

# News from the MUSE

R. Bacon  
CRAL

PNCG

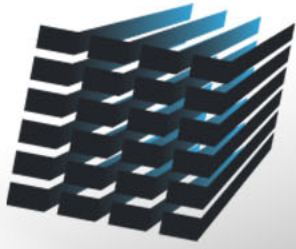
Lyon, Nov 17 2017





- Probing the cold circum-galactic gas around individual high-redshift galaxies with MUSE - *Floriane Leclercq*
- Spectral features of different ionizing sources within galaxies - *Anna Feltre*
- Galaxy mass assembly in various environments - *Benoît Epinat*
- Resolving Metallicity Gradients of intermediate redshift galaxies with MUSE - *David Carton*
- Physical properties of low mass MUSE-confirmed galaxies at  $z > 3$  in the Frontier Fields - *Johany Martinez*





**MUSE**  
multi unit spectroscopic explorer



**Instrumental news: adaptive optics**



**Science news: the MUSE Hall of Fame**

**ETH**

**What's next ?**



**AIP**



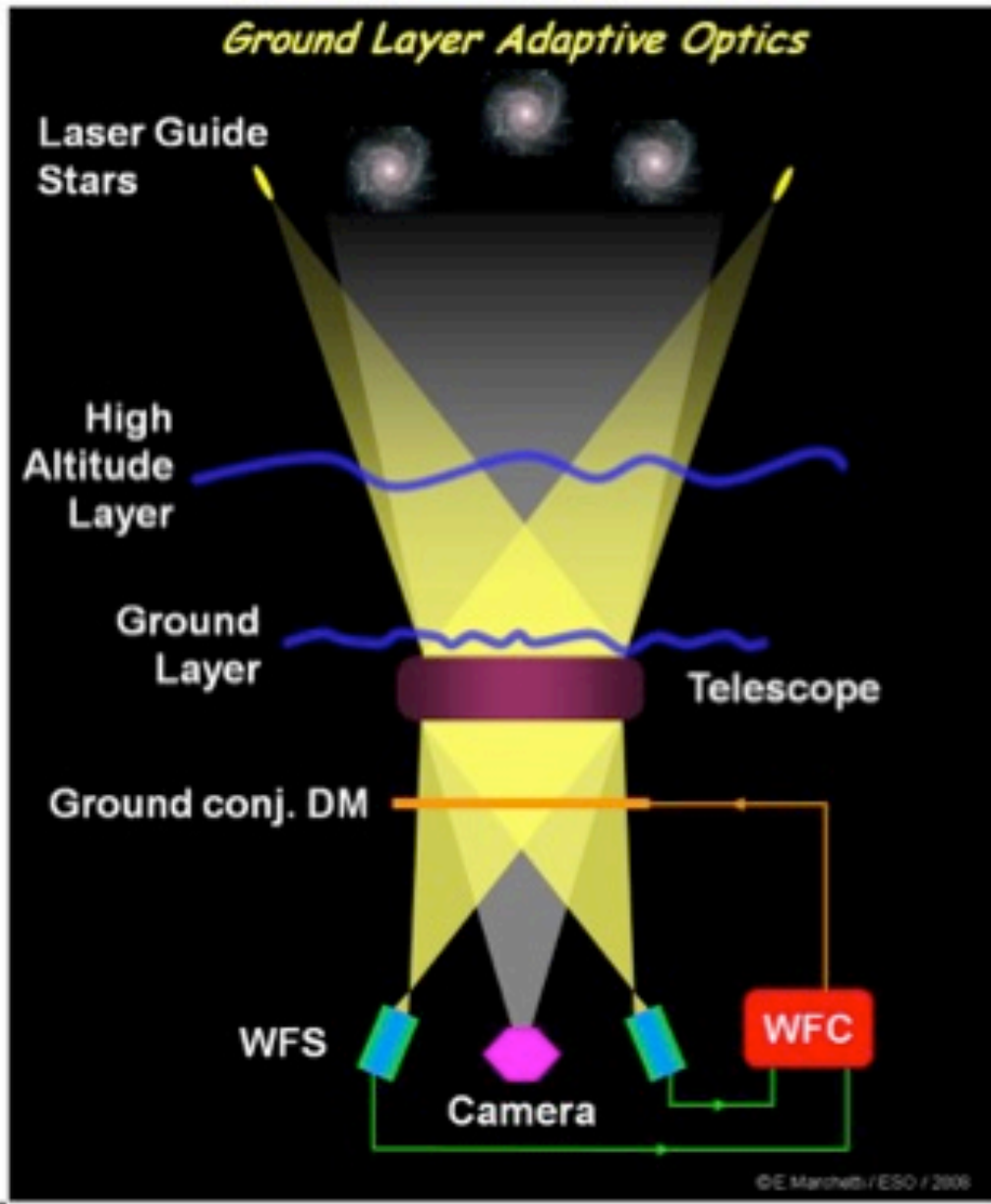




# MUSE-WFM GROUND LAYER AO MODULE

- **Improve Image Quality in 95% of atmospheric conditions**
- **On a large field of view (1 arcmin)**
- **With 99% sky coverage**
- **Without loss of throughput**
- **In the visible (500-1000 nm)**
- **Small overhead**
- **Easy to operate**
- **Robust (minimum downtime)**



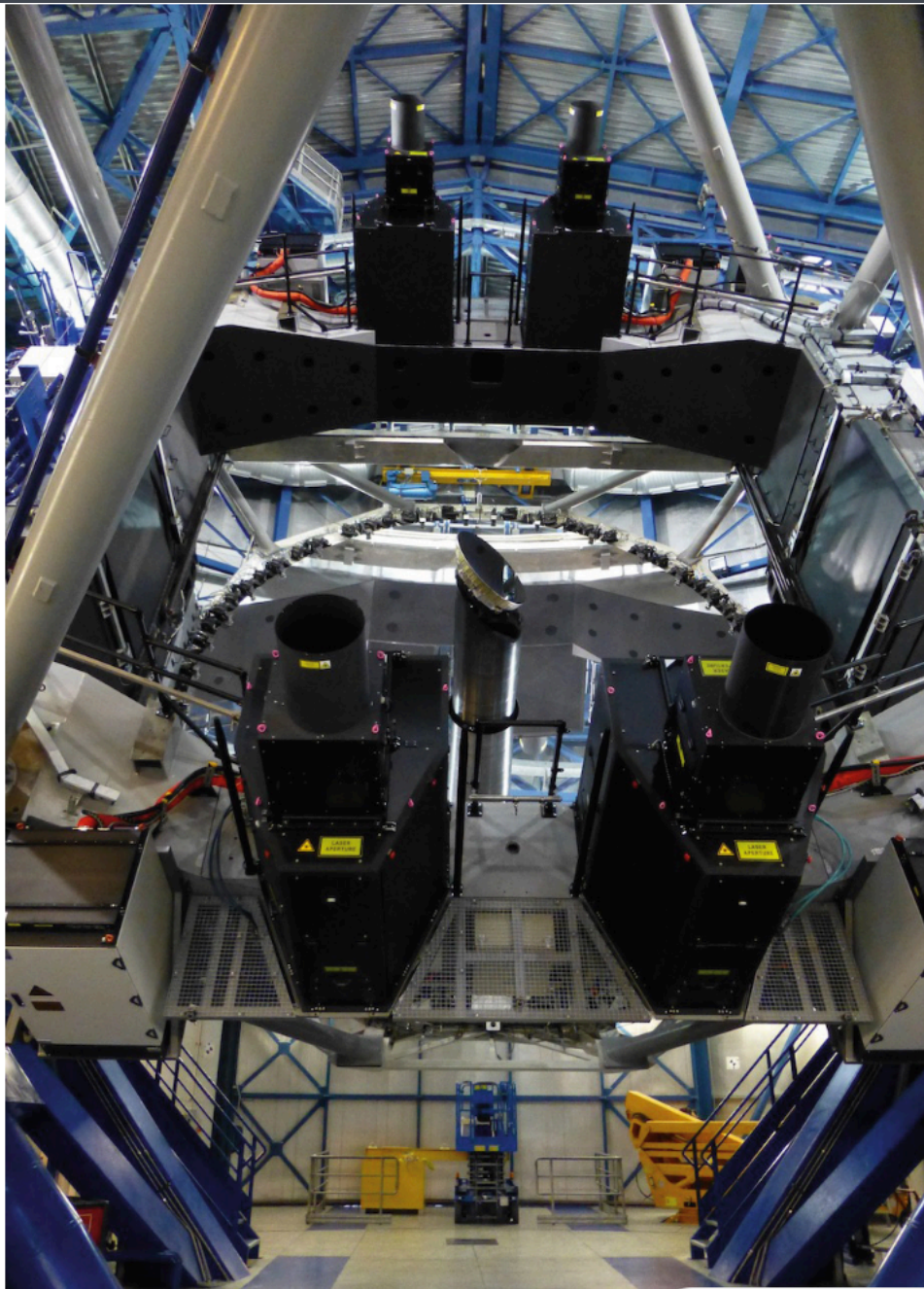
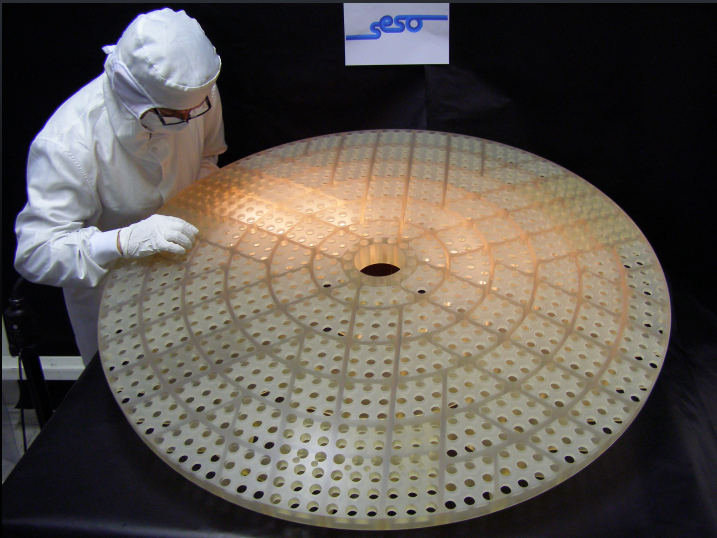
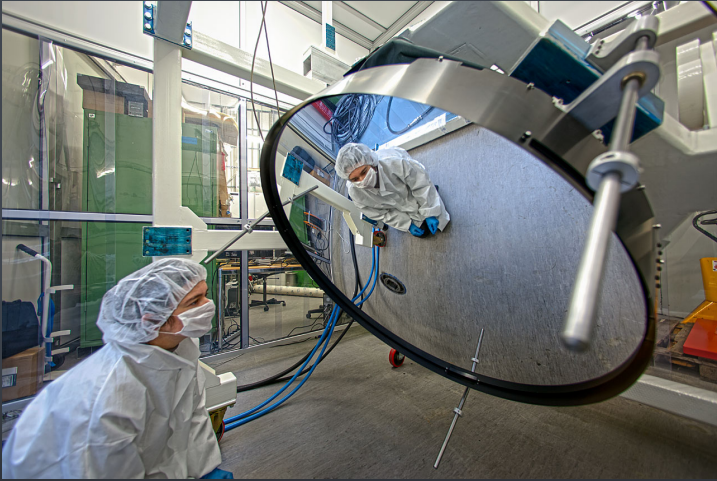






