Galaxy mass assembly in various environments as seen by MUSE

B. Epinat

IRAP/LAM

with T. Contini, N. Bouché, J. Brinchmann, H. Finley, D. Carton, L. Michel-Dansac, E. Ventou, A. Guerou, and the MUSE-GTO team

Galaxy evolution over 10 Gyrs in various environments

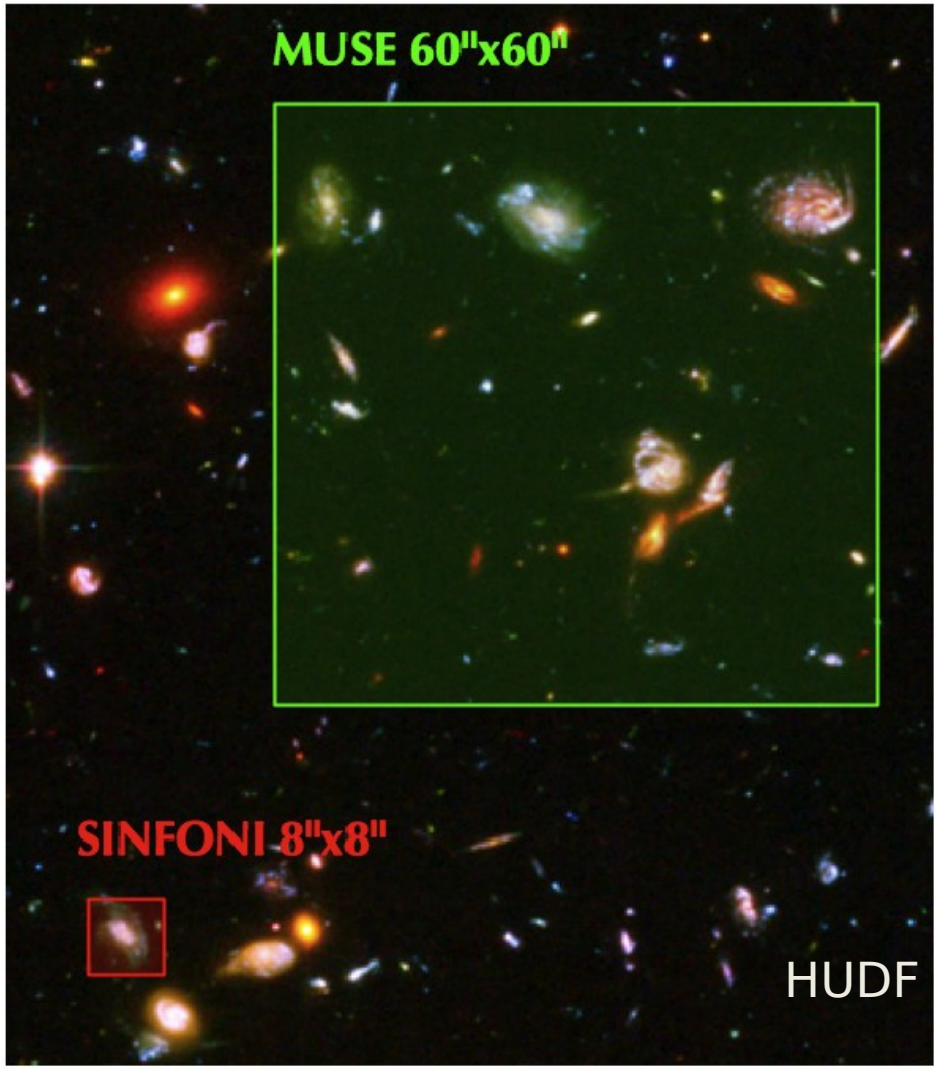
Build **statistical samples** of (spatially-resolved) **galaxies from z~3 to present-day**, **over a large range of stellar mass** (10^7-10^{11} $M_\odot$) and **different environments**

- Spatially-resolved properties: **kinematics**, metallicity gradients, etc
- Integrated properties (metallicity, SFR, etc), especially for the **lowest-mass** (unresolved) galaxies
- Close environment**:** major/minor **mergers** and gas **outflows/accretion**

