An ESO/RadioNet Workshop
ESO Garching, 10–14 March 2014

3D2014

Gas and stars in galaxies:
A multi-wavelength 3D perspective

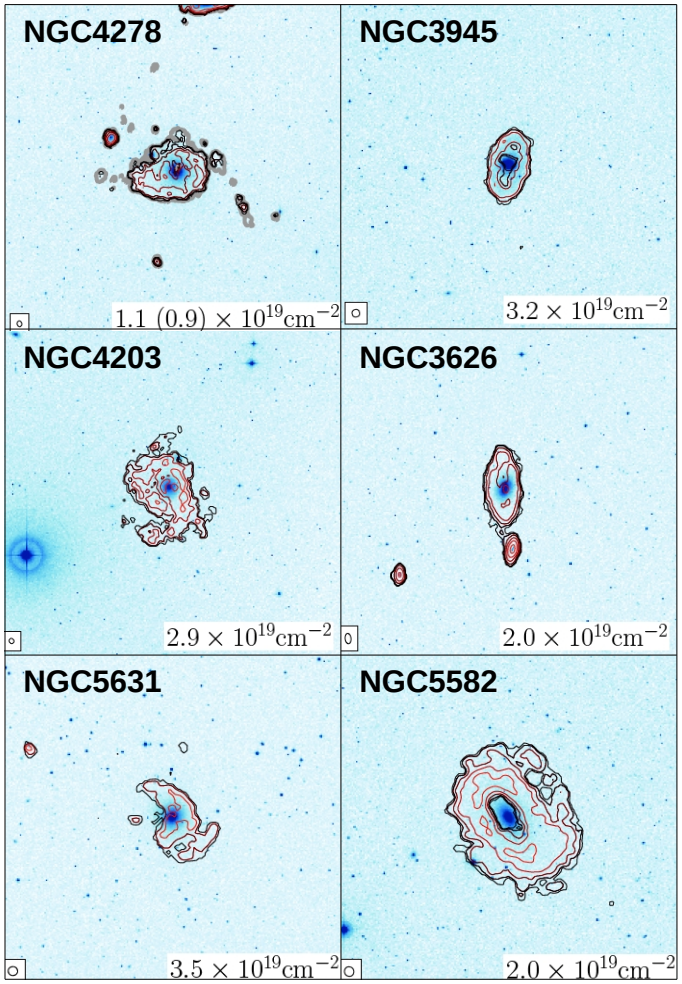
Highlight talk session 1
Monday 14:15

- **Yildiz**
- **Hilker**
- **Jimmy**
- **Weijmans**
- **Guerou**
- **Zibetti**

Star Formation in the outer region of Early Type Galaxies

Mustafa K. Yildiz, Paolo Serra, Tom Oosterloo, Raffaella Morganti, Reynier Peletier

HI



180x180 kpc

Sample
32 HI-rich ETG + HI-poor control sample (Serra et al. 2012)

mkyildiz@astro.rug.nl

Star Formation in the outer region of Early Type Galaxies

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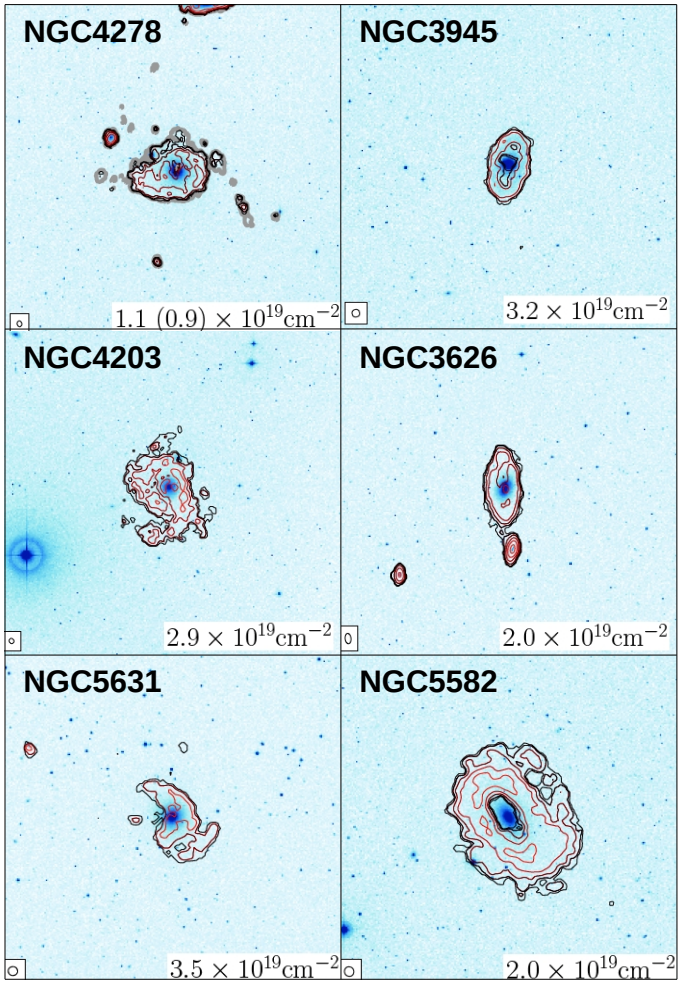
HI

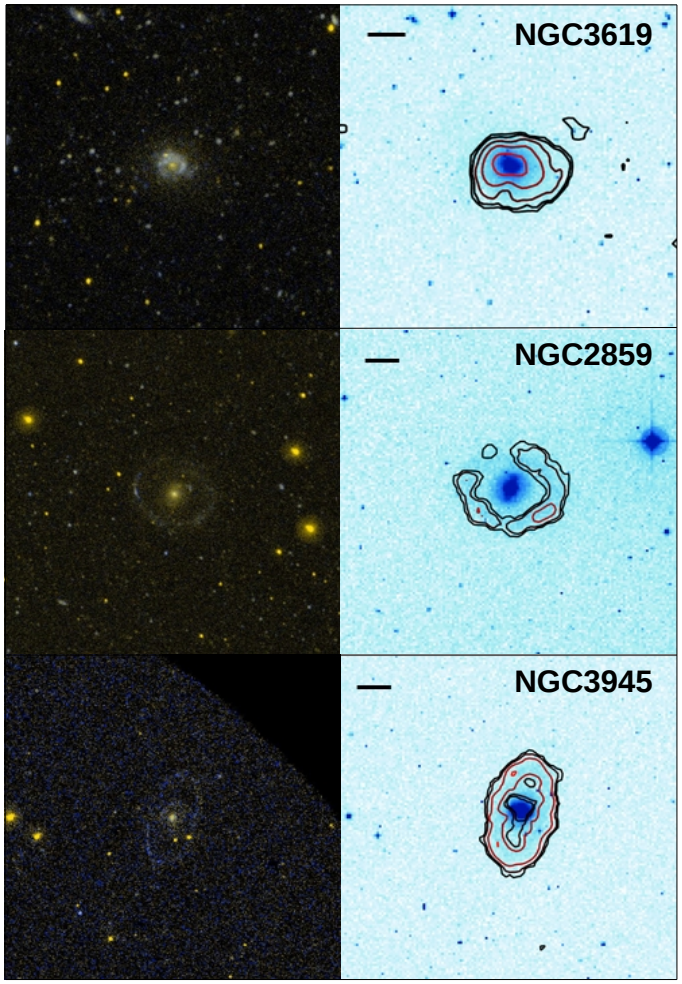


180x180 kpc

Sample

32 HI-rich ETG
+
HI-poor control sample
(Serra et al. 2012)

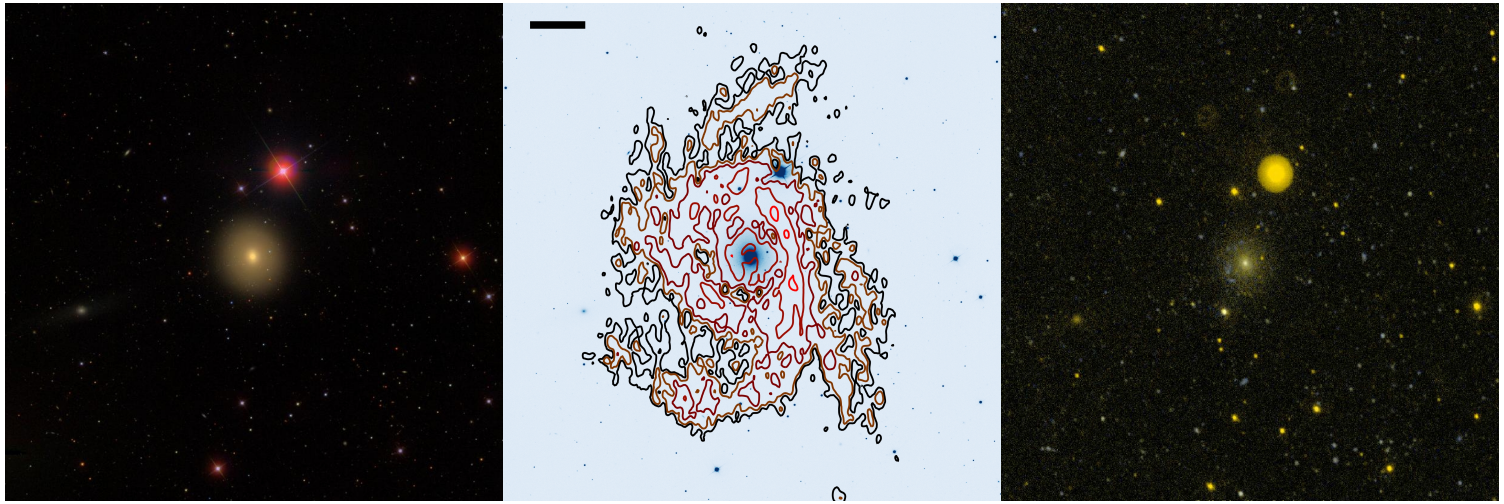
UV HI

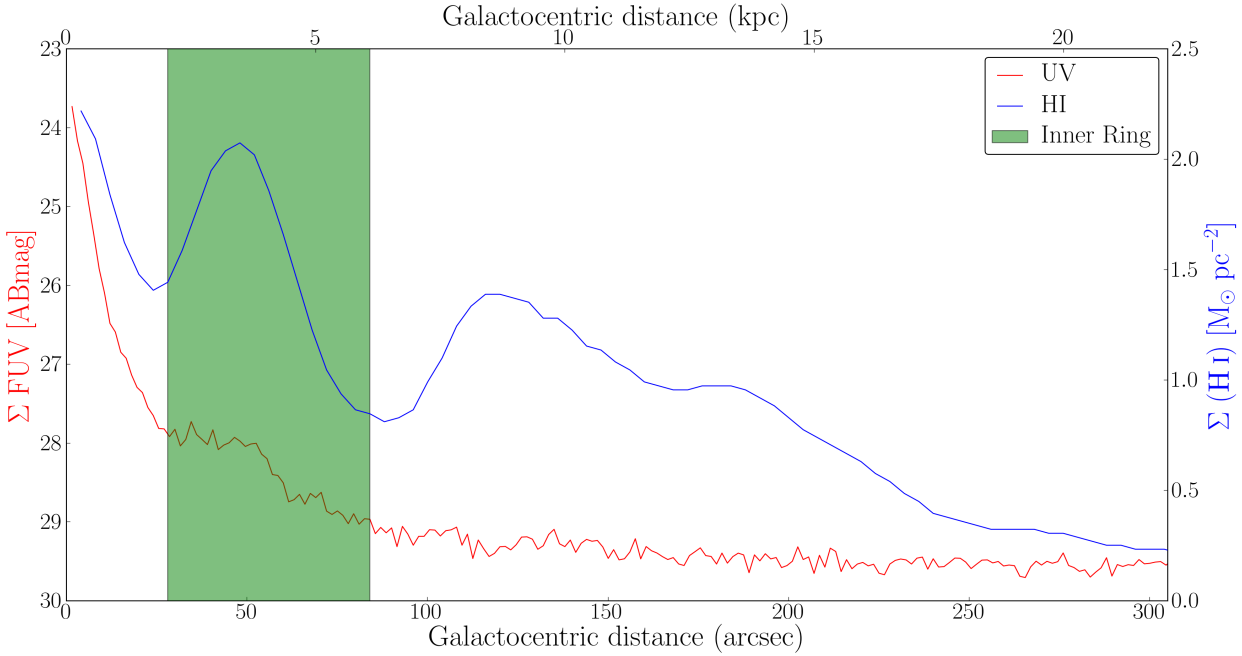


Scale bar: 10 kpc

mkyildiz@astro.rug.nl

NGC4203





M (HI) ~ 1.5x10^{9} M$_{\odot}$

SFR (on the HI disc) ~ 10^{-2} M$_{\odot}$yr^{-1}

M$_{contribution}$ (Δt=1Gyr) ~ 0.022%M$_{*}$

t$_{dep}$ of HI ~ 10^{11} yr

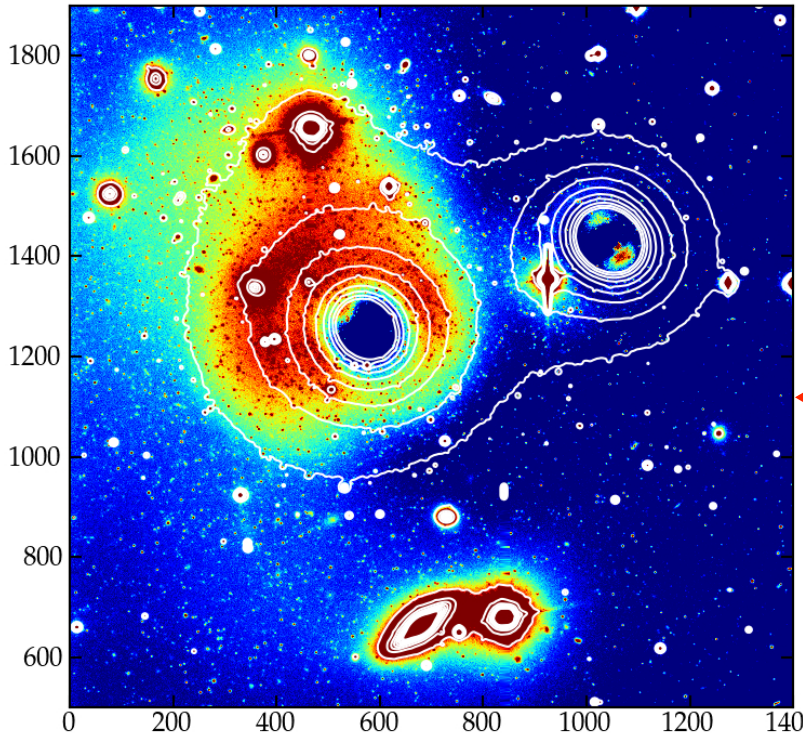
mkyildiz@astro.rug.nl

Large scale 3D kinematics of the Hydra galaxy cluster core – using FORS2/MXU observations as a coarse "IFU"

