Mapping physical properties of the most extreme UV-bright starburst galaxies in the local universe

Thiago S. Gonçalves
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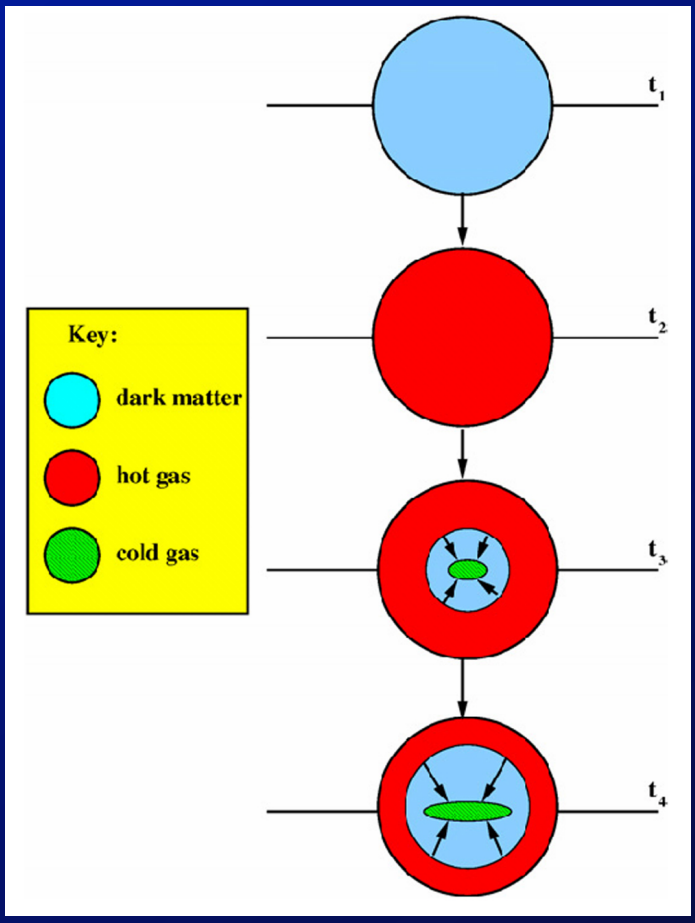
Star formation in galaxies



Baugh (2006)