# MUSE 2017

## Yepun become the first adaptative VLT



Lyon - Potsdam - Toulouse - Zurich



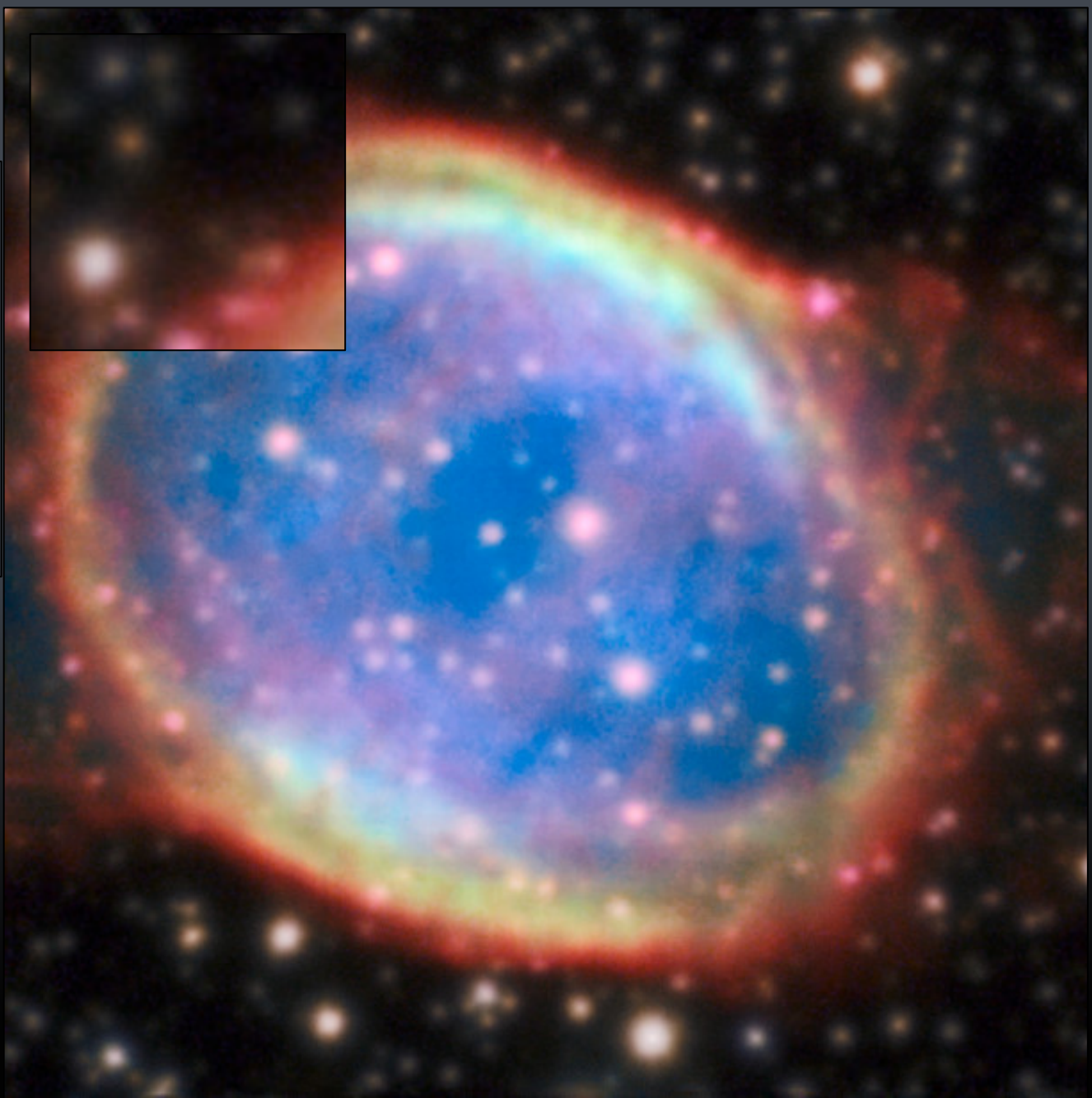
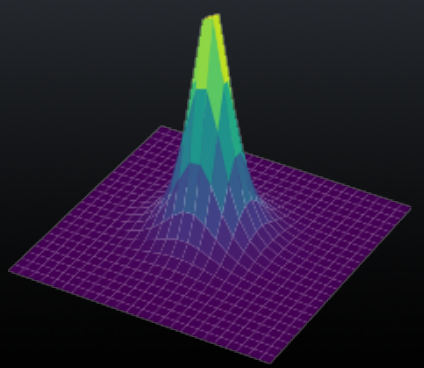






Planetary Nebulae  
NGC 6563  
Non AO  
120 s exposure  
Airmass 1.3  
Dimm 0.9 arcsec