Constraints on the main drivers of galaxy evolution over 10 Gyr

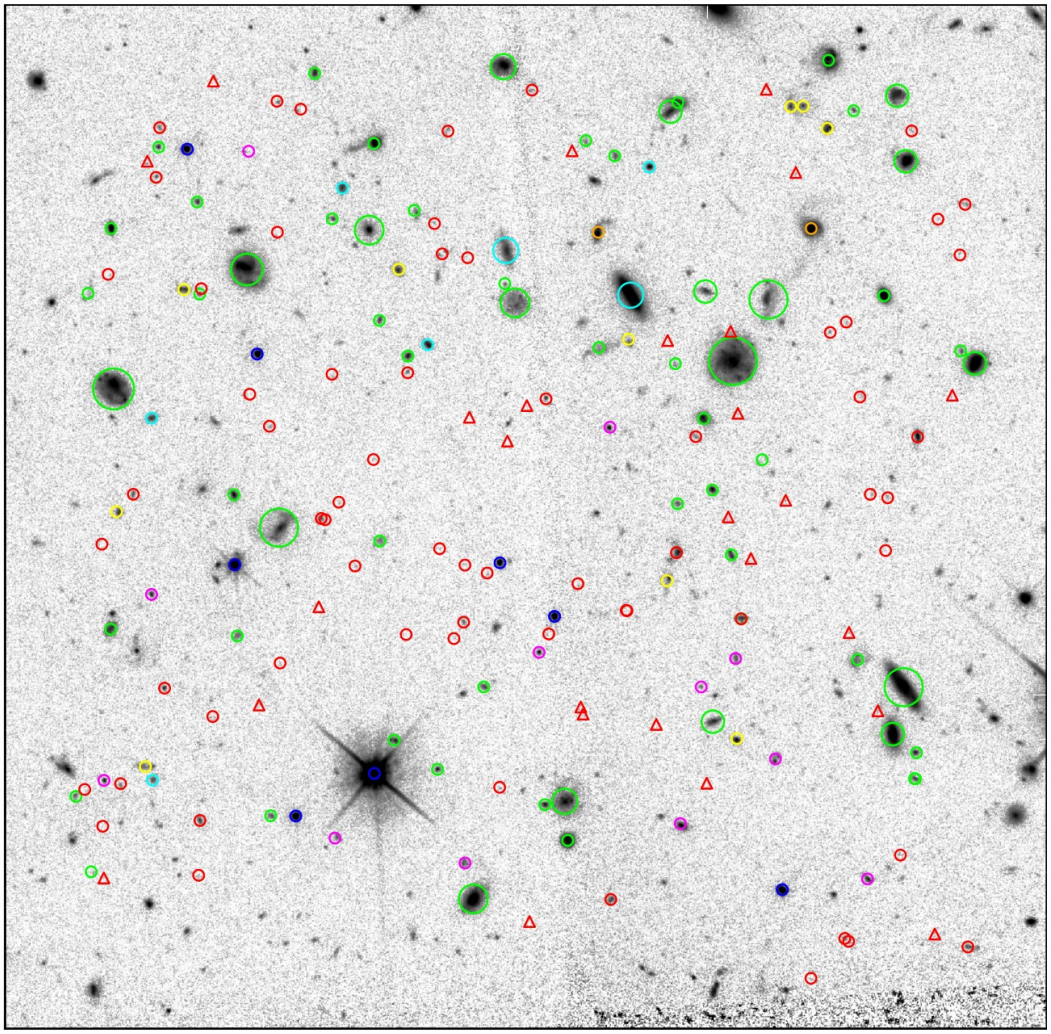
muse

multi unit spectroscopic explorer



- Integral field spectrograph
- Field of view: 1'x1'
- Spectral resolution: 0.2''
- Spectral range: 480 (465) – 930 nm
- Spectral resolution: R ~ 3000
- High throughput

MUSE-HDFS deep field

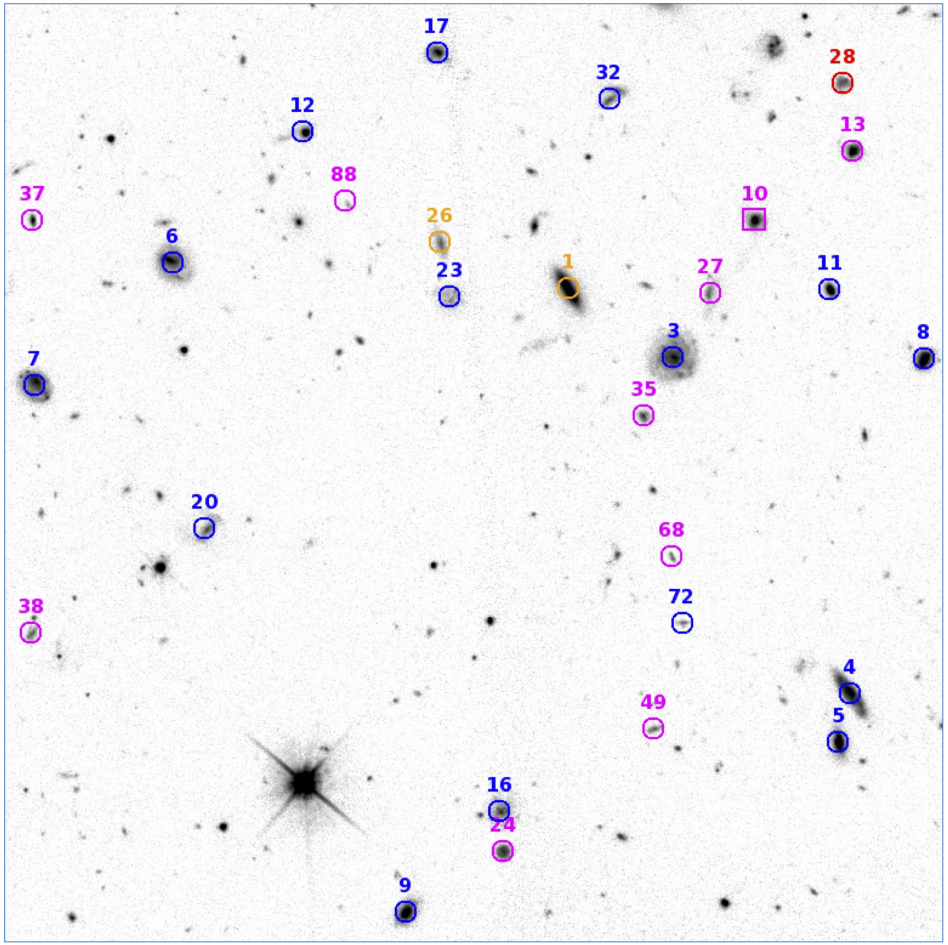


ACS F814W image

- Commissioning data
- 27 hours exposure
- FWHM ~ 0.65''
- $F_{lim} = 10^{-19}$ erg s^{-1} cm^{-2} arcsec^{-2}
- No pre-selection
- 189 redshifts up to $I_{AB} \sim 29.5$ (Bacon et al. 2015)

Resolved galaxies in MUSE-HDFS

Contini et al., submitted

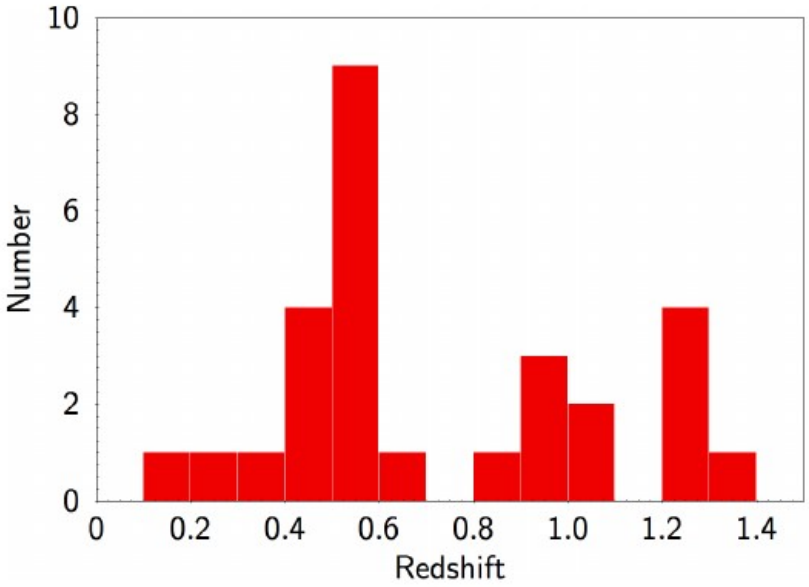


Criteria:

- Emission lines
- Emission size > 2 x PSF

Result:

- 28 galaxies with 0.2 < z < 1.4



Resolved galaxies in MUSE-HDFS

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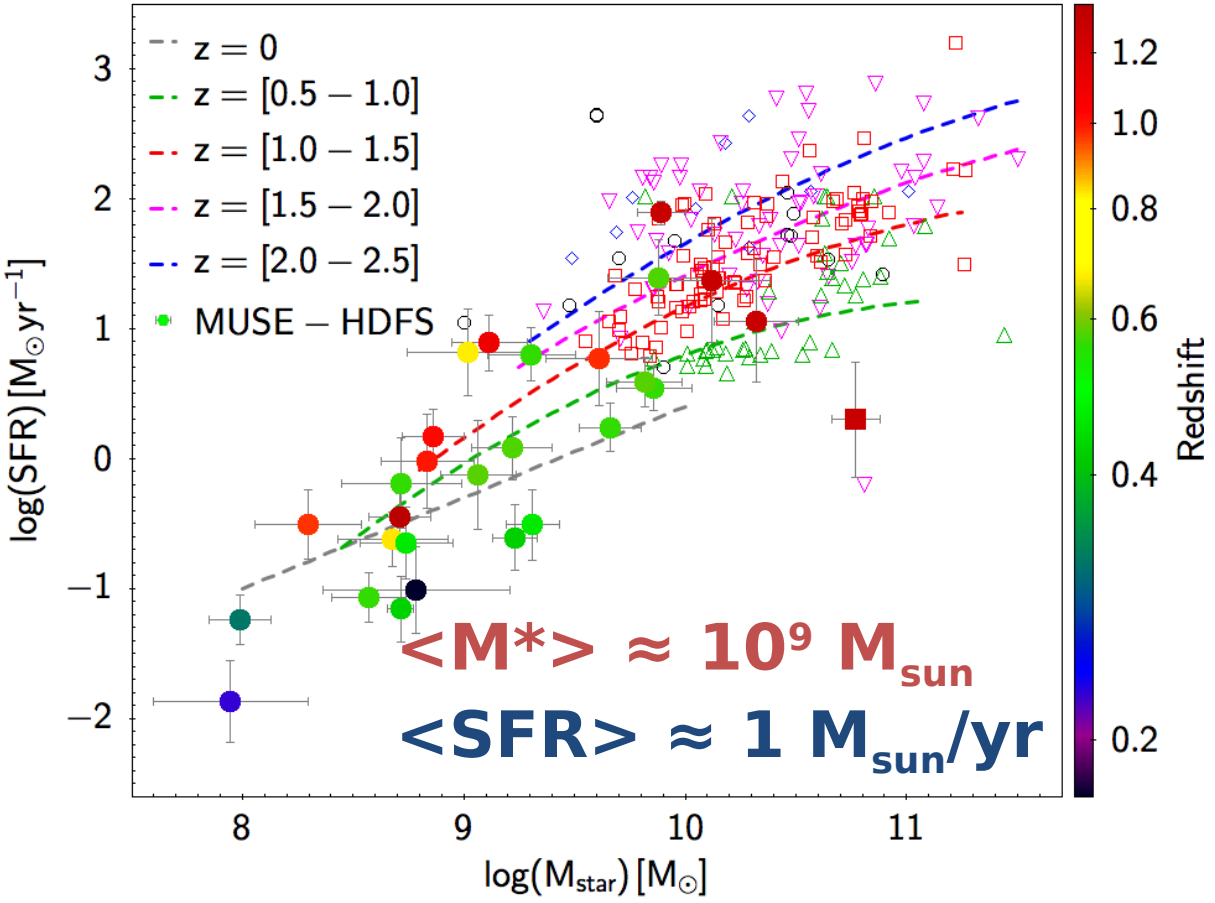
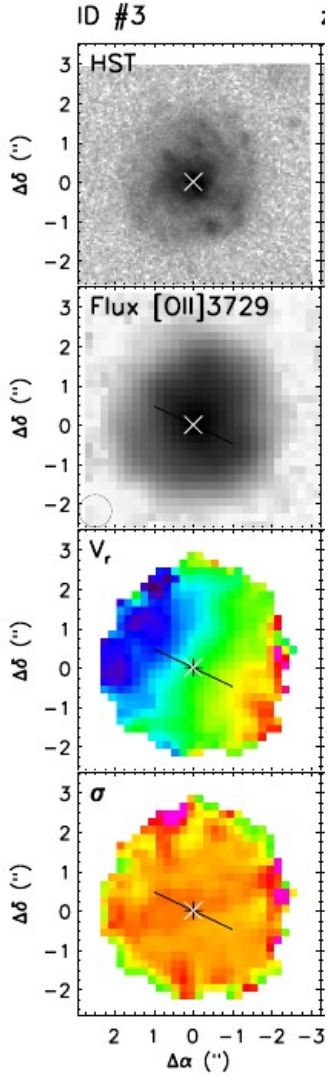