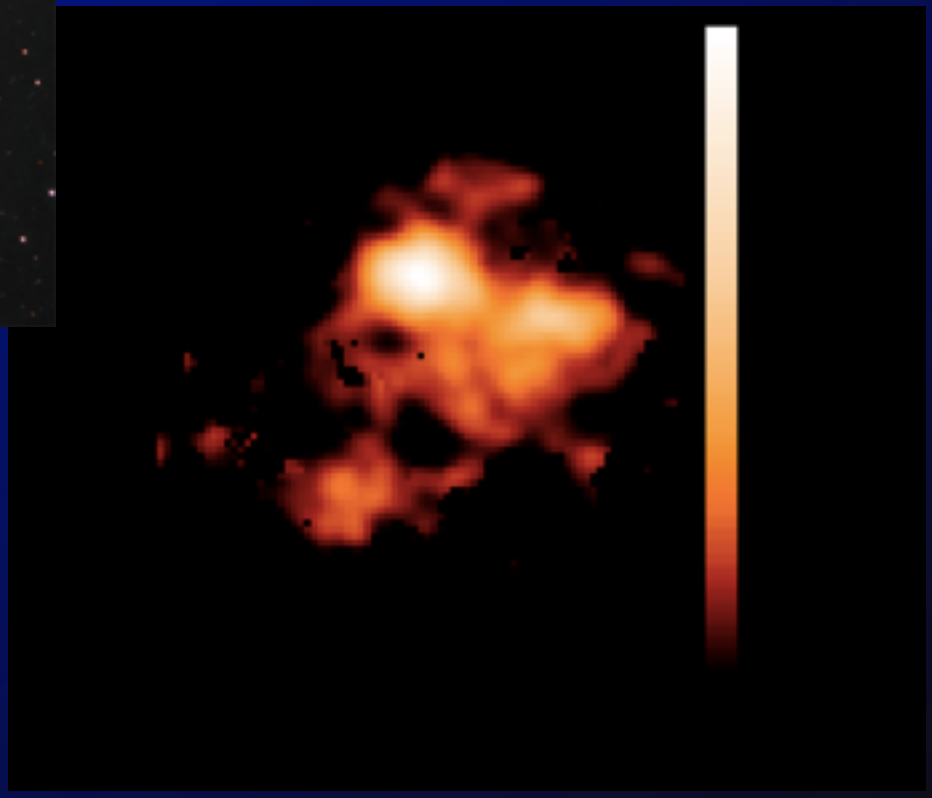
Star formation in galaxies

Star formation in galaxies

Local universe

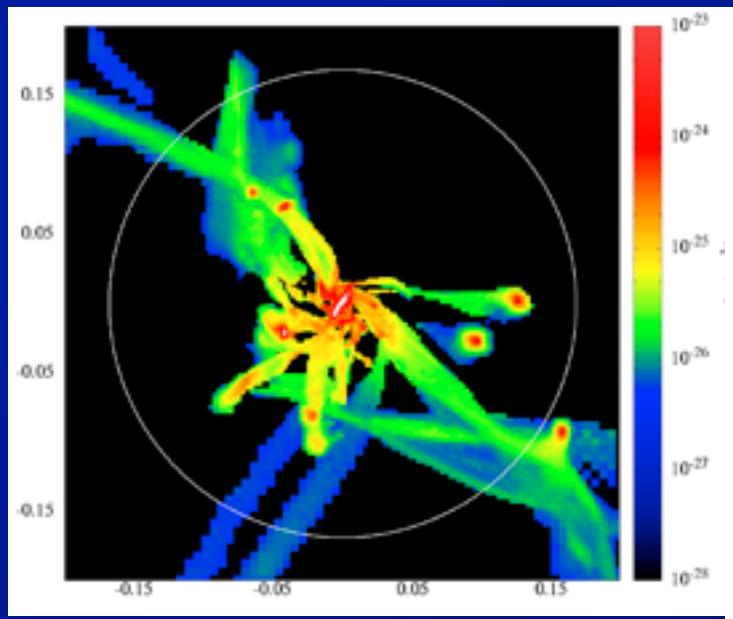
Star formation in galaxies

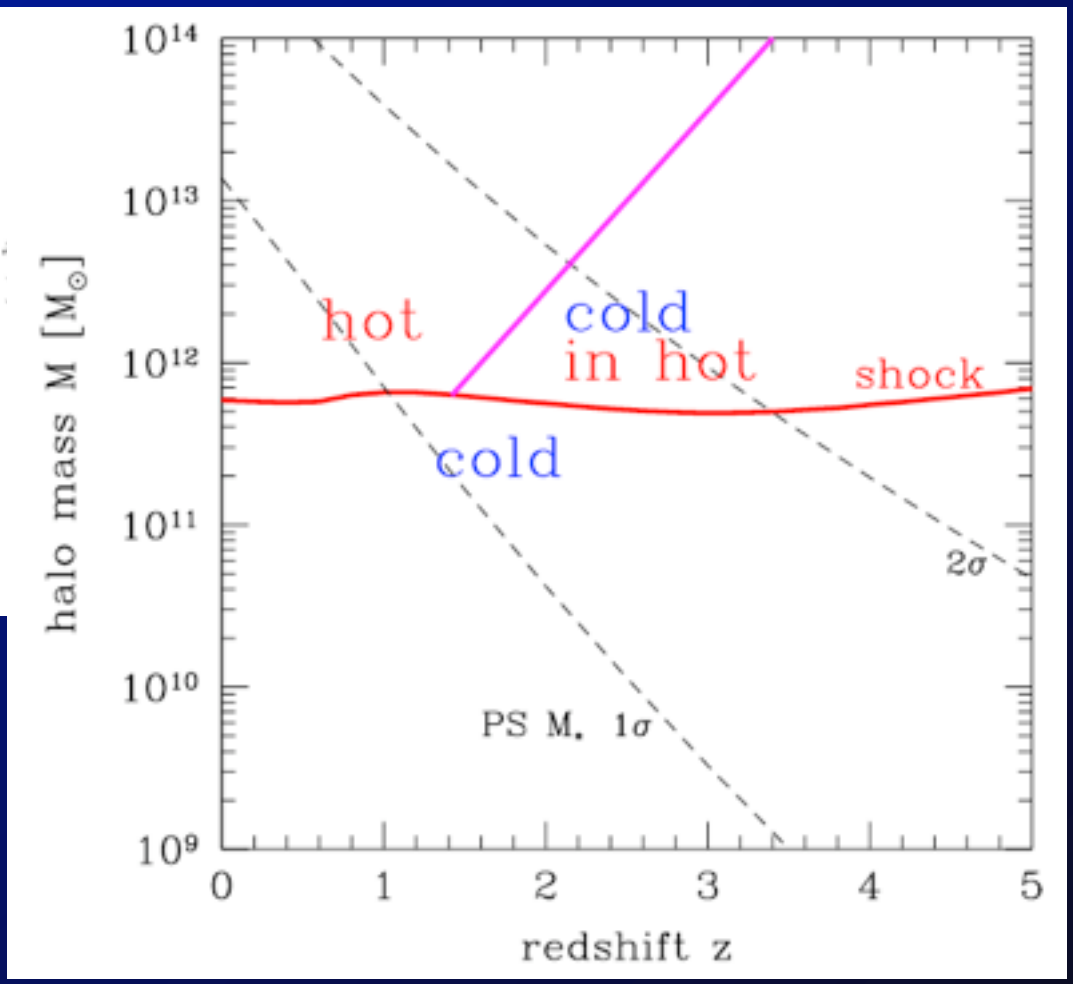
Local universe



High redshift

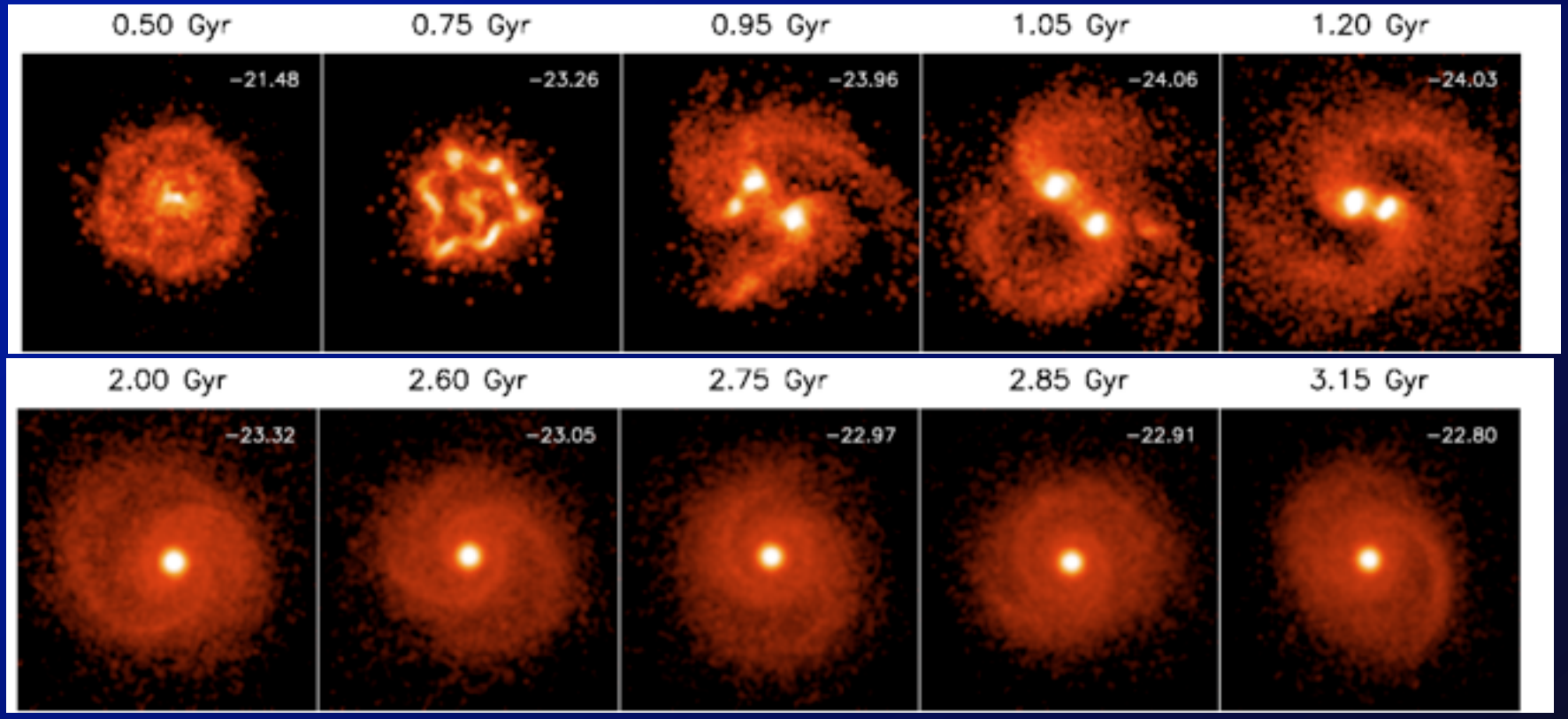
