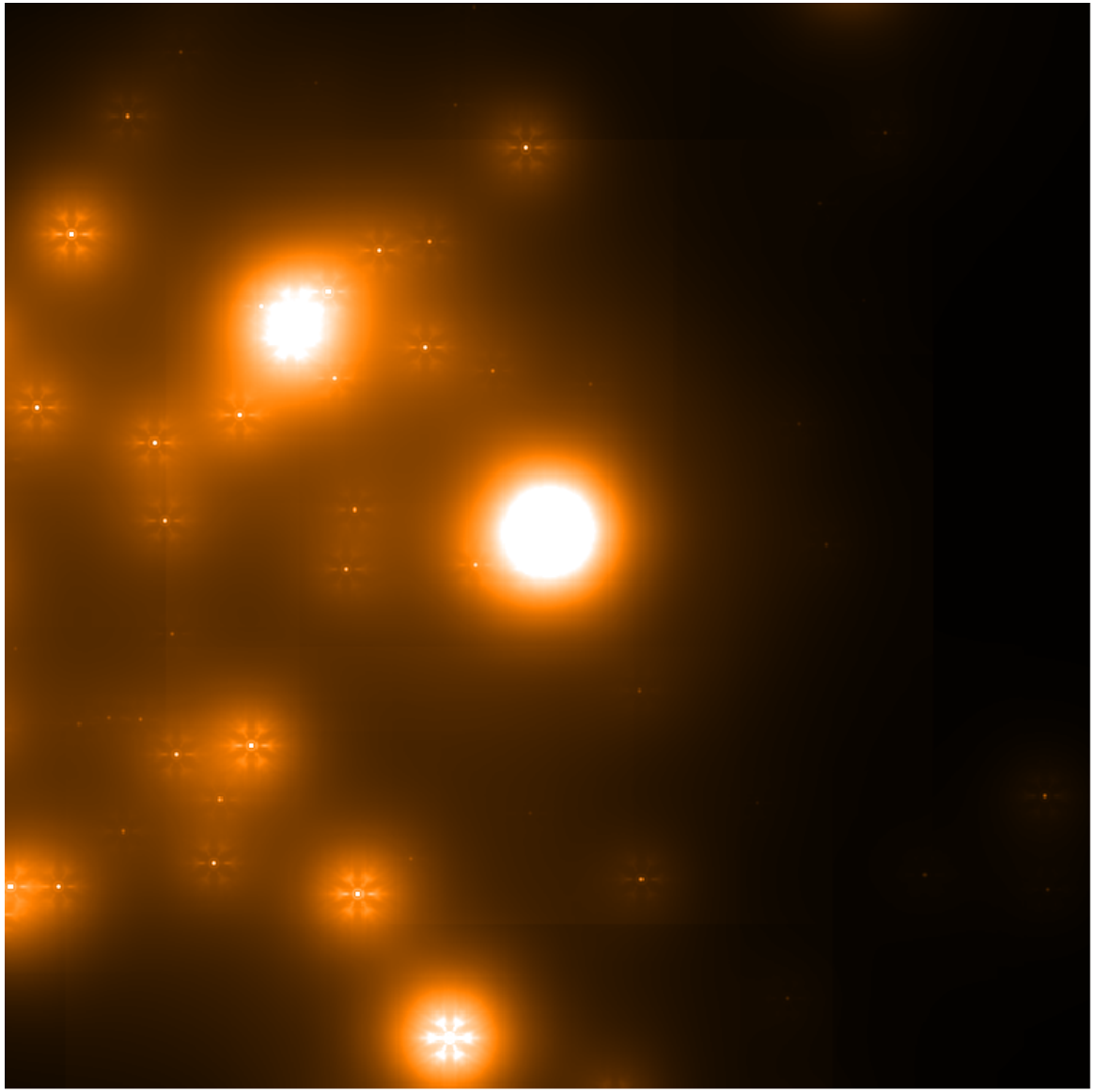


MOAO



LTAO

I-band Sky-cube Images: MOAO

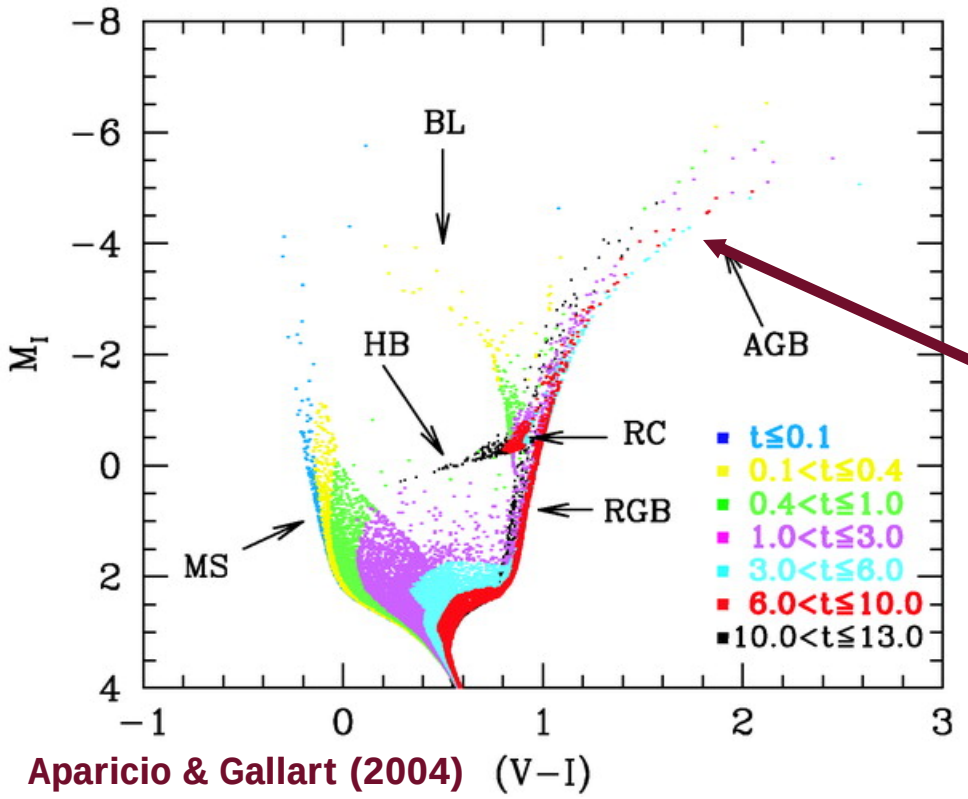


Input to EAGLE Phase A requirements:

- **Ensquared energy (EE)**
- **Crosstalk/form of PSF**

Next step is to include CaT templates…