Low mass and SFR compared to previous surveys

Spatially resolved information

Contini et al., submitted

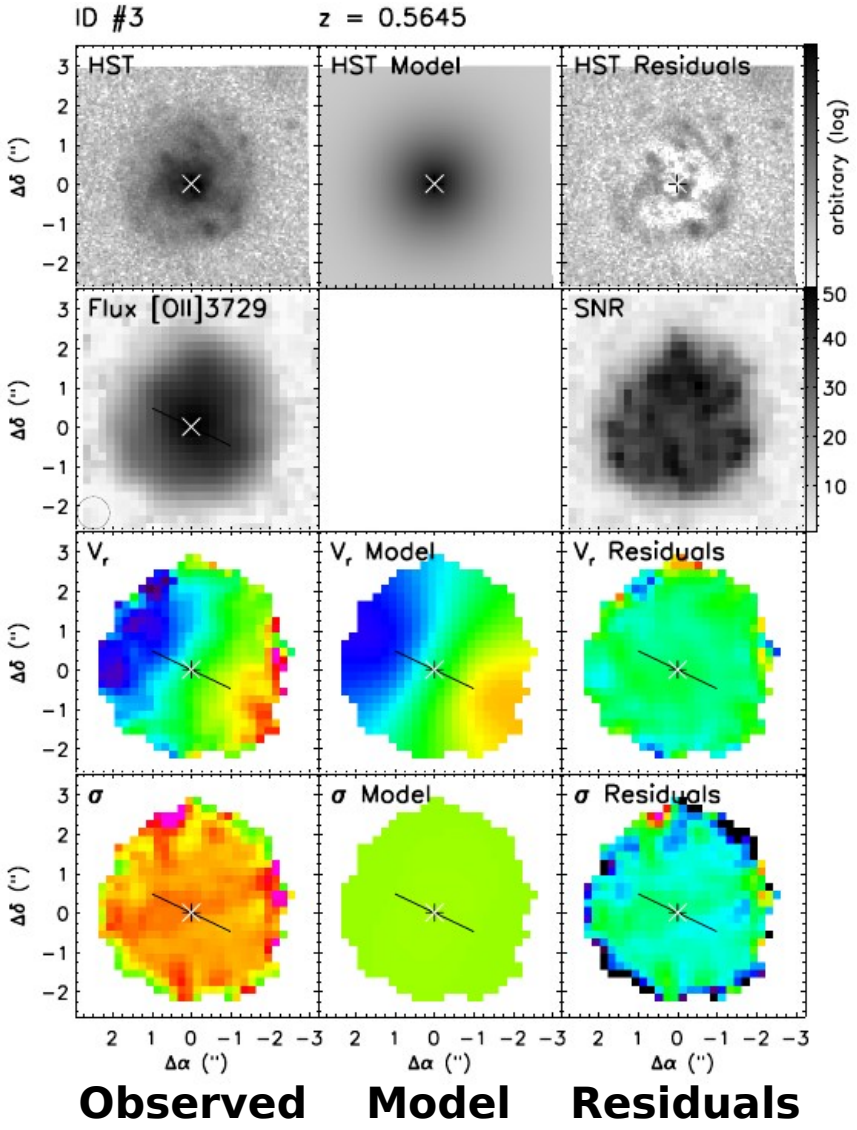


HST : High resolution broad band imaging

MUSE: Ionised gas emission line moments

Spatially resolved information

Contini et al., submitted

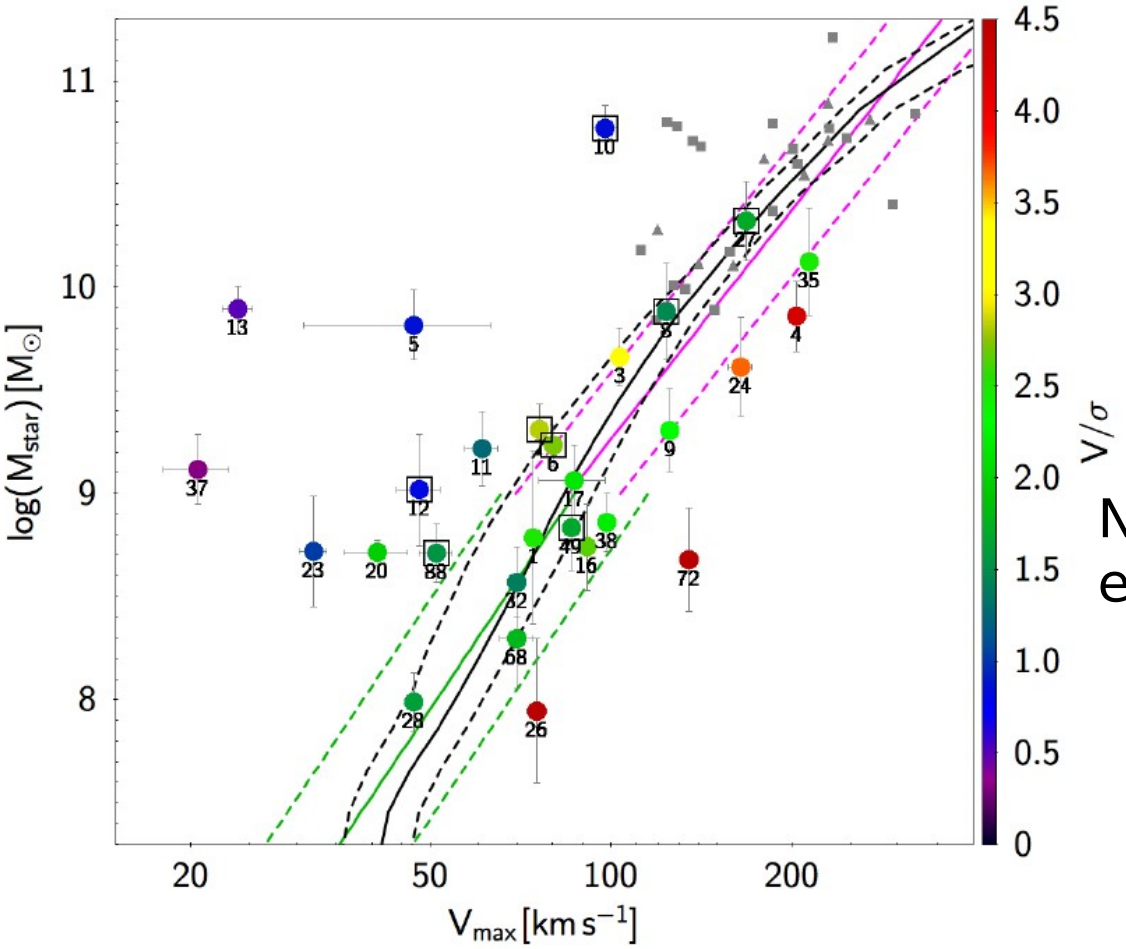


Mophology → GALFIT
- Projection parameters
- Size
- Bulge/disk

Kinematics → disk models
- Projection parameters
- Rotation
- Dispersion

Tully Fisher relation

Contini et al., submitted



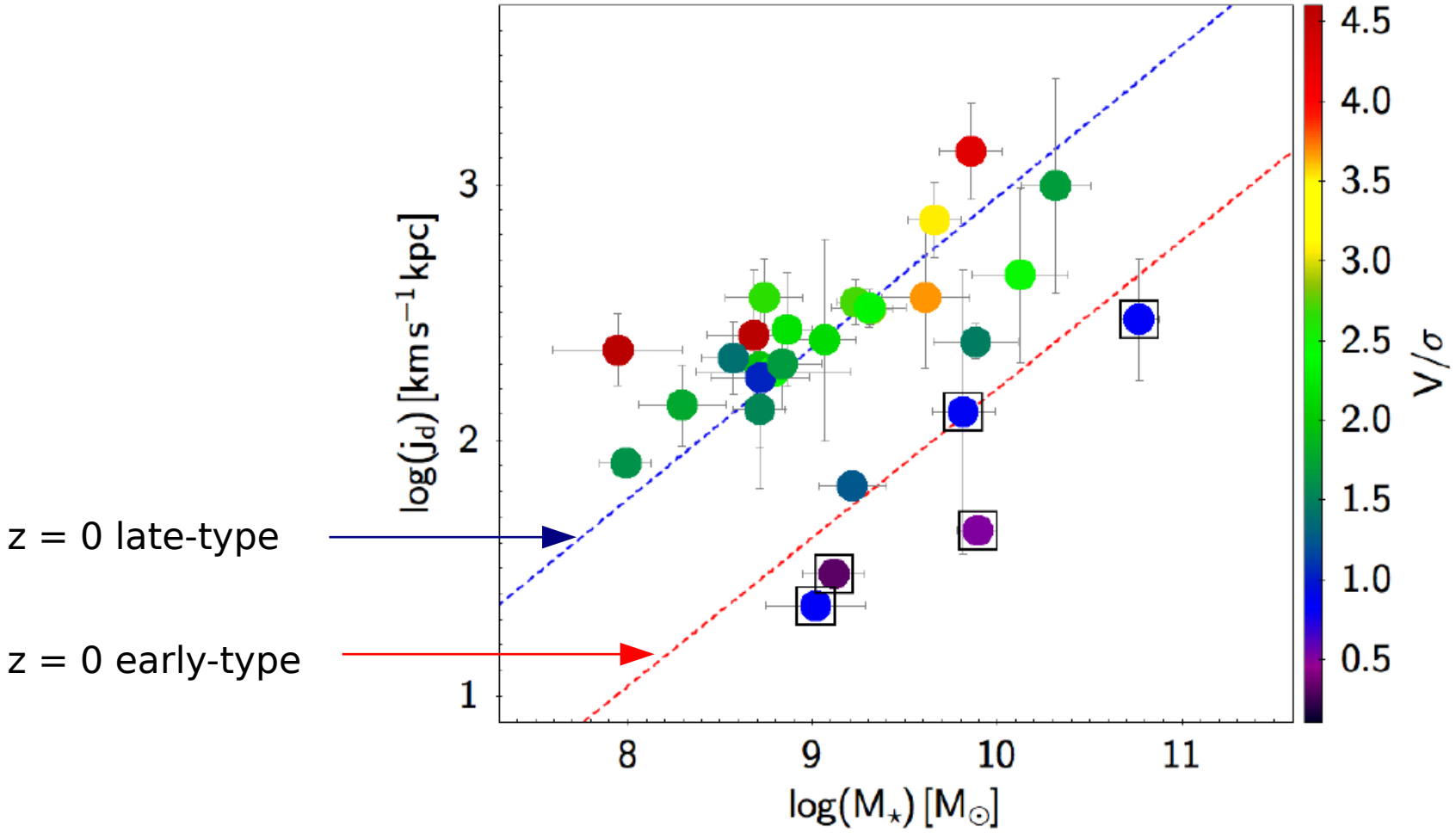
New range of mass explored at intermediate z

