

Evolution of galaxy dynamics over the last 10 Gyrs with MUSE/VLT

l'Observatoire
de Paris

Author: Mercier Wilfried
Supervisor: Contini Thierry (IRAP)
Co-Supervisor: Epinat Benoit (LAM)

Internship at IRAP
11 March - 26 July 2019



Galaxy evolution through cosmic time



Why studying kinematics ?



Explain the co-evolution of morphological and dynamical properties of galaxies

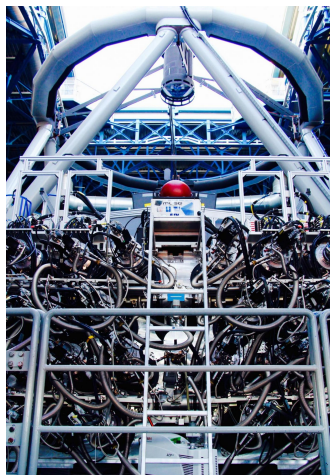
- ▷ main processes responsible for disc formation and settling ?
- ▷ impact of merging, inflows and outflows on these processes ?
- ▷ kinematics \rightarrow rotation curve \rightarrow dark matter and angular momentum distribution ?

IFS:

- ▷ 3D cubes (2D spatial + 1D spectral)
→ **photometry + kinematics**

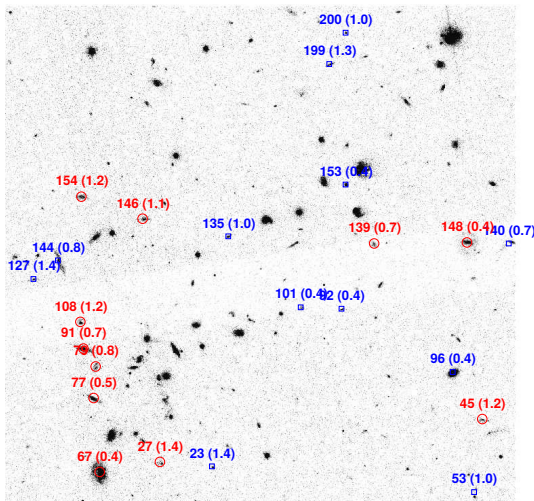
MUSE:

- ▷ $1 \times 1 \text{ arcmin}^2$ FoV → **environment**
- ▷ 0.2 arcsec spatial sampling
- ▷ spectral range [4650 Å, 9300 Å]
- ▷ seeing-limited or AO observations
- ▷ high sensitivity
→ **low-mass galaxies + blind surveys**



MUSE instrument. Credit:
Contini Thierry (IRAP)