Cold flows





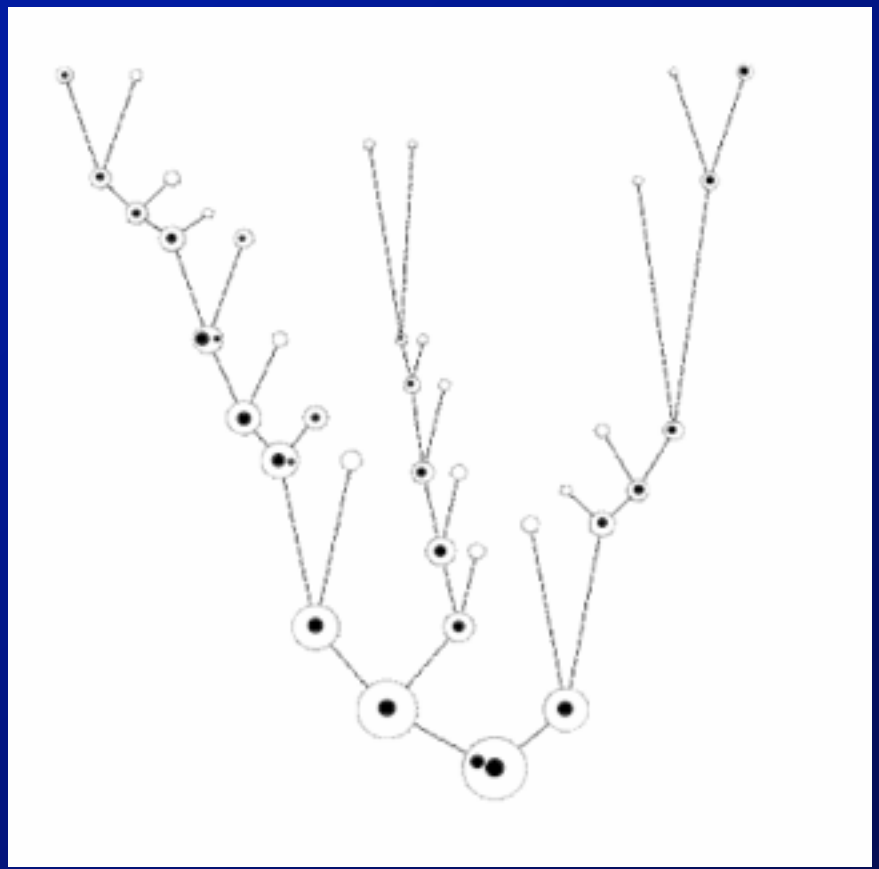
Dekel & Birnboim 2006

Local instabilities



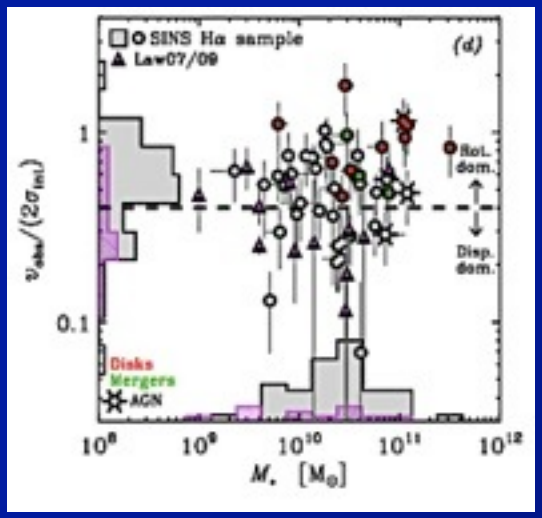
Immeli et al. 2004

Interactions and mergers?

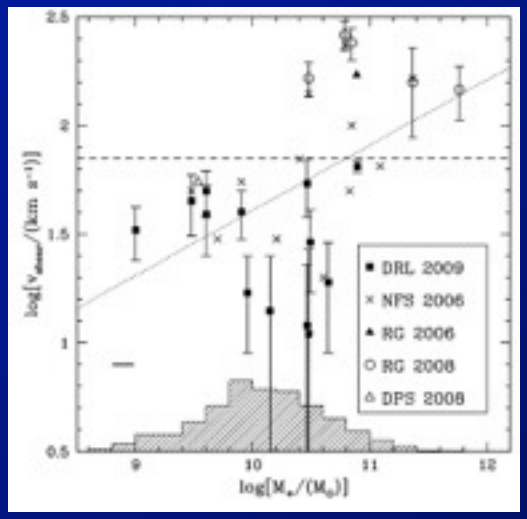


Marta Volonteri, UMich

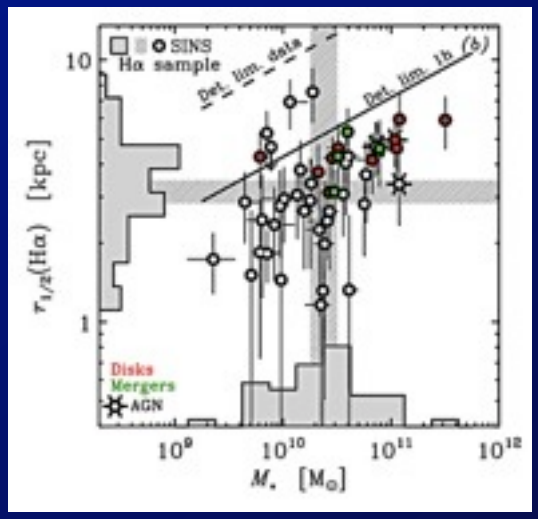