Measured FWHM (Moffat)  
1.02 arcsec @ 5100 A  
0.81 arcsec @ 9000 A

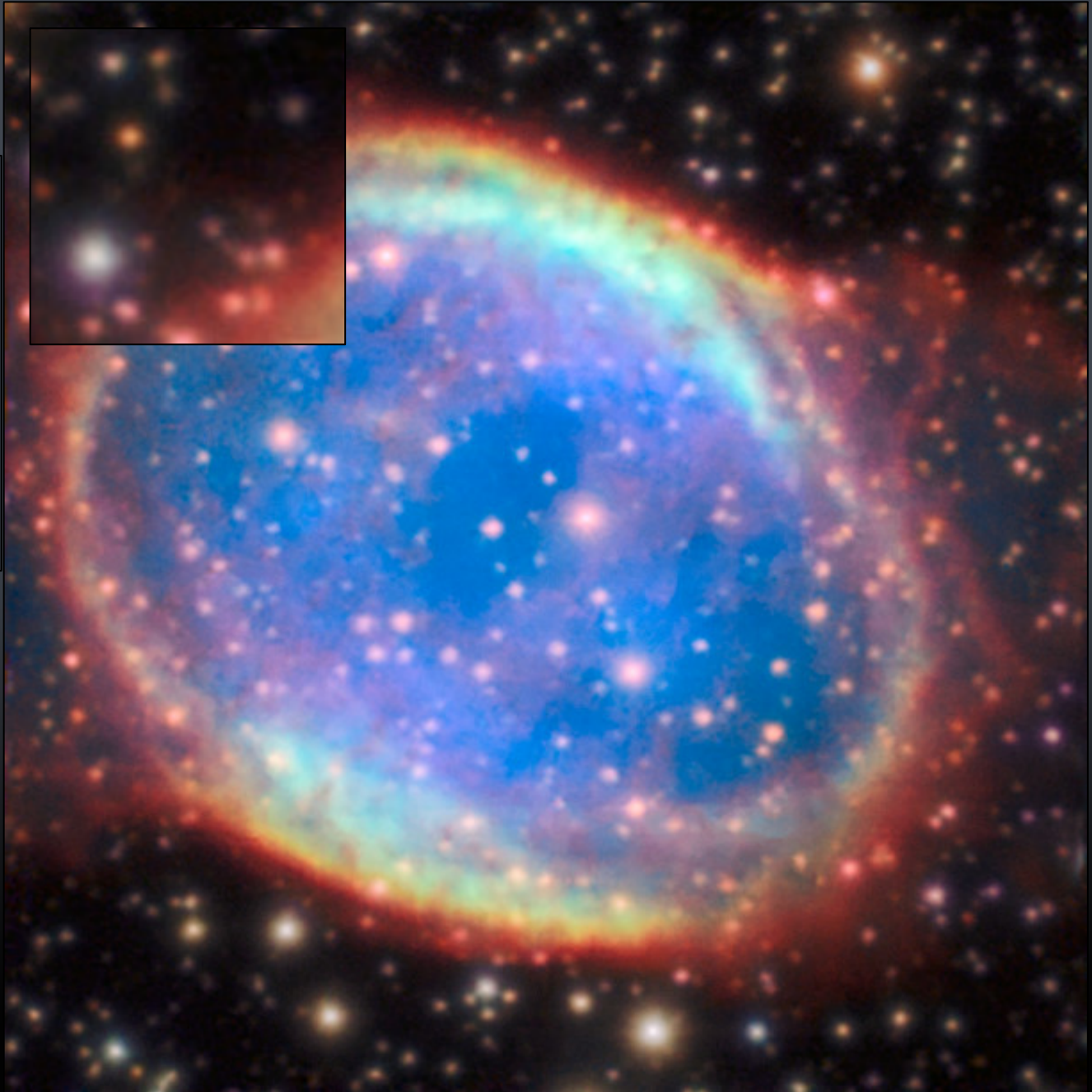
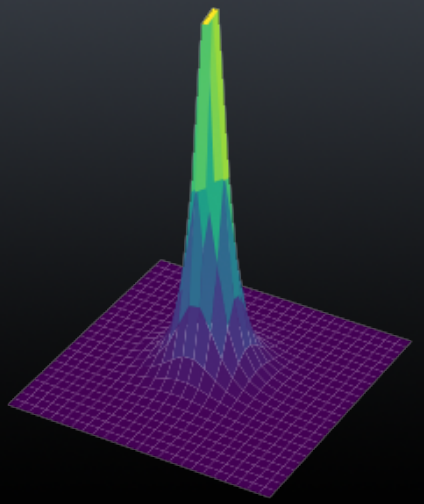


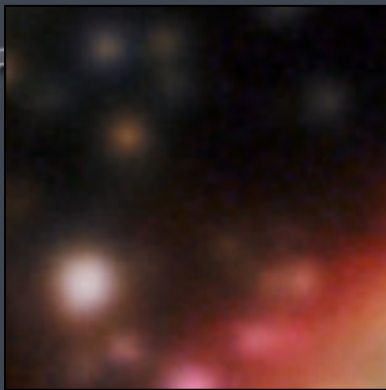
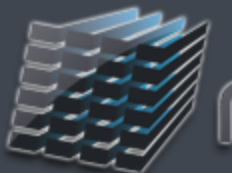




Planetary Nebulae  
NGC 6563  
with AO  
120 s exposure  
Airmass 1.3  
Dimm 0.9 arcsec

Measured FWHM (Moffat)  
**0.78** arcsec @ 5100 A  
**0.57** arcsec @ 9000 A



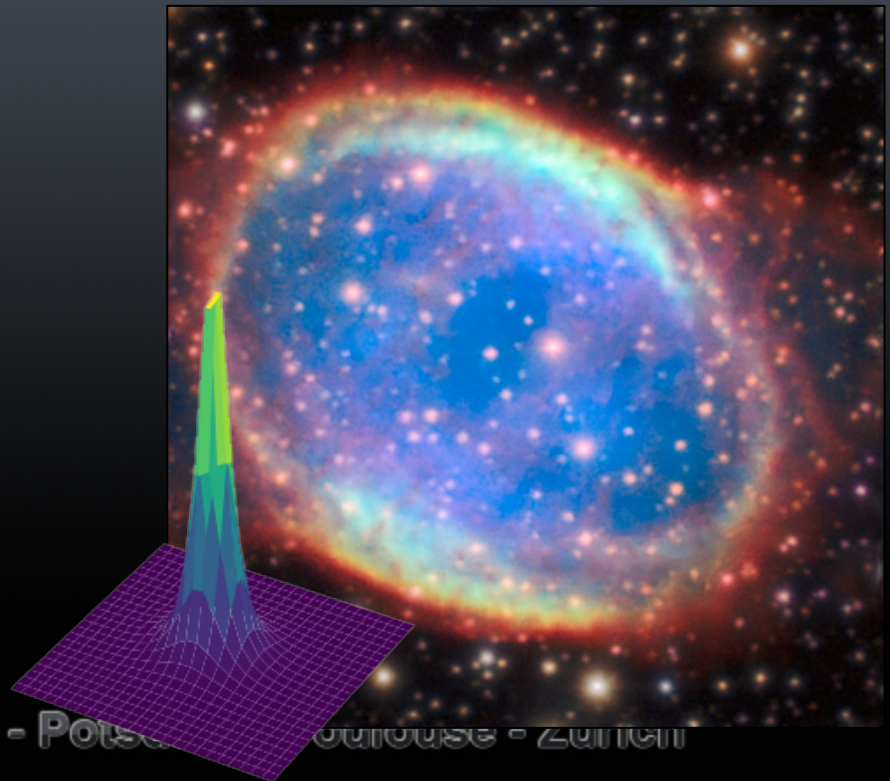
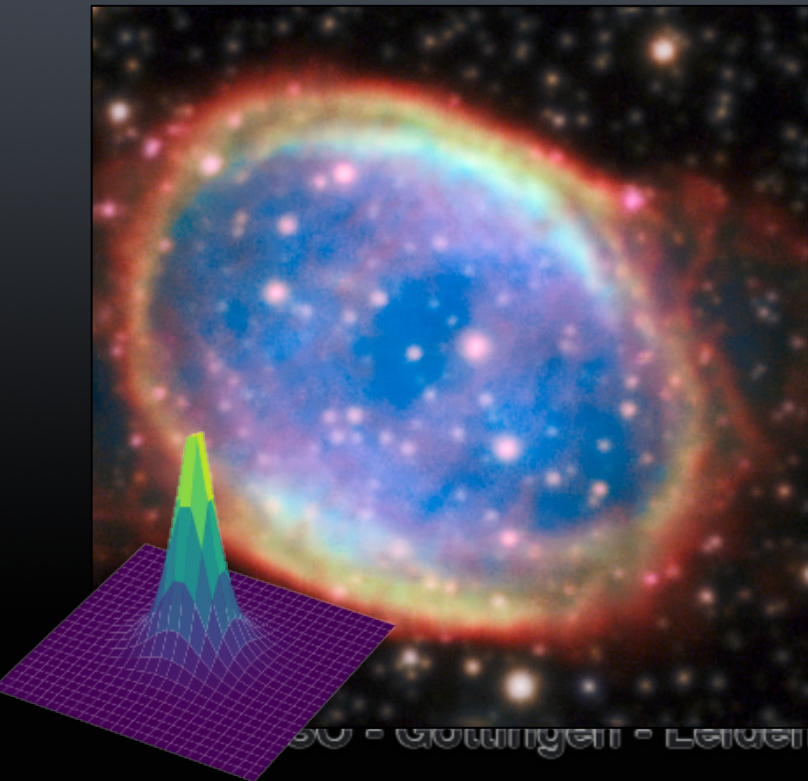