Low mass galaxies (< $10^{9.5}$ $M_\odot$) follow the TFR, but higher dispersion (espacially dispersion dominated)

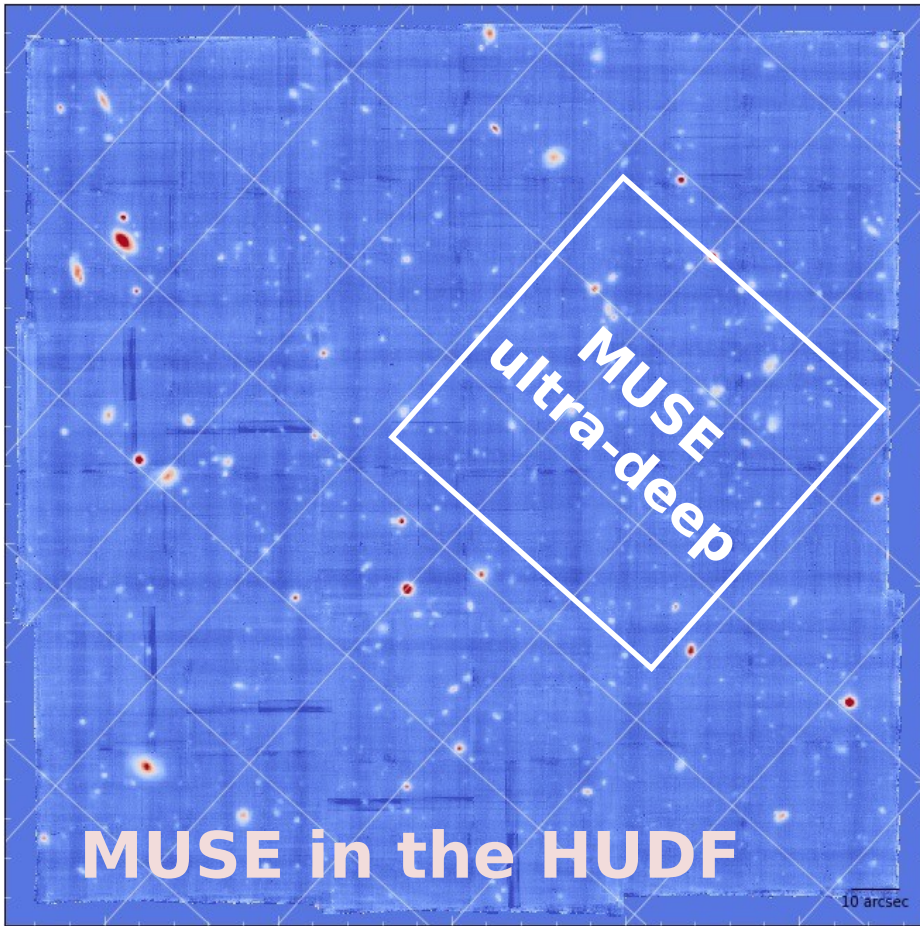
Angular momentum

Contini et al., submitted

$$J^* = 2 \times R_d \times V_{max}$$



Next deep fields in GTO



MUSE UDF

- 3' x 3' mosaic
- 10h exposure
- Including 1 ultra-deep field: UDF-10 (~80h)