HST



FS09



Law09



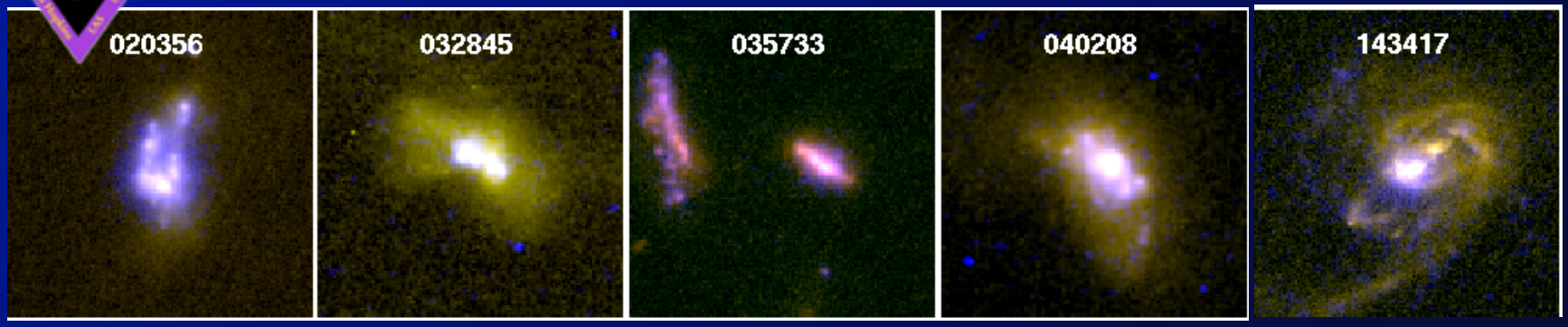
FS09

High velocity dispersion

Stellar mass dependence of observables

- Stellar mass of selected sample
- Samples with and without AO
- Issues with observations at high z: Surface Brightness / Resolution

