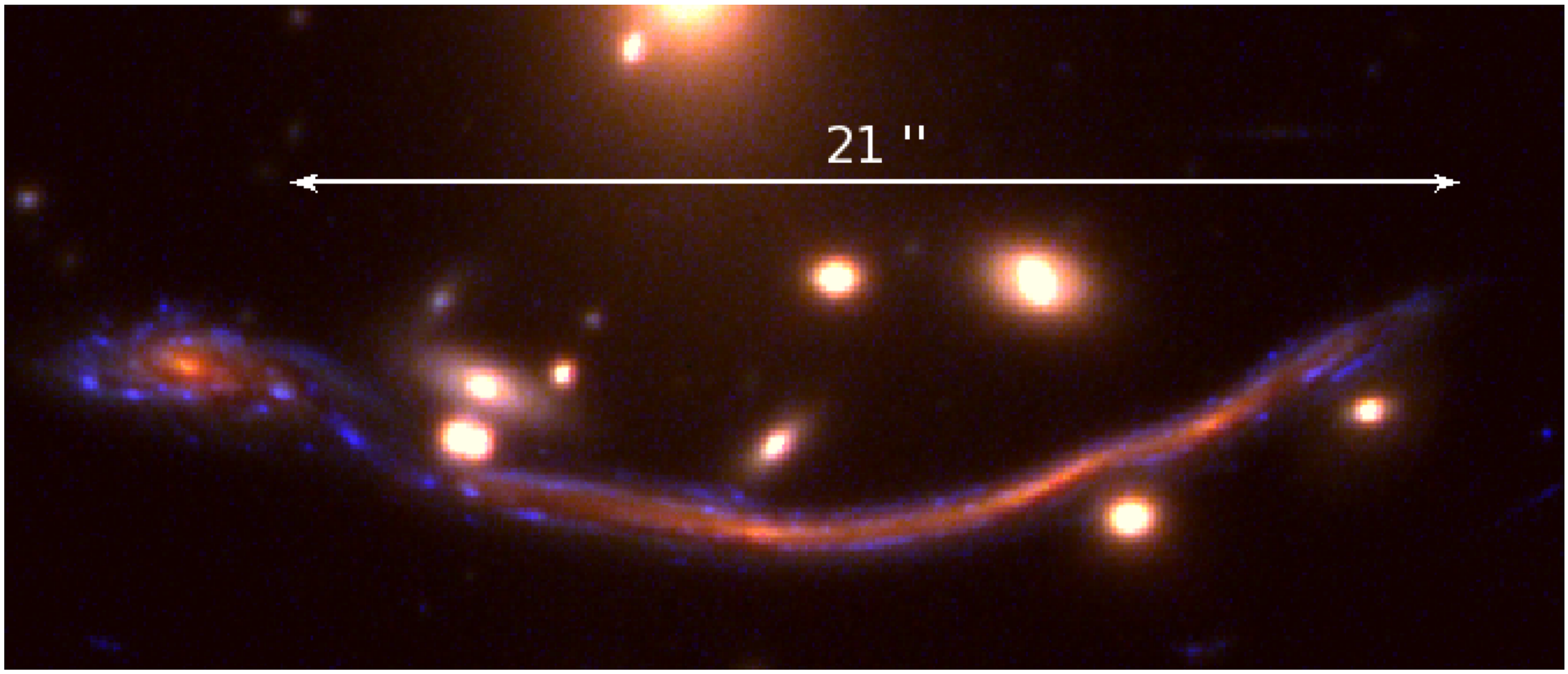
CENTRE DE RECHERCHE ASTROPHYSIQUE DE LYON



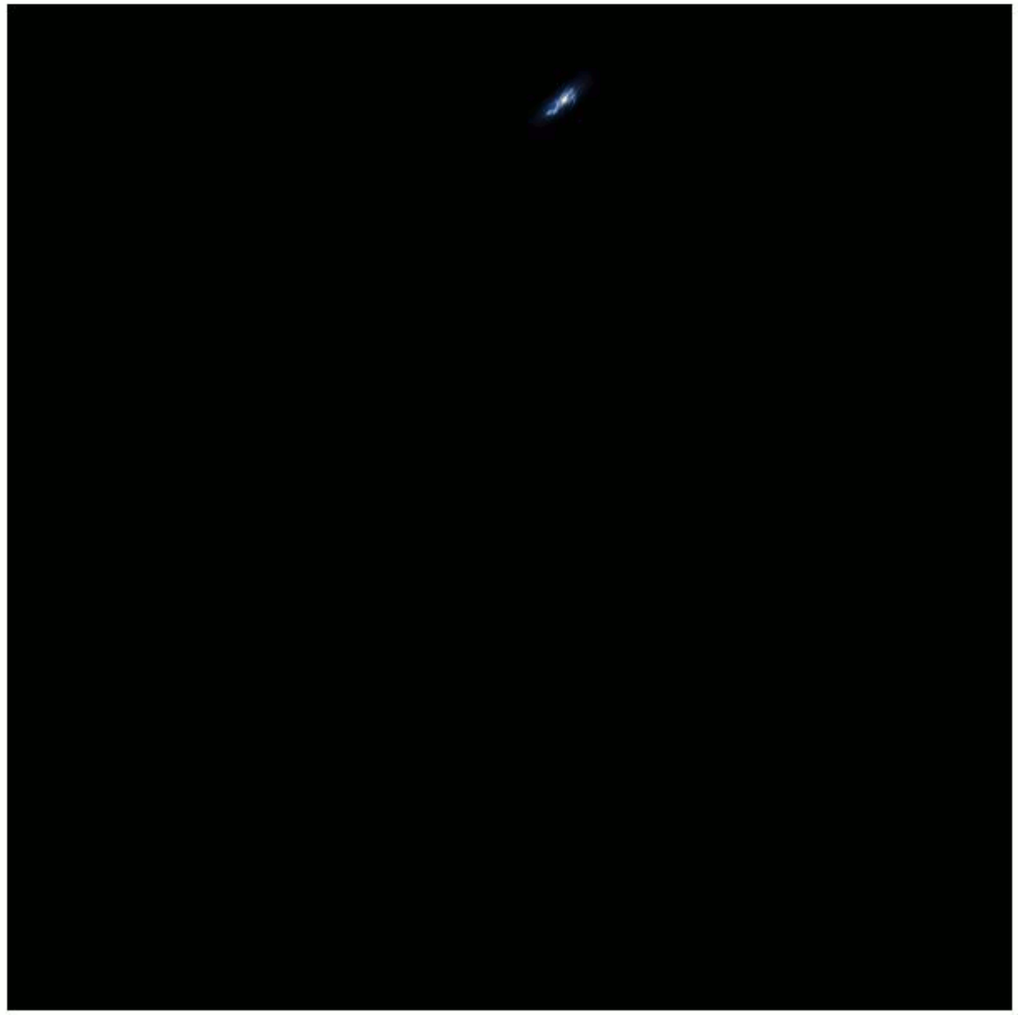
RESOLVED PROPERTIES OF INTERMEDIATE REDSHIFT EXTENDED ARCS SEEN WITH MUSE

Vera Patrício

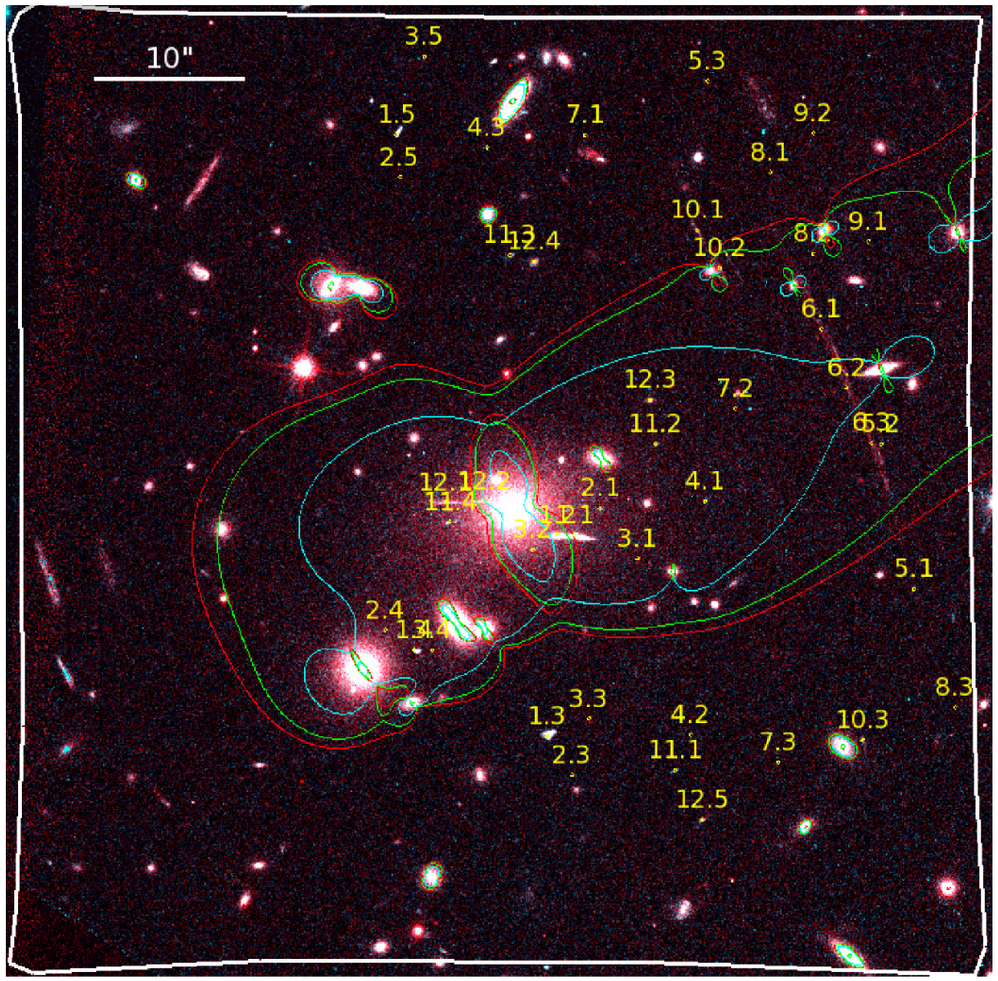
Johan Richard, Johany Martinez, Guillaume Mahler, David Lagattuta, Benjamin Clément, Hayley Finley, et al

GRAVITATIONAL LENSING

- Sources are magnified:
  - High spectral signal to noise; allows to probe unusual lines and stellar continuum.
  - Sources are spatially extended; allows to probe smaller spatial scales