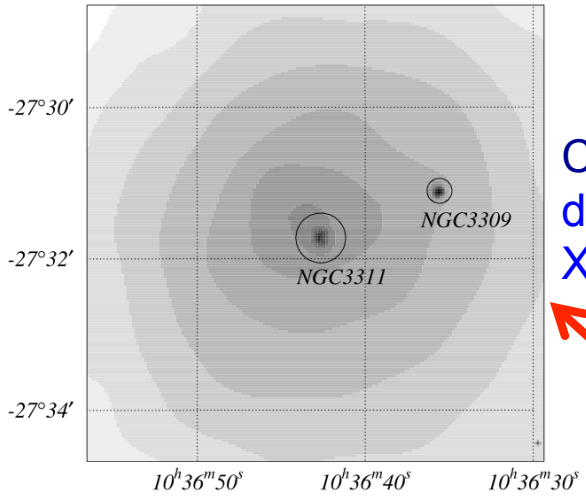
M. Hilker (ESO), **C.E. Barbosa (ESO, IAG-USP)**, T. Richtler (U. de Concepcion), L. Coccato (ESO), M. Arnaboldi (ESO), C. Mendes de Oliveira (IAG-USP)

see also poster #10

Residual map after subtraction of symmetric elliptical models of NGC 3311 and NGC 3309.

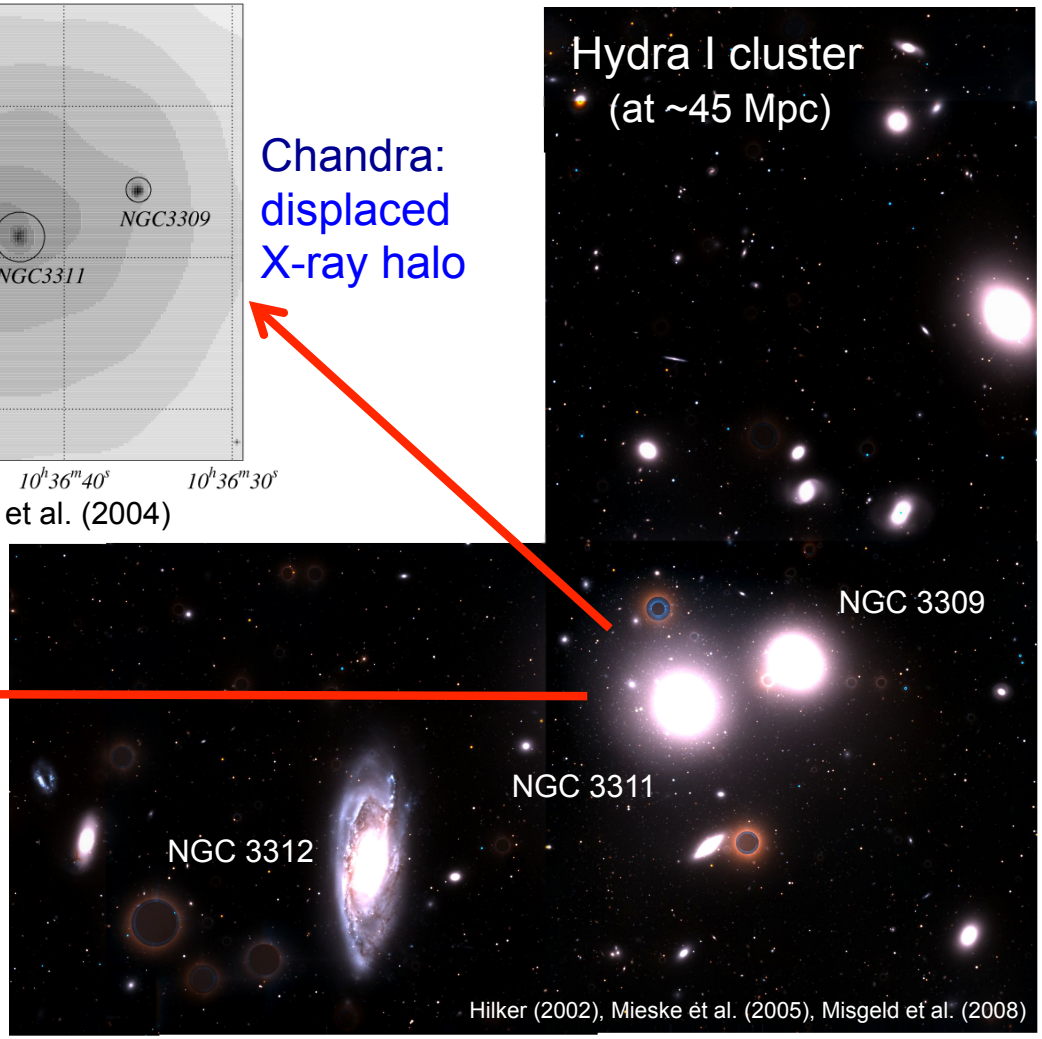


Arnaboldi et al. (2012)

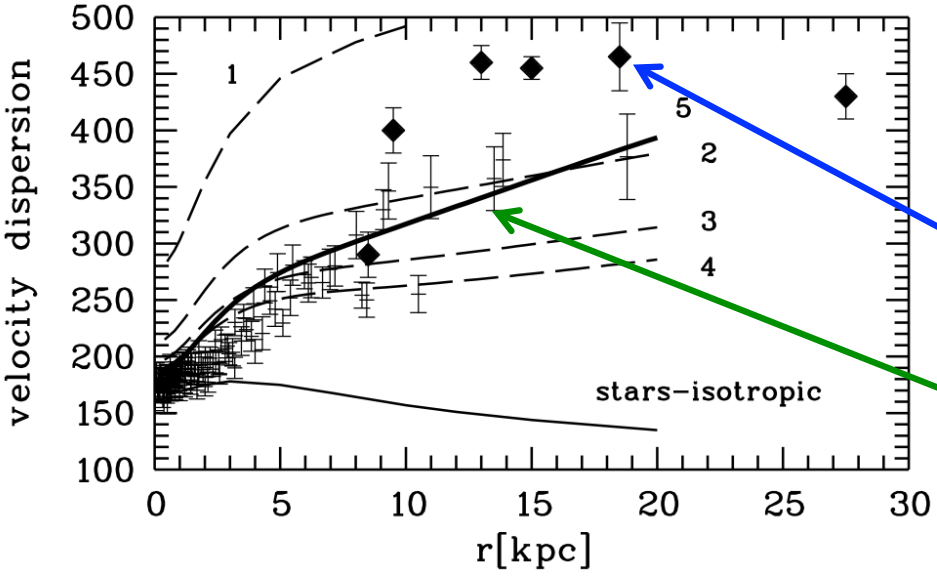


Hayakawa et al. (2004)

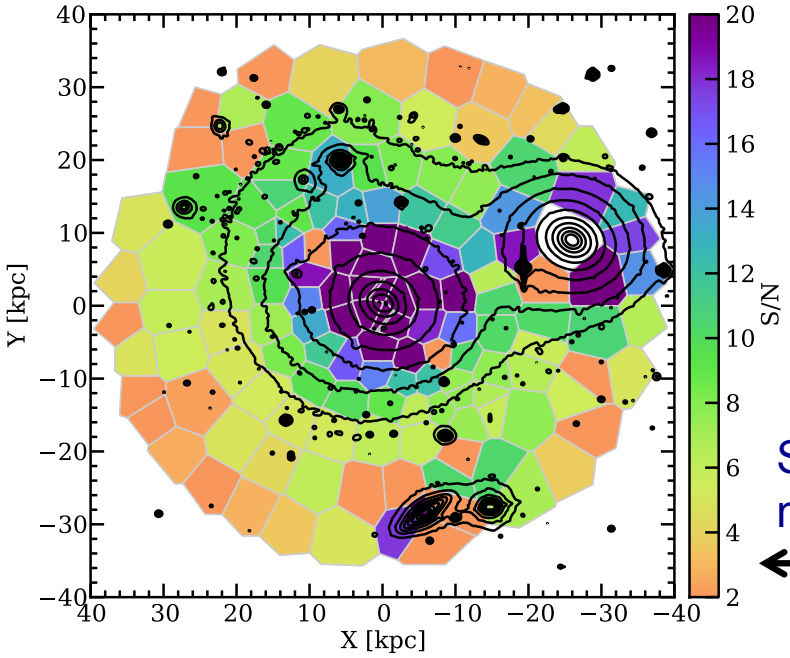
Chandra: displaced X-ray halo



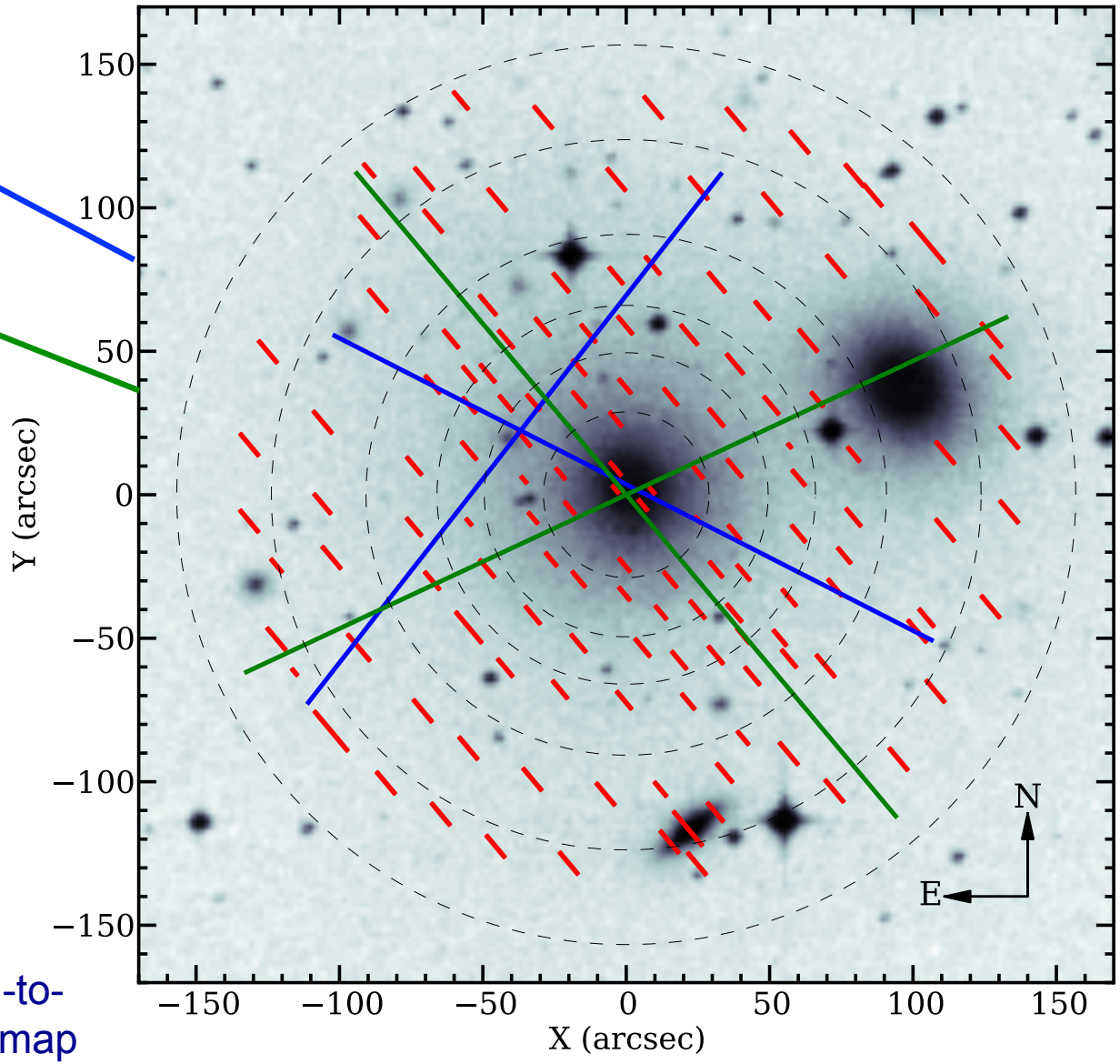
Inconsistent results from long-slit spectra and the ‘onion shell’ approach