Groups

- ~8 - 10 groups

Other fields

Sample size ~ x20 → ~ 500 galaxies

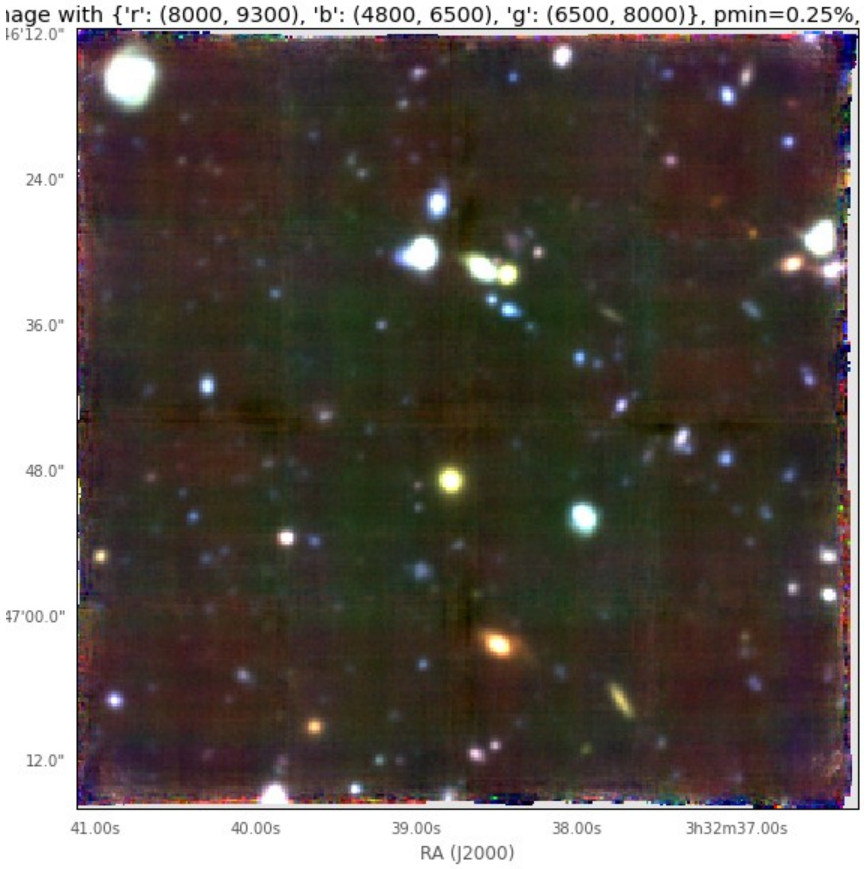
MUSE UDF-10: galaxies at intermediate z

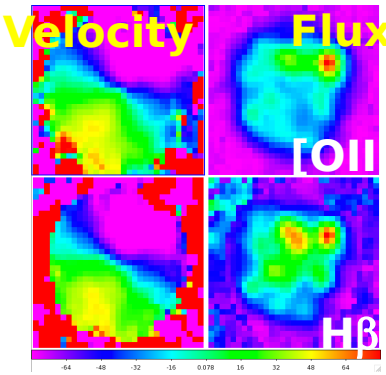
Version **0.21** – Sep 25th, 2015

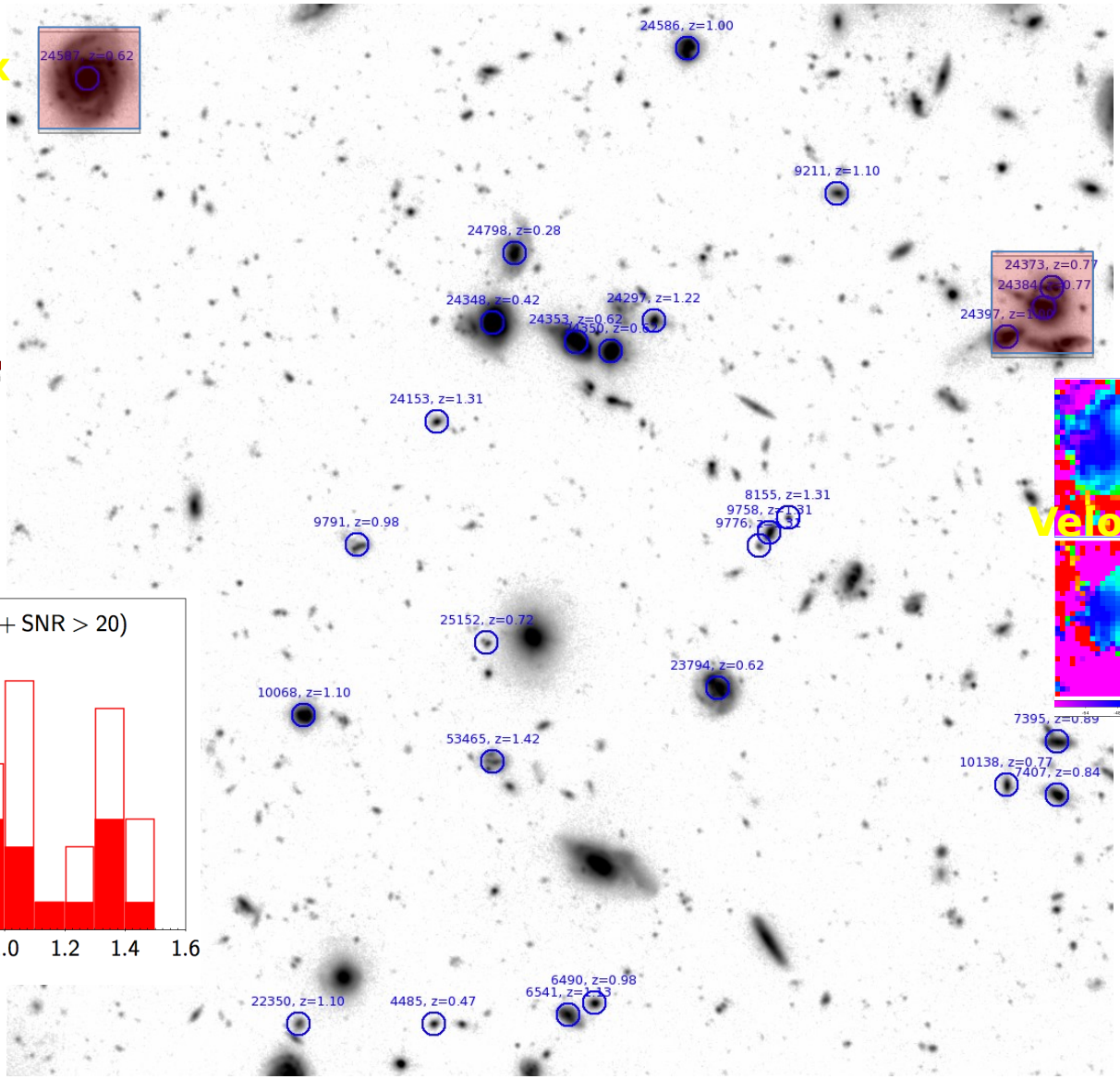
- 49 exposures ~ **20h**
- PSF ~ 0.7''

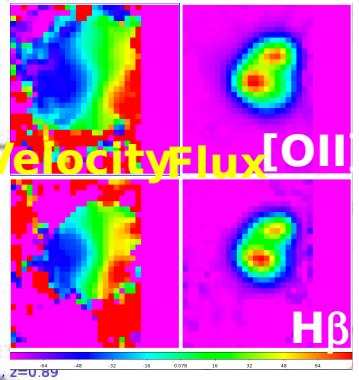
- 58 galaxies @ 0.21 < z < 1.42
  - ~ 29 spatially resoved