The sample of Lyman break analogs

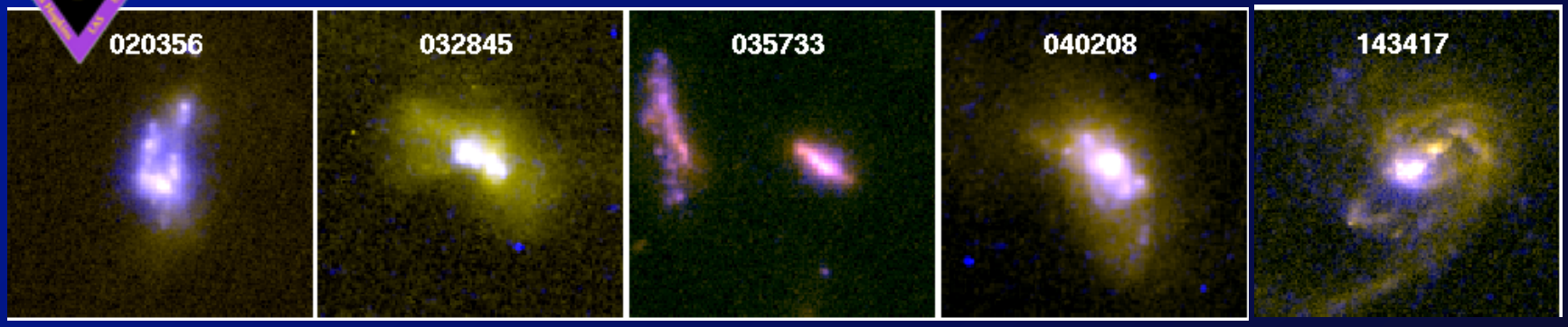


$L_{FUV} \geq 2 \times 10^{10}\ L_{\odot}$

$I_{1530} \geq 10^{9}\ L_{\odot}\ kpc^{-2}$

Hoopes et al. (2007)
Overzier et al. (2009)

The sample of Lyman break analogs



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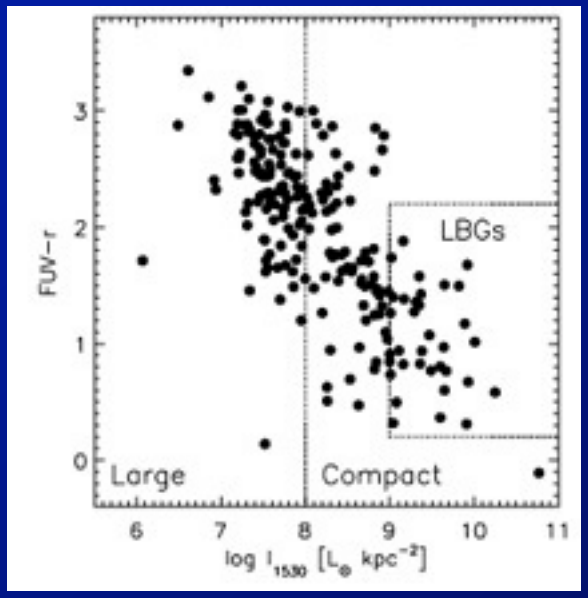
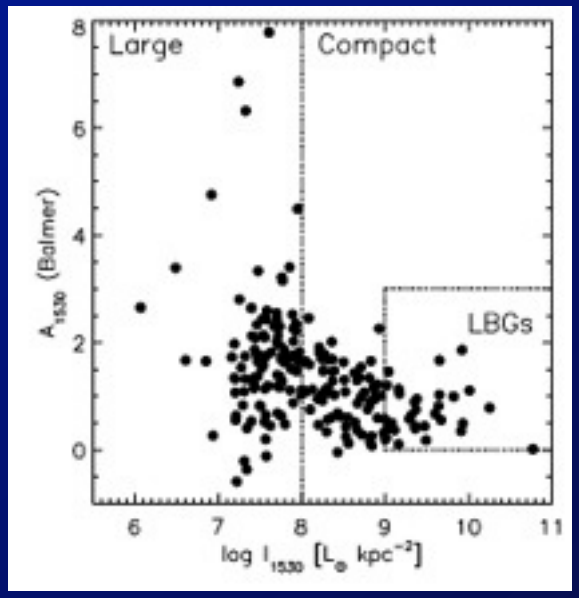
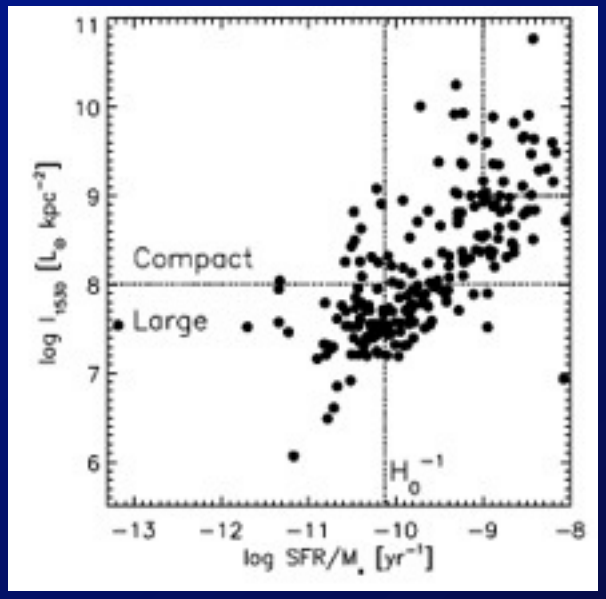
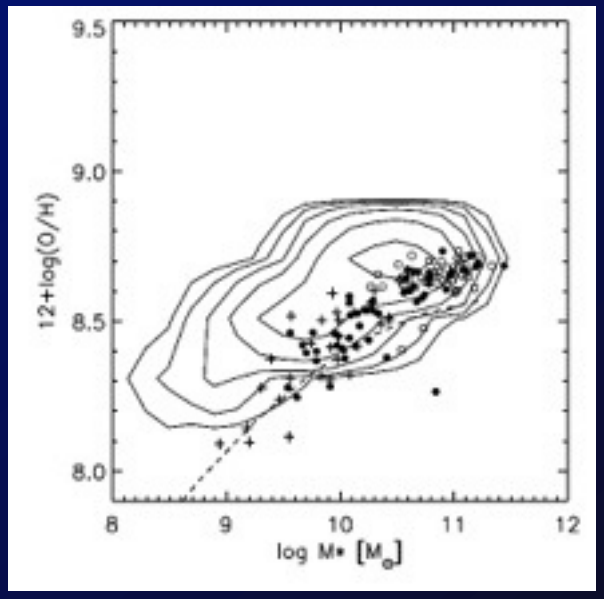
LBAs are similar to high-z starbursts!