Richtler et al. (2011), Ventimiglia et al. (2011)

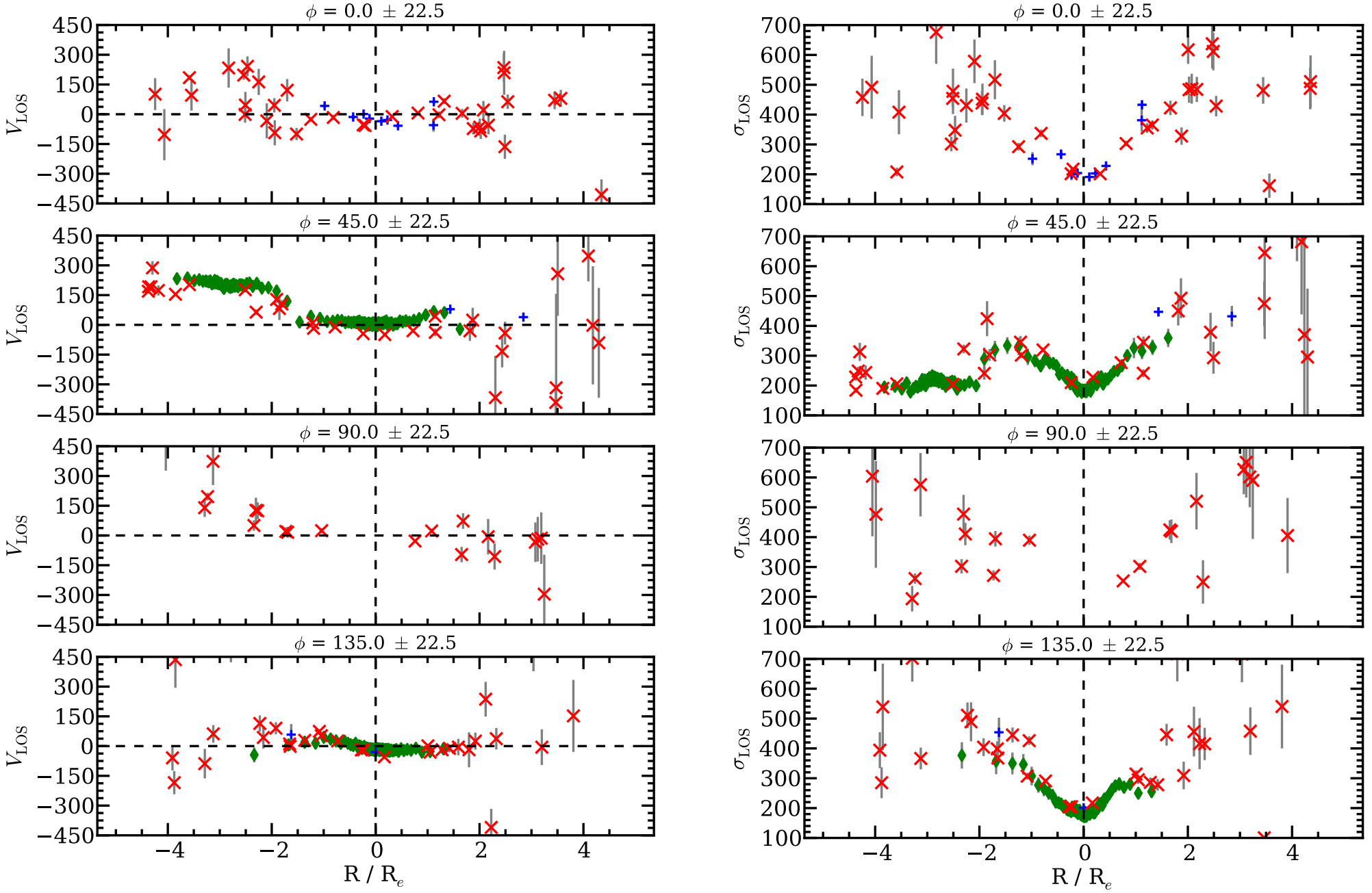


Signal-to-noise map



FORS2/MXU observations with 1400V grism of six different masks (only science slits shown)

Radial velocity and dispersion profiles for cones at different angles

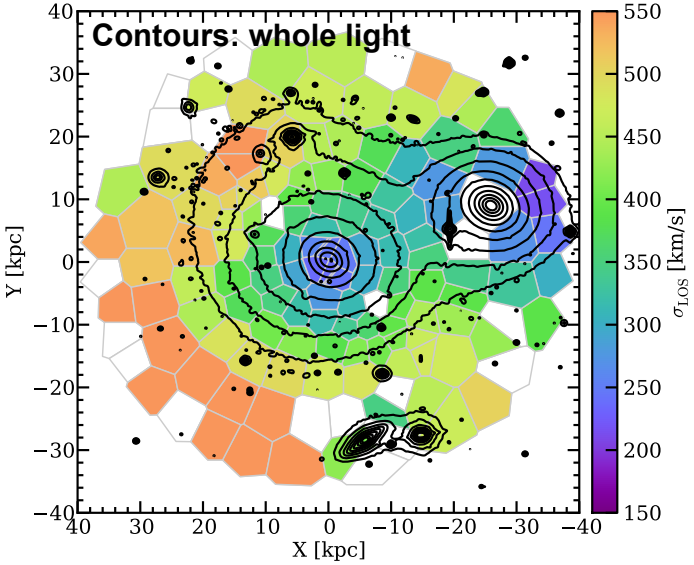


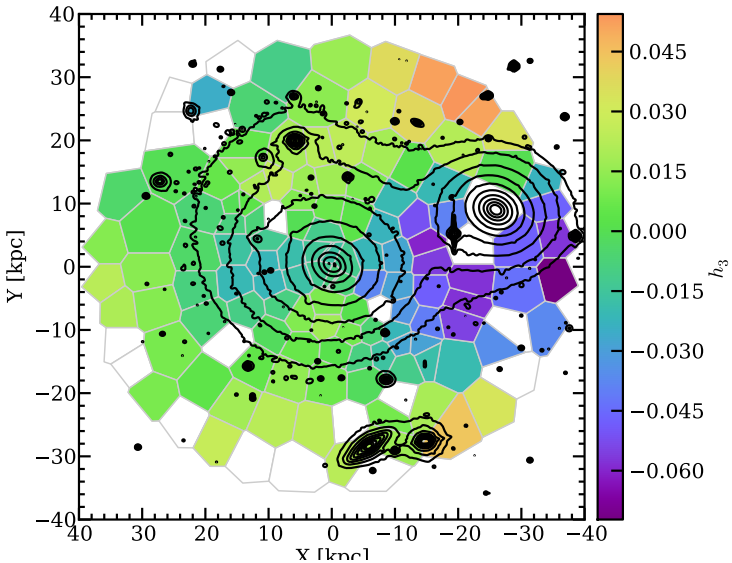
2D kinematics (red) are consistent with 1D probes from long-slit spectra (green and blue)

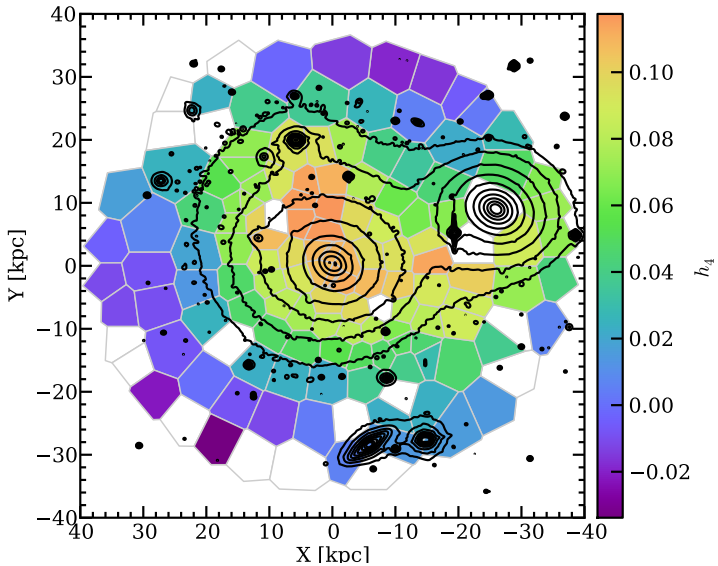
Velocity dispersion

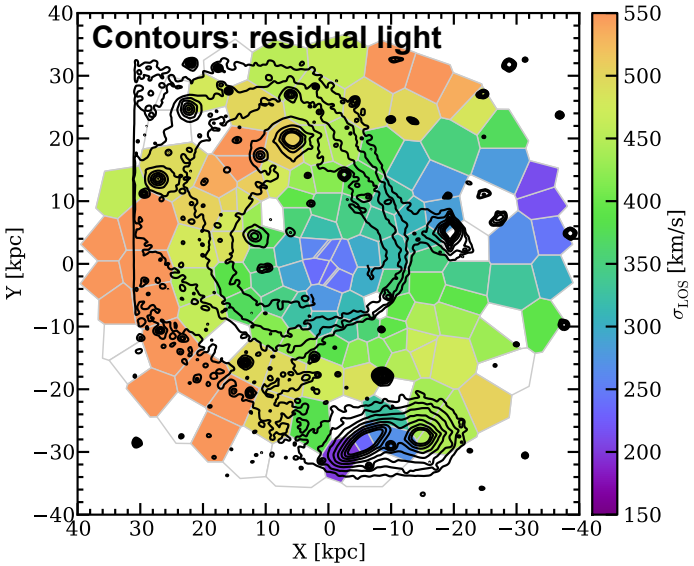
h3 (skewness)

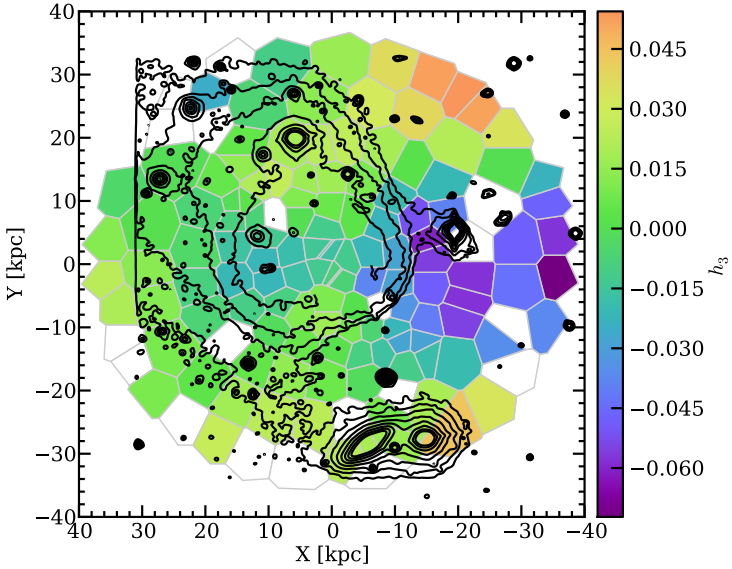
h4 (kurtosis)