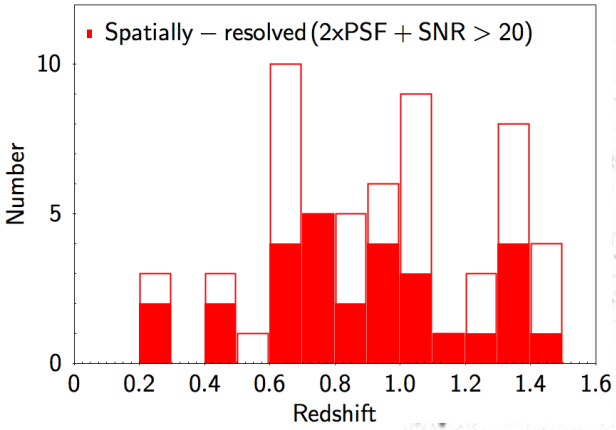
Redshift range	Emission lines	Galaxies
[0.0 – 0.27]	Hβ, [OIII], Hα	1
[0.27 – 0.42]	[OII], Hβ, [OIII] , Hα	3
[0.42 – 0.92]	**[OII], Hβ, [OIII]**	**23**
[0.92 – 1.5]	**[OII]**	**31**




Velocity
Flux
[OII
Hβ


24586, z=1.00
24587, z=0.62
9211, z=1.10
24798, z=0.28
24373, z=0.77
24348, z=0.42
24353, z=0.62
24297, z=1.22
24153, z=1.31
8155, z=1.31
9758, z=1.31
9776, z=1.31
9791, z=0.98
25152, z=0.72
23794, z=0.62
10068, z=1.10
53465, z=1.42
7395, z=0.89
10138, z=0.77
7407, z=0.84
6490, z=0.98
22350, z=1.10
4485, z=0.47


Velocity
Flux
[OII
Hβ


Spatially − resolved (2xPSF + SNR > 20)
Number
Redshift
0
5
10
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6

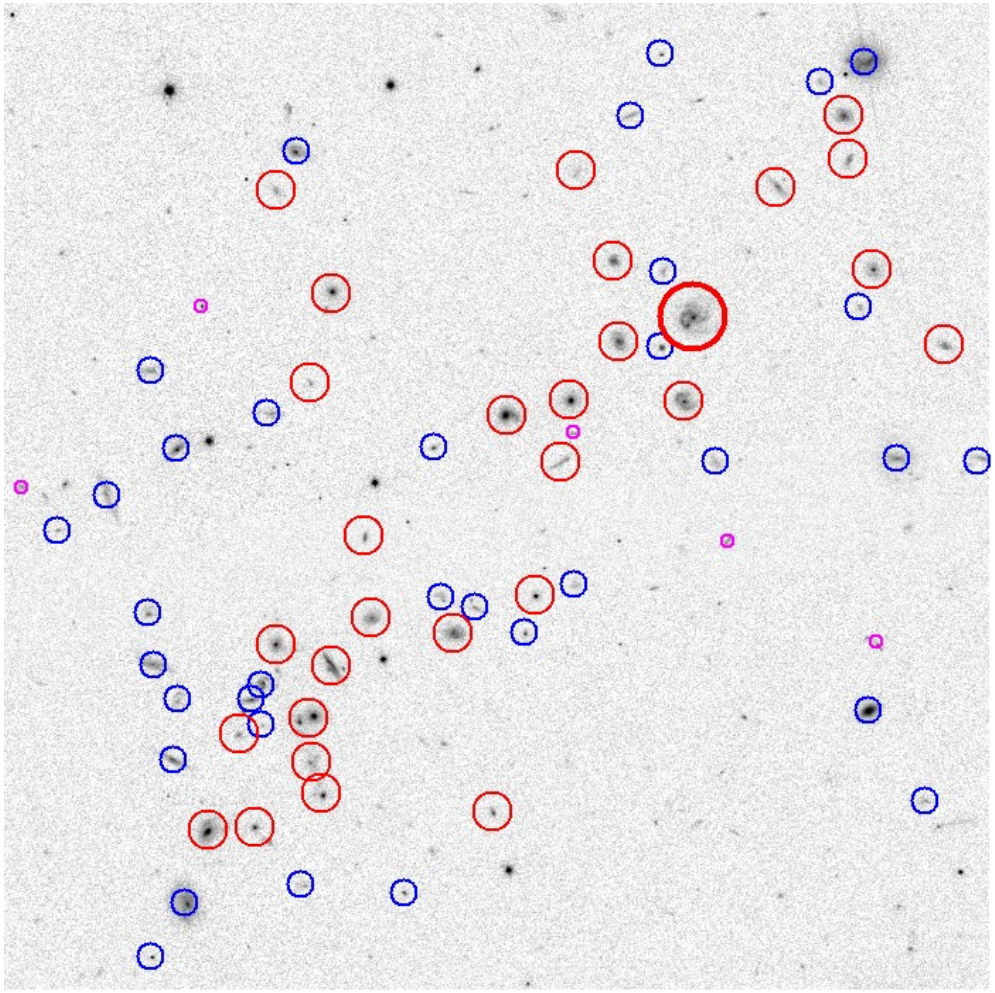
Galaxies in z~1 groups

- Groups selected from VVDS (Cucciati et al.) and COSMOS (Knobel et al.)
  → rich groups (> 4 secured members in MUSE FoV ~ 400 kpc)
- ~ 8 – 10 groups at various redshifts
- Start with 5 groups @z~0.7 → [OII], Hb, [OIII]

	GTO#4 Dec 14	GTO#5-6 Apr-May 15	GTO#9-10 Oct-Nov 15	Number of galaxies	Spatially resolved
CGR28	**2h**	**8h**		29 (x3) / 39	8 / 17
CGR32	**1.25h**			17 (x2)	5
CGR83	**2.5h**			15 (x2)	5
CGR116	**2.2h**			13 (x2)	0
VGR189			**2h**		

→ Group members number increased thanks to MUSE
→ Number of spatially resolved galaxies increases when deeper and better seeing

