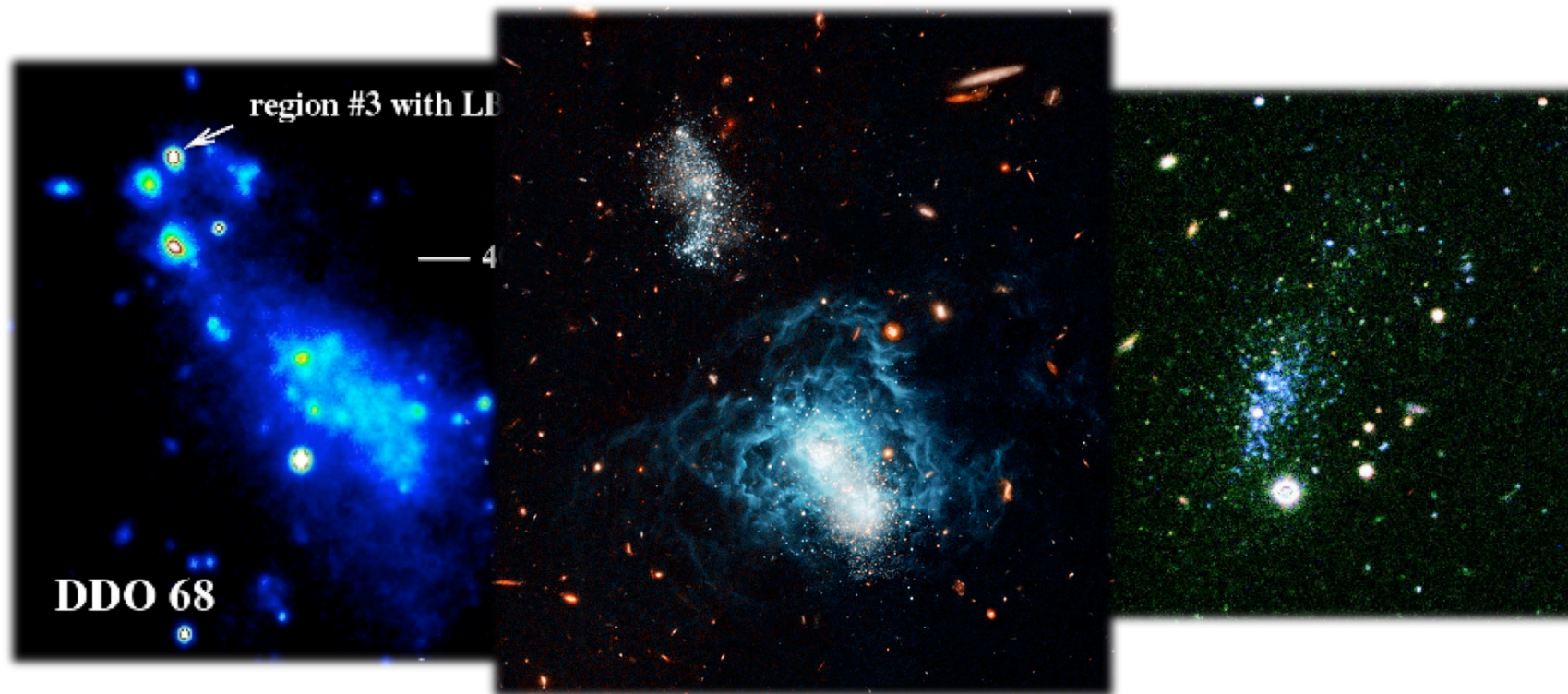


Massive stars far beyond the Local Group

*Chris Evans (UKATC, Edinburgh), Miriam Garcia (CAB, Madrid)
Jean-Claude Bouret (LAM), Thierry Lanz (OCA)*



Introduction

Key points/requirements:

- Need empirical data to test predictions at very low Z
- UV spectra of metal-poor massive stars at >1 Mpc
-> LUVOIR
- Complementary optical spectroscopy
-> E-ELT/MOSAIC

Goal: UV spectra of individual massive stars in I Zw 18 (18 Mpc, $Z \sim 0.03Z_{\odot}$)