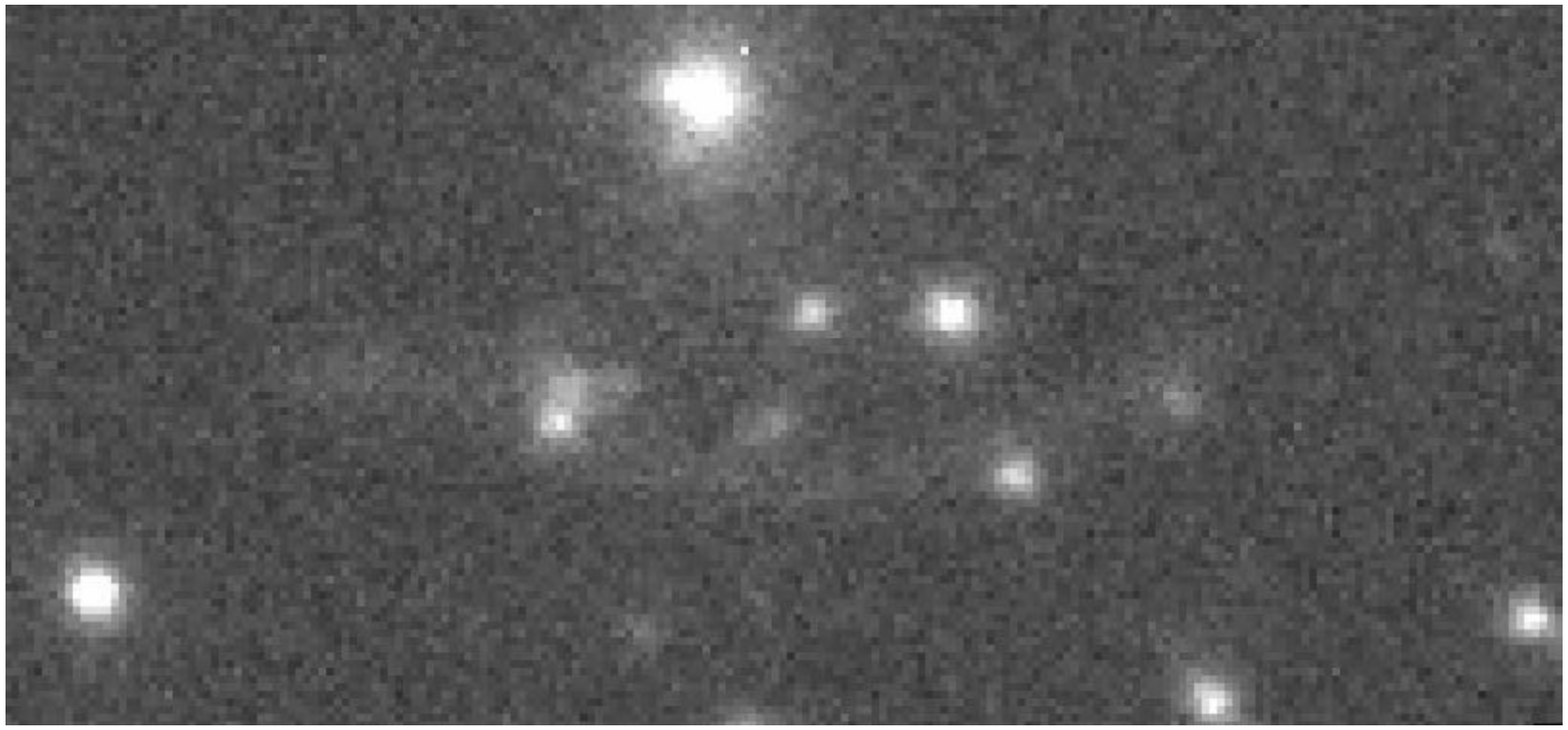
MUSE

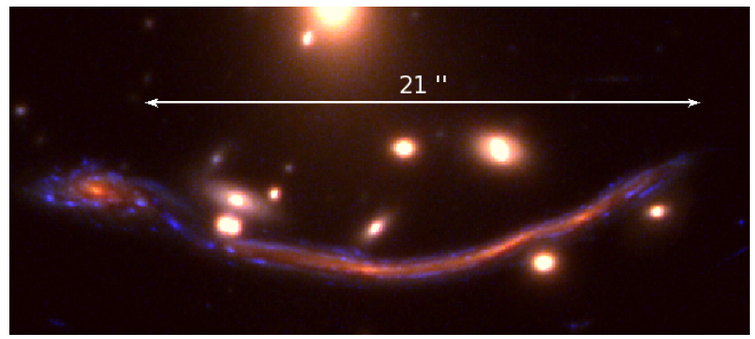


Richard+15 | CLUSTER SMACS2031

- Multi Unit Spectroscopic Explorer
  - IFU at UT4
    - 1 x 1 arcmin field of view
    - Optical: 4750 - 9500 Å
    - Spatial sampling: 0.2x0.2”
    - Spectral sampling: 1.25 Å

GRAVITATIONAL LENSING + MUSE





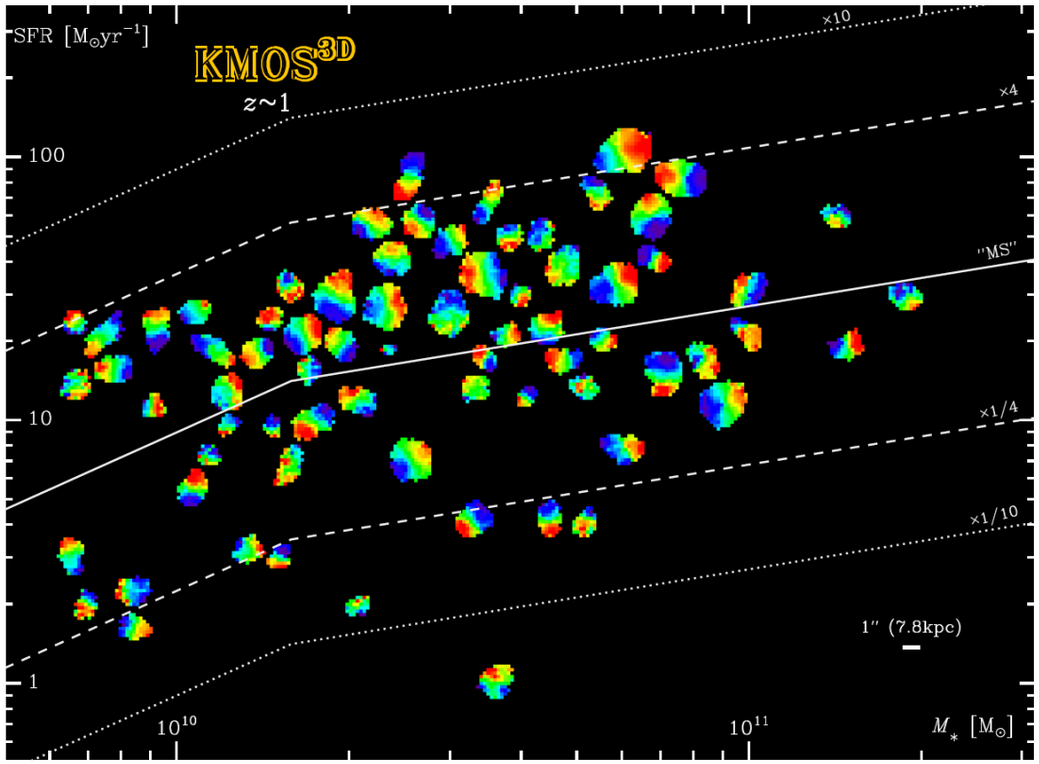
Cluster A370

z = 1.034
21 '' extension
300 - 900 pc
in MUSE resolution

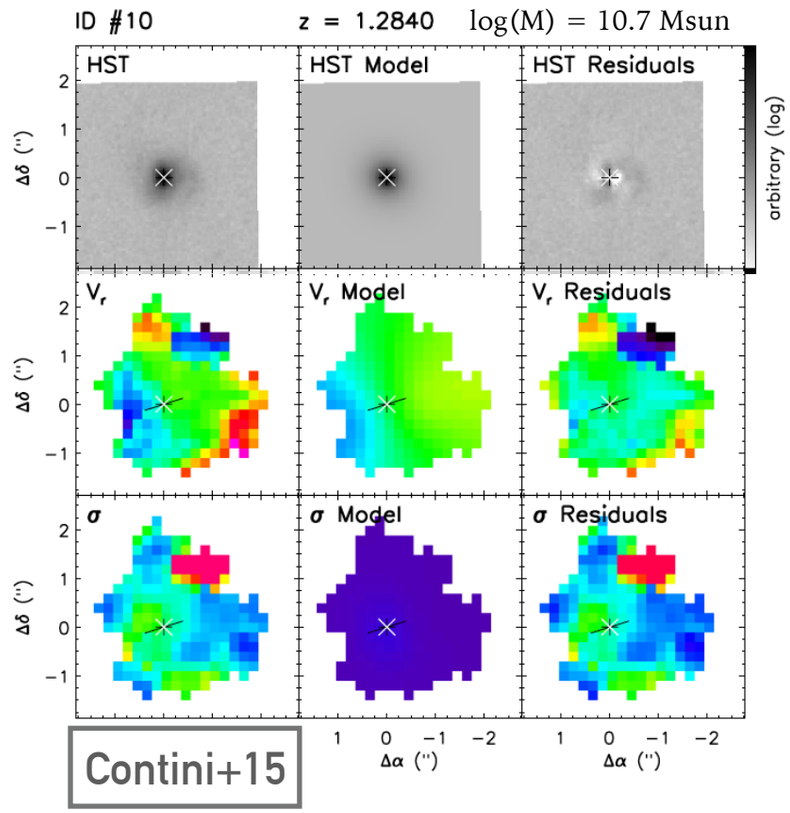
A sample of 7 **lensed extended arcs** (>5-20'') at intermediate redshift (**0.6< z <1.5**) that allows to:

- obtain **high S/N integrated spectrum.**
- derive **resolved properties** such as gas kinematics, extinction and metallicity maps.