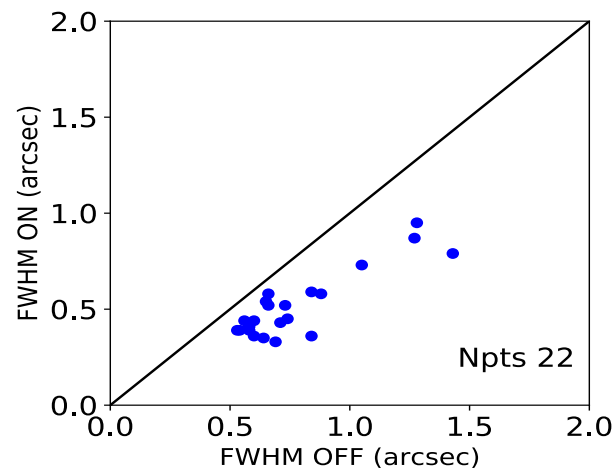
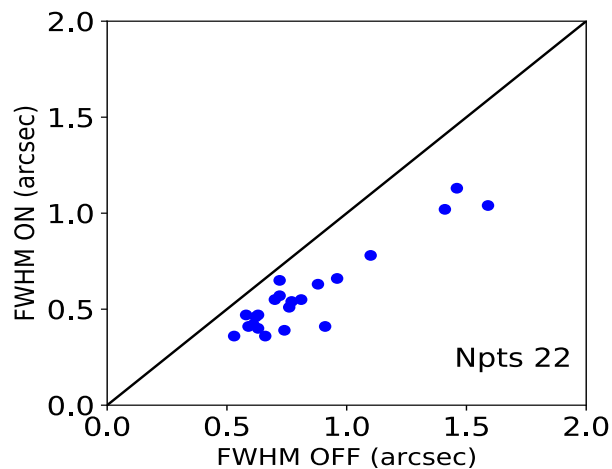
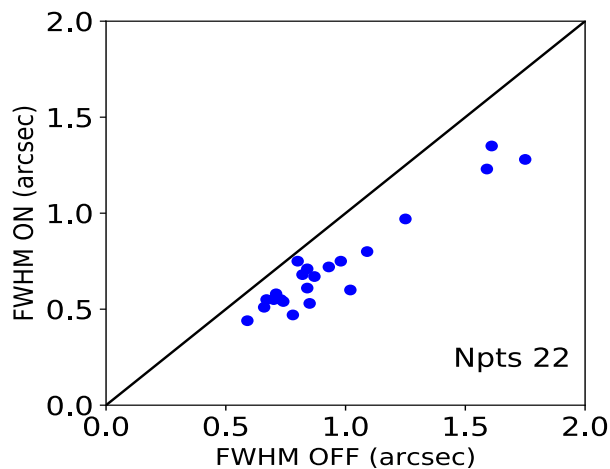
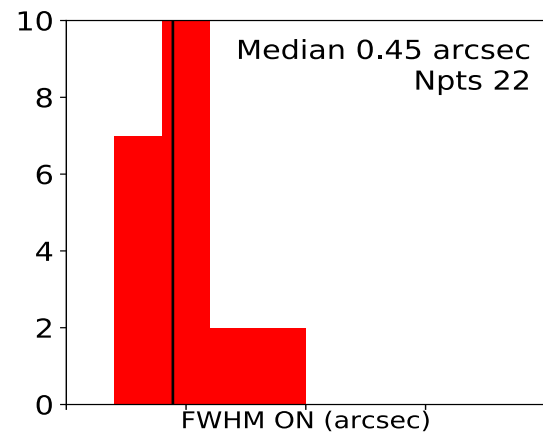
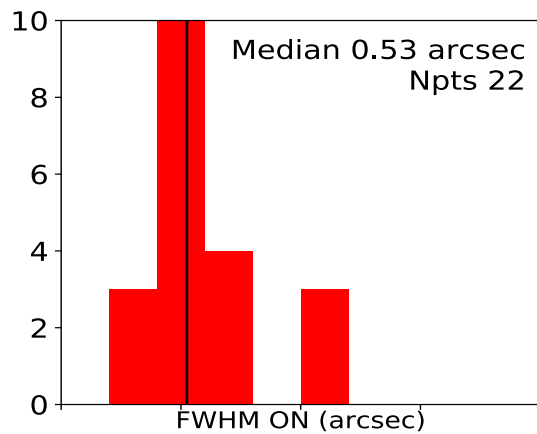
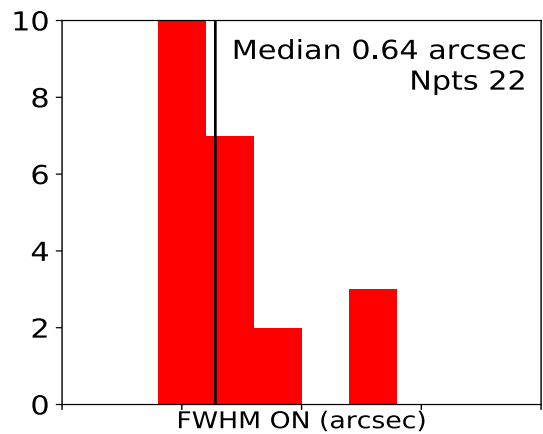
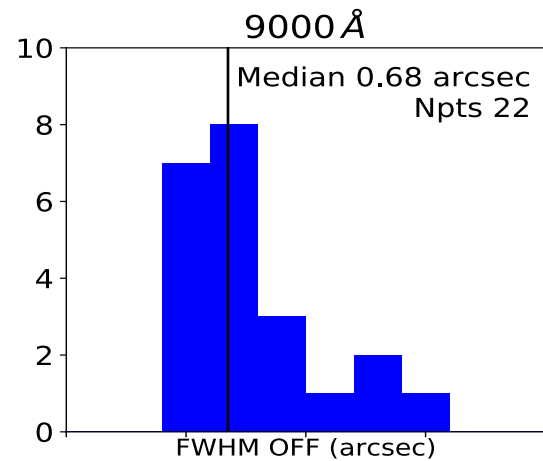
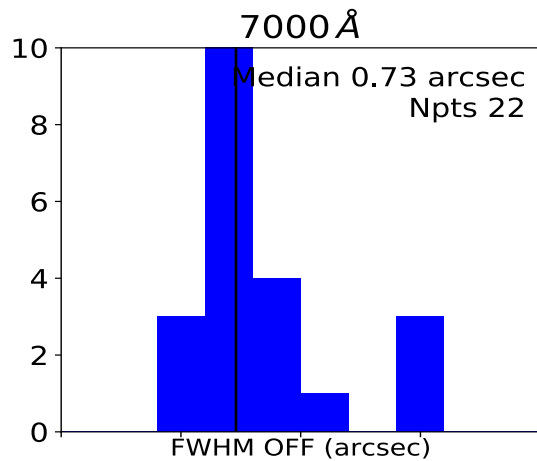
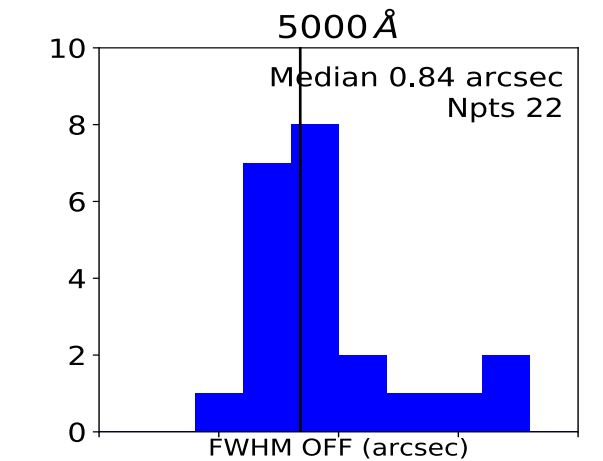
Gain FWHM  
 1.3 @ 5100 A  
 1.4 @ 9000 A



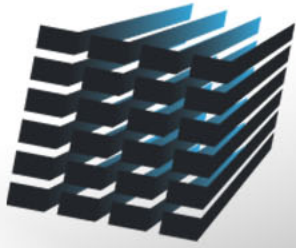
Measured FWHM (Moffat)  
 1.02 arcsec @ 5100 A  
 0.81 arcsec @ 9000 A

Measured FWHM (Moffat)  
 0.78 arcsec @ 5100 A  
 0.57 arcsec @ 9000 A









**MUSE**  
multi unit spectroscopic explorer



Instrumental news: adaptive optics



Science news: the MUSE Hall of Fame

**ETH**

What's next ?