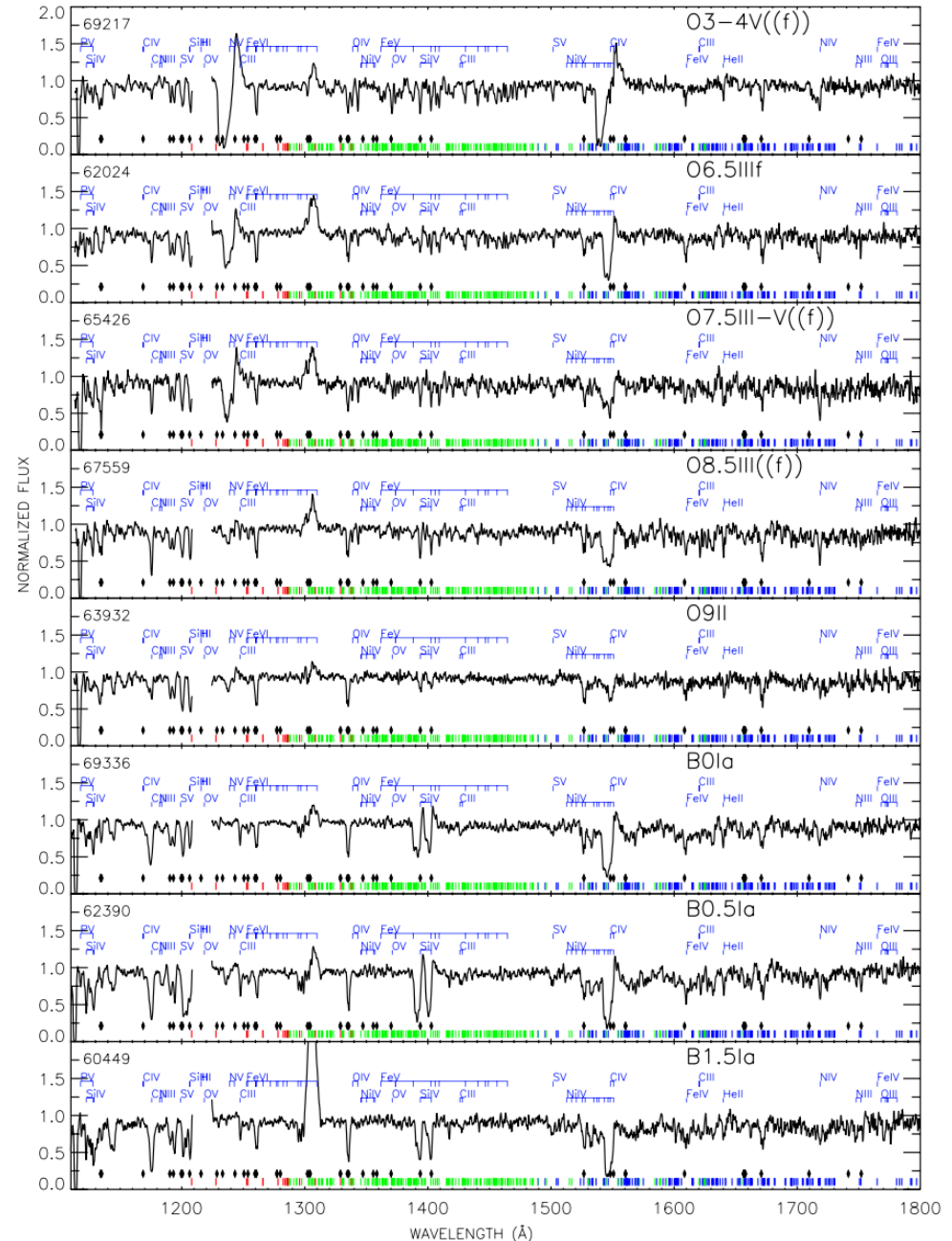
Current limits: UV

COS spectra in IC1613

Garcia et al. (2014)



Need UV for v_{∞} and Fe/H
Fe/H of IC1613 ~ SMC
Sub-solar $[\alpha/\text{Fe}]$ of -0.10