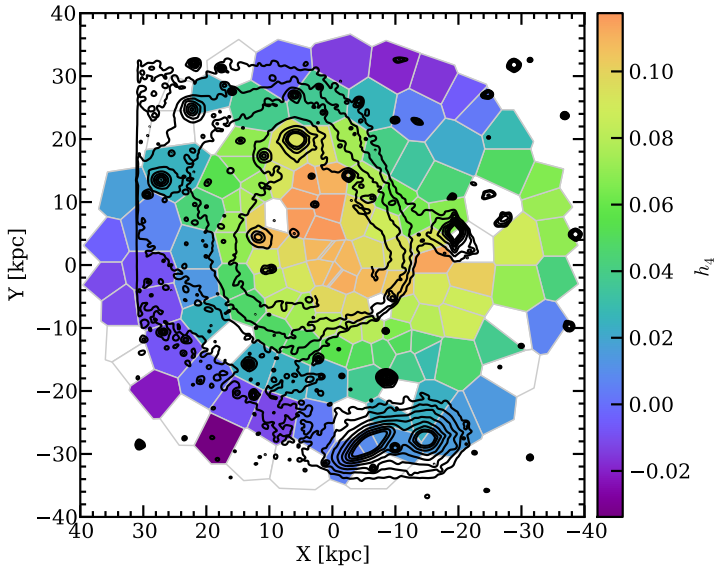










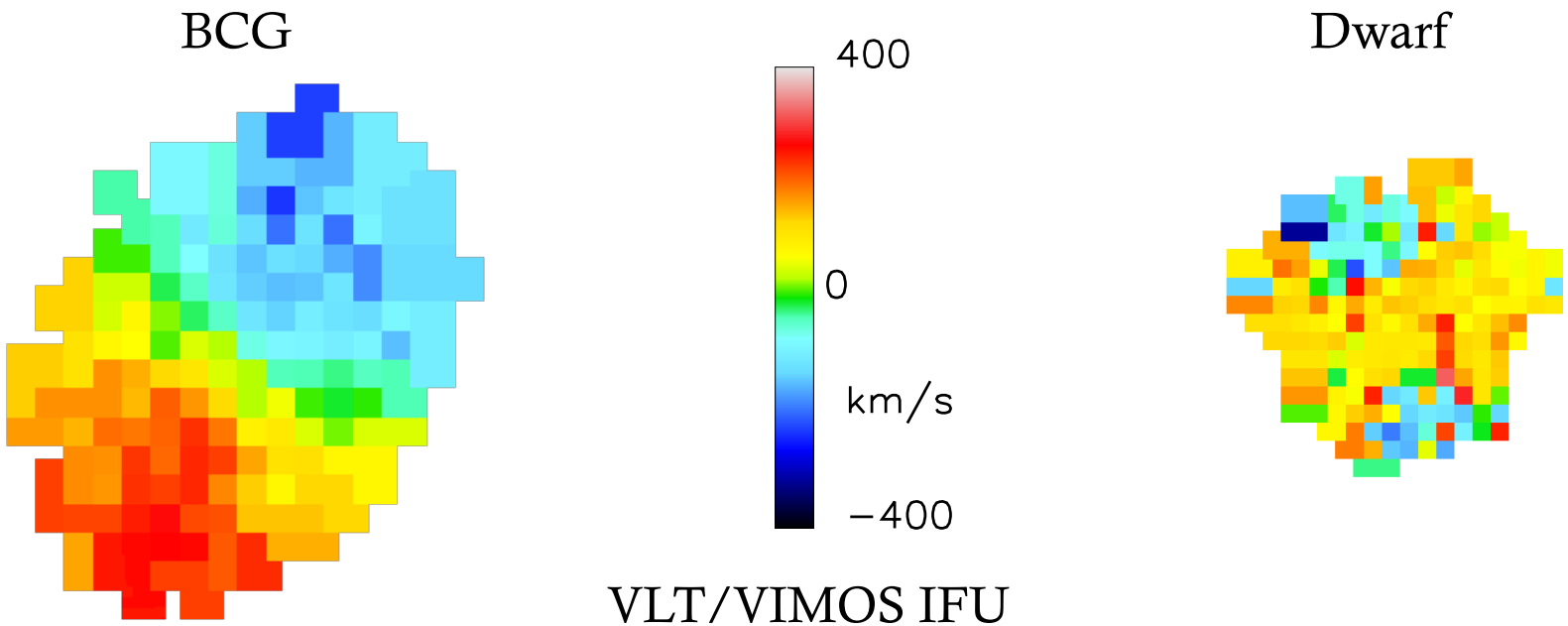


Our results suggest a superposition of kinematical sub-structures varying with position angle. They coincide with the residual light and a group of infalling dwarf galaxies. Thus, the stellar halo around NGC 3311 in the core of Hydra I is still forming and is not in dynamical equilibrium.

Angular Momenta and Dynamical Masses of Brightest Cluster and Dwarf Galaxies

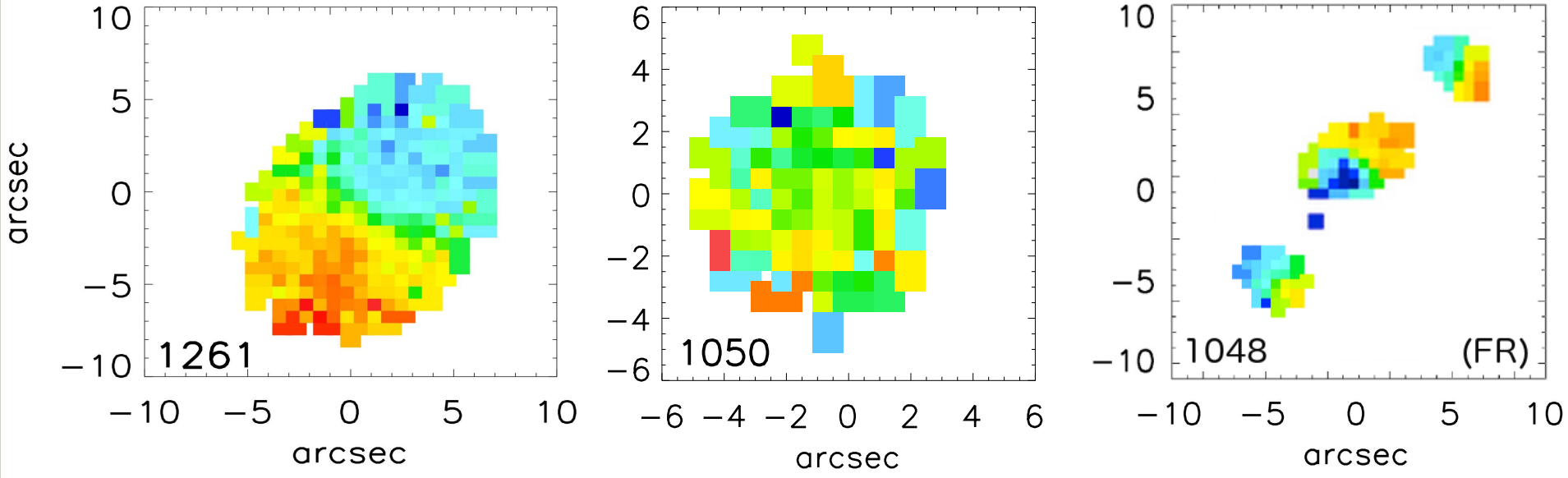
Jimmy - Texas A&M University

Kim-Vy Tran, Sarah Brough, Amélie Saintonge, Paola Oliva, Karl Gebhardt, Anja von der Linden, Warrick J. Couch, and Rob Sharp



Angular Momentum in BCGs

Velocity



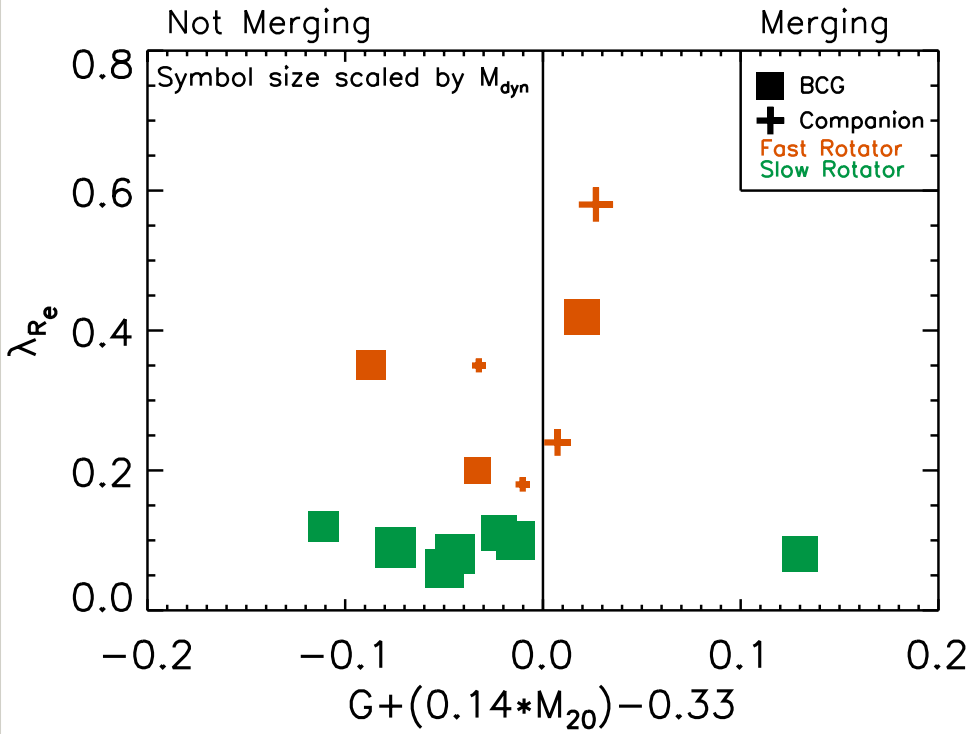
Fast Rotator (Isolated) Slow Rotator (Isolated) Fast Rotator (Companions)

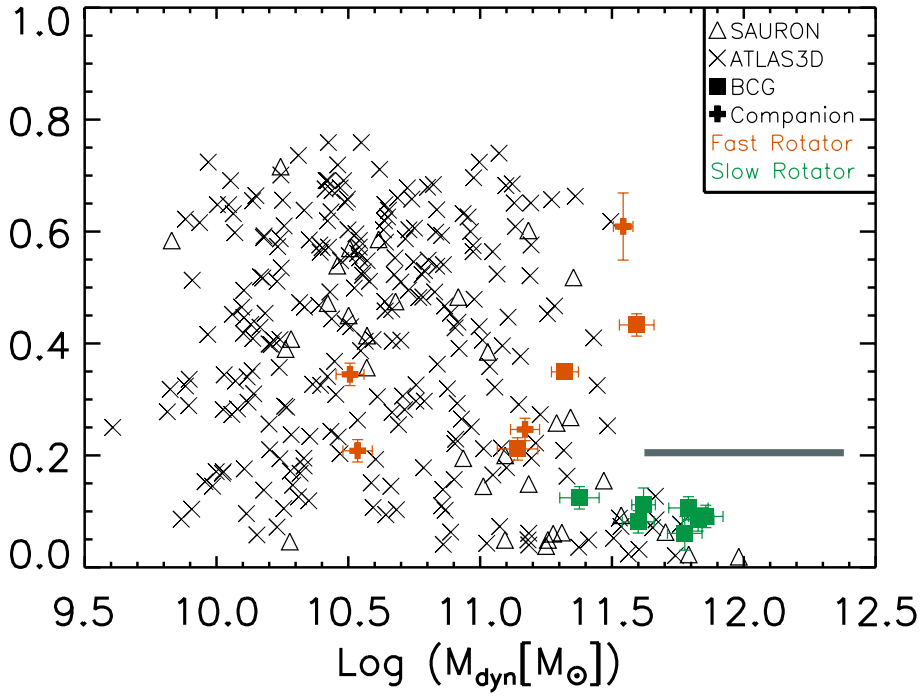
$$\lambda_R \equiv \frac{\langle R|V|\rangle}{\langle R\sqrt{V^2+\sigma^2}\rangle}$$

$$\text{FR: } \lambda_{Re} \geq (0.31 \pm 0.01) \times \sqrt{\epsilon_e}$$

Jimmy et al. 2013

What makes a galaxy Fast or Slow Rotating?