AIP

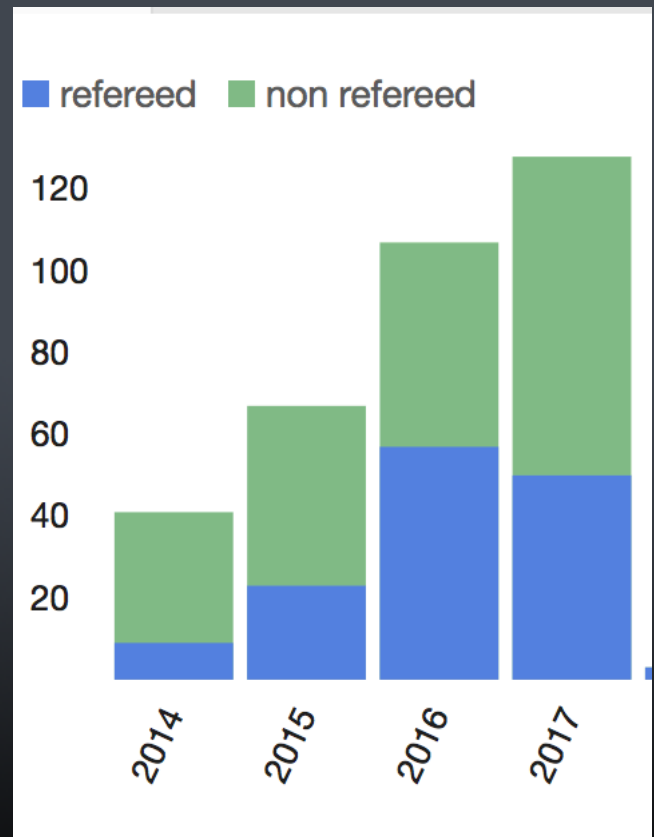




# MUSE statistics

## Requested Nights

	XShooter	MUSE	FORS2
P97	221	220	215
P98	255	229	231
P99	188	203	198
P100	287	266	196
P101	201	186	177

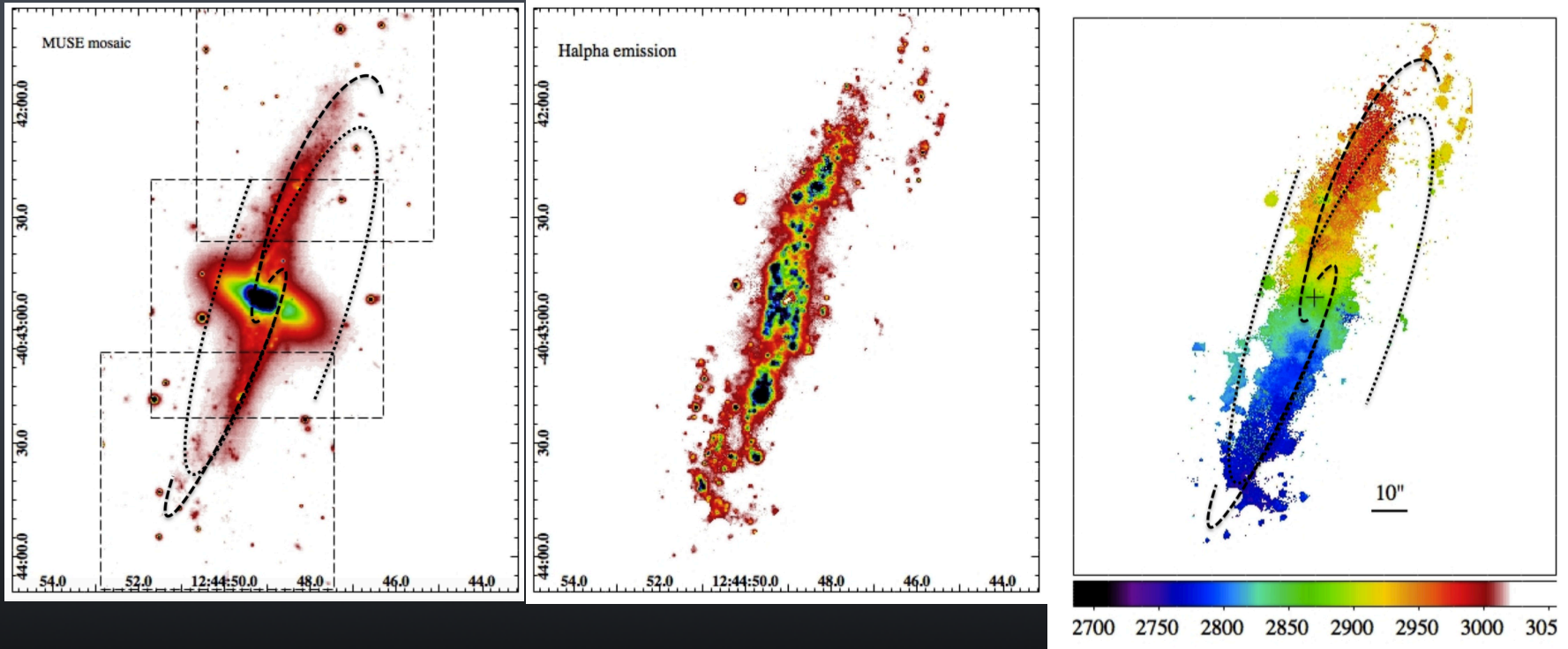


346 papers, 1416 citations  
(as of 16/11/2017)

Continuum map

Ha map

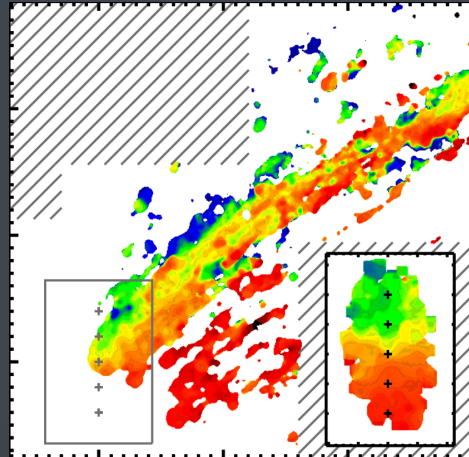
Ha velocity field



Mapping the inner regions of the polar disk galaxy NGC 4650A with MUSE  
E. Iodice, L. Coccato, F. Combes, T. de Zeeuw, et al, A&A 583, A48 (2015)

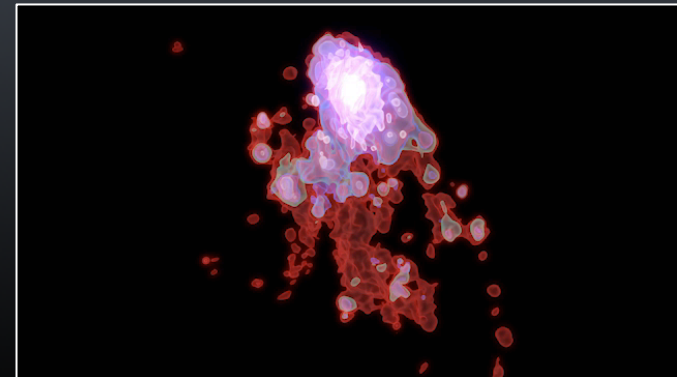
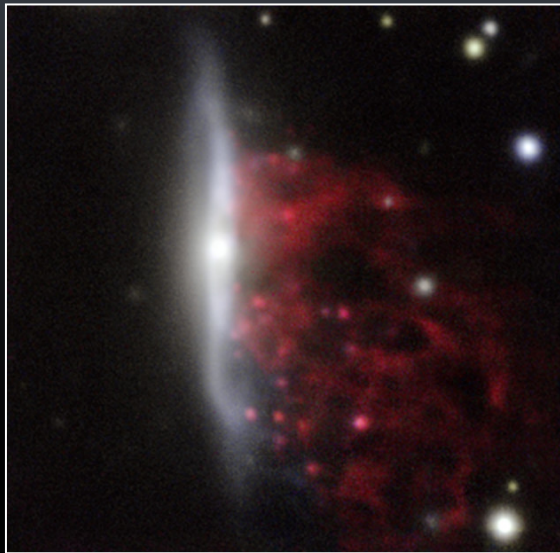