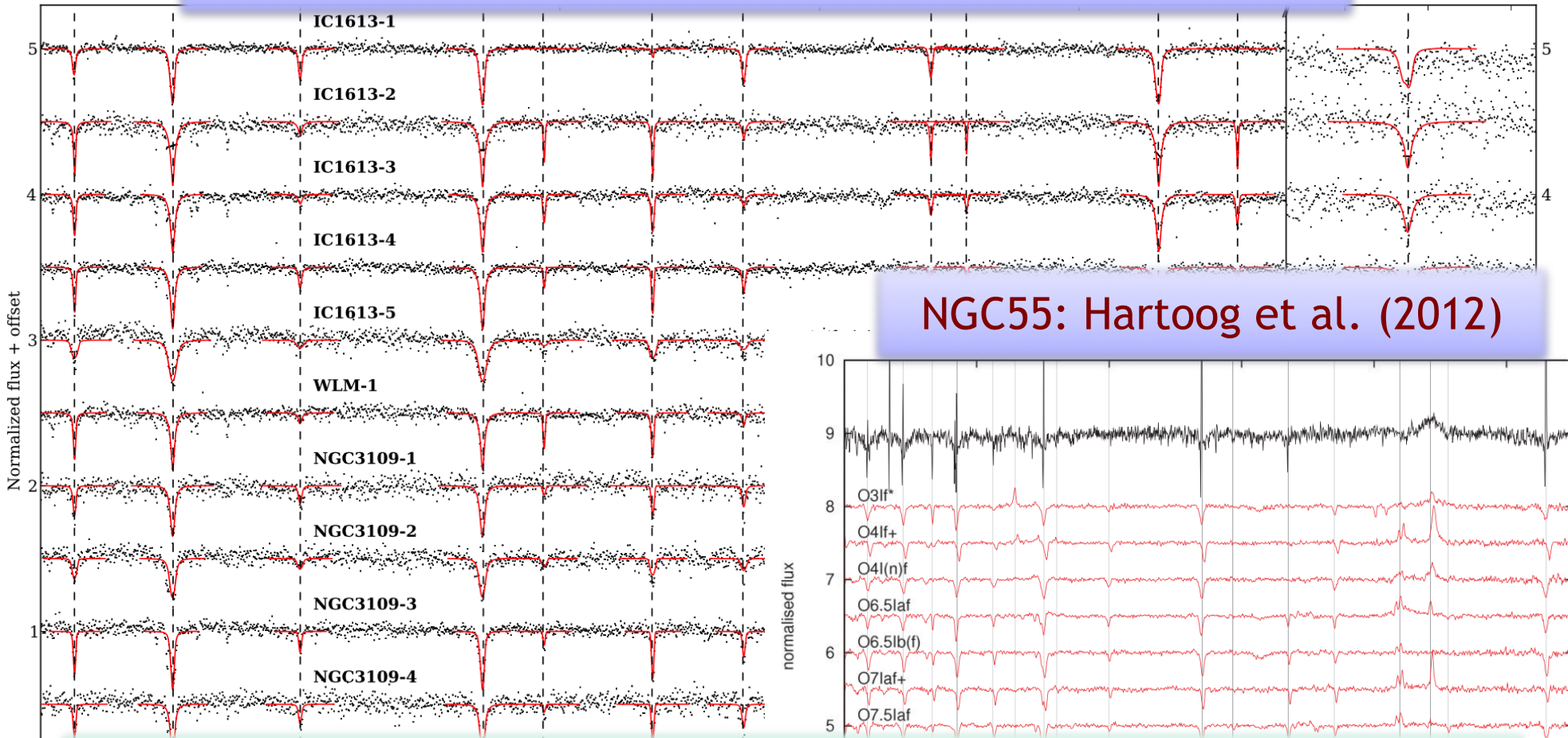


2 to 5 orbits per star

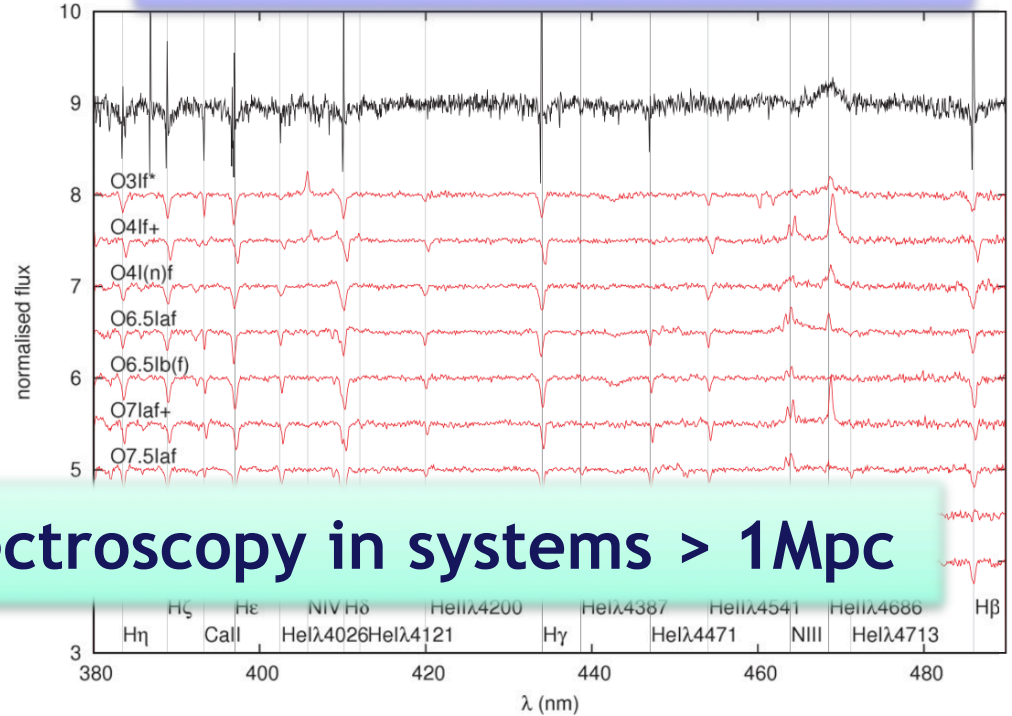


Current limits: Optical

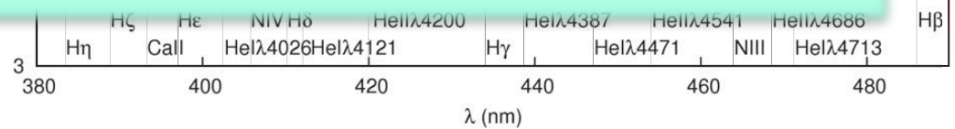
WLM, IC1613, NGC3109 (Tramper et al. (2011, 2014))



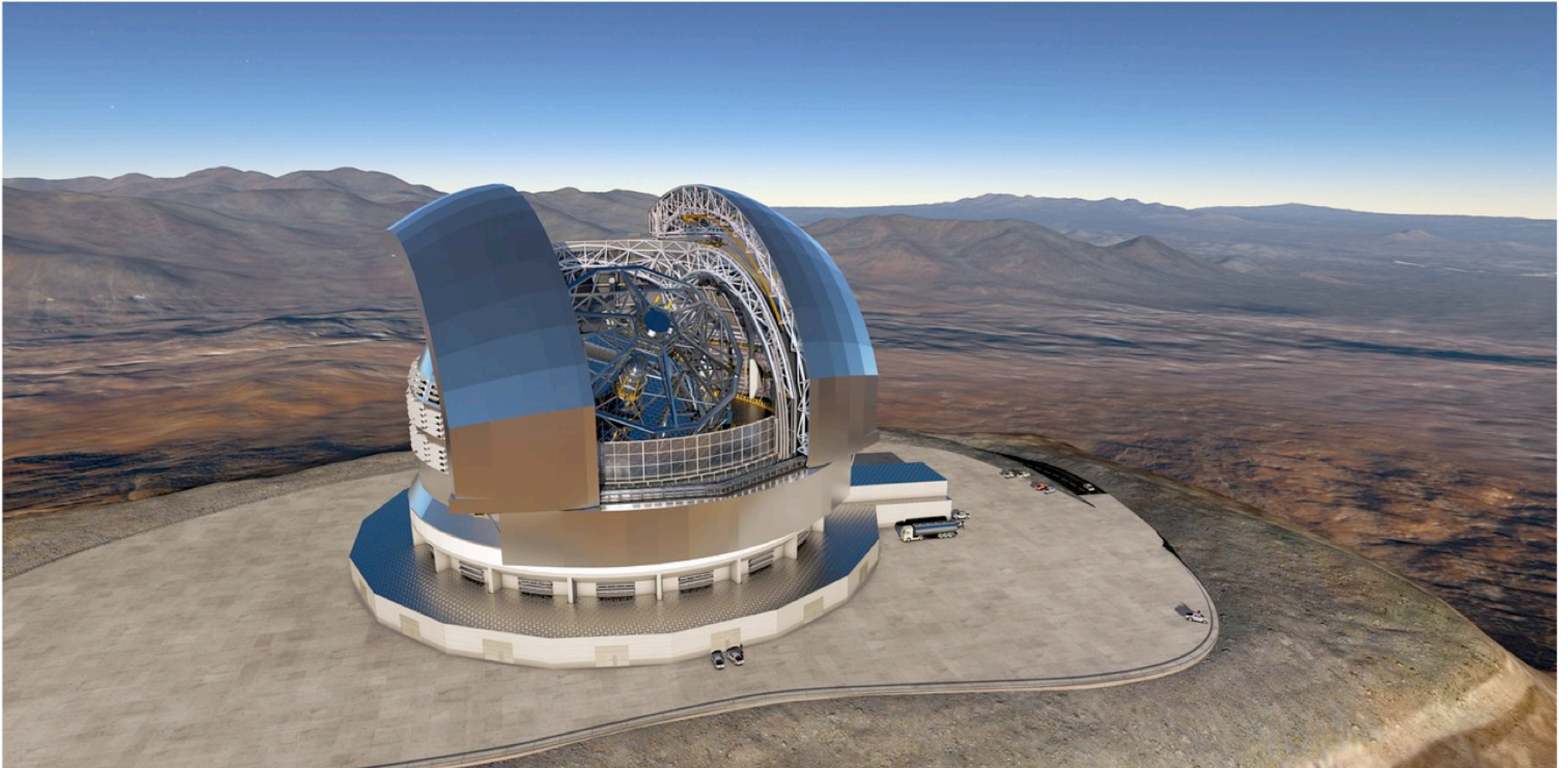
NGC55: Hartoog et al. (2012)