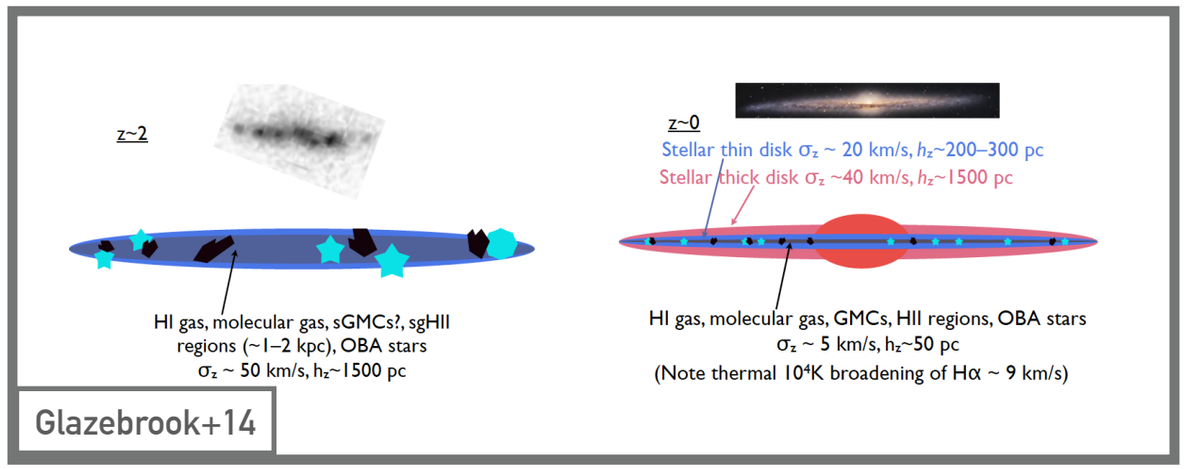
GALAXIES AT INTERMEDIATE REDSHIFTS



Wisnioski+15



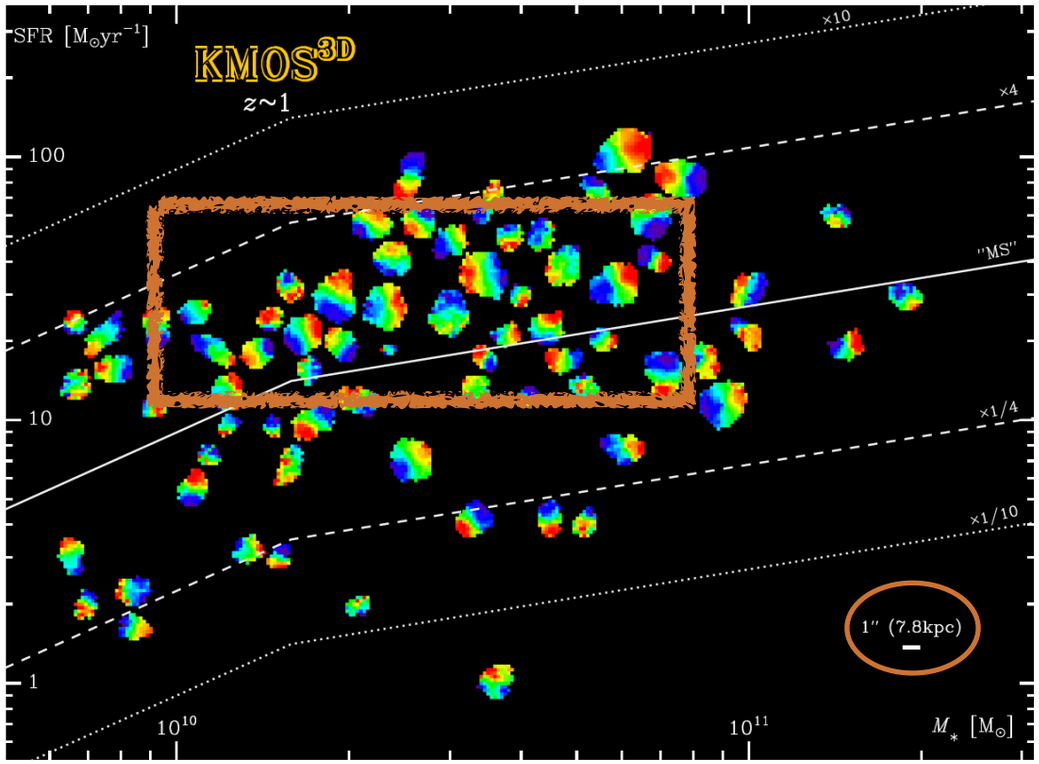
Contini+15



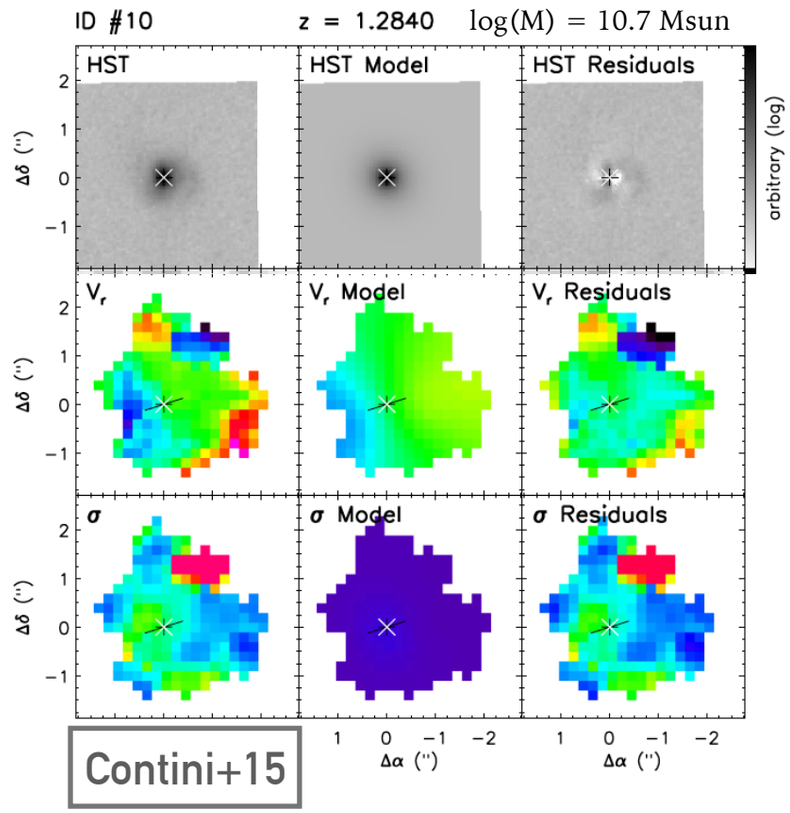
Glazebrook+14

- large fraction (~>30%) of rotating discs
- higher values of the velocity dispersion
- very clumpy compared with local galaxies

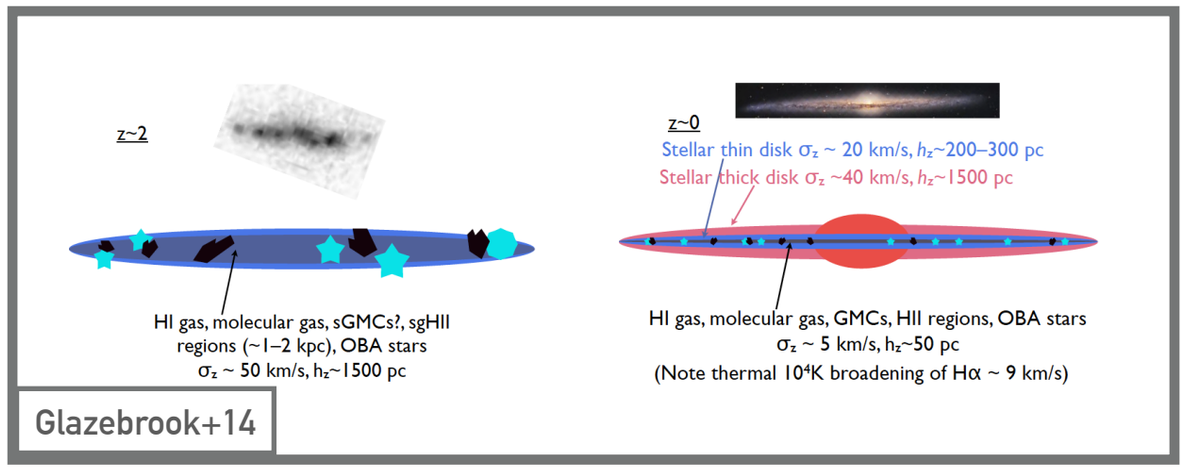
GALAXIES AT INTERMEDIATE REDSHIFTS



Wisnioski+15



Contini+15

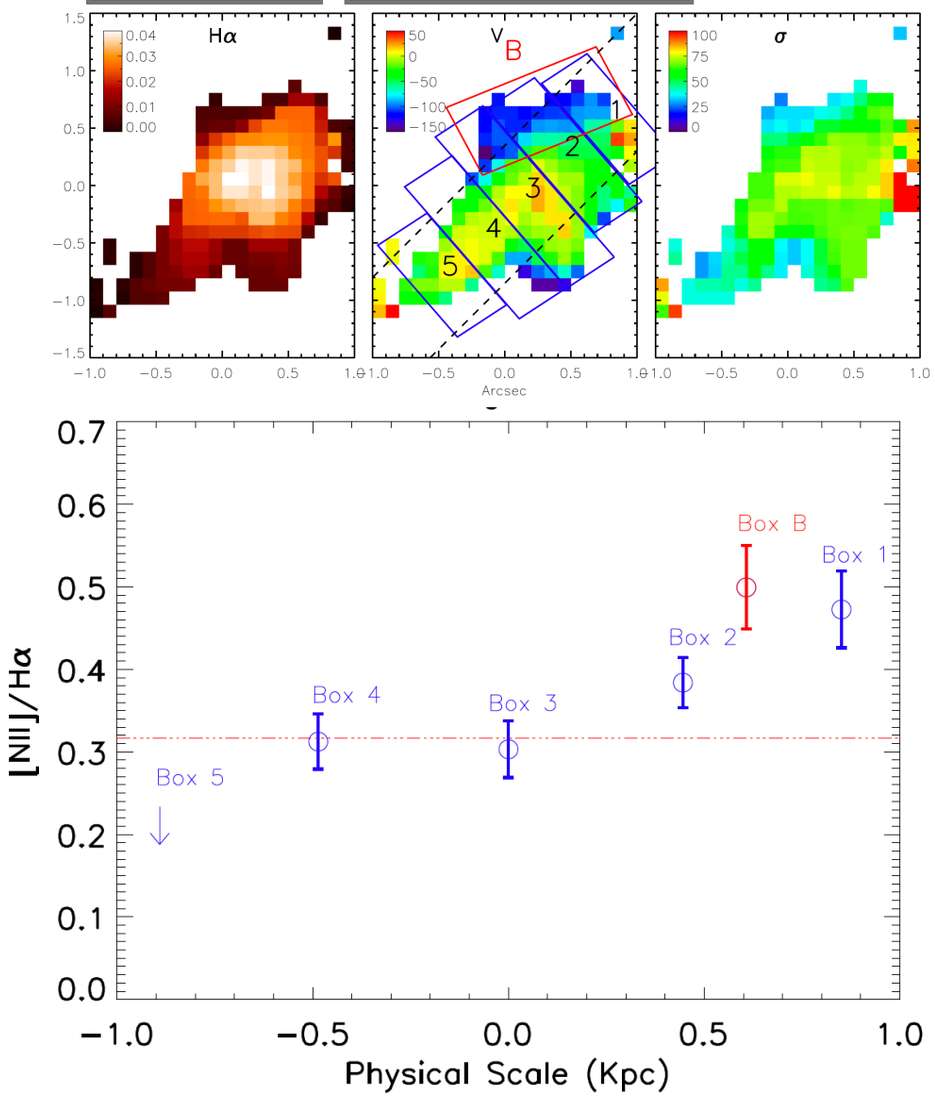


Glazebrook+14

- large fraction (~>30%) of rotating discs
- higher values of the velocity dispersion
- very clumpy compared with local galaxies

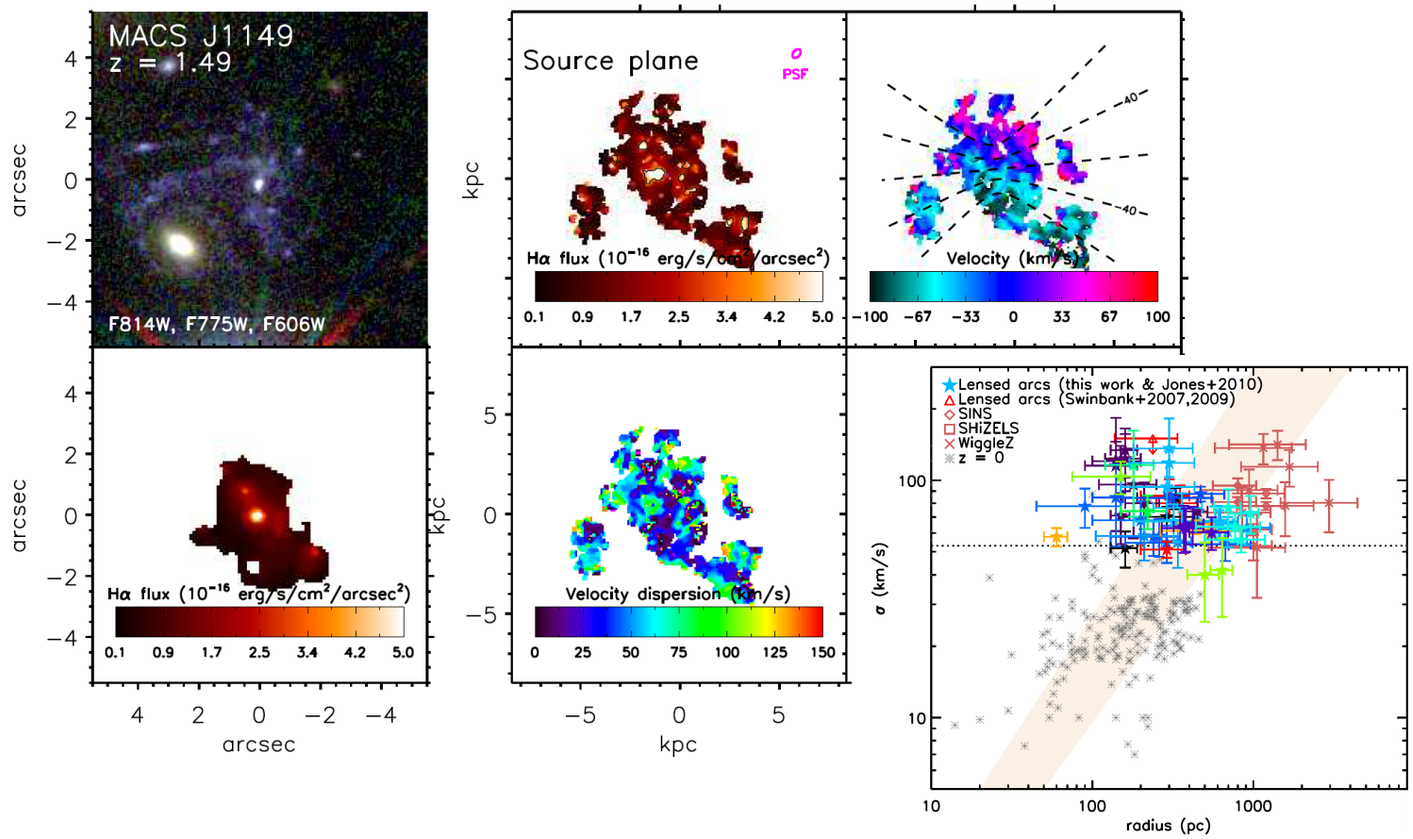
SOME LENSING STUDIES

Yuan+12a | OSIRIS - A2667



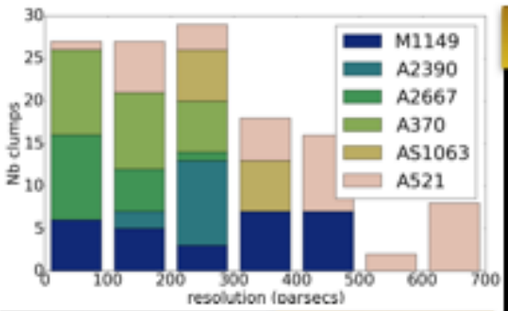
'we find a blue-shifted region of strong [N II]/H emission in the outer disk. (..) we propose that this elevated ratio region is contaminated by a significant fraction of shock excitation due to galactic outflows.'