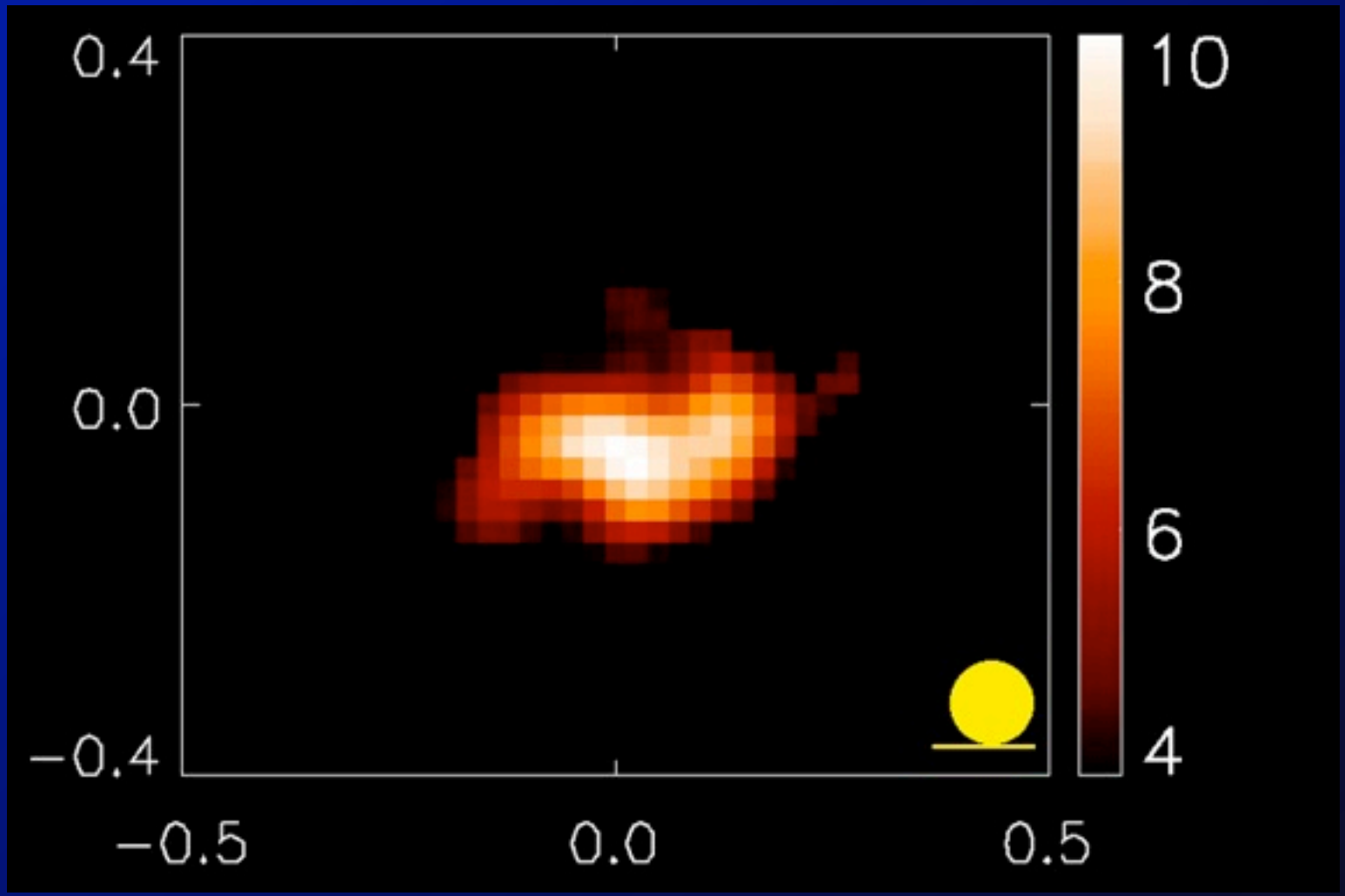






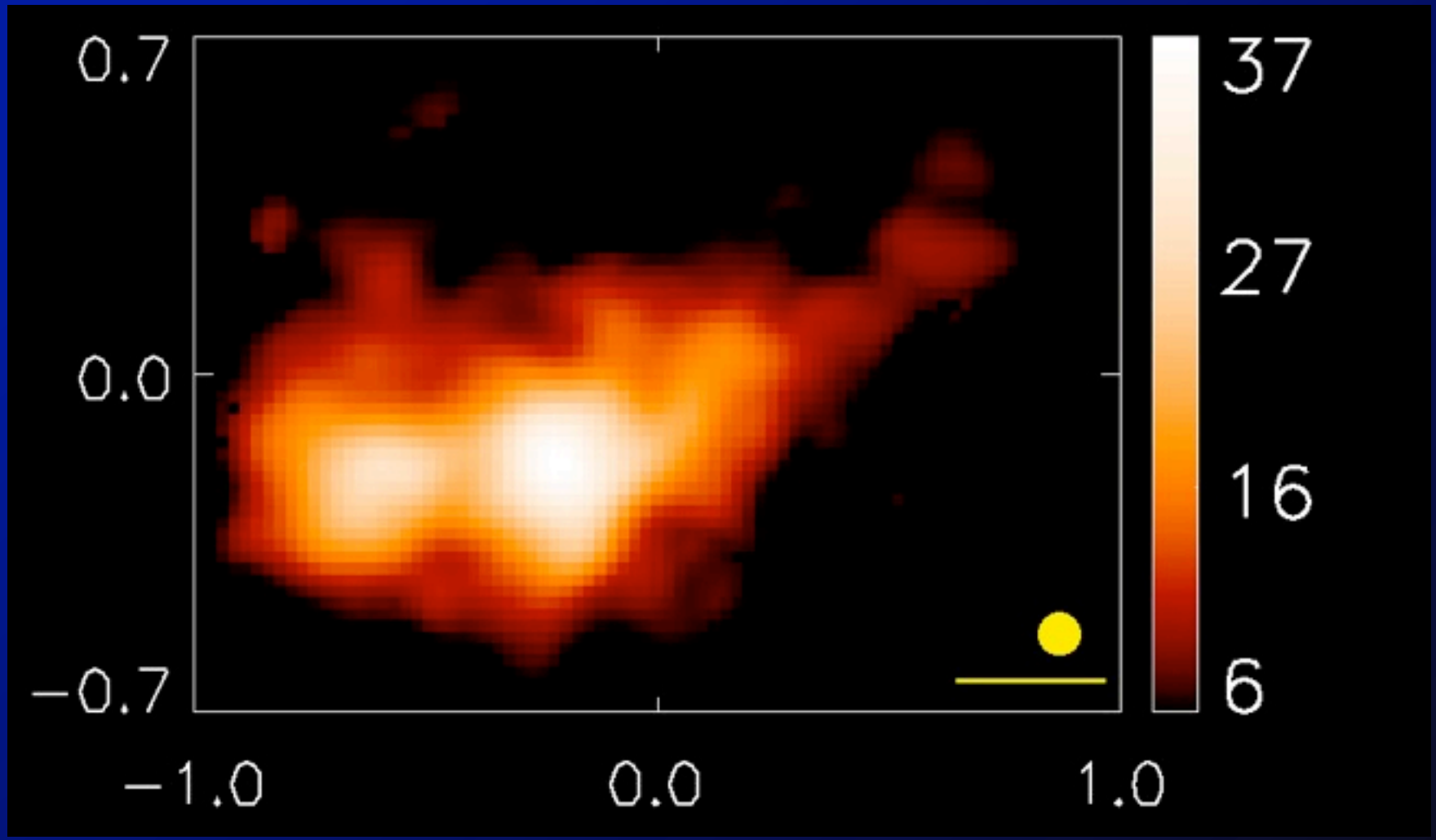


The low-z advantage



high-z

The low-z advantage



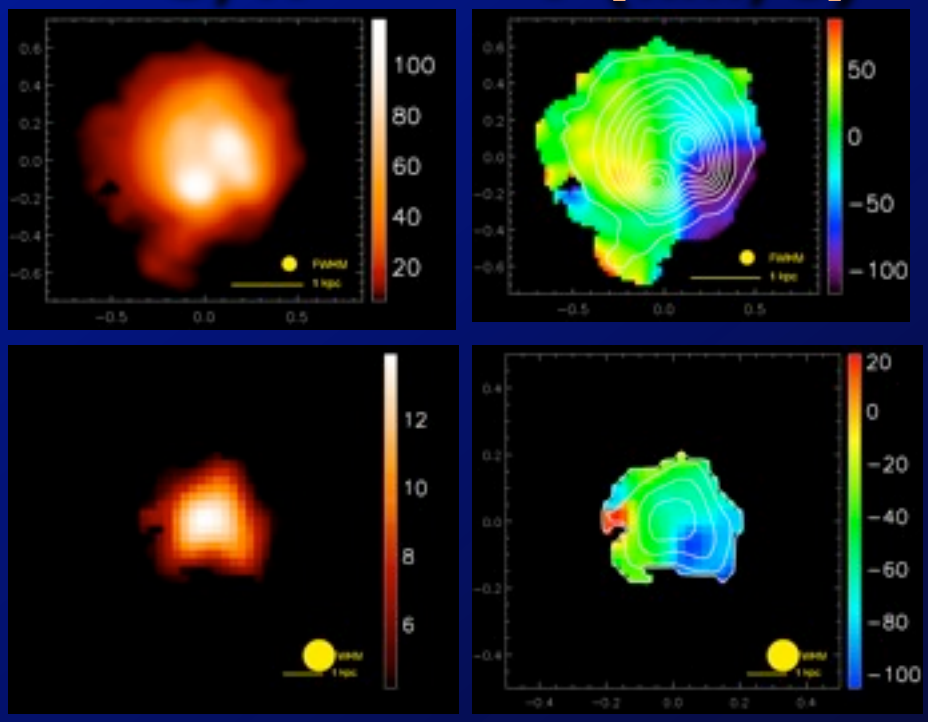
low-z

Keck/OSIRIS data: low-z X high-z

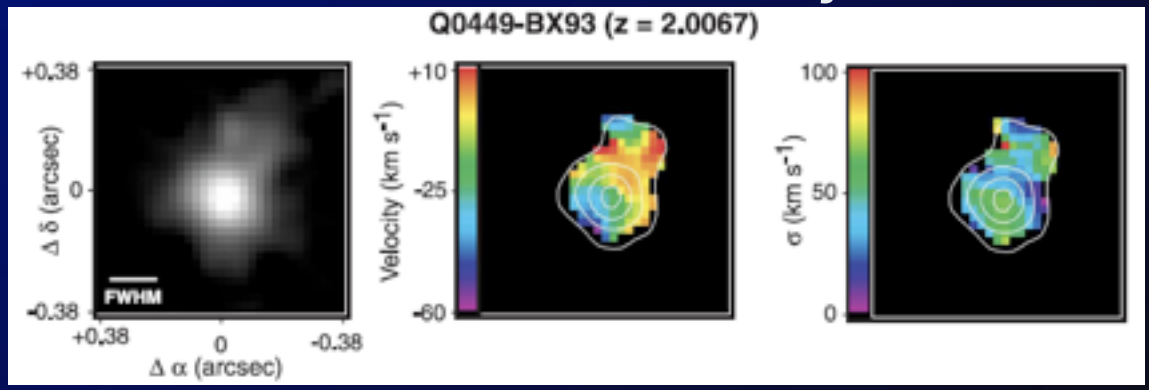
Real data
(200 pc, high S/N)

Artificially
redshifted to z=2.2
(1 kpc, low S/N)