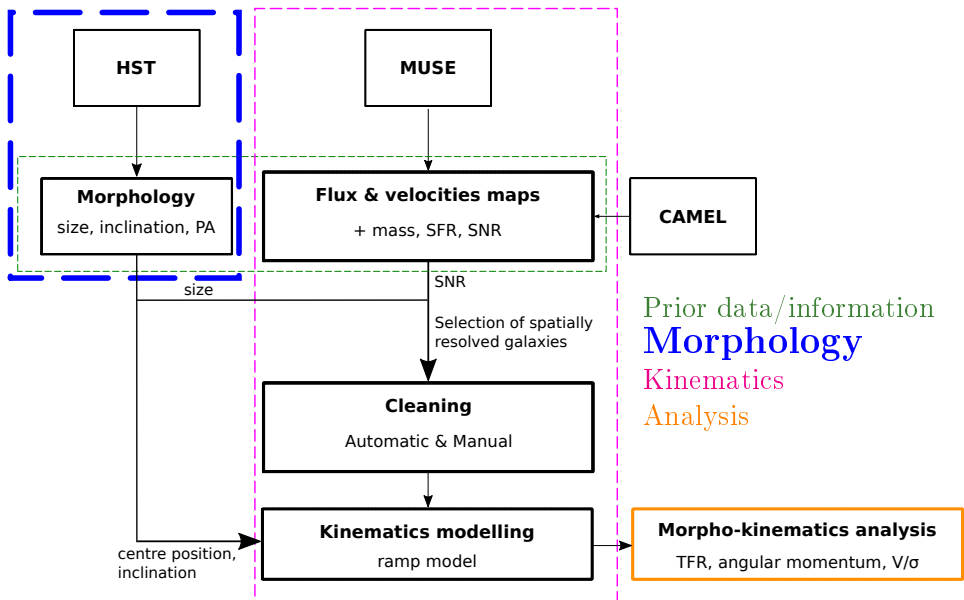
Initial sample



HST image of COSMOS group CGr30

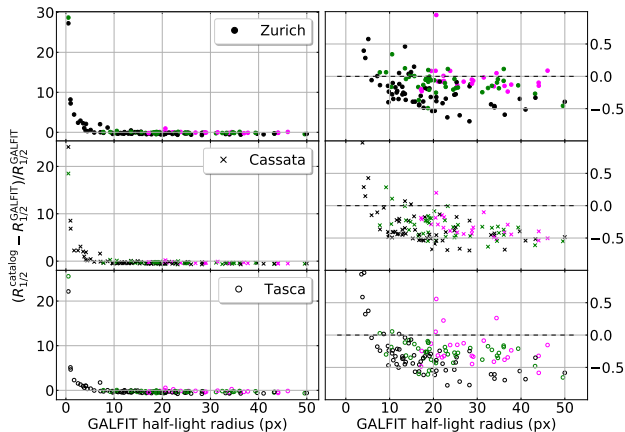
- ▷ 16 MUSE fields in COSMOS area
- ▷ exposures from 1 to 10 hr
- ▷ seeing-limited (FWHM $\lesssim 0.7''$) or AO (FWHM $\lesssim 0.5''$)
- ▷ **~ 500 field galaxies with [OII] detection**
 - HST-ACS counterparts
 - $0.4 \leq z \leq 1.4$

Methodology



Checking morphological parameters

Half-light radius

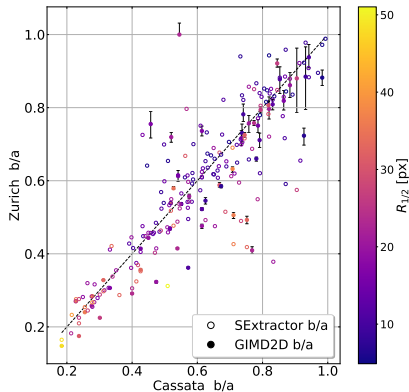


spheroidal disk-like irregulars

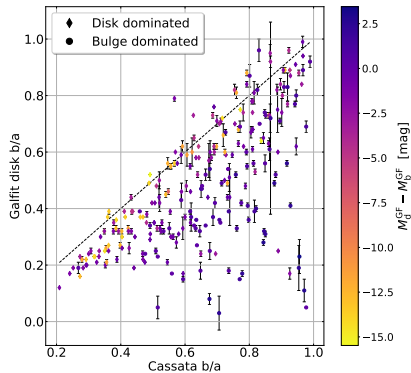
GALFIT run by V.
Abril-Melgajero (LAM)
on structure galaxies
▷ GALFIT radius
used as a reference

Checking morphological parameters

Ellipticity

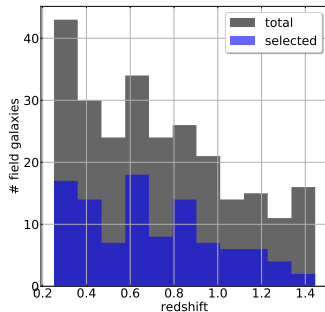
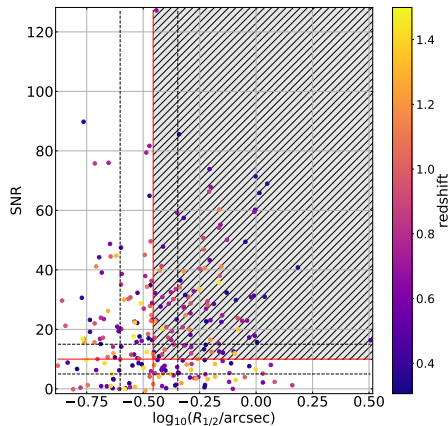