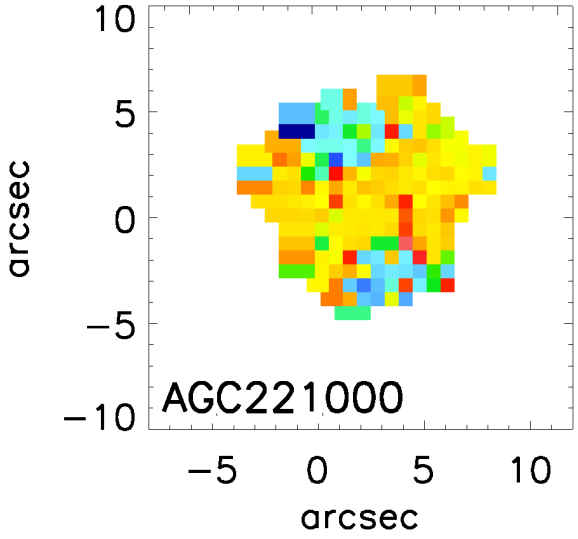


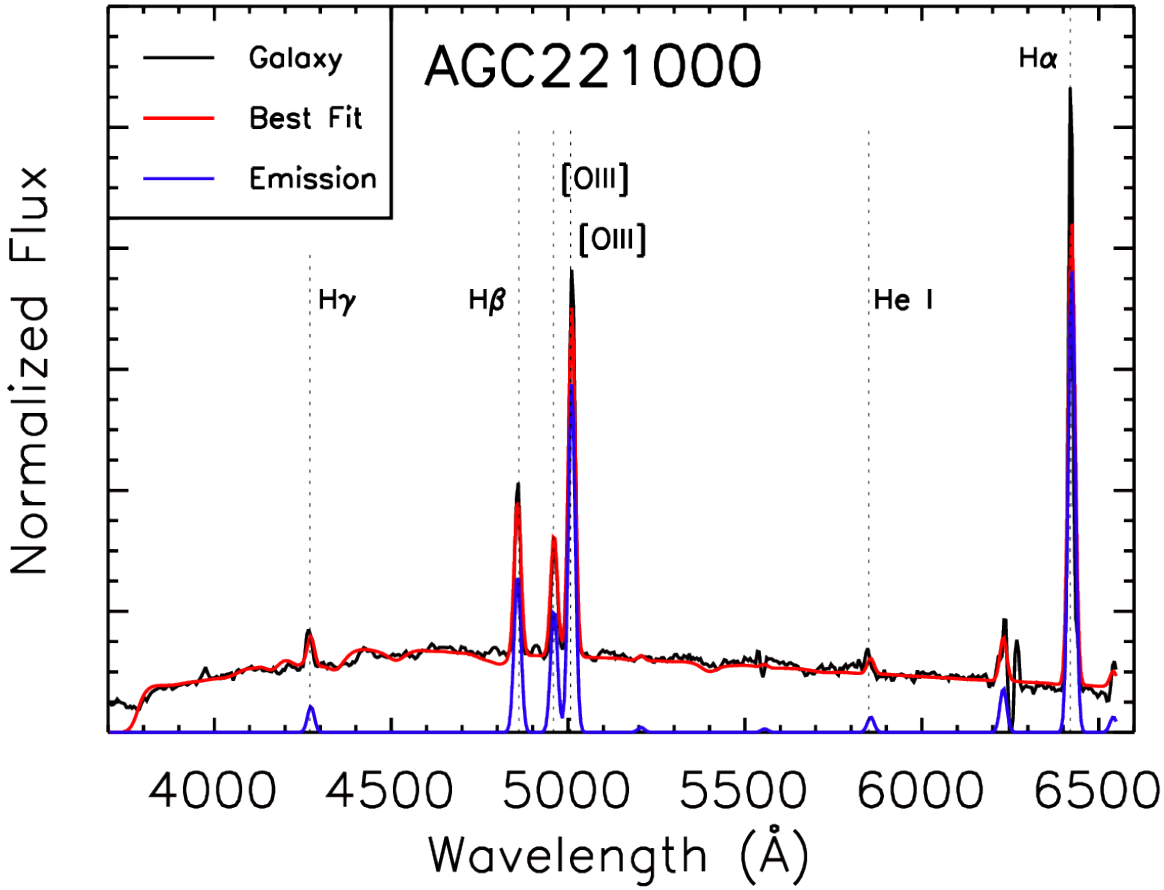
Recent Mergers? (Probably not)

Mass?

Jimmy et al. 2013

From the very large to the very small





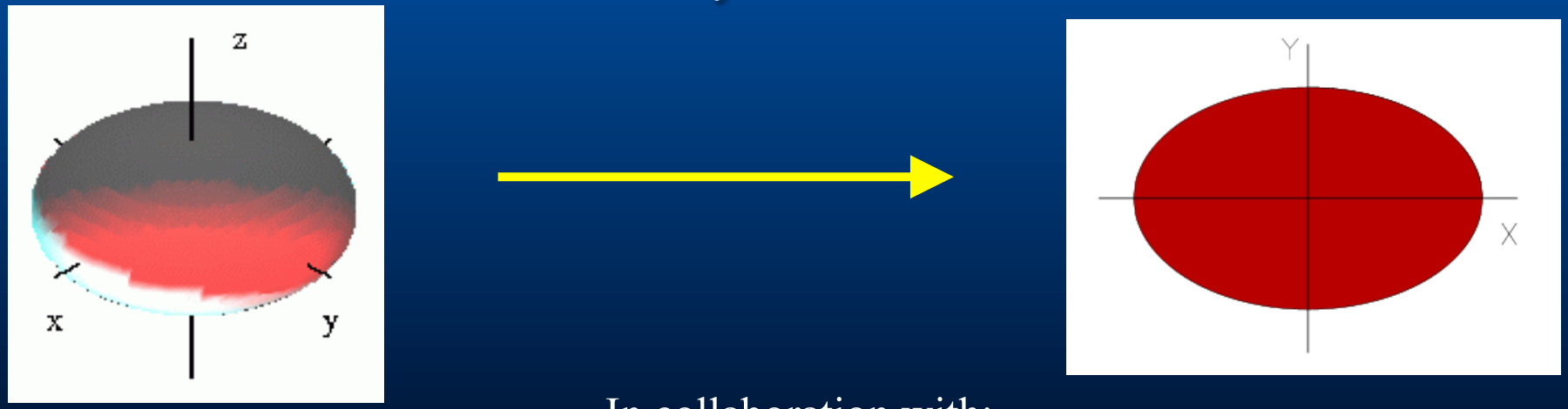
Jimmy et al., in prep

University of St Andrews

Poster 41

Intrinsic shapes of early-type galaxies

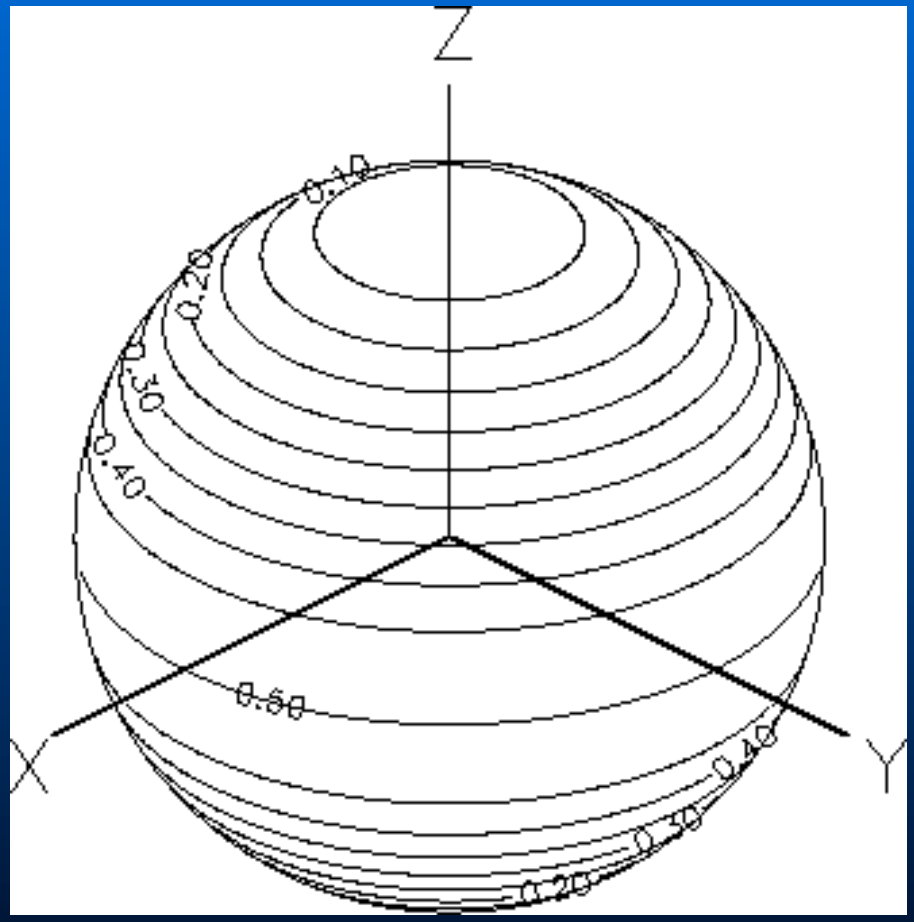
Anne-Marie Weijmans
University of St Andrews



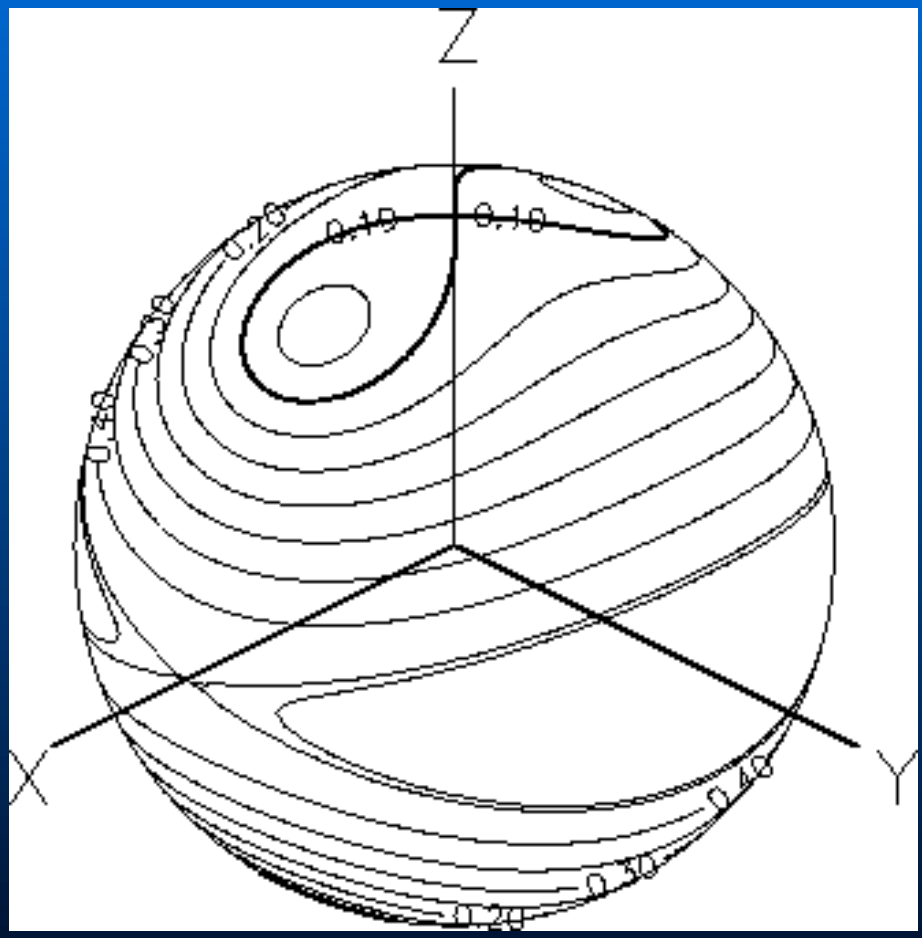
In collaboration with:
P.T. de Zeeuw, E. Emsellem, D. Krajnović & Atlas3D Team

ESO, 3D 2014, 10 March 2014

Shape depends on viewing angles

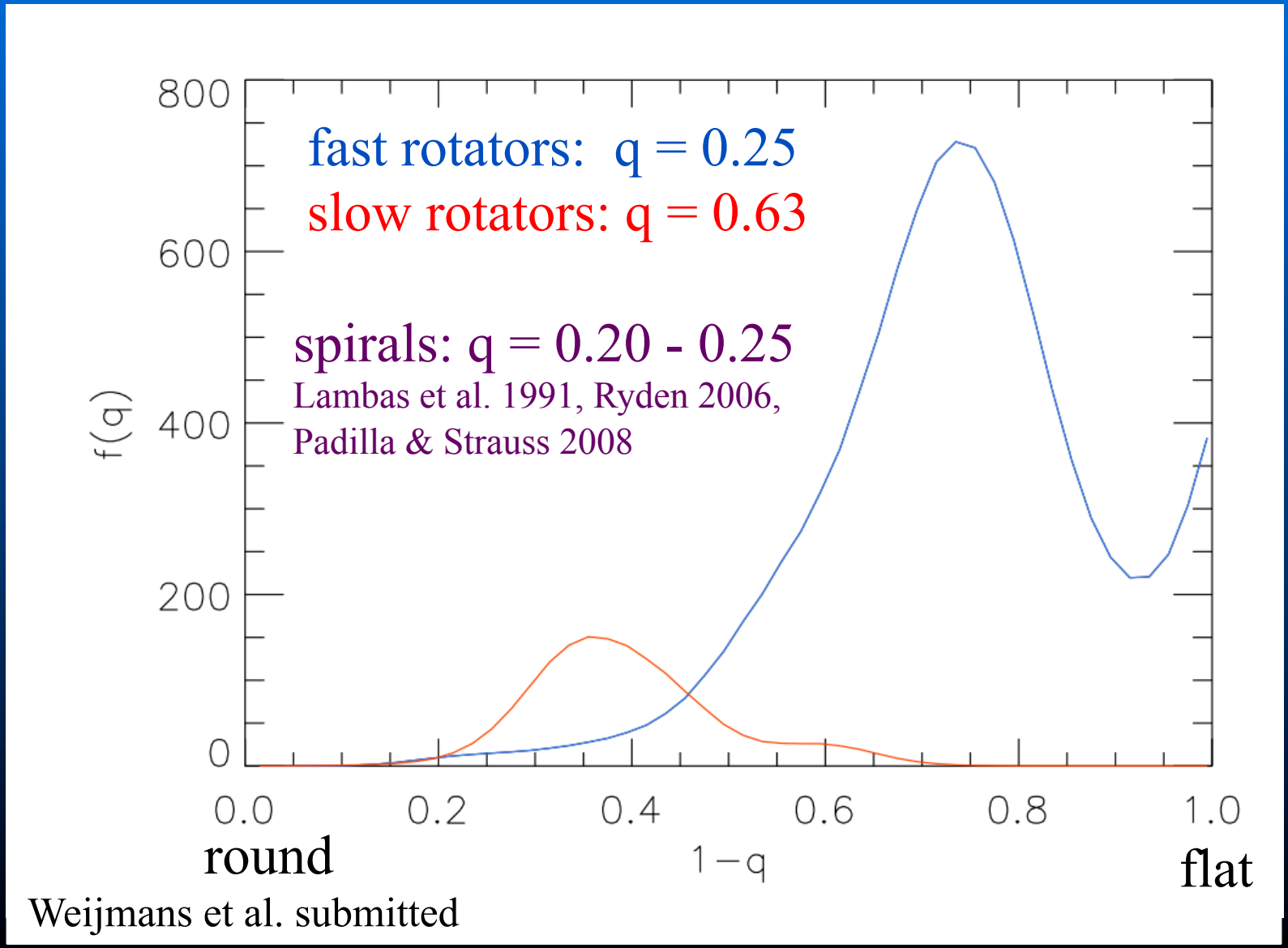


oblate galaxy

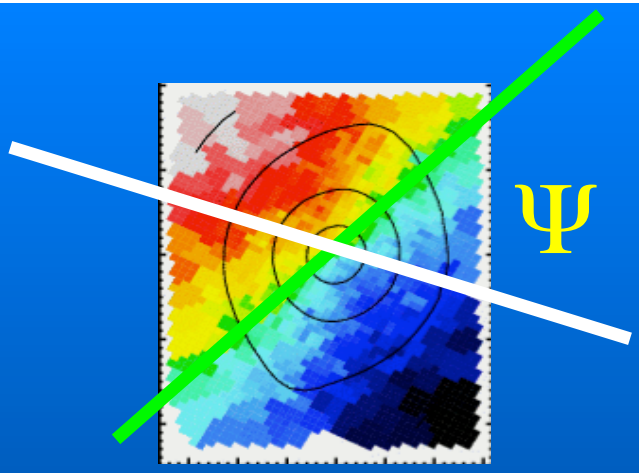


triaxial galaxy

Intrinsic shape distribution
fast rotators are as flat as spirals!