We require UV+optical spectroscopy in systems > 1Mpc



Optical-IR: E-ELT from mid-2020s



MOSAIC for the E-ELT



European
Southern
Observatory

ann16017 — Announcement

Planning Starts for MOS and HIRES Instruments on the E-ELT

The world's biggest telescope gets the world's best instrumentation

23 March 2016



MOSAIC



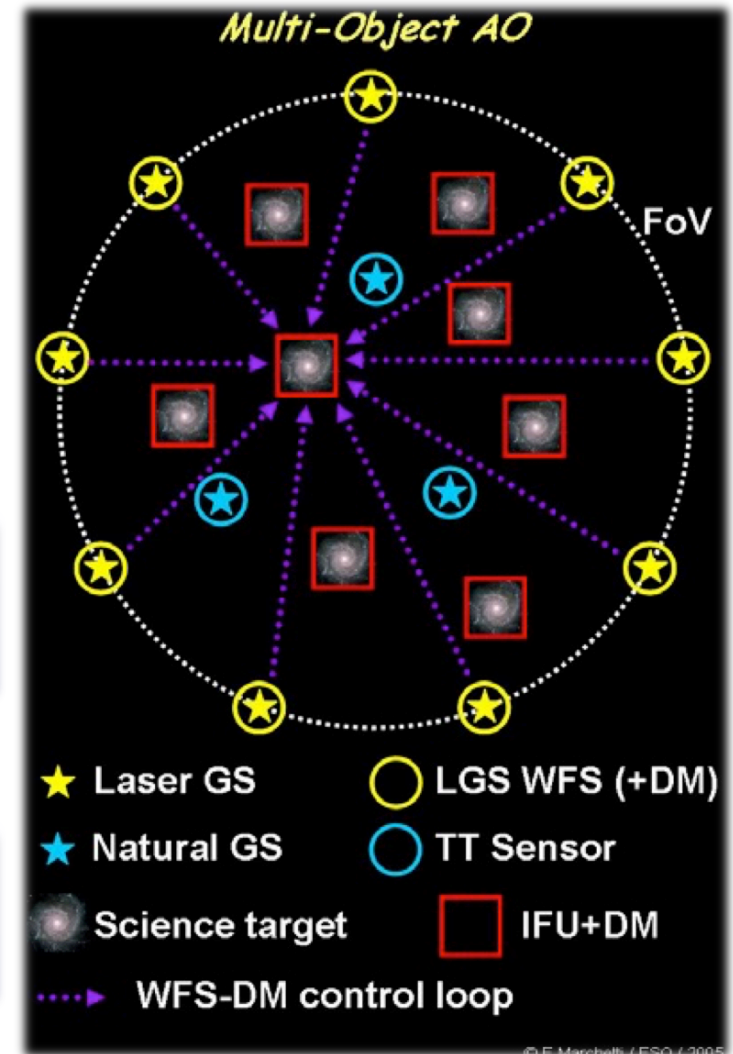
2 year Phase A study - mid-term review in March
Partners: France, UK, Brazil, Germany, Netherlands