Sensitivities @1.3 Mpc with EAGLE



Aparicio & Gallart (2004)

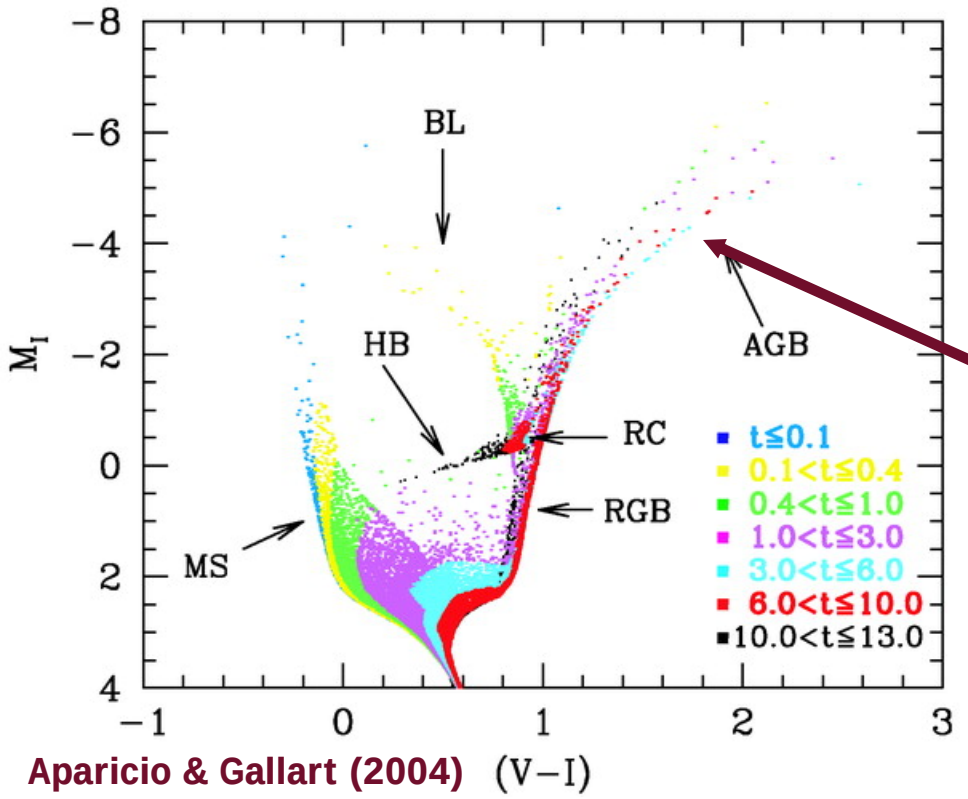
DM = 25.54

Sensitivities: @ R=10,000

TRGB: M_I ~ –4 → I ~ 21.5

ONERA simulations give
30% EE in ~175 mas in I-band

Sensitivities @1.3 Mpc with EAGLE



Aparicio & Gallart (2004)