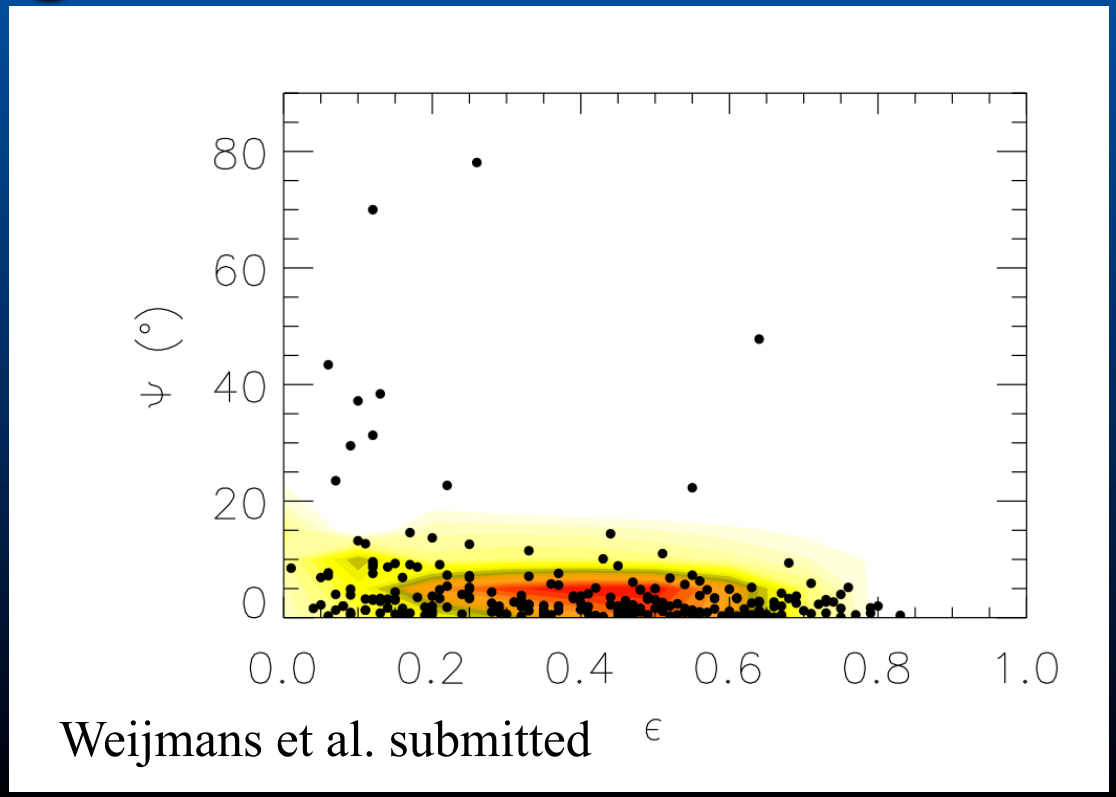
Weijmans et al. submitted



Kinematic misalignment: fast rotators are oblate!

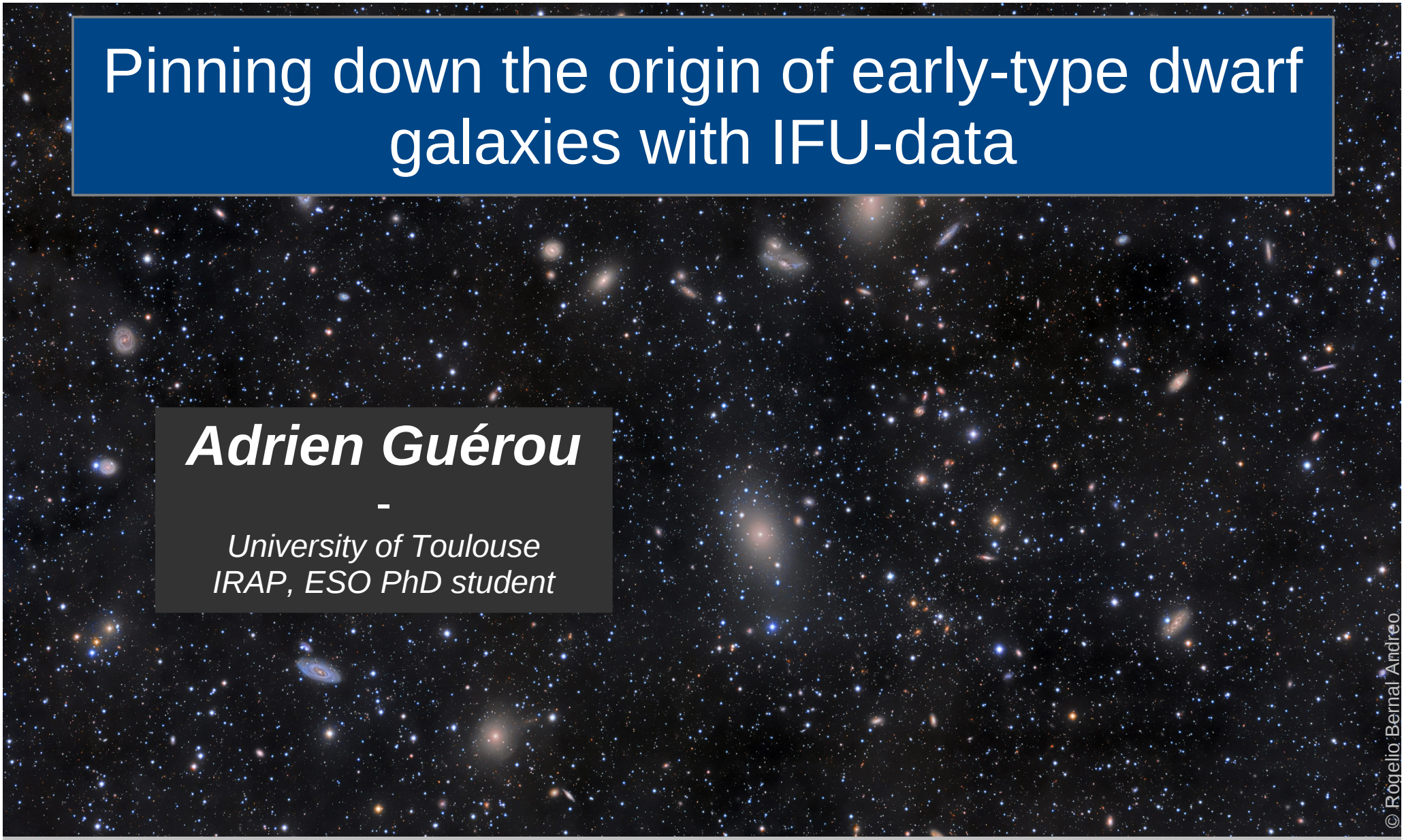
- Angle between projected axis and minor axis of galaxy image
- Caused by:
  - triaxiality
  - intrinsic misalignment

Poster 41



Weijmans et al. submitted

Pinning down the origin of early-type dwarf galaxies with IFU-data



Adrien Guérou

-

University of Toulouse
IRAP, ESO PhD student

Supervisors:
Contini, Thierry *(IRAP)*
Emsellem, Eric *(ESO)*

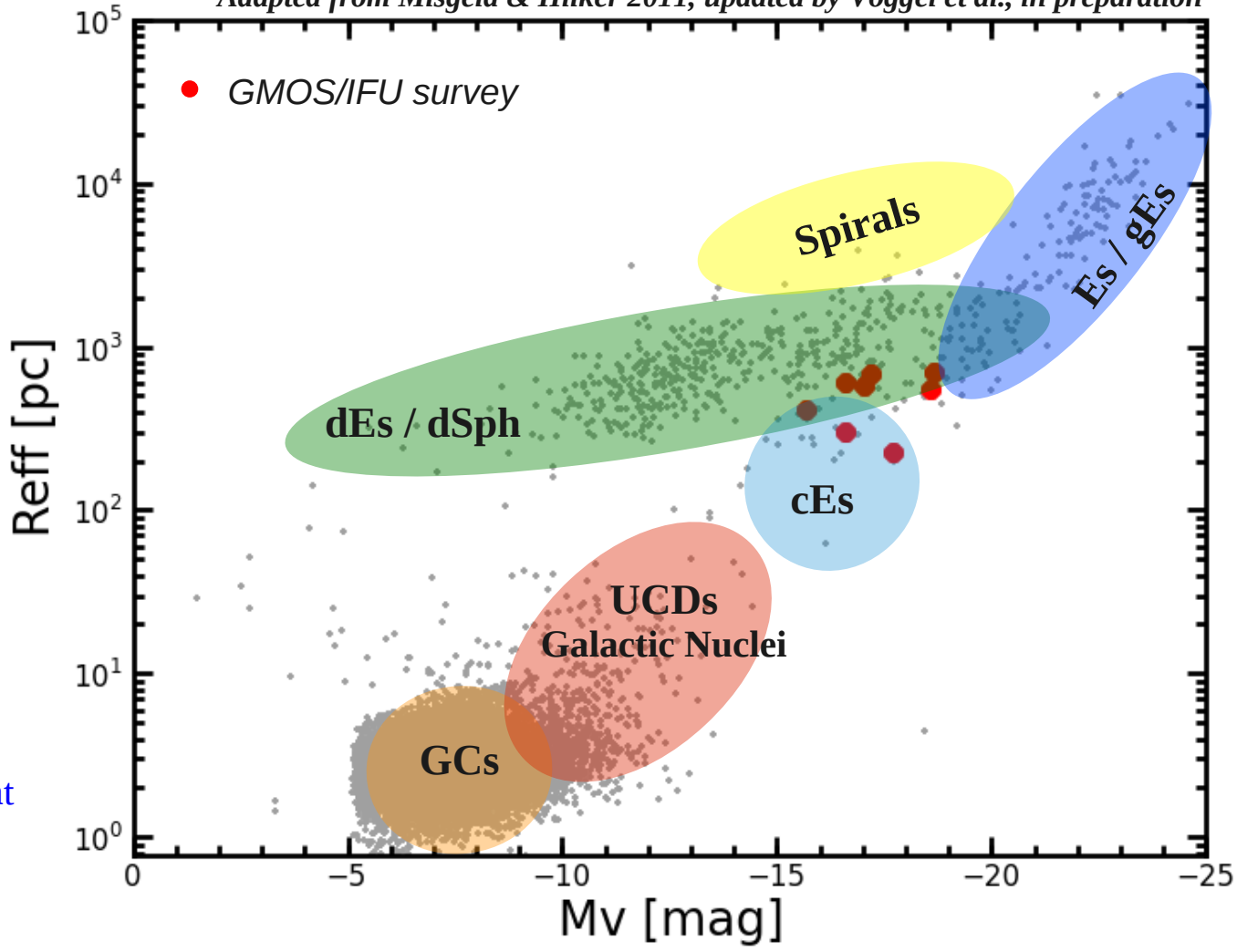
Collaborators:
Coté, Patrick *(Herzberg Institute of Astrophysics)*
Ferrarese, Laura *(Herzberg Institute of Astrophysics)*
McDermid, Richard *(Macquarie University)*

ESO3D2014 ***10-14 March 2014*** ***ESO-Garching***

Early-type dwarfs: *historic & scientific contexts*

- Dwarfs galaxies
  - M_V > ~-19 mag
  - Size ~ 0.1 to 10 kpc
  - Mass ~ $10^{\wedge 6}$ - $10^{\wedge 9}$ $M_\odot$
- Motivation
  - Largest galaxy population
  - Especially in clusters
- Origins of dwarf galaxies...
  - Extension of giants Es
  - AND / OR
  - Late-type spirals transformed in-situ and/or by their environment

Adapted from Misgeld & Hilker 2011, updated by Voggel et al., in preparation

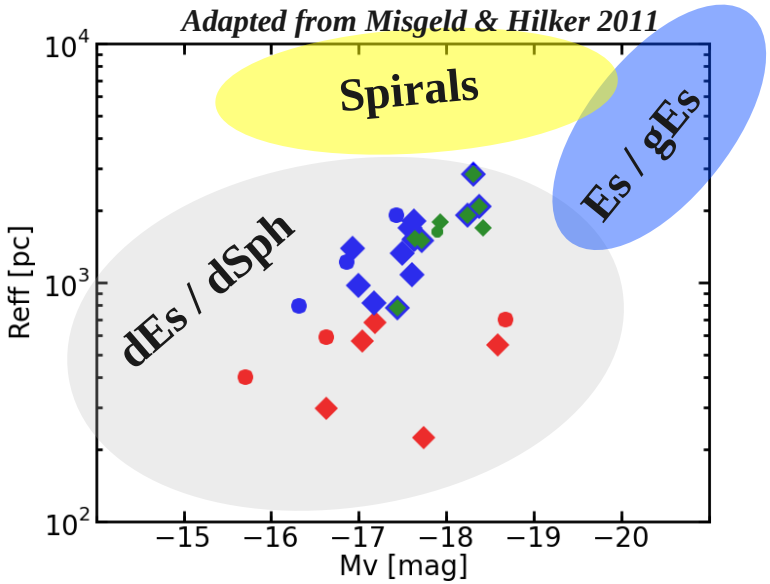


Question: Origin (progenitors) & evolution (physical processes) of dEs in clusters ?