MOSAIC modes

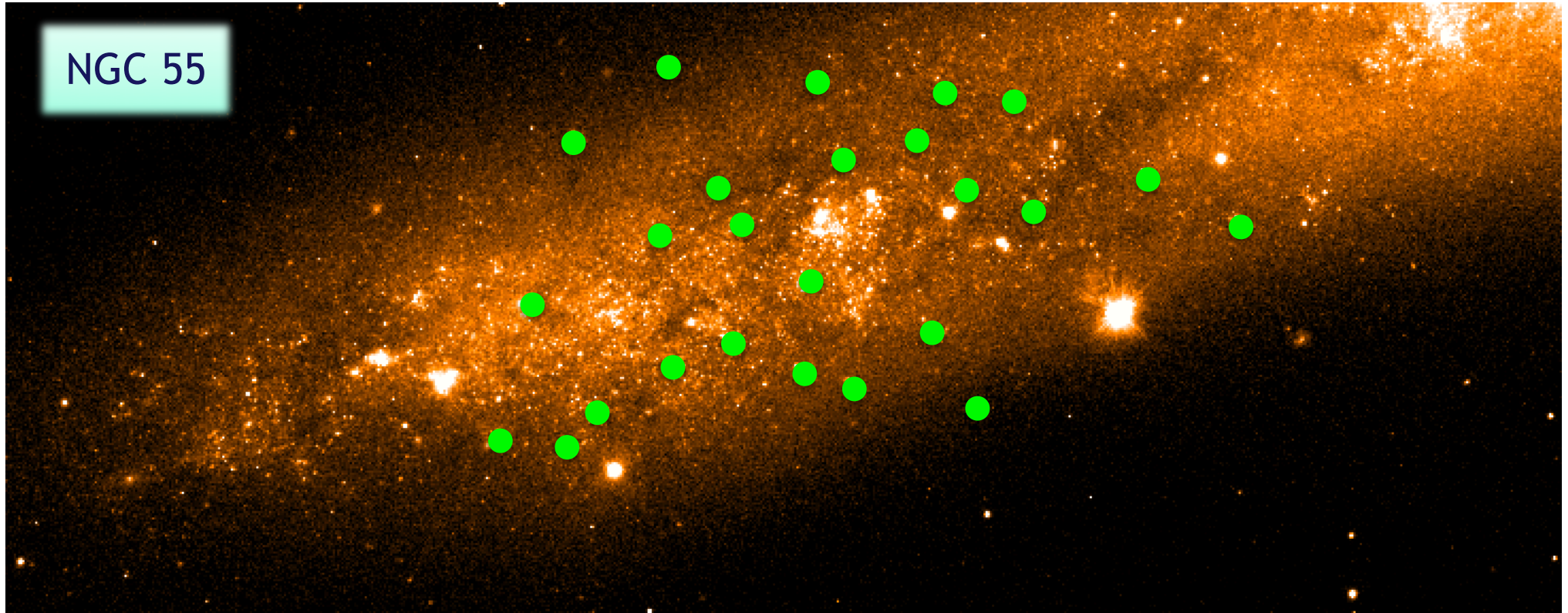
Evans et al. Proc. SPIE
arXiv:1207.0768

- ‘High definition’: 10s of objects at fine spatial resolution provided by multi-object AO