# Jellyfish Galaxies



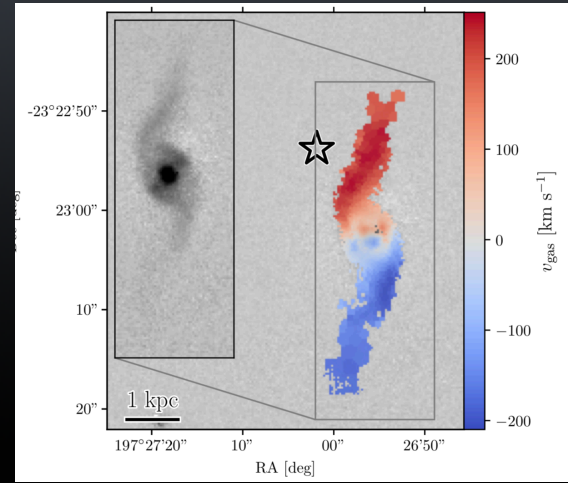
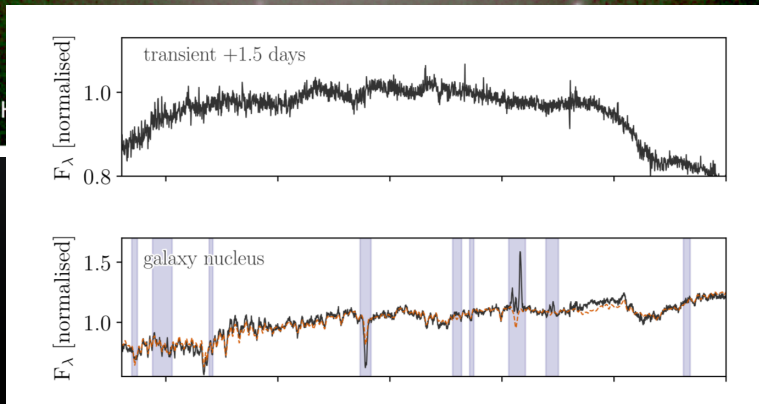
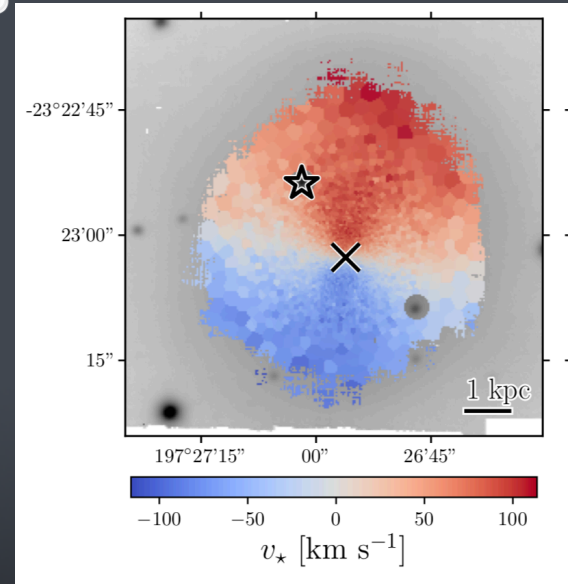
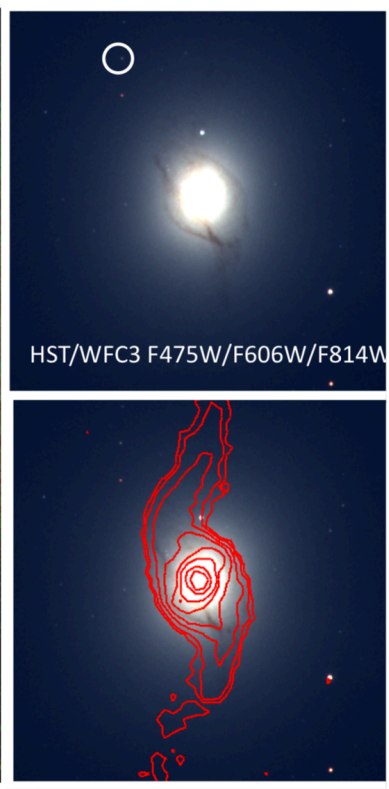
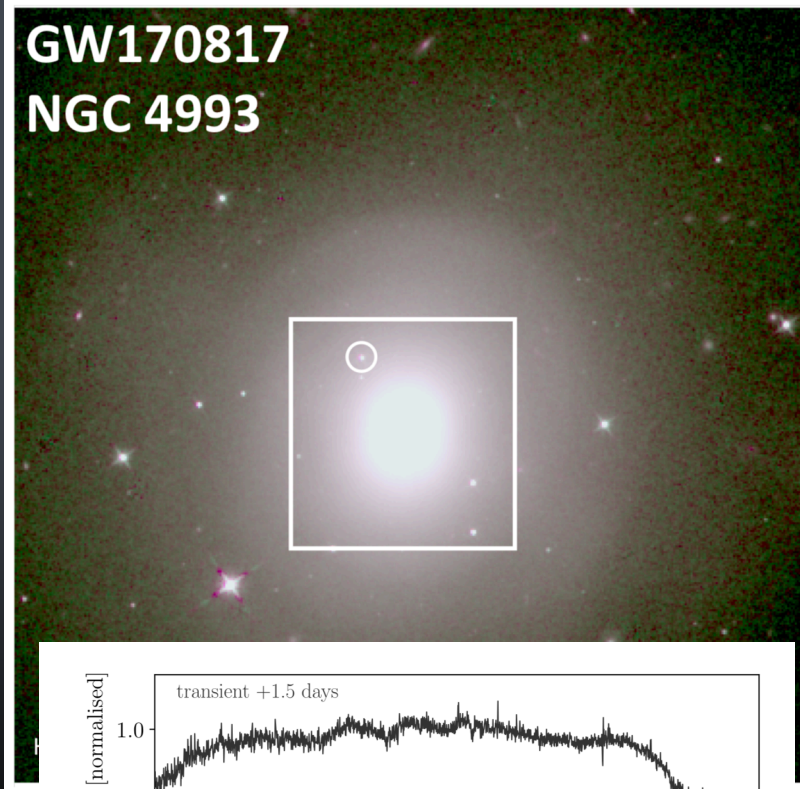
MUSE sneaks a peek at extreme ram-pressure stripping events - I. A kinematic study of the archetypal galaxy ESO137-001, M. Fumagalli et al, 2014, MNRAS, 445, 4

Ram Pressure Feeding Supermassive Black Holes, B. Poggianti, Y. Jaffé et al, 2017, Nature, 548, 7667