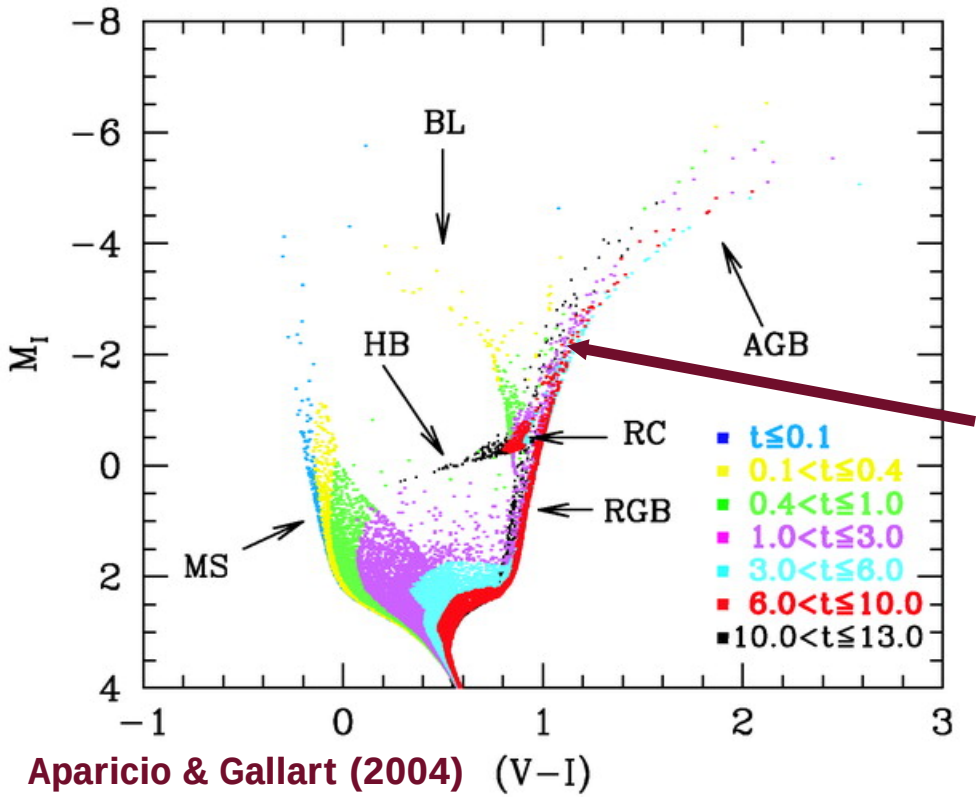
DM = 25.54

Sensitivities: @ R=10,000

TRGB: M_I ~ –4 → I ~ 21.5

D	Total time (S/N>10)
8m	~6 hrs, cf KMOS [5σ/8hrs]
30m	
42m	

Sensitivities @1.3 Mpc with EAGLE



Aparicio & Gallart (2004)