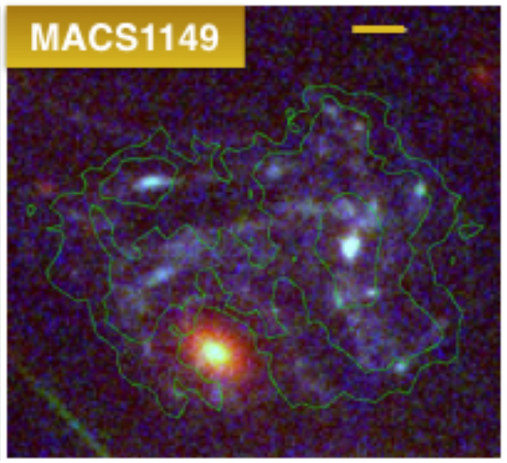
Livermore+15 | OSIRIS - MACS1149

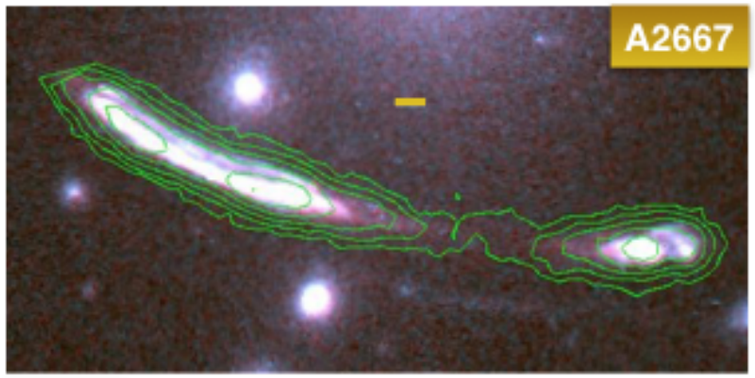


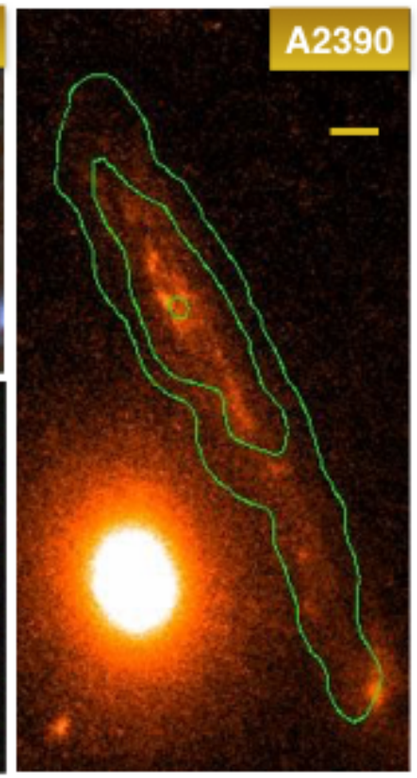
'we find that the clumps have similar velocity dispersions to unlensed high-z samples while being smaller and less luminous (…) This could be an indication that these clumps are not virialised, and that their velocity dispersions may have additional contributions from star formation feedback or gravitational instability'

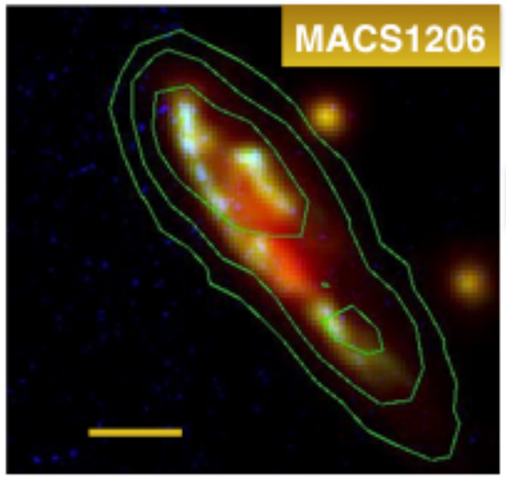
MUSE ARCS SAMPLE

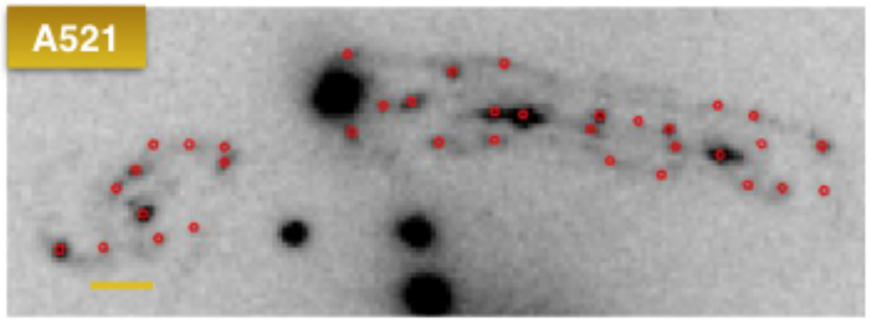


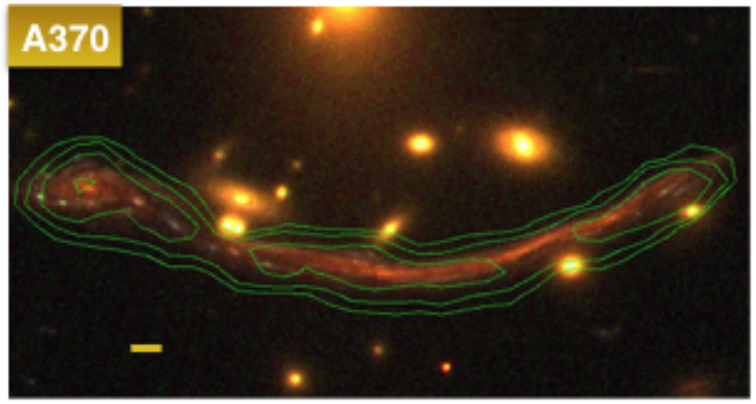












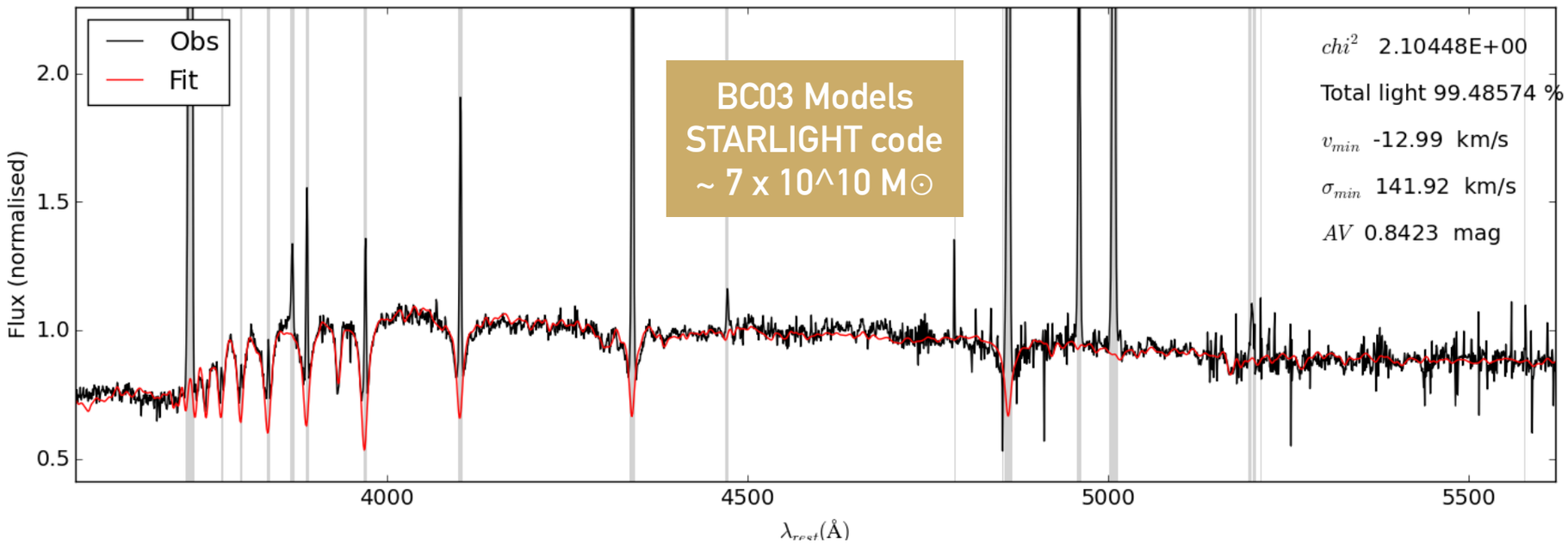
Cluster	z	μ	μ*SFR [M⊙/yr]	Z/Z⊙	E(B-V) [mag]	V/σ	clumps
AS1063	0.611	4.2	26	1.6	0.4	2	13
A2667	1.034	14	112	1.8	0.6*		16
A370	0.720	35	30	1.9	0.2	2.3	25
MACS0416	0.939	15	13	1.2			10
A2390	0.91	10	10	1.1	0	2.3	12
A521	1.04	13					36
MACS1206	1.03	30	20	1.2		2	25
MACS1149	1.488	23				3 **	27

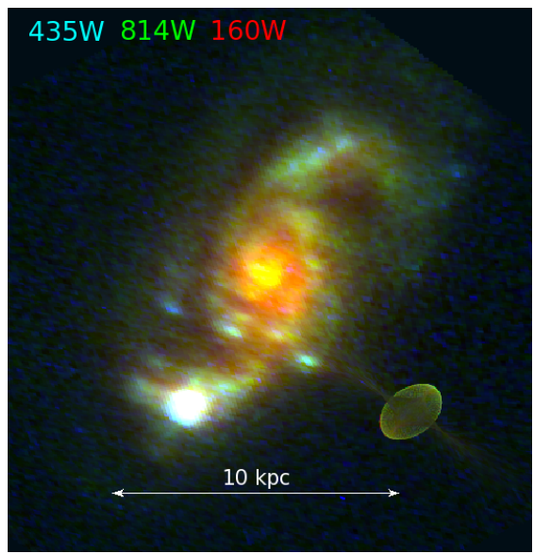
** Yuan+12, **Yuan+11*

Global Properties:

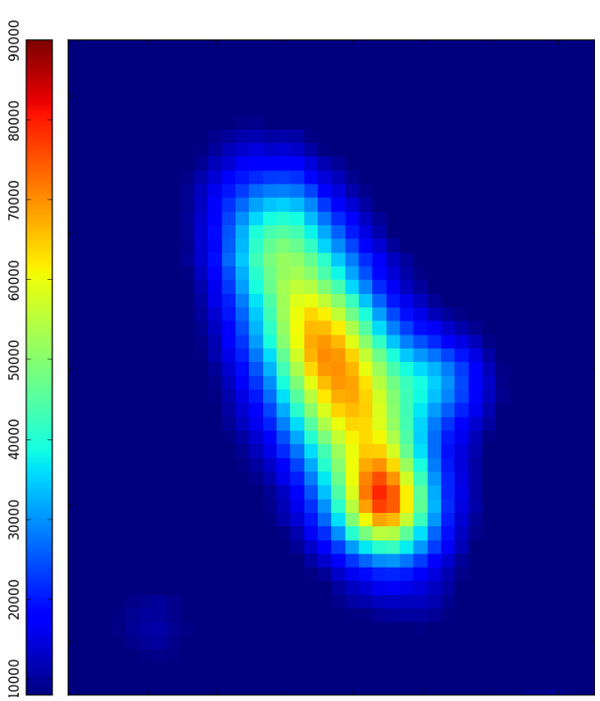
- $M_* \sim 10^{10} M_\odot$
- high SFR (10-80 $M_\odot$/yr),
- magnitude V~20-22
- rotating disks