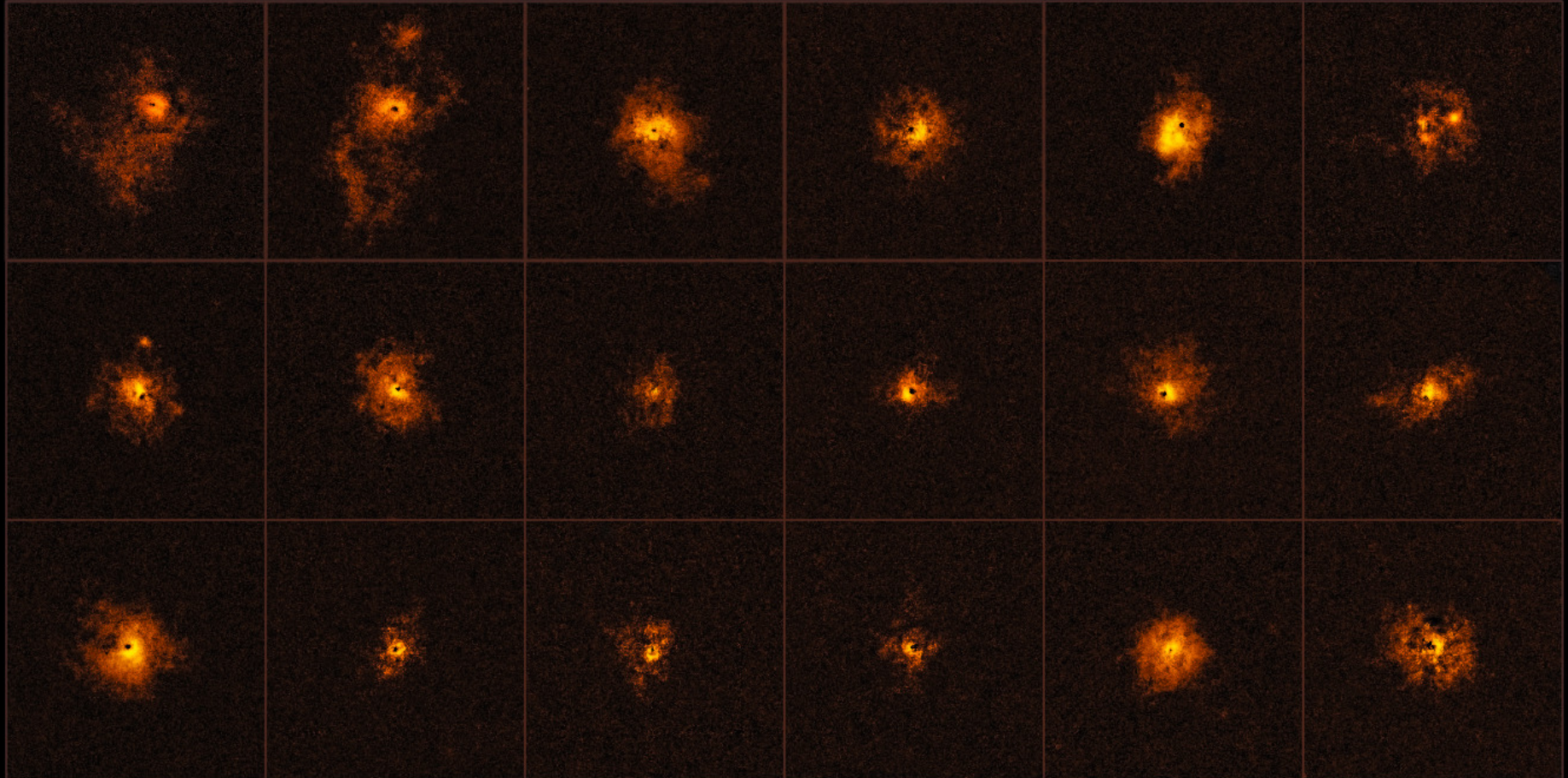


GASP collaboration

# The environment of the binary neutron star merger GW170817, Levan et al, 2017 ApJ, 848







Ubiquitous Giant Ly $\alpha$  Nebulae around the Brightest Quasars at  $z \sim 3.5$  Revealed with MUSE, E. Borosiva et al, 2016, ApJ, 831, 39

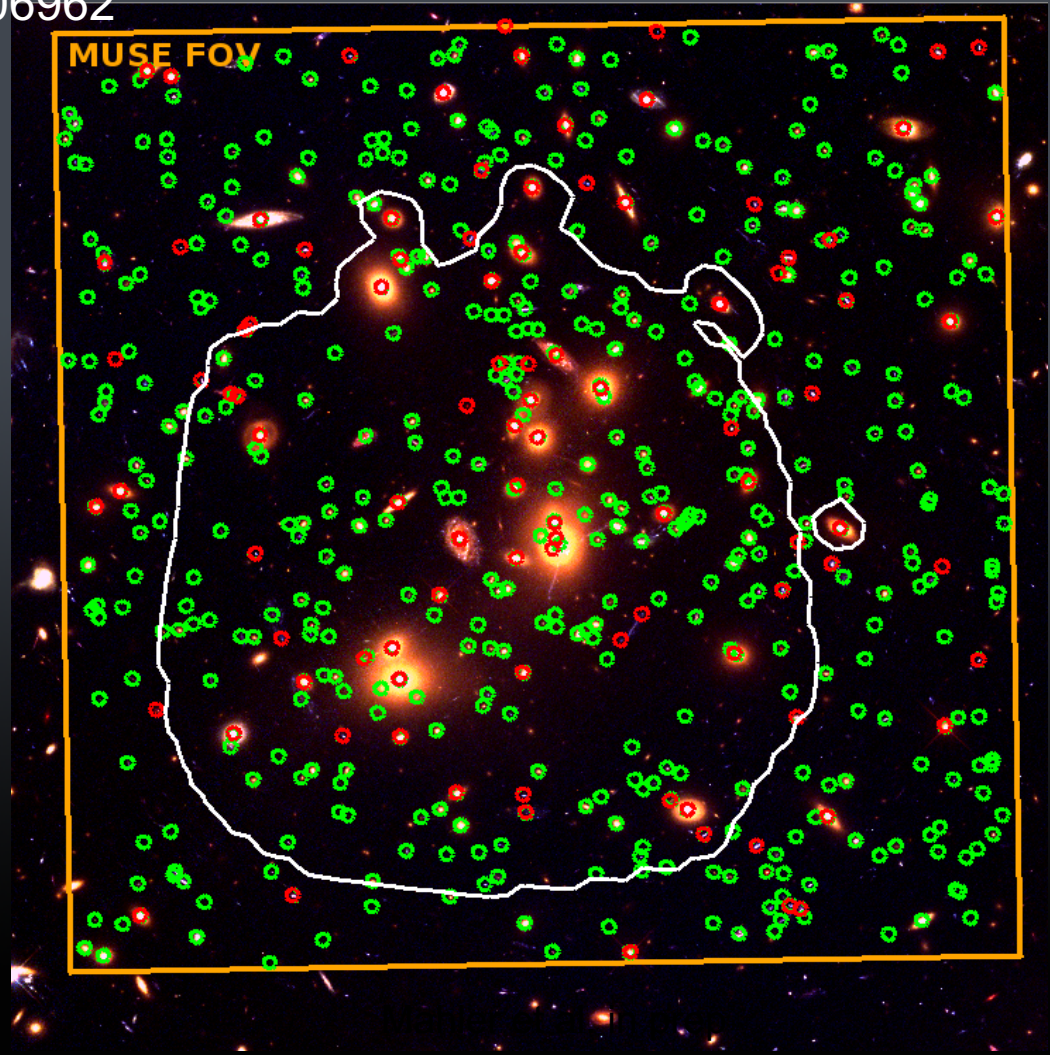
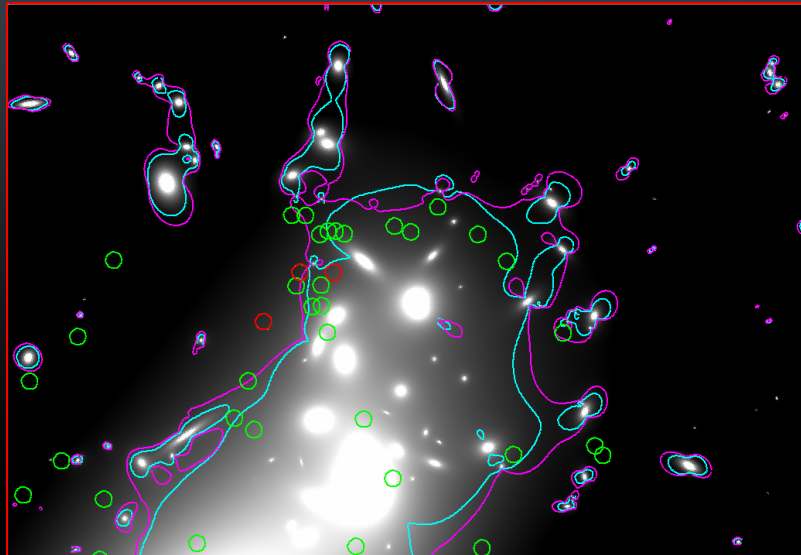




# Lensing Clusters

Strong lensing analysis of Abell 2744 with MUSE and Hubble Frontier Fields images, G. Mahler et al, arXiv:1702.06962