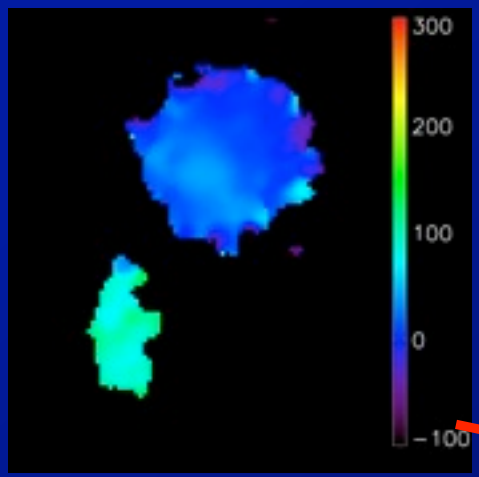
Law et al. 2007

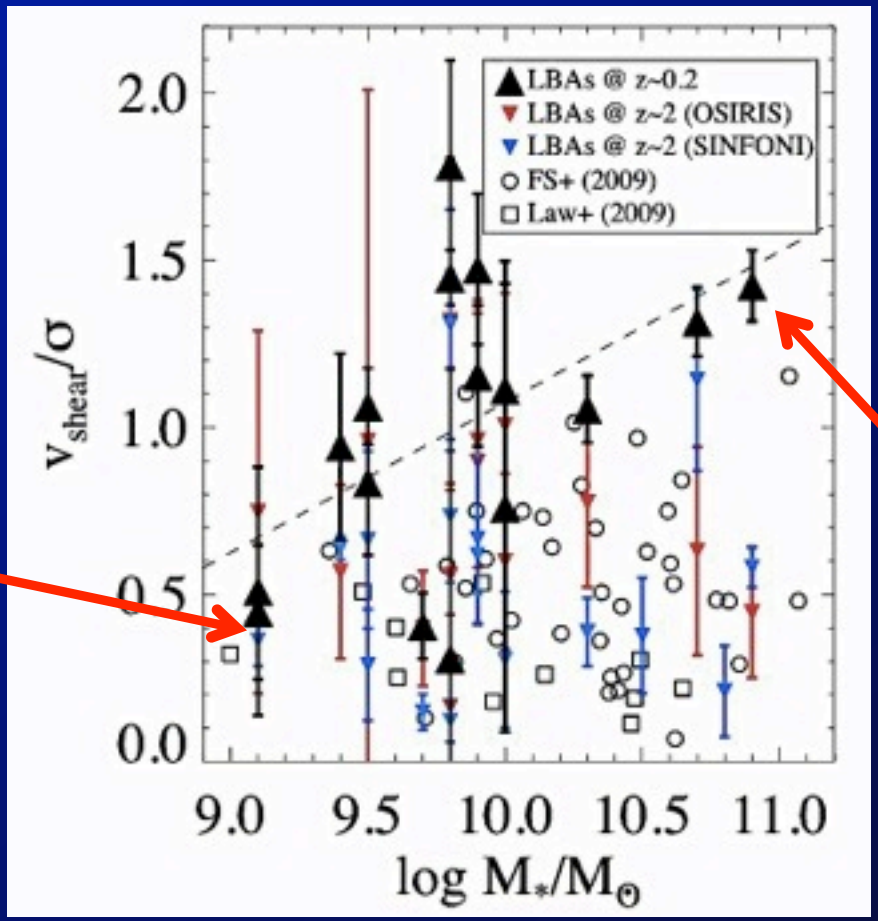


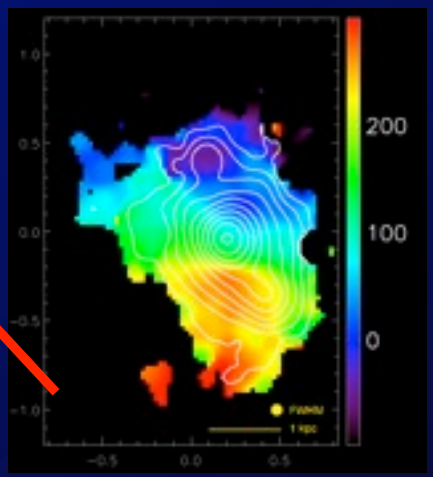
Gonçalves+10



Stellar mass dependence



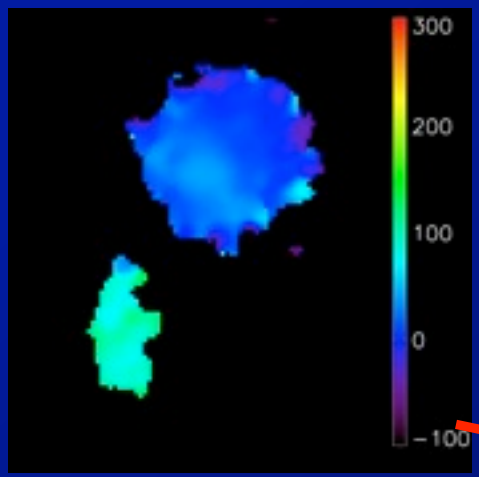


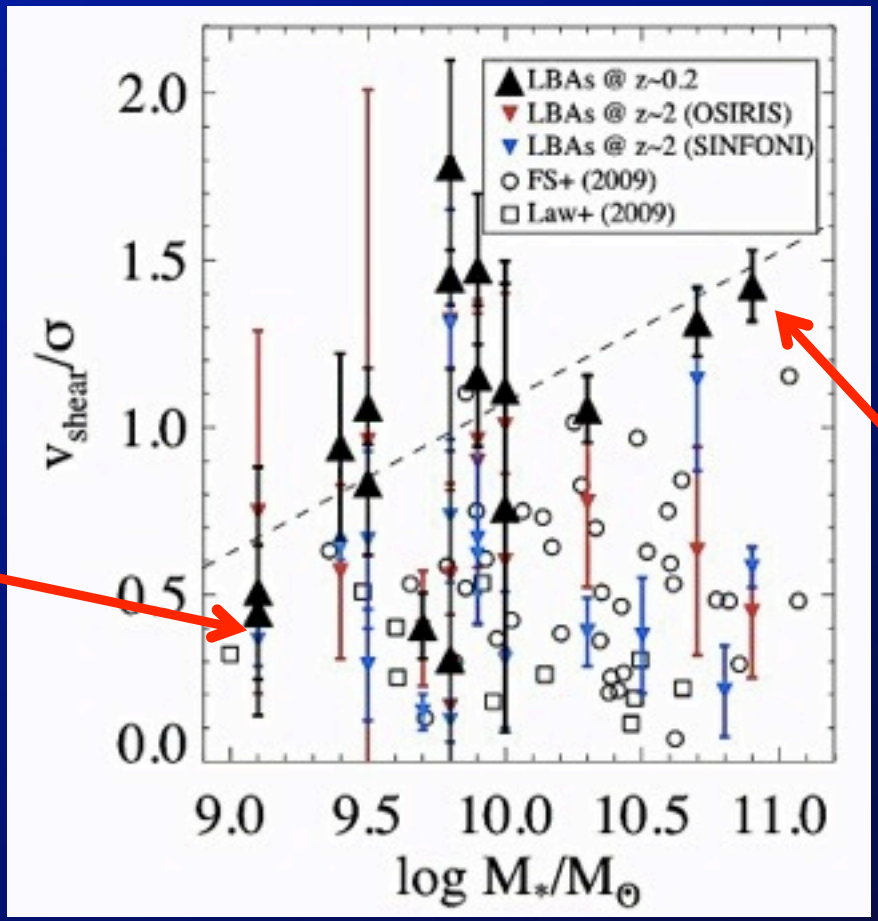


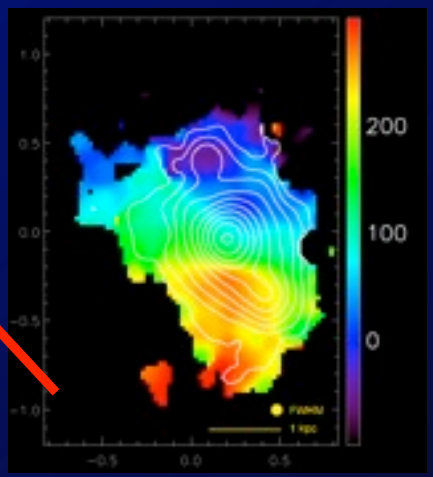
Gonçalves+10

More massive objects show stronger velocity shears with similar values to high-z

Stellar mass dependence







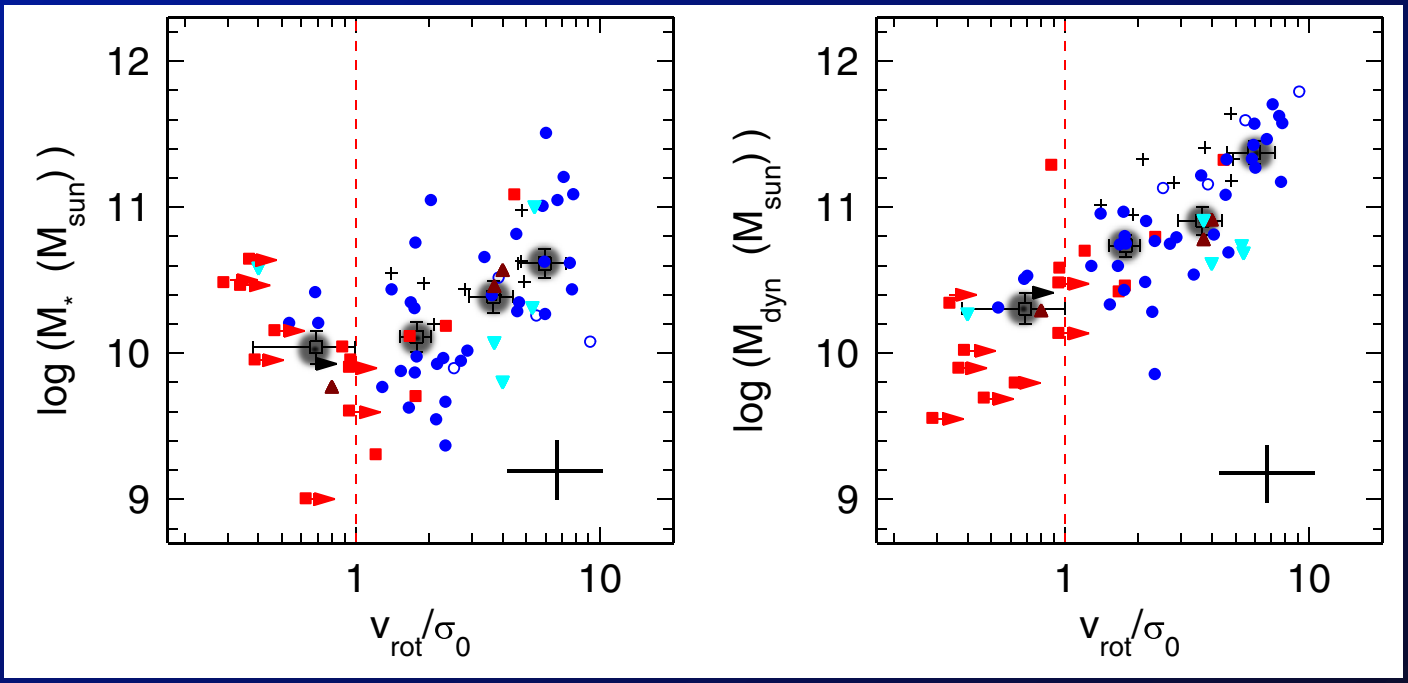