▷ values are consistent between catalogues



▷ scatter is due to bulge dominated (spherically symmetric) systems

Sample selection and redshift distribution



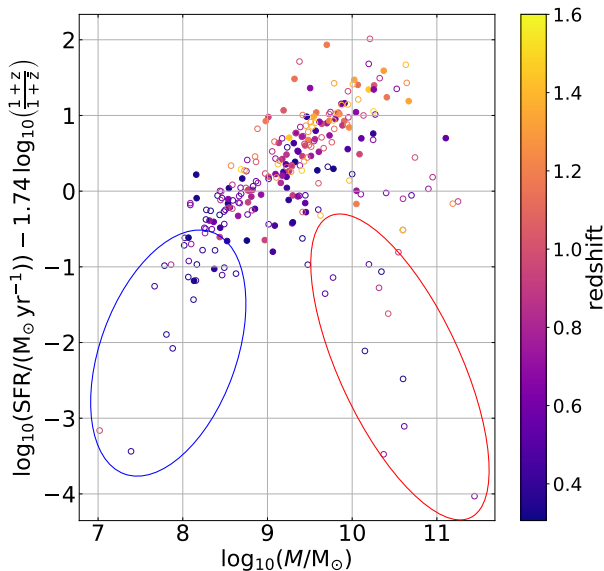
The total number corresponds to galaxies with photometric data in Cassata and/or Zurich catalogues.

- ▷ sample of **103 galaxies** with $R_{1/2} > 0.35''$ and $\text{SNR} > 5$
- ▷ we loose galaxies at $z \approx 1.4$
- ▷ redshift distribution is not drastically changed

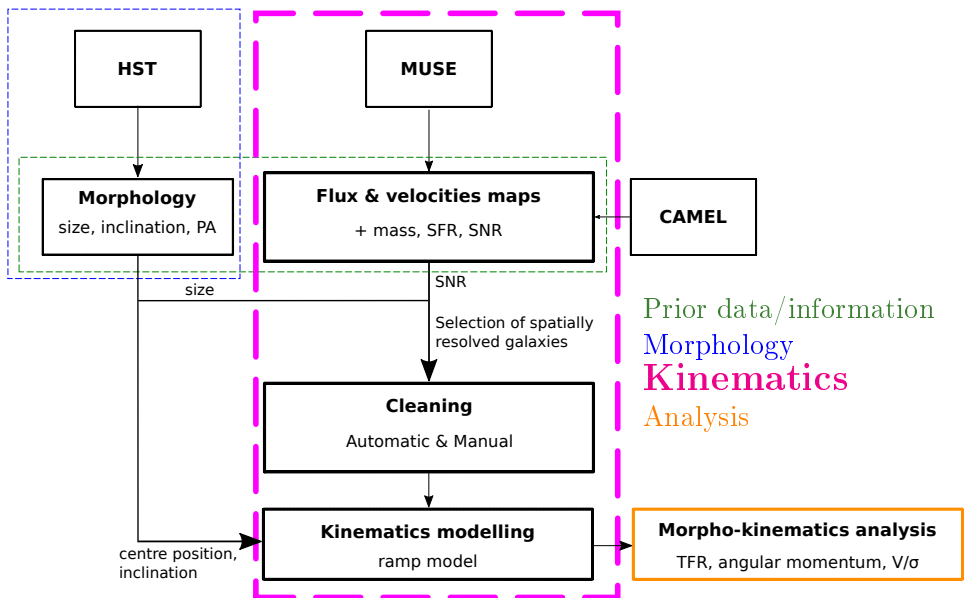
Characteristics of our sample

Mass-SFR relation

- ▷ Most of our sample galaxies are on the main sequence
- ▷ massive quiescent (low [OII]) and very low mass galaxies (small size) are lost