AS1063 (Z=0.6) — STELLAR CONTINUUM

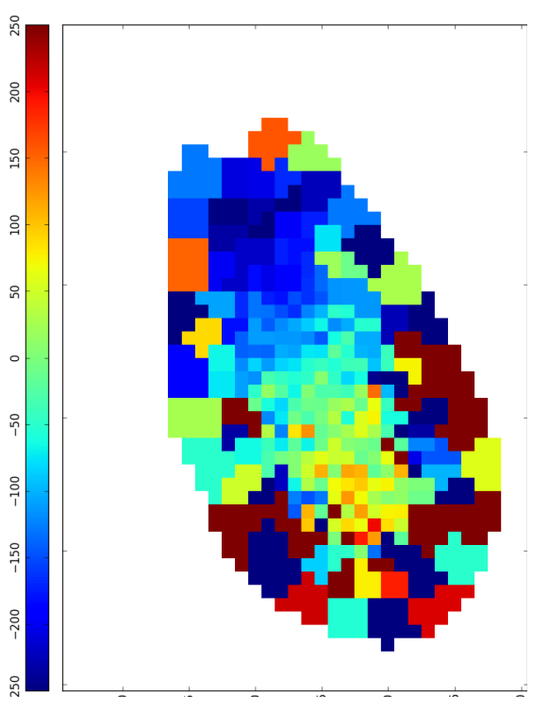




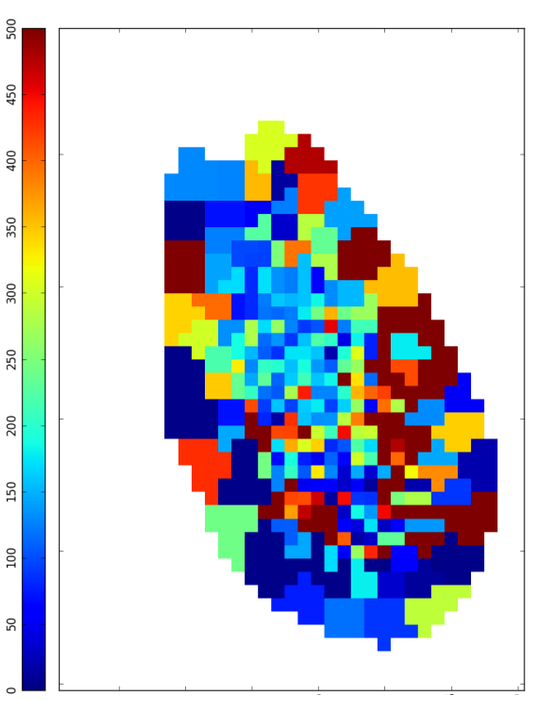
Source Plane | HST



MUSE white light



Stellar kinematics

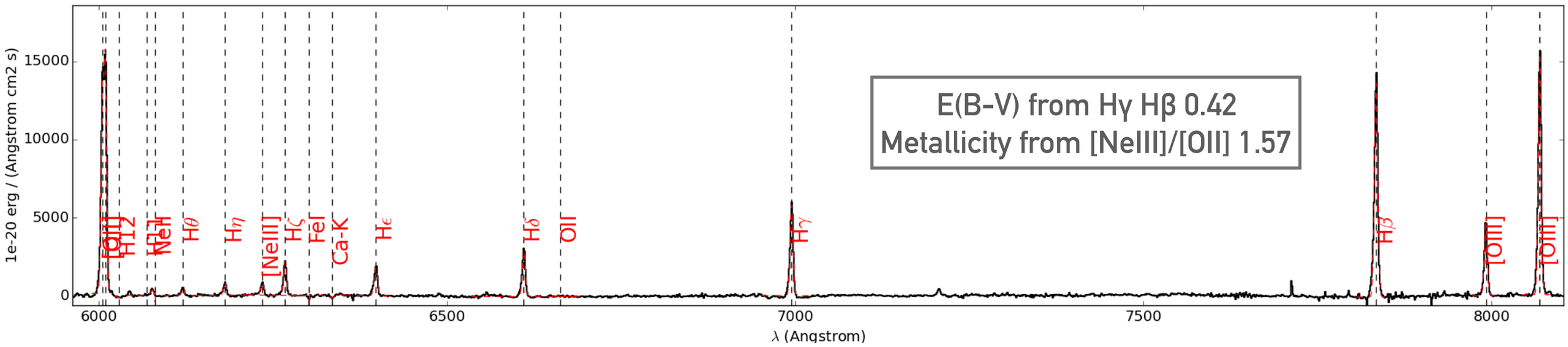


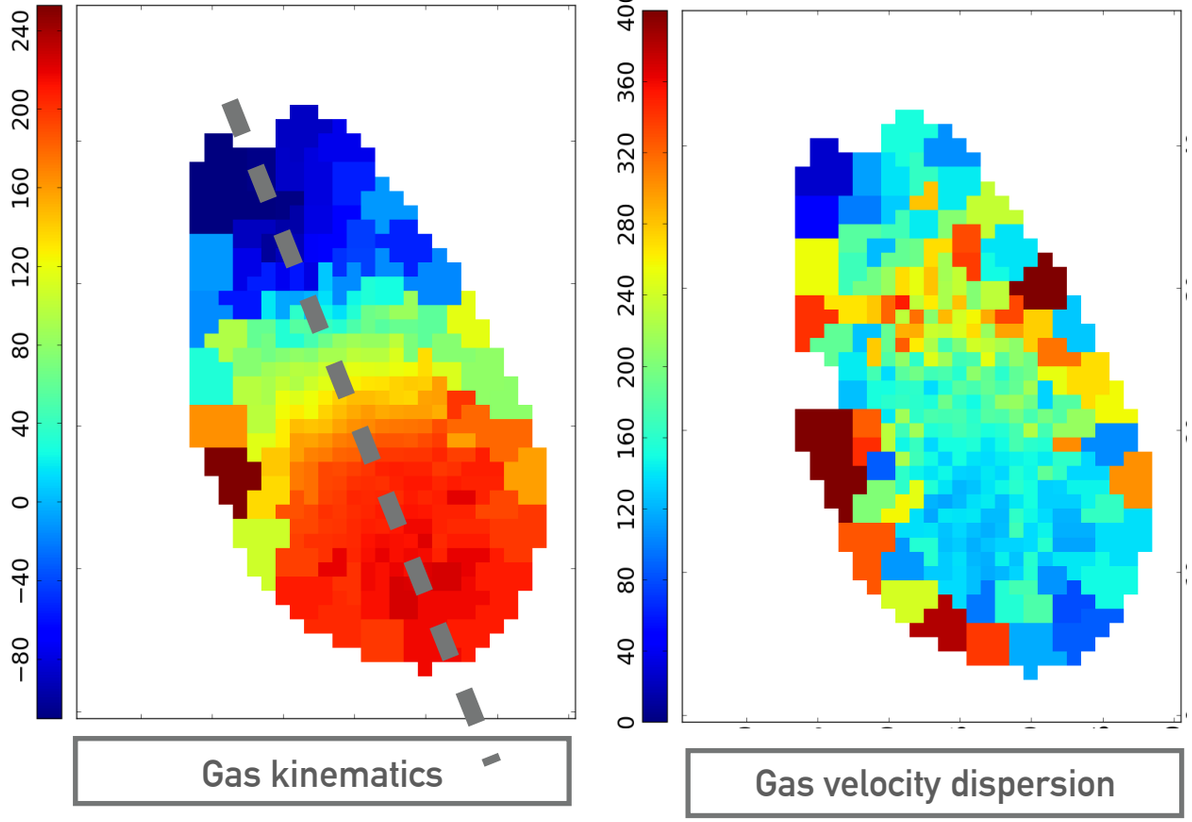
Stellar dispersion

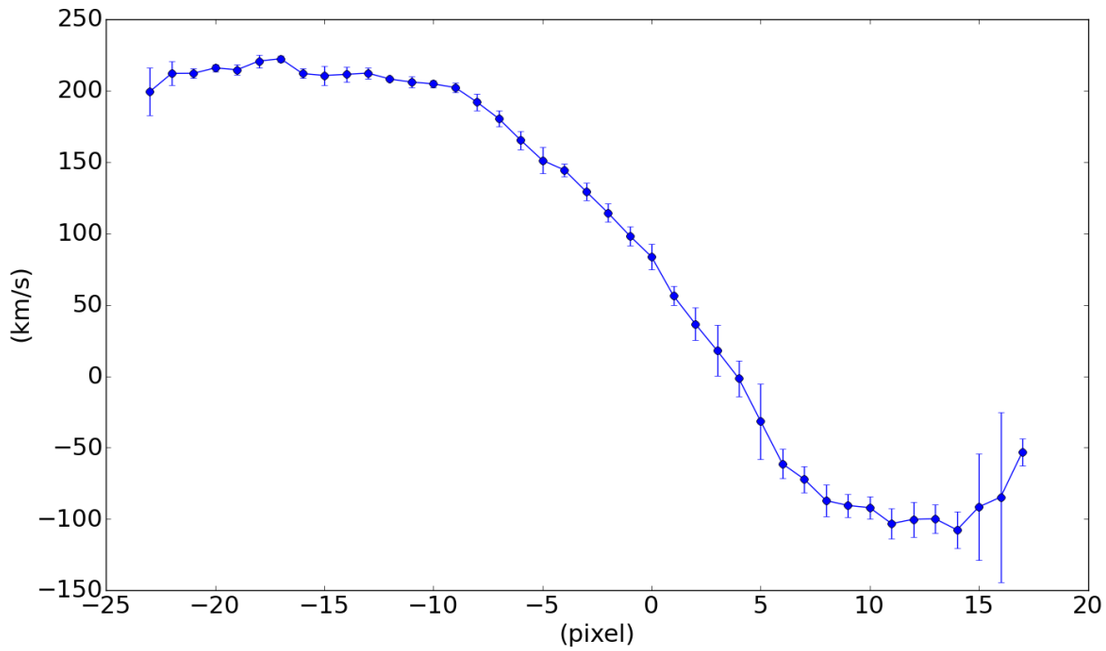
IndoUS star library

pPXF code (Cappellari&Emsellem +04)