GMOS/IFU survey: *First results*

- Need for kinematics, dynamics, stellar populations analyses

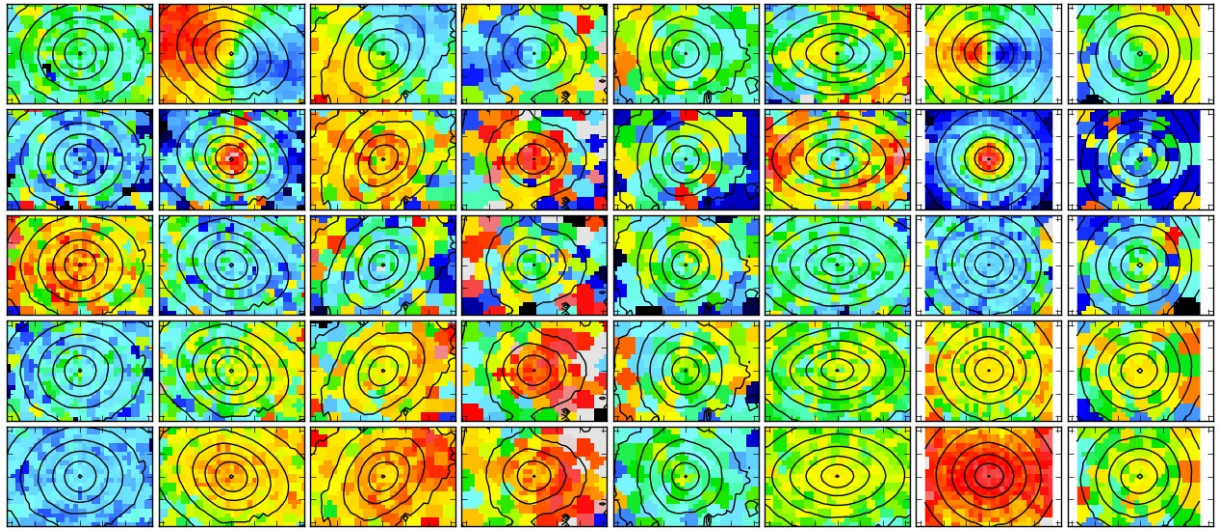
	Rýs et al. + 2013, 2014	Toloba et al. + 2009, 2011, 2014	GMOS survey (P.I: Patrick Coté)
Sample	12	21 (+18)	**8 (+3)**
Instrument	SAURON IFU	ISIS/IDS Long slit	**GMOS IFU**
FOV	33" x 41"	-	**5" x 7"**
Spectral res.	~100 Km.s-1	~40 Km.s-1	**~75 Km.s-1**
Spatial sampling	0.94" / spaxel	0.4" / pixel	**.2 " / spaxel**



- **GMOS/IFU survey:** Data reduction ***(Gemini IRAF package)*** & Analysis ***(pPXF, Cappellari, Emsellem, 2004)***

Kinematics
- V (Km/s)
- σ (Km/s)

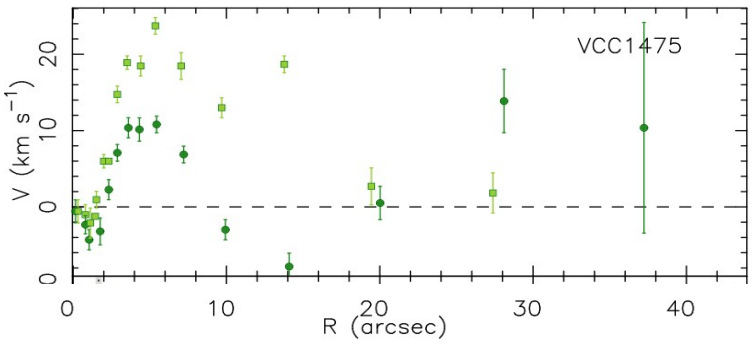
Line strengths
- Hβ
- Fe5335
- Mgb
- ...

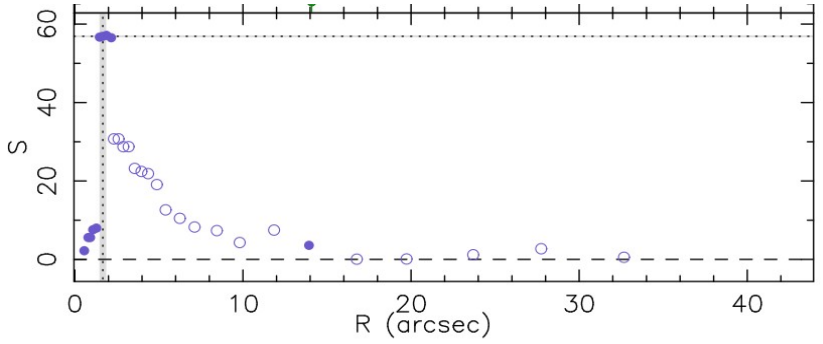


Good data quality!

GMOS/IFU survey: *Kinematically Decoupled Cores (KDCs)*

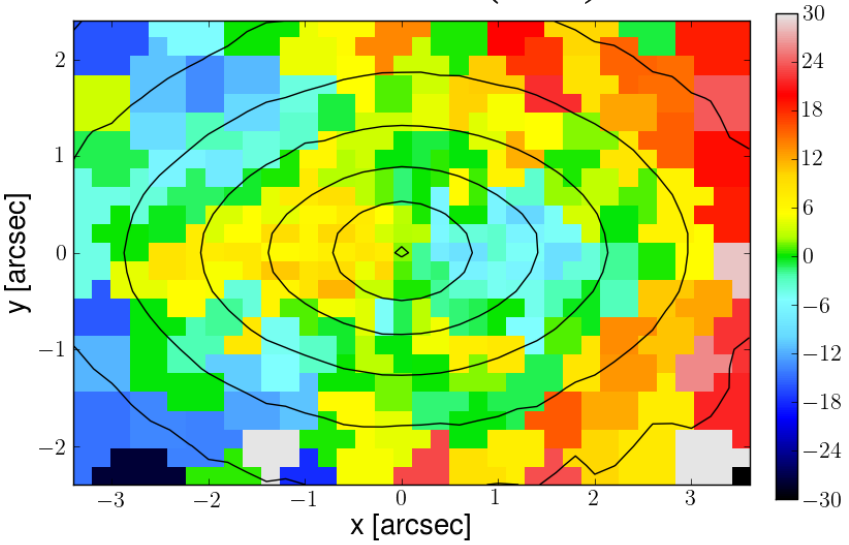
- KDC in VCC1475 from *Toloba+2014*:



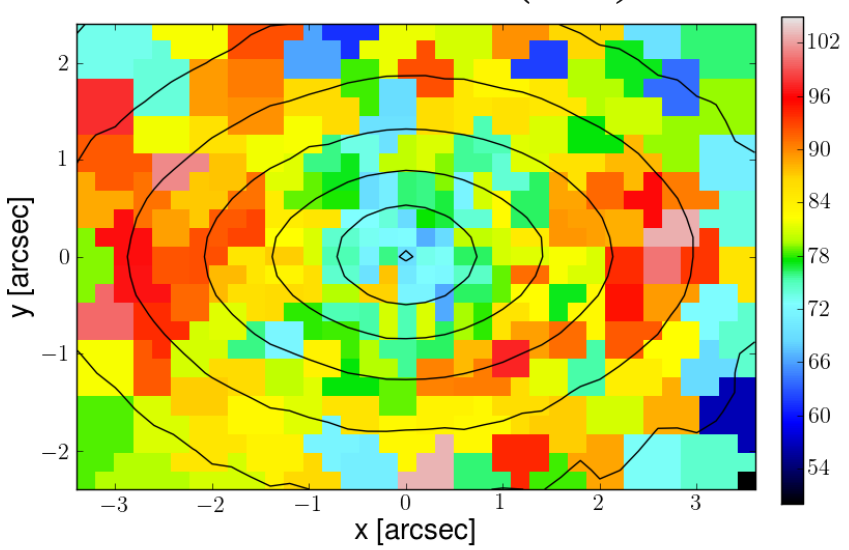


- Confirmation of a KDC:
  Revealed as a "counter-rotating" inner disk from the GMOS/IFU survey

VCC1475 - V (Km/s)

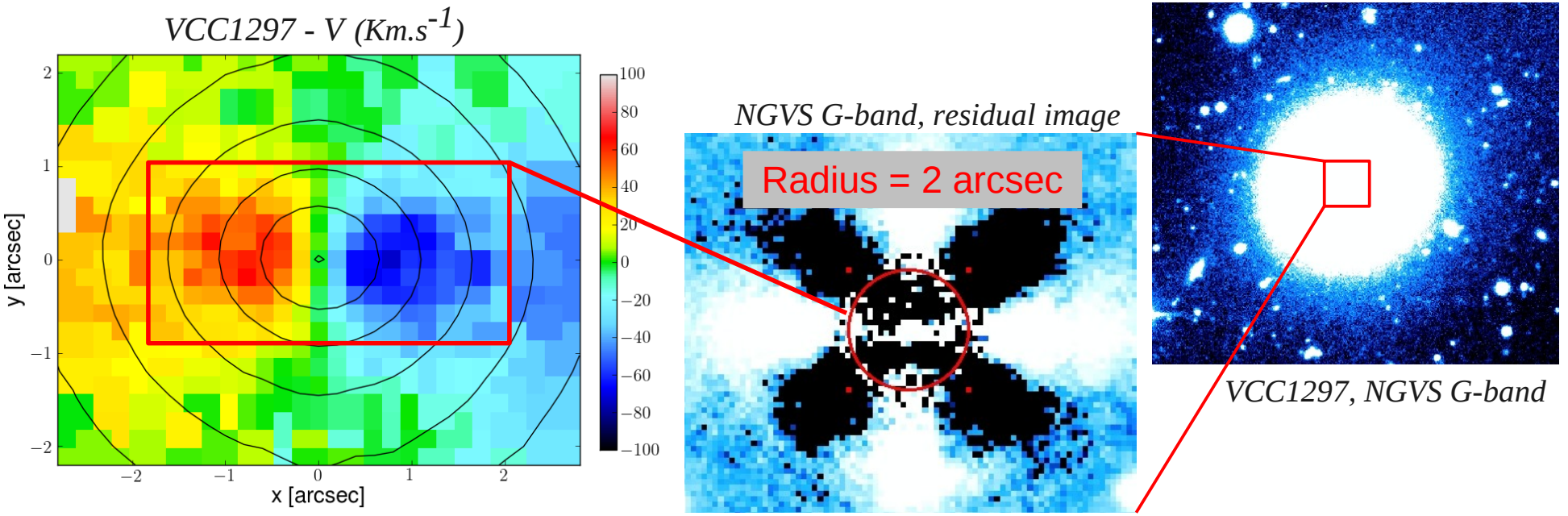


VCC1475 - σ (Km/s)



GMOS/IFU survey: *Other first results & Future work*

- VCC1297: Inner disk confirmed with NGVS data ***(P.I: Ferrarese)***



- Work in progress
  - Dynamics analysis (NGVS data) *=> Substructures, Scaling relations (M/L, etc..)*
  - Stellar population (STIS data, *P.I: McDermid Richard*) *=> Ages, metallicity, nuclear properties, etc.*

- Work to do
  - Global picture with other samples
  - Other science cases (MUSE), larger FOV, fainter dwarfs, etc. *=>DM content, etc.*

Galaxy stellar masses:
what can we gain from a 3D perspective?