- ‘High multiplex’: >100 objects observed at seeing limit/with ground-layer AO



MOSAIC modes

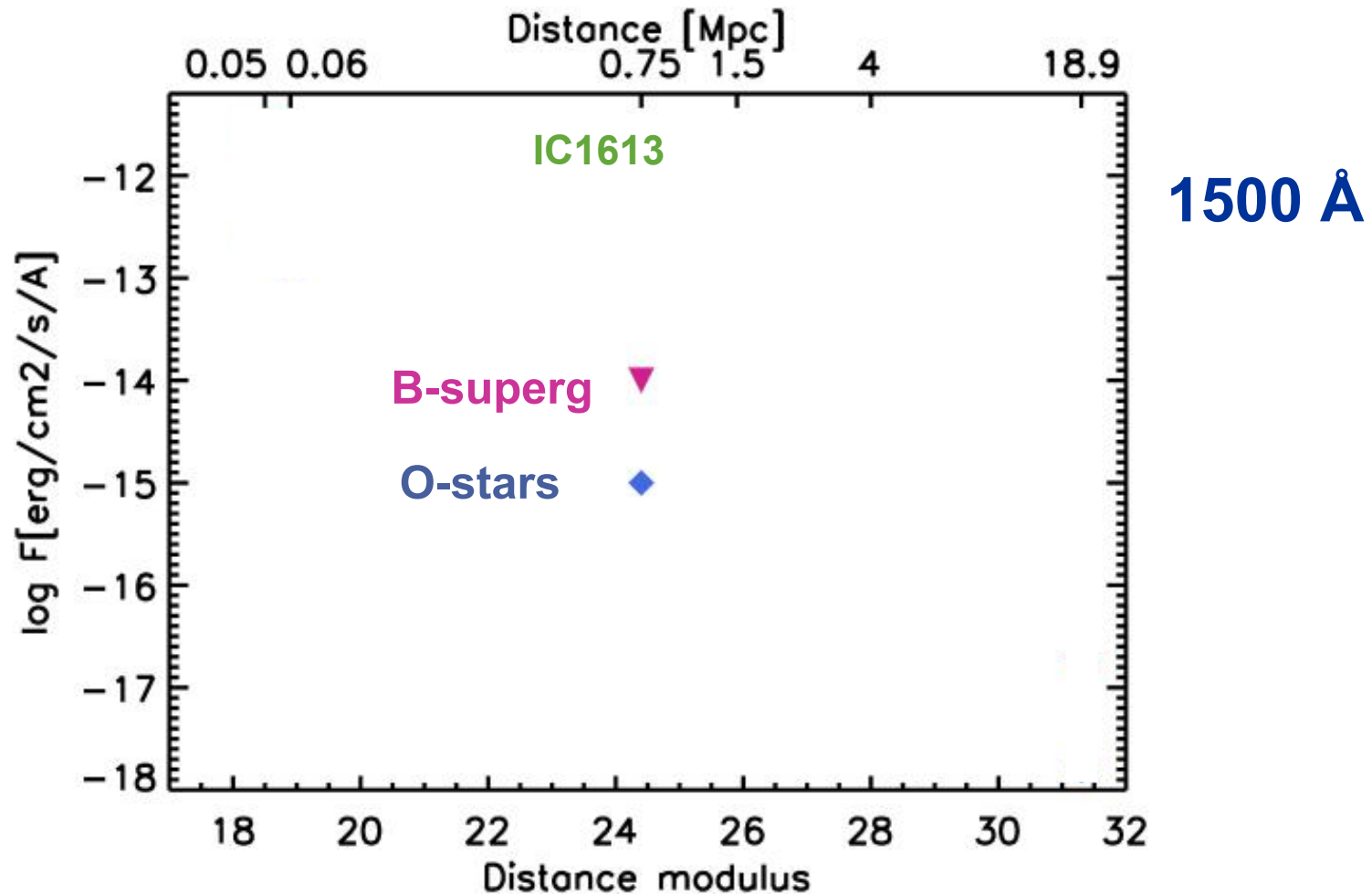


- ‘High multiplex’: >100 objects observed at seeing limit/with ground-layer AO

Want high-quality UV spectra beyond 1 Mpc - simply not feasible with *HST*

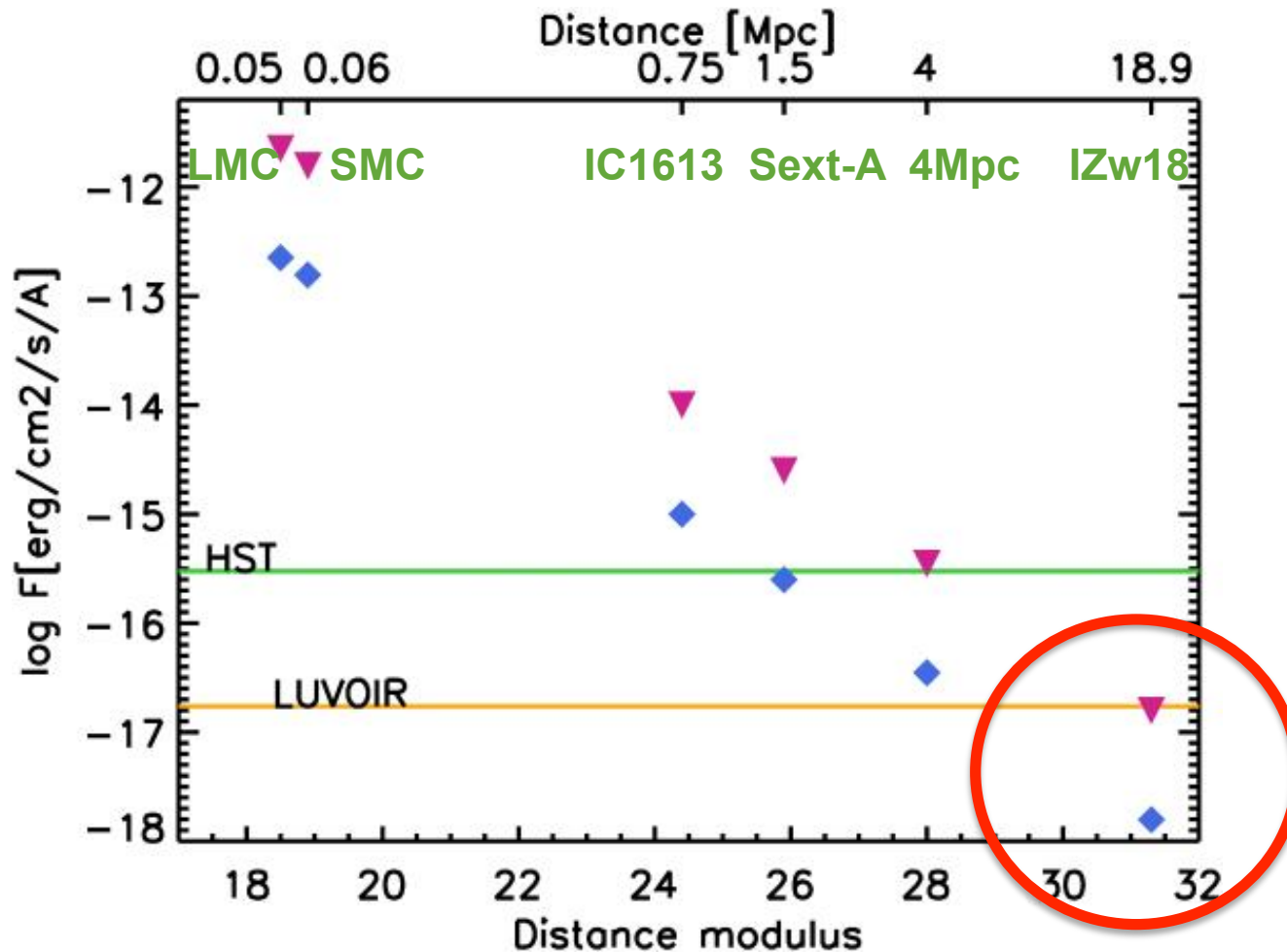
UV: Requirements/sensitivity for massive stars

- 1150-1800Å, $R \geq 2000$

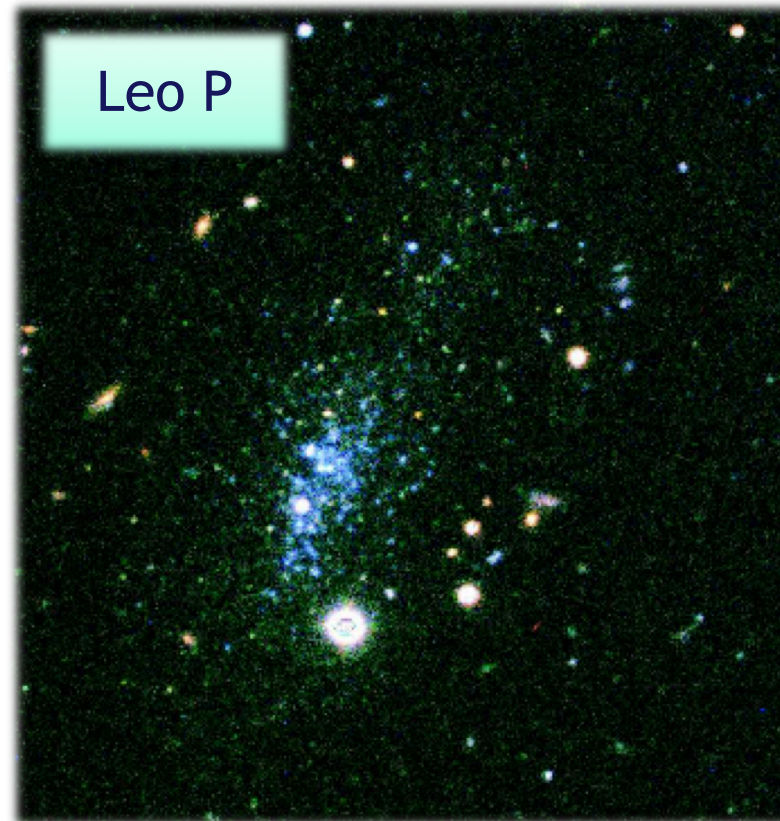


UV: Requirements/sensitivity for massive stars

- 1150-1800Å, $R \geq 2000$
Scaled from COS data for $d=12\text{m}$



A closer low-Z system



~1.65 Mpc (McQuinn et al. 2015)

$12+\log(\text{O}/\text{H}) = 7.14$ (Skillman et al. 2013)

-> ~3% solar!