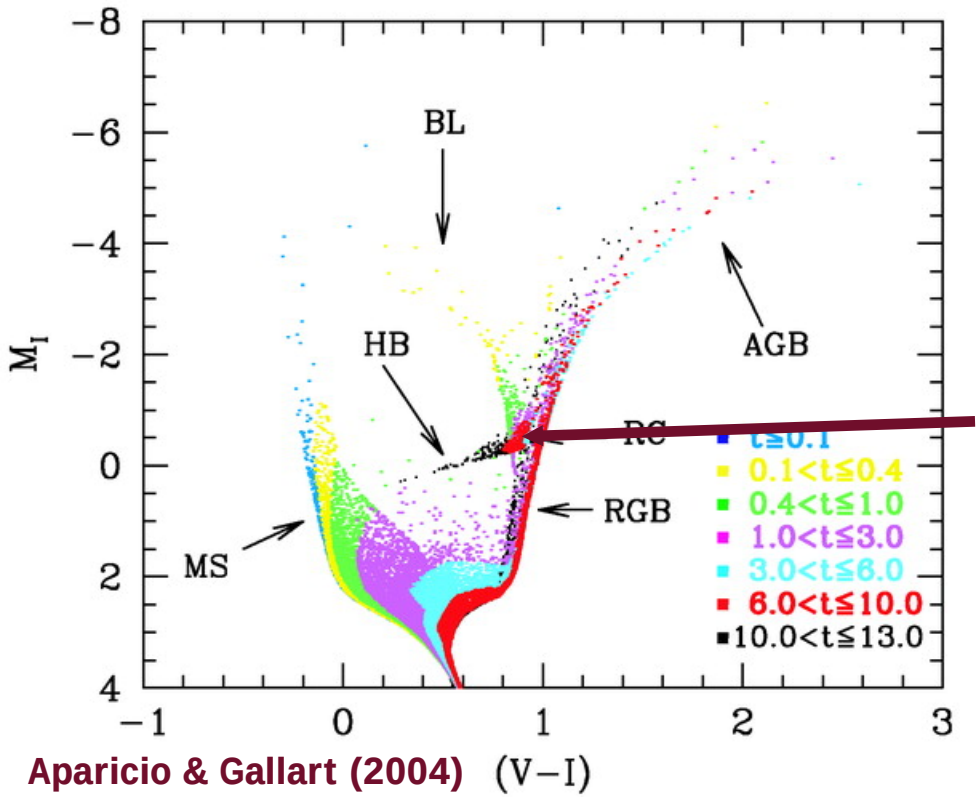
DM = 25.54

Sensitivities: @ R=10,000

Upper RGB: M_I ~ –2 → I ~ 23.5

D	Total time (S/N~10)
8m	200 hrs
30m	3 hrs
42m	2 hrs

Sensitivities @1.3 Mpc with EAGLE



Aparicio & Gallart (2004)

DM = 25.54

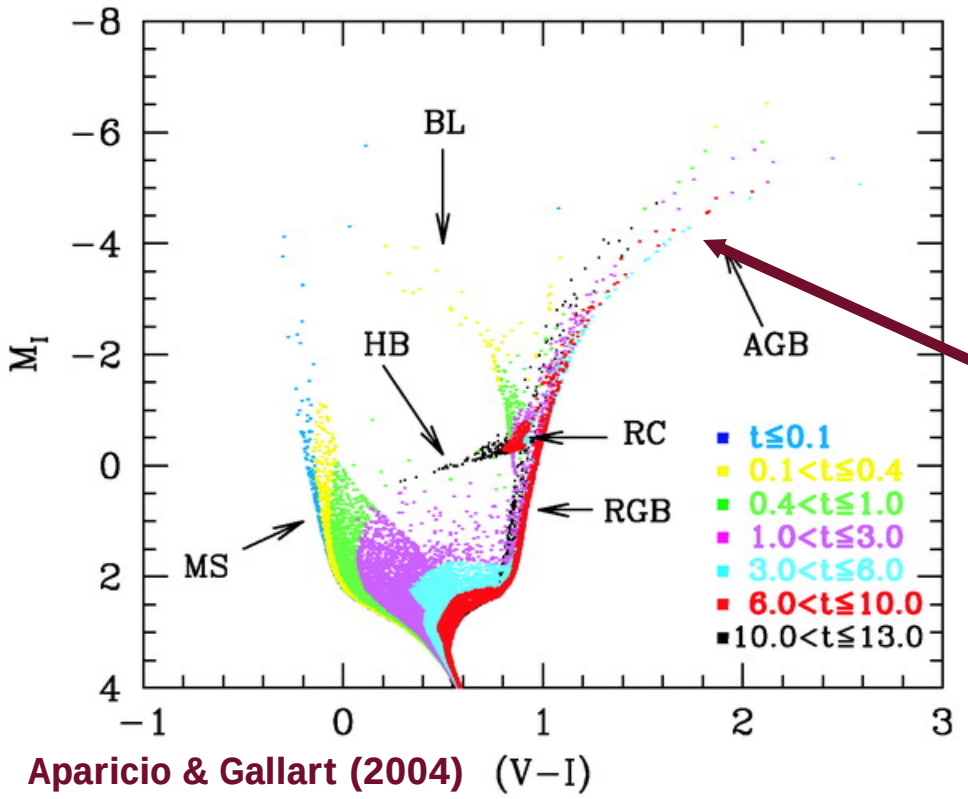
Sensitivities: @ R=10,000

RC: $M_I \sim 0 \rightarrow I \sim 25.5$

D	Total time (S/N~10)
8m	10,000 hrs
30m	125 hrs
42m	50 hrs

cf. ESO E-ELT ETC, R~10,000, LTAO, 100mas → 47.5 hours

Sensitivities @15.5 Mpc with EAGLE



Aparicio & Gallart (2004)

DM = 30.9, M87 in Virgo

Sensitivities: @ R=4,000

TRGB: $M_I \sim -4 \rightarrow I \sim 26.9$

D	Total time (S/N~10)
30m	500 hrs
42m	250 hrs

Thank You