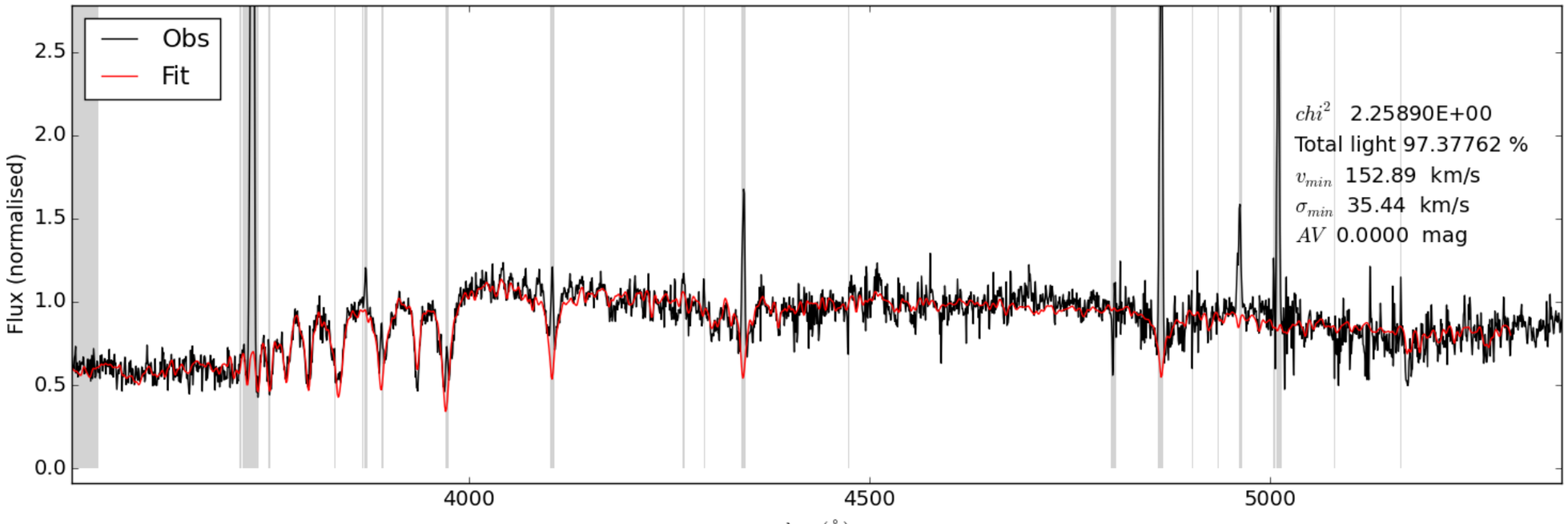
AS1063 (Z=0.6) — GAS EMISSION







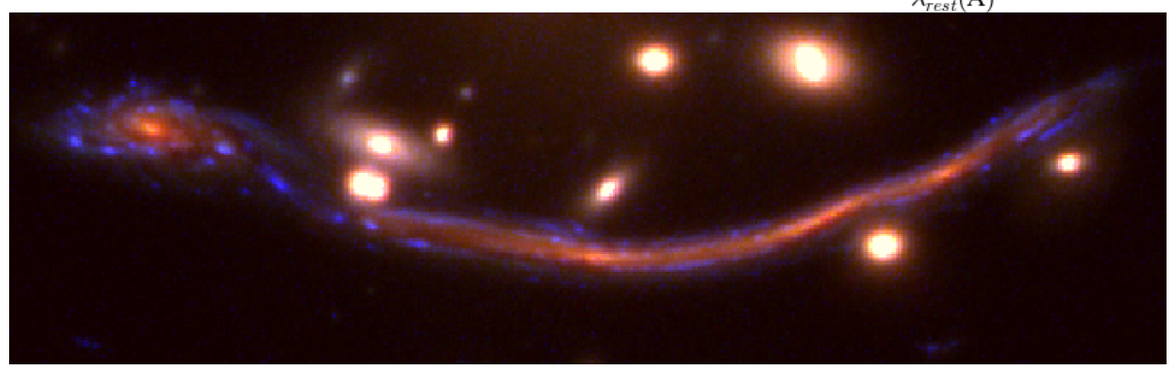
A370 (Z = 0.7) — STELLAR EMISSION



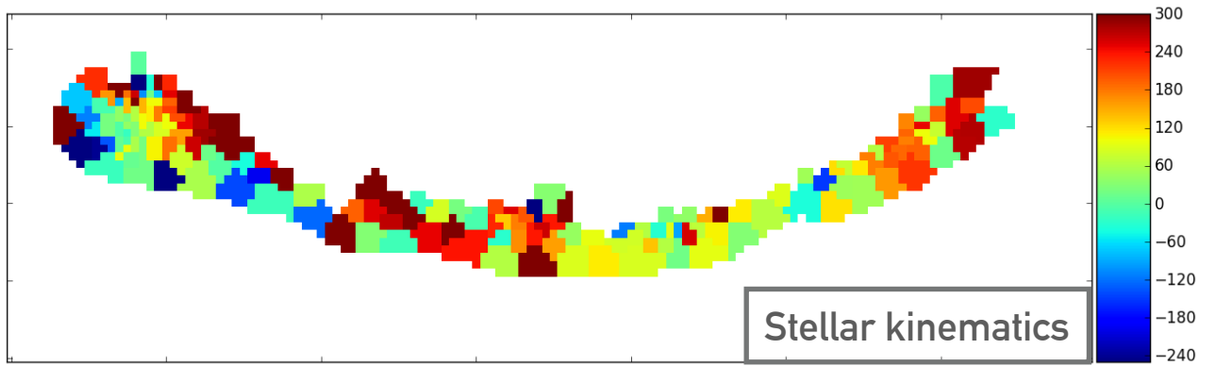
BC03 Models

STARLIGHT code

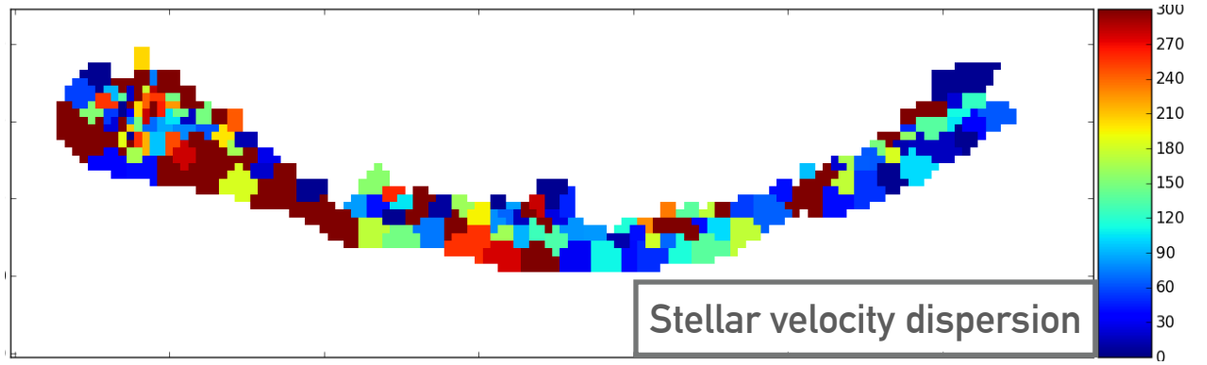
~ 1.6 x 10^10 M⊙



MUSE white light

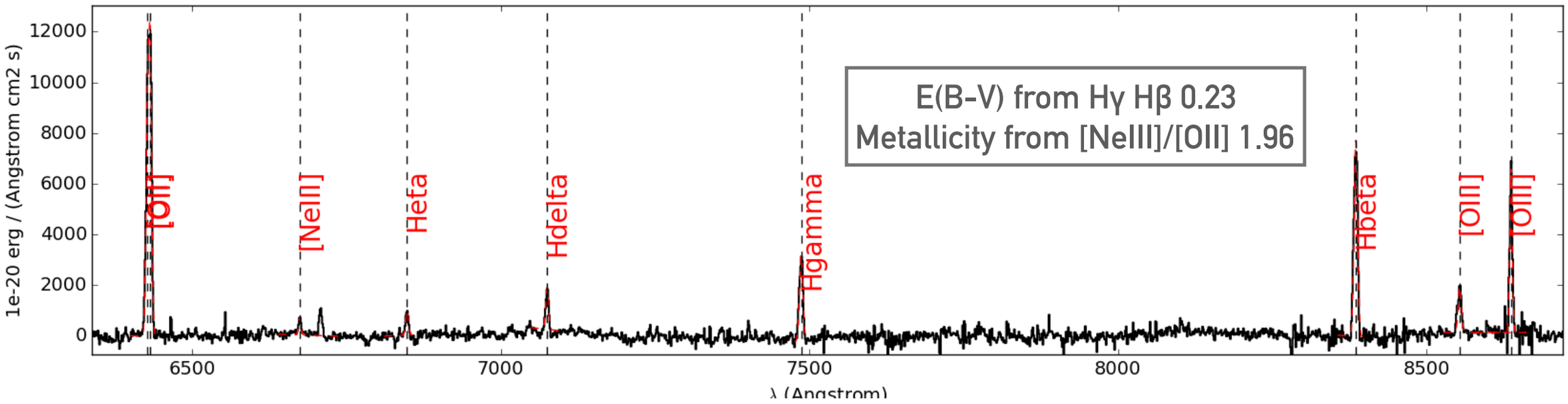


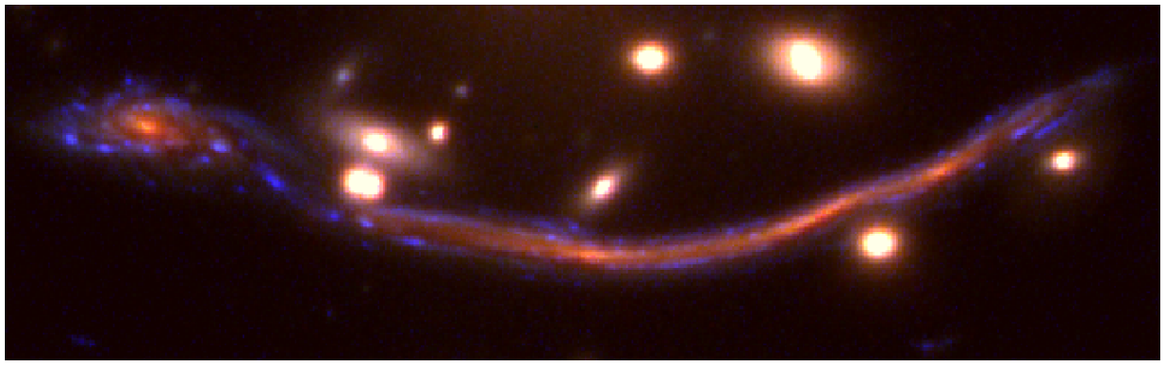
Stellar kinematics



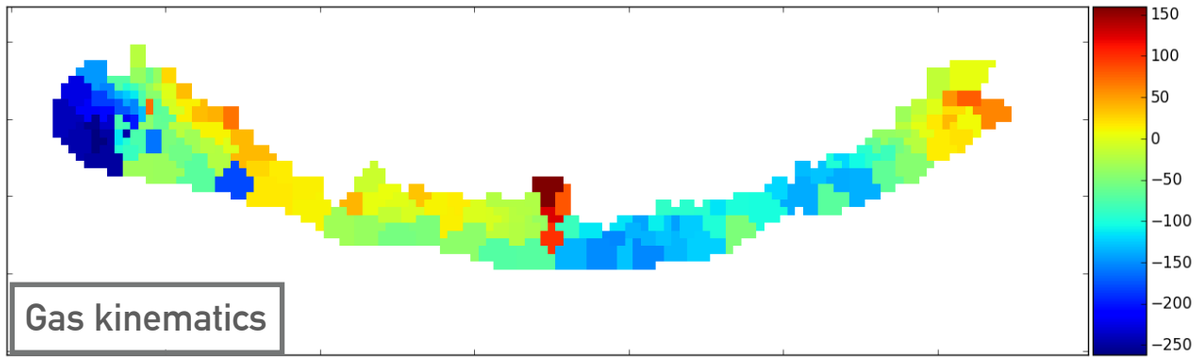