Bernstein-Cooper et al. (2014):

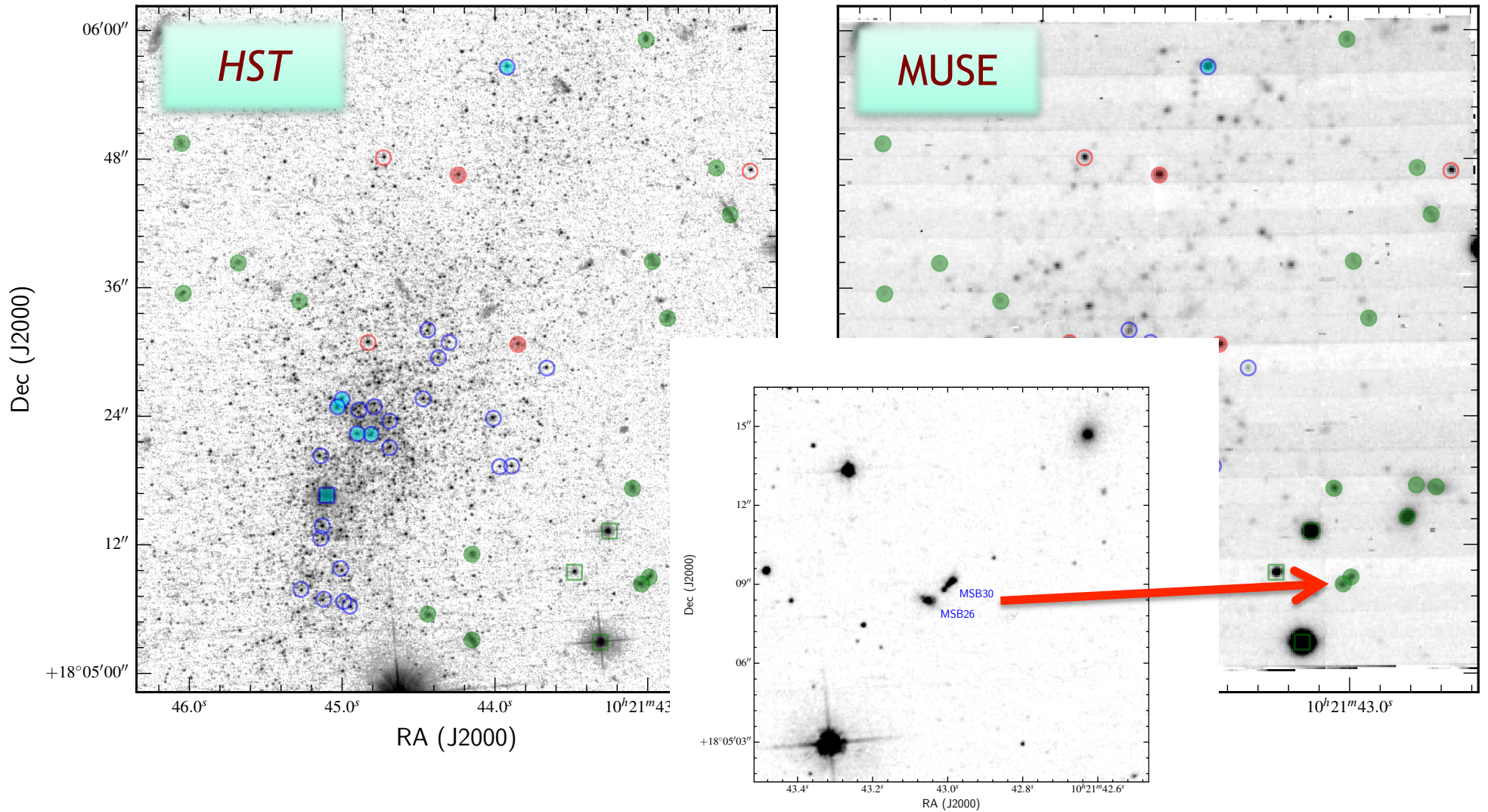
HI mass = 9.5×10^5

Stellar mass = $\sim 6 \times 10^5$



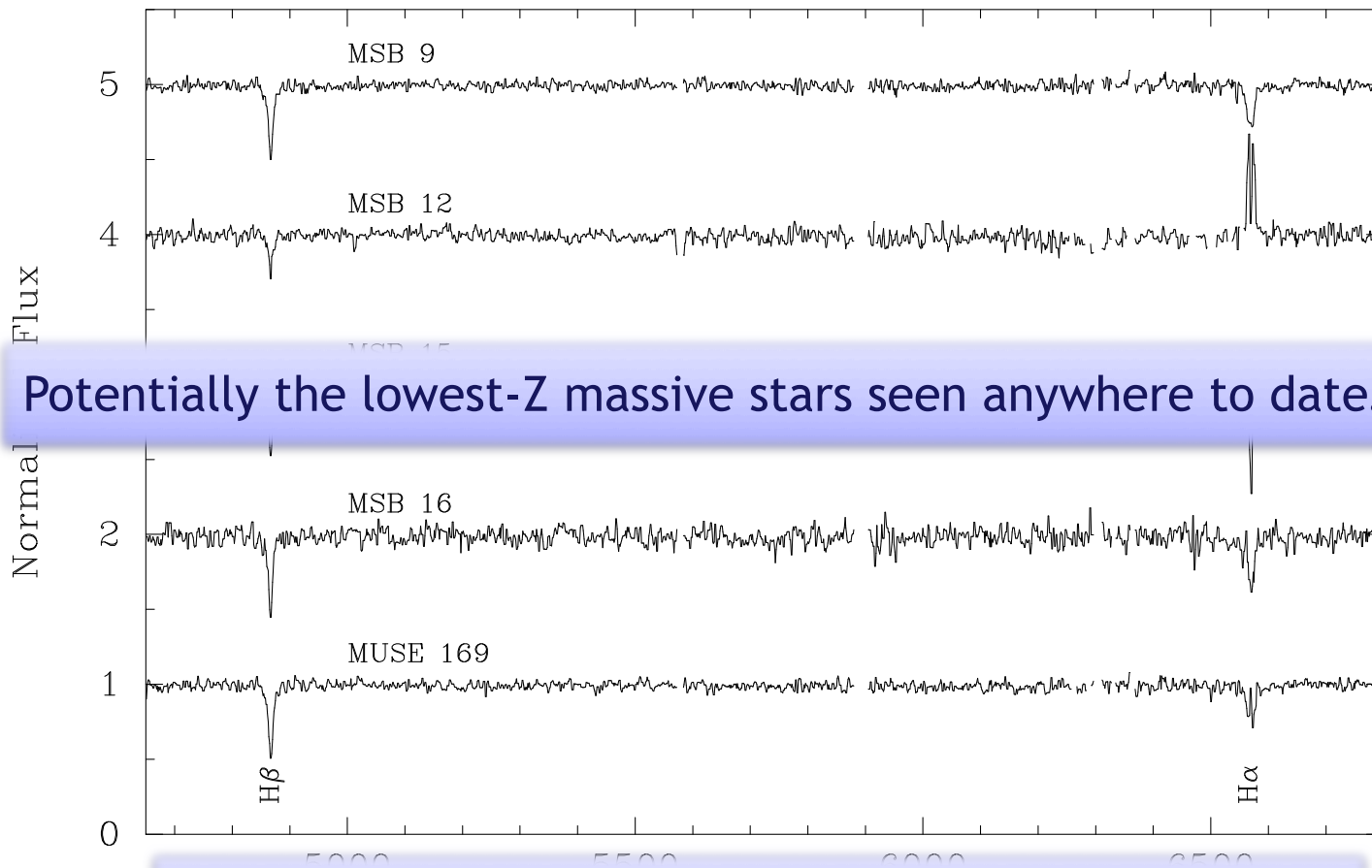
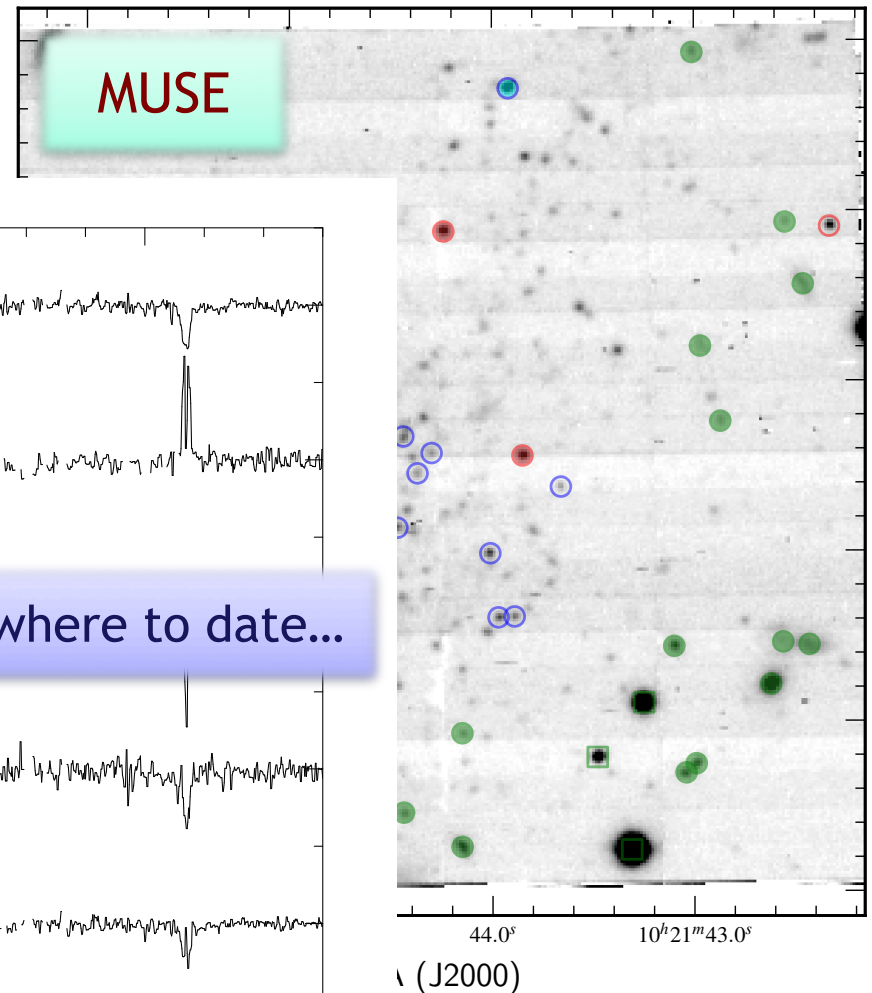
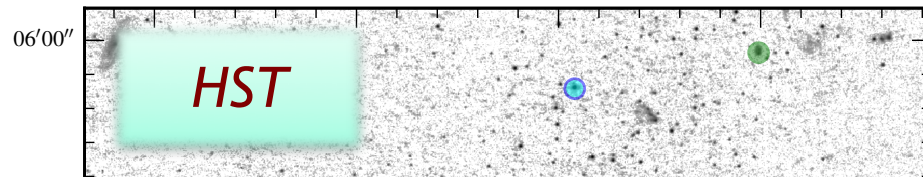
Leo P with MUSE

8hrs MUSE observations
Evans et al. in prep.



Leo P with MUSE

8hrs MUSE observations
Evans et al. in prep.



Potentially the lowest-Z massive stars seen anywhere to date...

At least 50ks exposures for *HST*-STIS data



Summary

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Thanks!