500 spectroscopic redshifts





# The MUSE Hubble Ultra Deep Field Survey

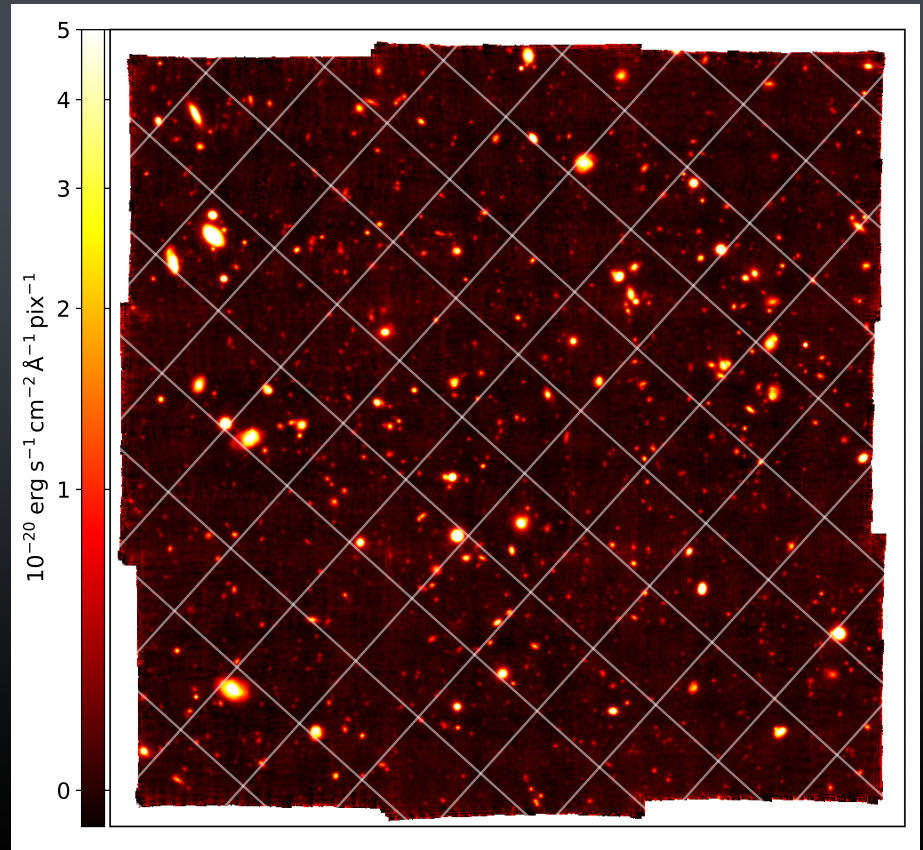
The deepest spectroscopic survey ever performed, 10 & 30 hours depth, 1600 redshifts



**Hubble Ultra Deep Field**  
Hubble Space Telescope • Advanced Camera for Surveys

NASA, ESA, S. Beckwith (STScI) and the HUDF Team

STScI-PRC04-07a

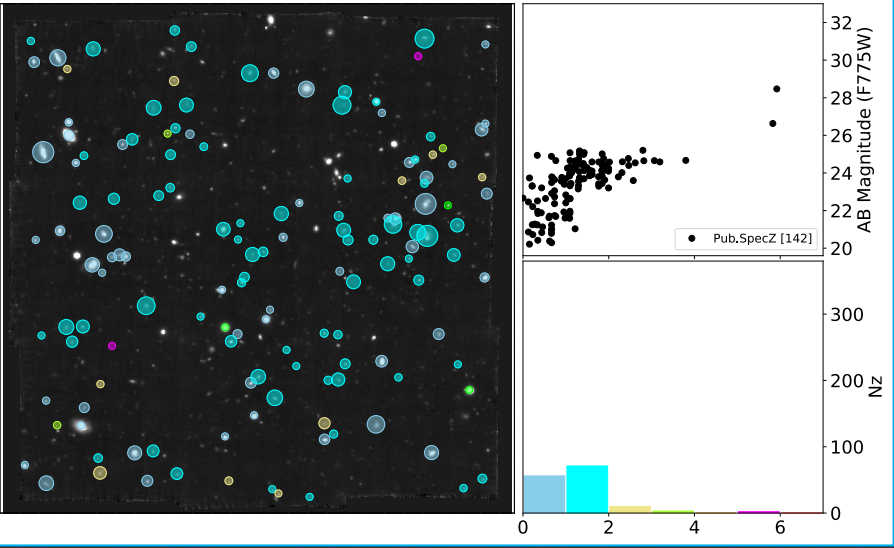




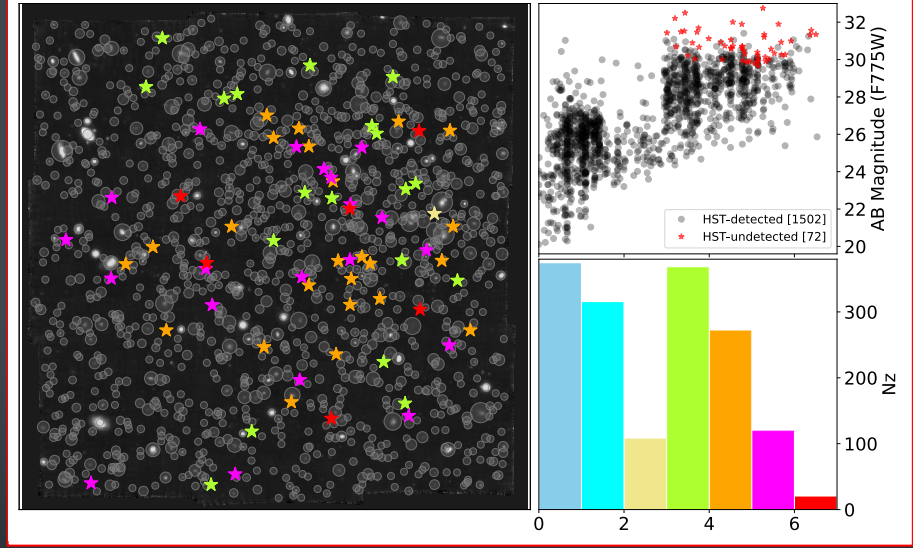
# The MUSE Hubble Ultra Deep

72 Ly $\alpha$  without HST counterpart

Previous spectroscopic redshifts [142]



MUSE redshifts [1574] HST undetected [72]



Pre MUSE  
142 spectro-z  
AB<25  
z<3

In 10 years

x 10 spectro-z  
+ 6 magnitudes  
+ 4 z bins

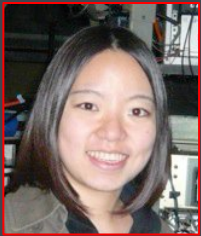
MUSE  
1443 spectro-z  
AB<31  
z<7

In 100 hours of VLT

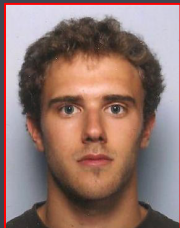


# The MUSE Hubble Ultra Deep Field Survey

To appear in A&A 2017, 610, A1 ... A10



I. Survey description, data reduction and source detection, Bacon et al



II. Spectroscopic redshifts and comparisons to color selections of high-redshift galaxies, Inami et al.

III. Testing photometric redshifts to 30th magnitude, Brinchmann et al.



IV. Global properties of C III] emitters, Maseda et al.

V. Spatially resolved stellar kinematics of galaxies at redshift  $0.2 < z < 0.8$ , Guerou et al.

VI. The Faint-End of the Ly $\alpha$  Luminosity Function at  $2.91 < z < 6.64$  and Implications for Reionisation, Drake et al.



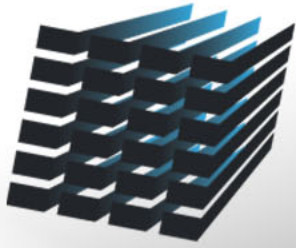
VII. FeII\* Emission in Star-Forming Galaxies, Finley et al.

VIII. Extended Lyman-alpha haloes around high-redshift star-forming galaxies, Leclercq et al.

IX. Evolution of galaxy merger fraction since  $z \sim 6$ , Ventou et al.

X. Ly $\alpha$  Equivalent Widths at  $2.9 < z < 6.6$ , Hashimoto et al.





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Instrumental news: adaptive optics



Science news: the MUSE Hall of Fame



What's next ?



AIP





# MUSE Narrow Field Mode

- LTAO diffraction limited
- $7 \times 7$  arcsec<sup>2</sup>, 25 mas sampling
- To be commissioned in 2018



Vidéo de  
Johann Kolb (ESO)





## A BLUE MUSE for the VLT

- Blue sensitive: **370-600 nm**
  - MUSE 480-930 nm
- Larger Spectral resolution: **R~5000**
  - MUSE: R=1500 @ 480 nm
- Larger field of view: **2 arcmin<sup>2</sup>**
  - MUSE: 1 arcmin<sup>2</sup>
- Same throughput: **40% end-to-end**
- Science case:
  - Globular clusters
  - PN, diffuse, evolved star nebulae
  - **Resolved stellar population and kinematics in nearby galaxies**
  - **Faint low SB galaxies**
  - **High redshift galaxy: LBG and LAEs z=2-4**
  - **Diffuse gas emission**
  - **Lyman continuum leakers**