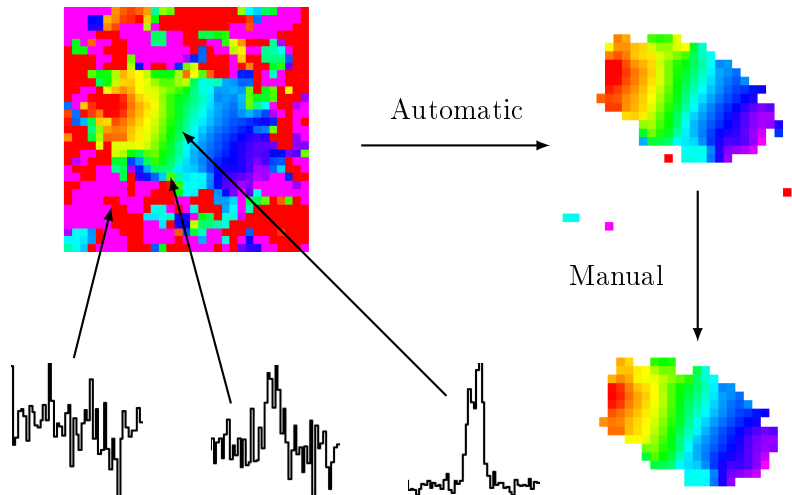


Methodology



Kinematical modelling

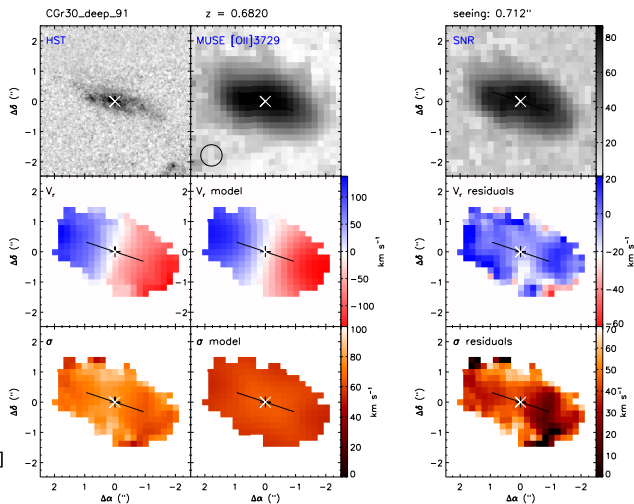
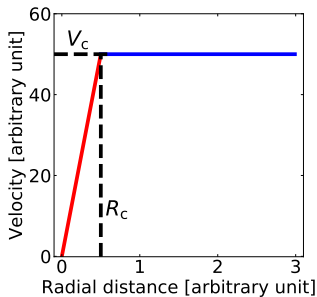
Cleaning galaxies



Kinematical modelling

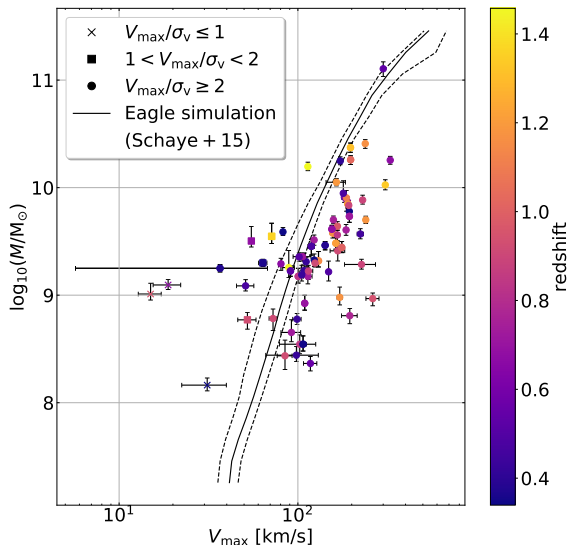
Fitting a model

Use a ramp model
with a **linear**
internal variation
and a **plateau**.



First results

Tully-Fisher relation



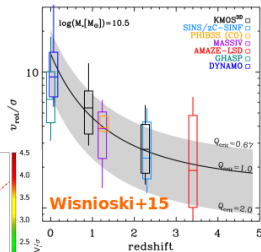
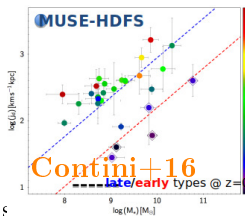
- ▷ First TFR obtained yesterday
- ▷ **still investigating**
- ▷ comparison with Eagle simulation (Schaye+15)

Short term:

- ▷ TFR evolution with z

Long term:

- ▷ Improve morphological modelling
- ▷ Angular momentum evolution ?
- ▷ Dark matter vs. luminous mass ?
- ▷ **better selection + larger sample**



Swinbank+17