Stefano Zibetti

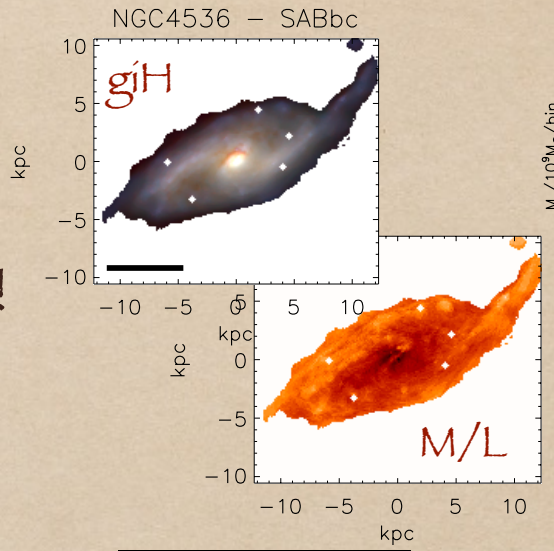
with Anna Gallazzi, Elena Tundo,
Stéphane Charlot and the CALIFA collaboration

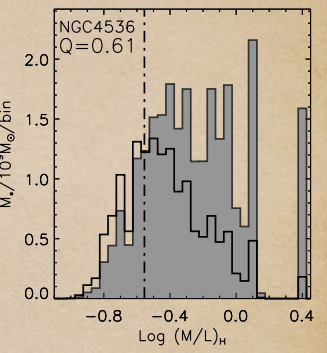
SteMaGE - Towards an unbiased view of the role of Stellar Mass in Galaxy Evolution - FP7 CIG

- Key role of stellar mass:
  - Basic galaxy property correlating with most important physical quantities
  - Evolution of SMF main tracer of galaxy formation and assembly history
  - Dynamics
- SteMaGE, a systematic effort to:
  - calibrate optical/NIR stellar mass estimators
  - correct biases in SMF
  - access galaxy structure in stellar mass

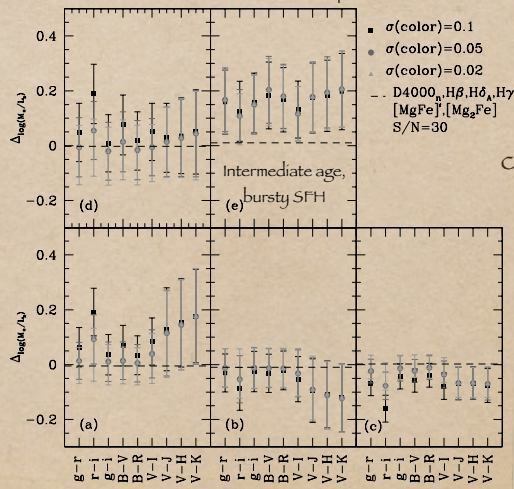
Spatial+Spectral resolution

- Why spatial? Mass weighing is NOT the same as light weighing! Need to take the diversity of galaxy regions into account
- Why spectral? Need to resolve SFH to lift degeneracies in colors which bias M/L
- CALIFA[+SDSS[+UKIDSS]] sample (PI S. F. Sánchez)



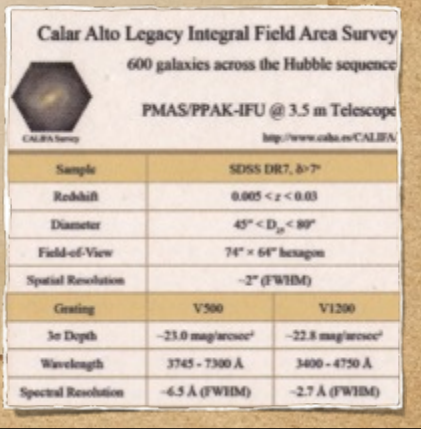


Zibetti, Charlot & Rix (2009)



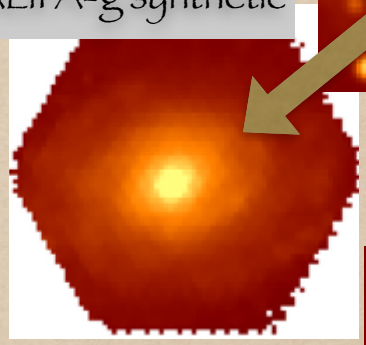
Bias in recovered M/L ratio from broad-band colors and spectral indices (Gallazzi & Bell 2009)

CALIFA Survey



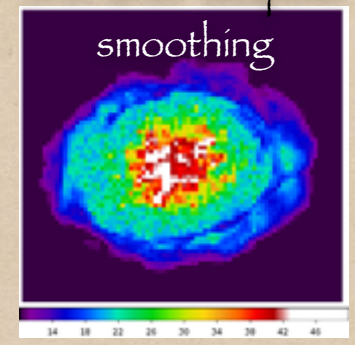
Method

CALIFA-g synthetic

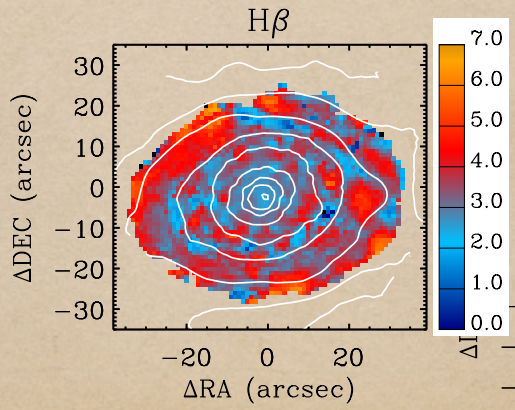


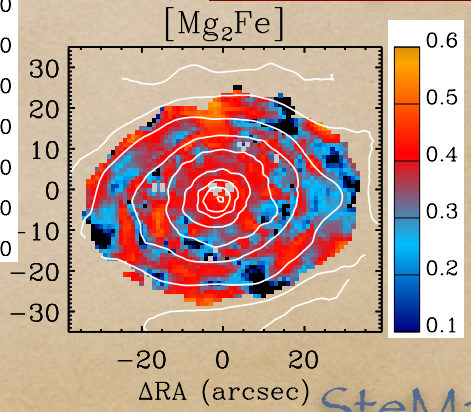
Adaptive smoothing

SNR after adaptive smoothing

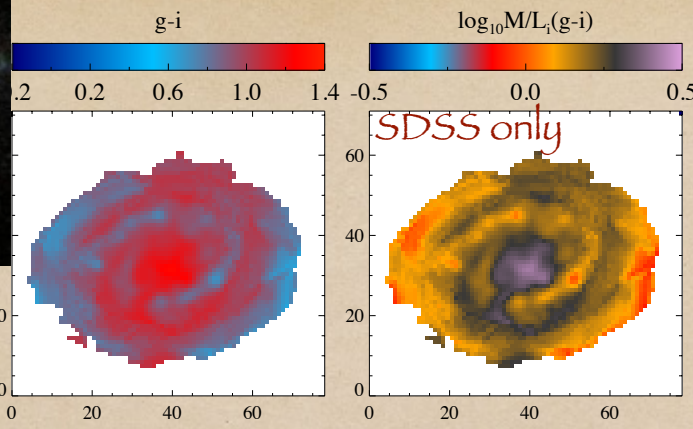


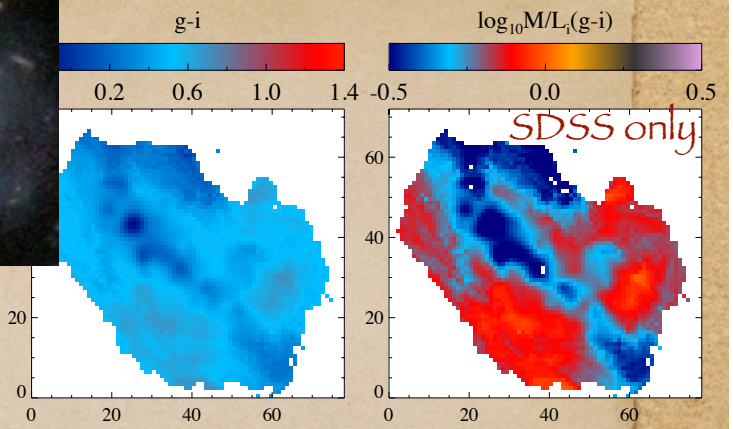
- CALIFA-SDSS match: resample & PSF match
- Adaptive smoothing for optimal SNR>20 [10]/pix: azmooth3C
- Stellar continuum-nebular line decoupling (customized GANDALF+pPXF) spaxel by spaxel
- Bayesian parameter estimation, based on 5 spectral absorption indices (Gallazzi et al. 2005) and color[s]

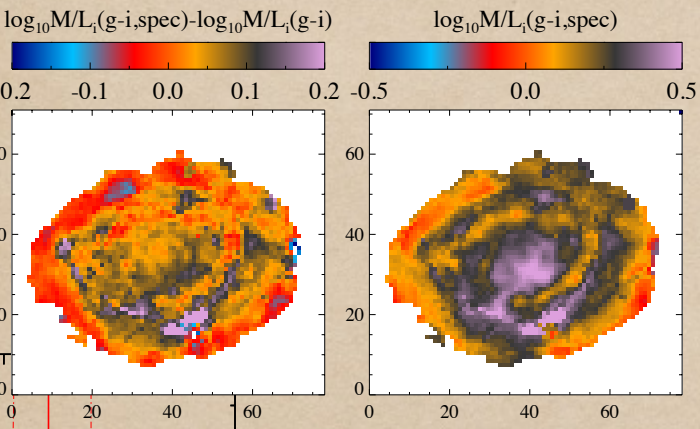


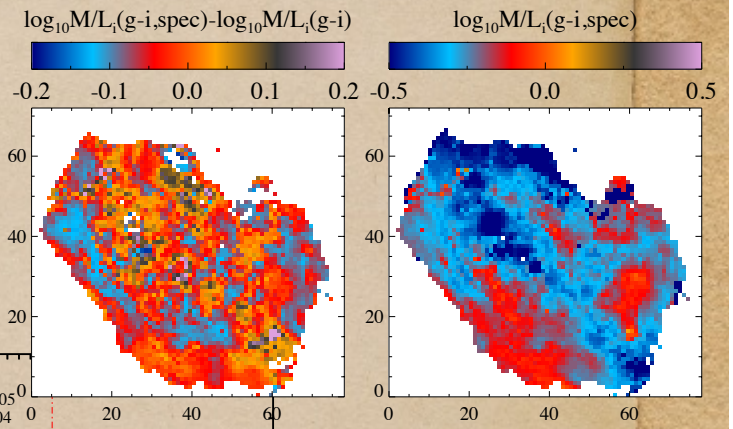


SteMaGE

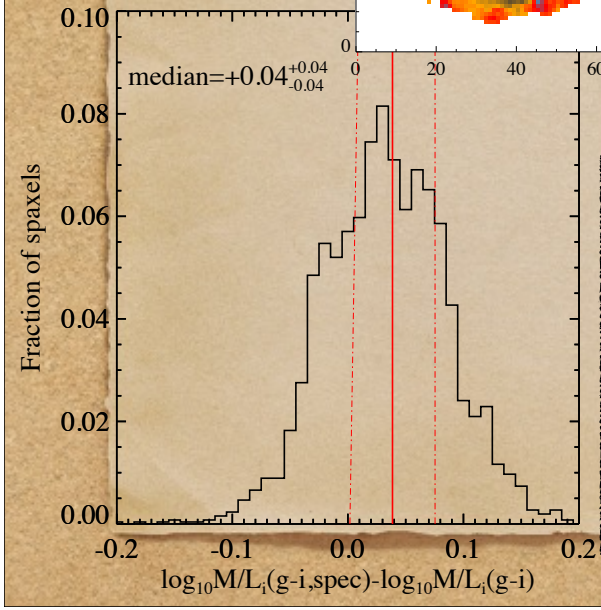




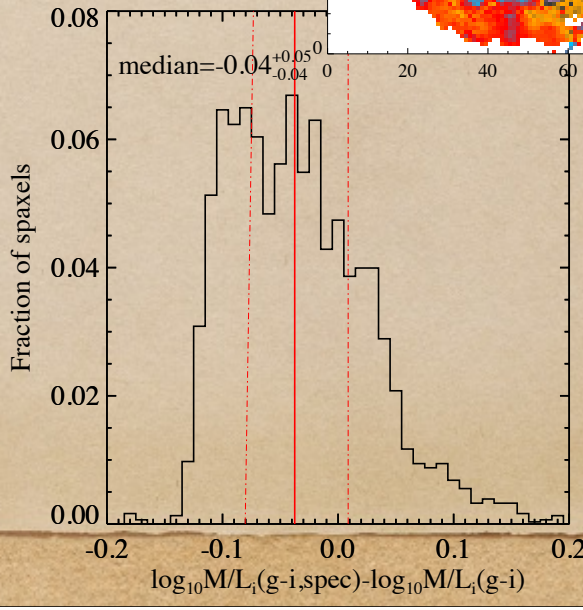




Difference: with and w/o spectroscopy



Difference: with and w/o spectroscopy



Systematic differences Correlations with structure

SteMaGE