Example of group 28

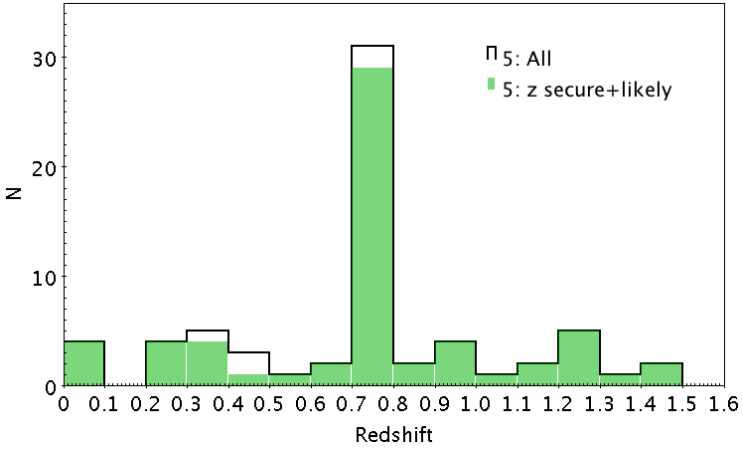


Gr#28

z=0.726

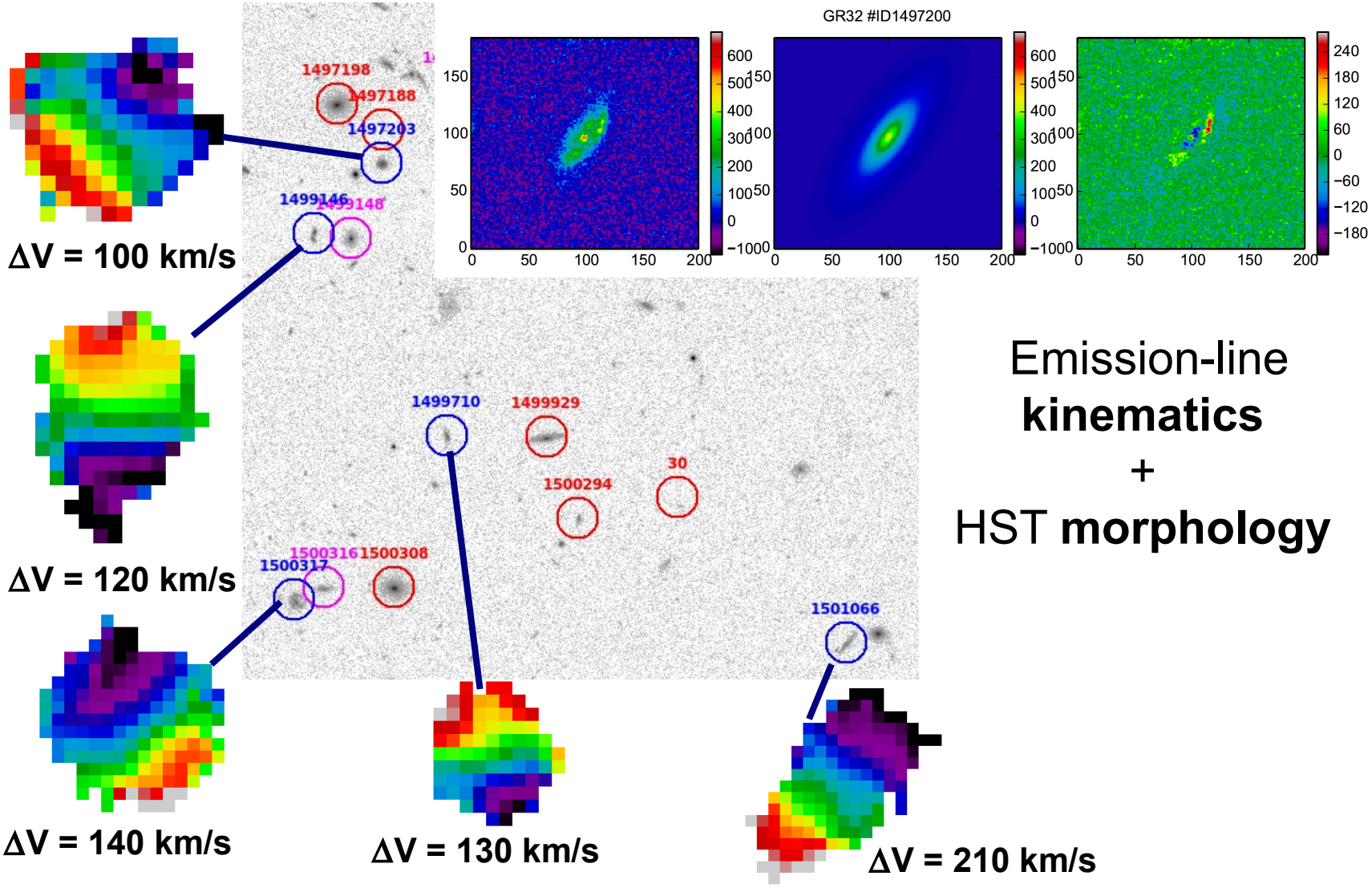
~2h exp.
FWHM~0.6-0.8''

N_{group} ~ 30 (x3)



Galaxies in group - Inter-z galaxies (z<1.45)
High-z galaxies (z>1.45)

Spatially resolved properties

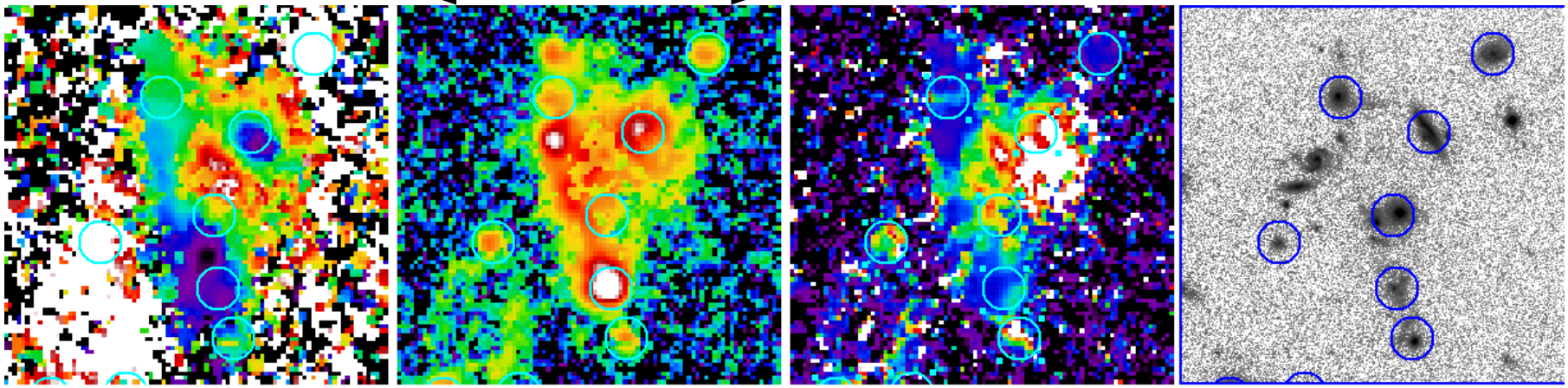


Emission-line
kinematics
+
HST **morphology**

Complex interaction in group 28

Bright in [OII], almost no emission in [OIII] and Hβ

18'' ~ 100 kpc



ΔV = 600 km/s | log([OII]) | 30 < σ <250 km/s | log(HST_f814)

Workplan

On-going analysis on groups:

- Morphology and kinematics models
- Stellar mass & SFR determination
- Peculiar case studies
- Stellar kinematics of passive galaxies

→ Dynamics vs position in the group
→ Comparison with galaxies in low density environment (e.g. TF, angular momentum, etc.)

Deeper data and more groups to increase the size of the sample