Stellar velocity dispersion

A370 (Z = 0.7) — GAS EMISSION

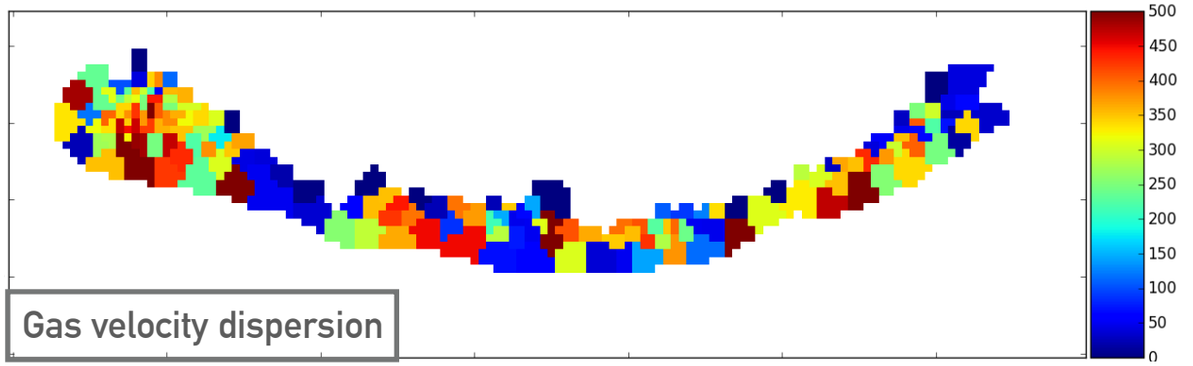




[OIII] continuum subtracted

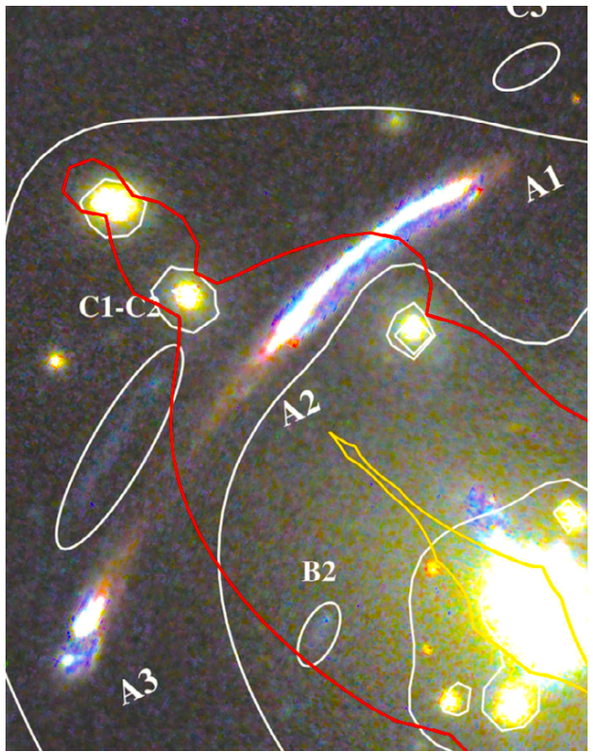


Gas kinematics

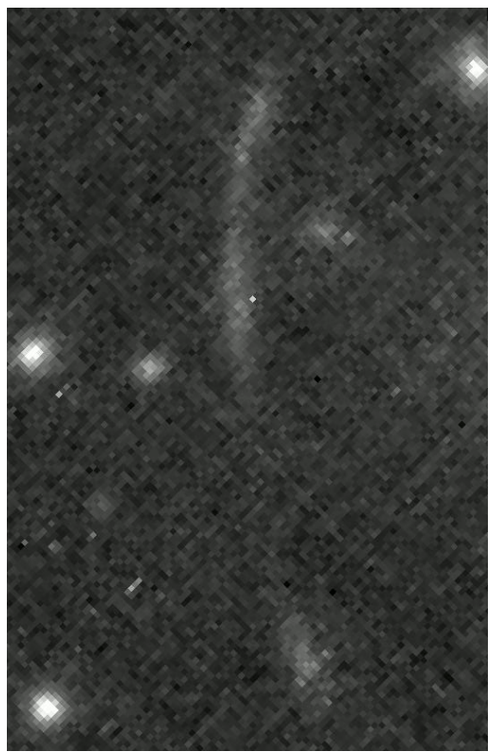


Gas velocity dispersion

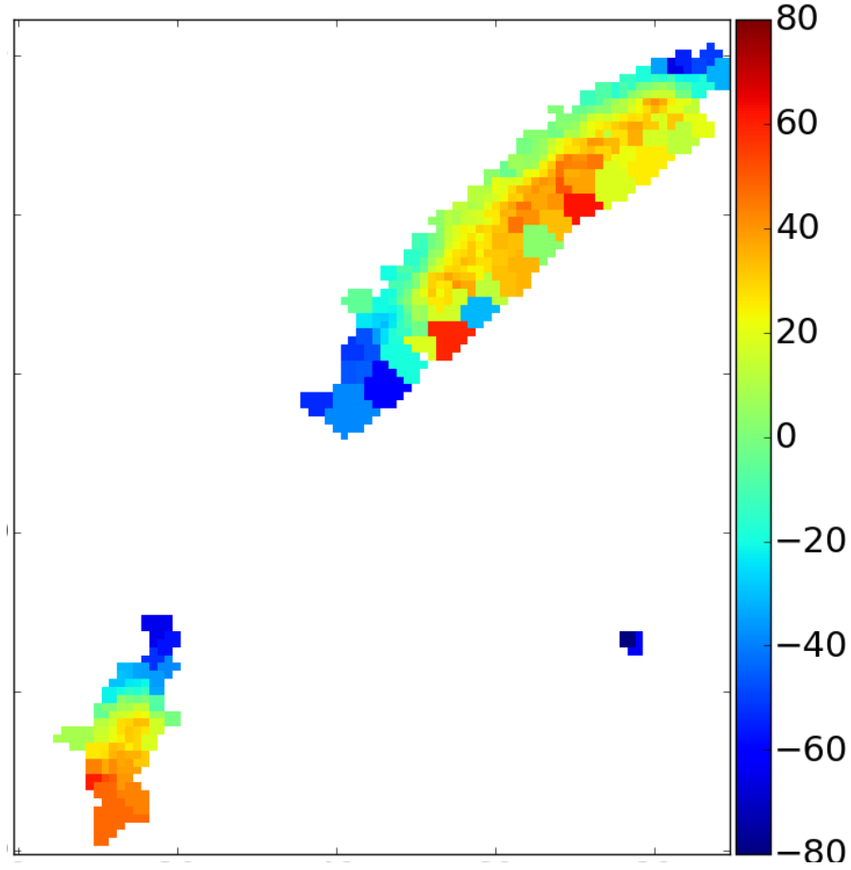
A2667 (Z=1.034)



HST (Covone +06)



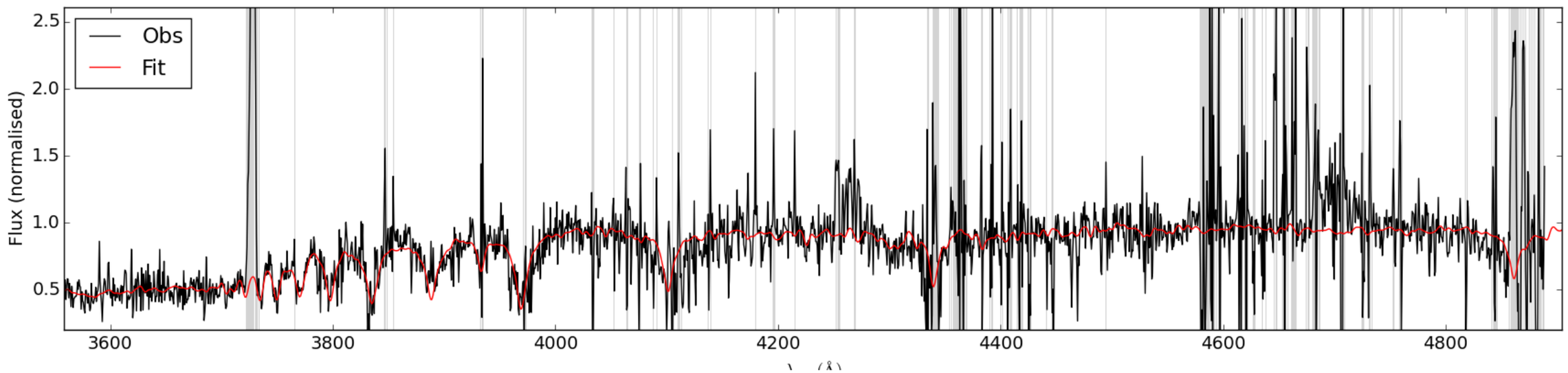
MUSE



z = 1.03381

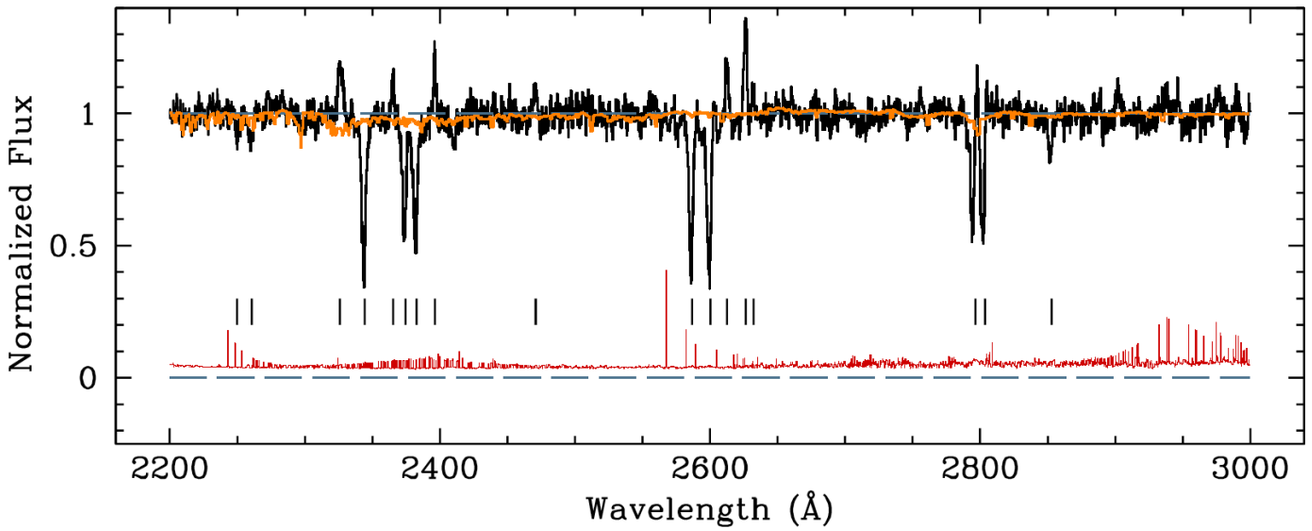
logM∗ = 10.28 (Cao+14)

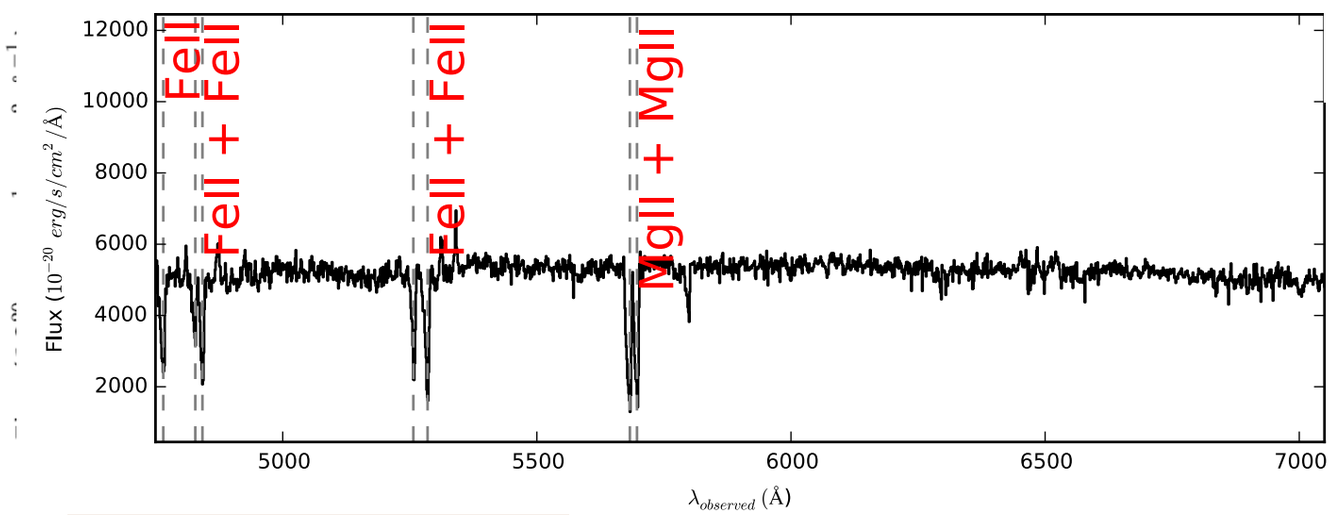
1.86 Z/Zsun

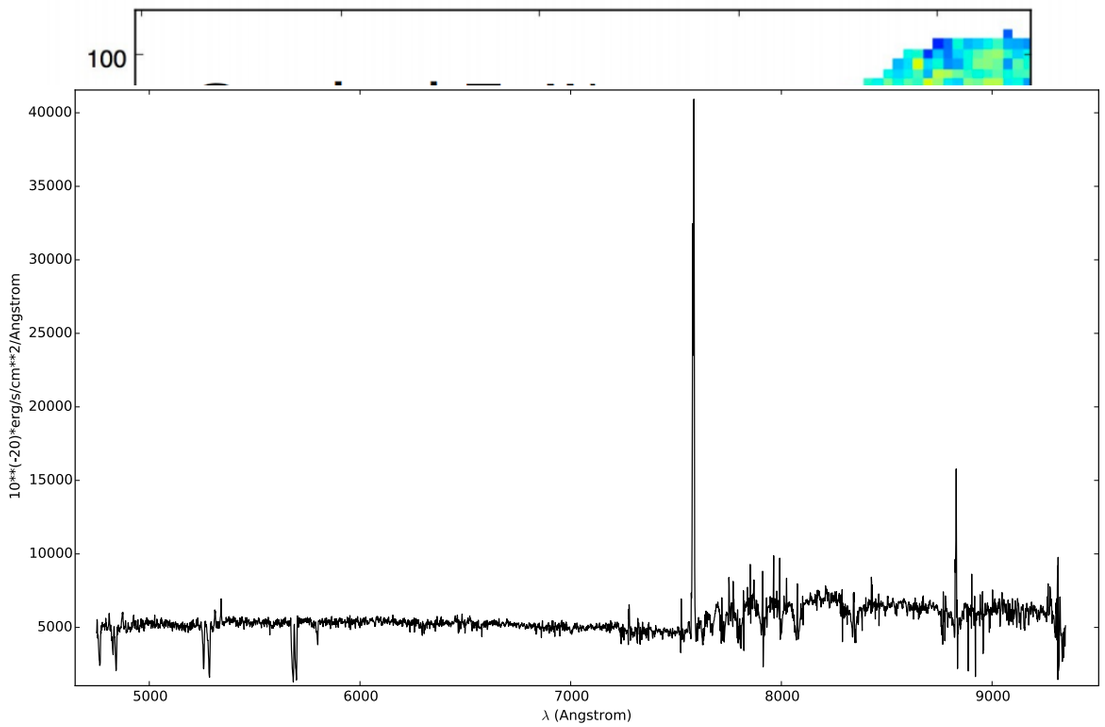


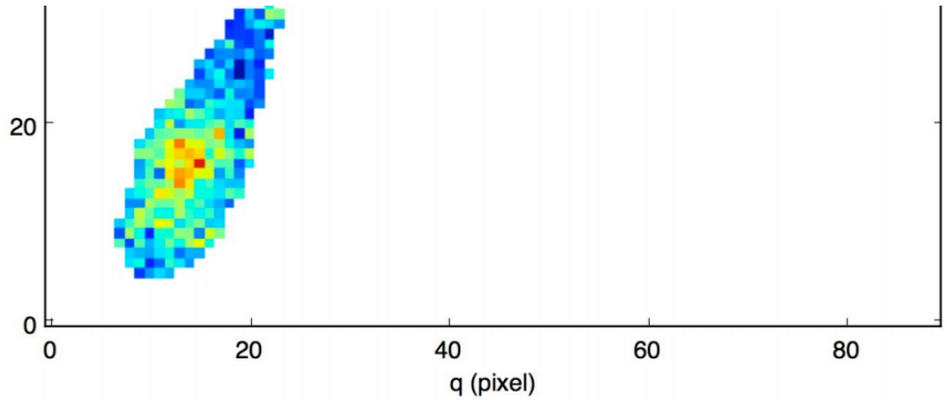
A2667 (Z=1.034) — OUTFLOWS THROUGH FEII* EMISSION

Erb+12 composite spectrum (96 galaxies, <z>= 1.4)





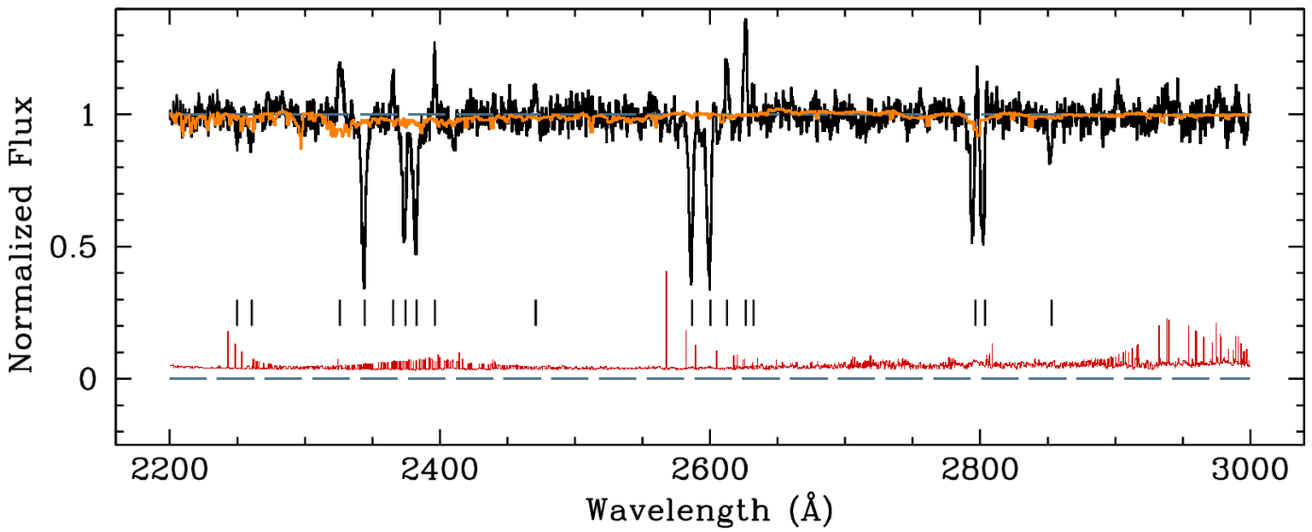


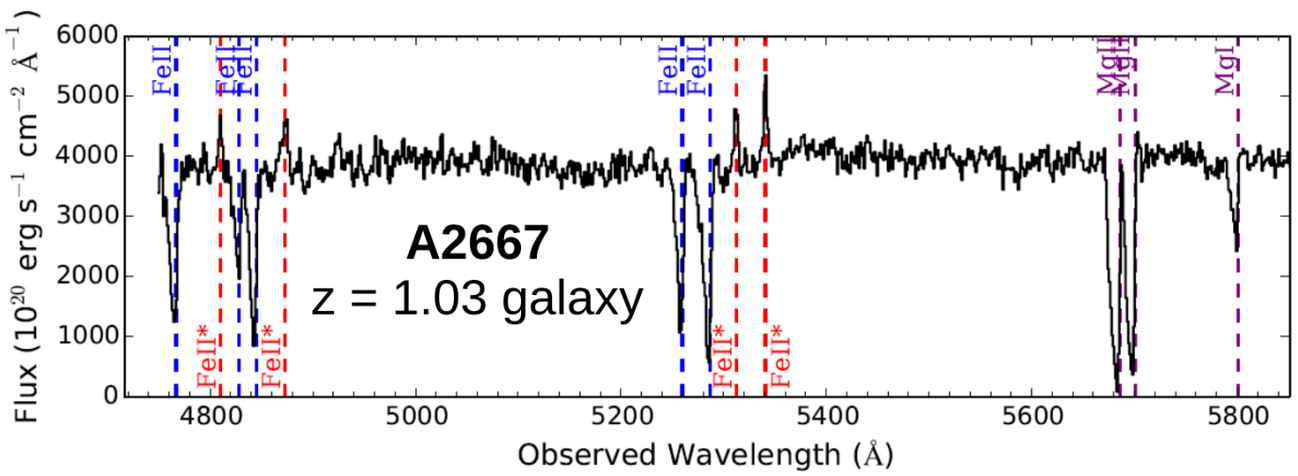


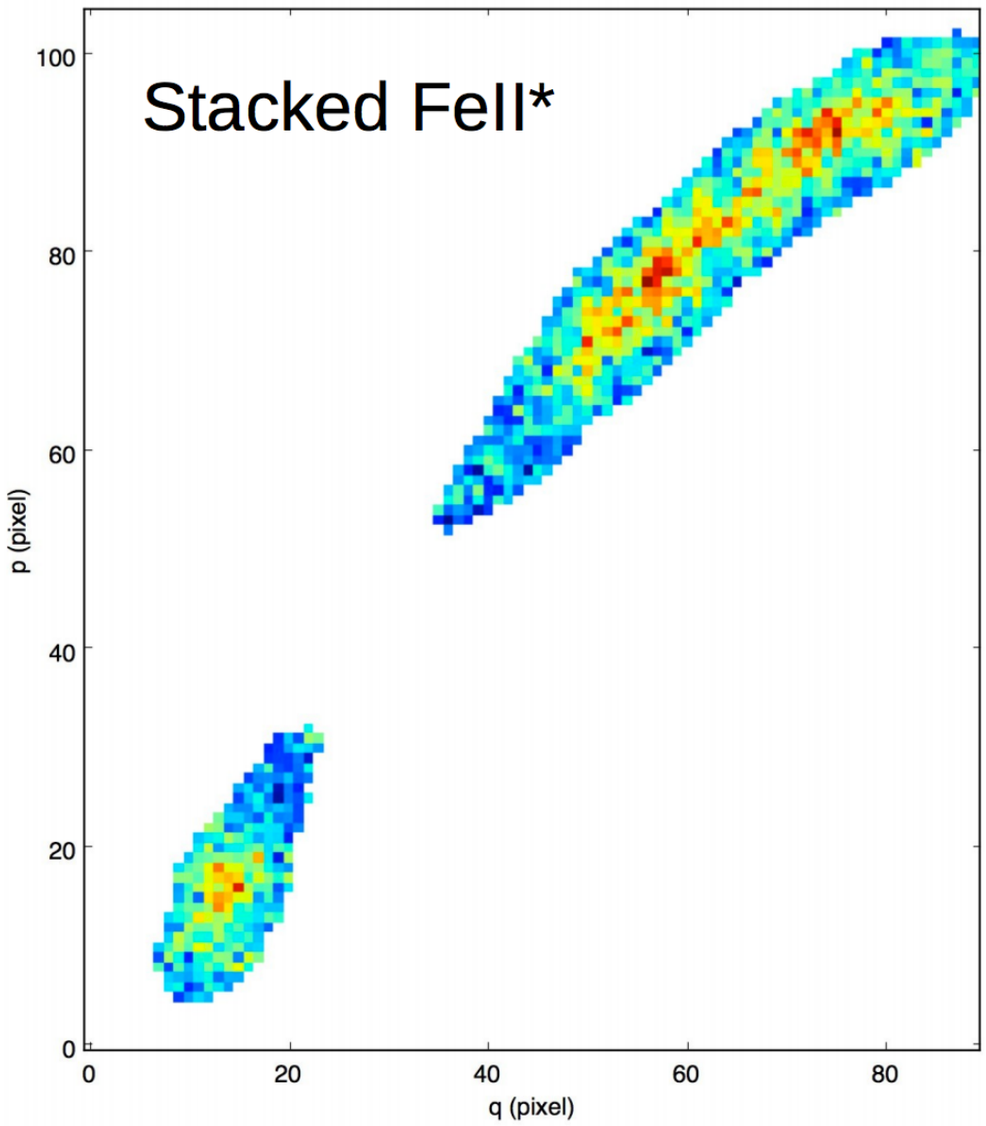
Finley et al, in prep

A2667 (Z=1.034) — OUTFLOWS THROUGH FEII* EMISSION

Erb+12 composite spectrum (96 galaxies, <z> = 1.4)







Finley et al, in prep

MORE TO COME SOON!