Gonçalves+10

More massive objects show stronger velocity shears with similar values to high-z

Stellar mass dependence

Comparisons between seeing-limited and AO data at high-z:

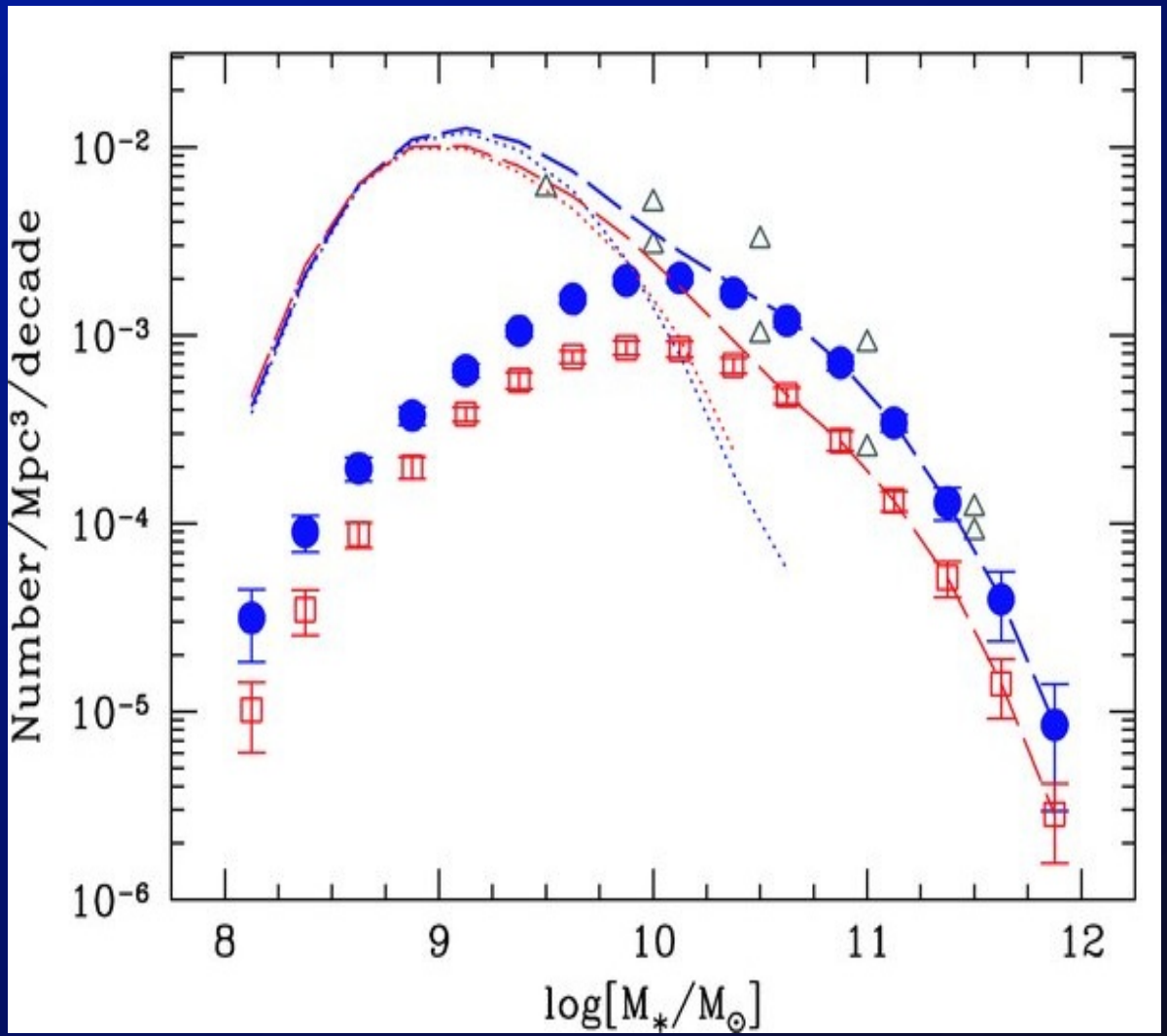
- Loss of resolution yields smaller velocity gradients
- Less massive galaxies are dispersion-dominated



Newman+12

Stellar mass dependence

But stellar mass function is steep at high-z!



Reddy & Steidel, 2009

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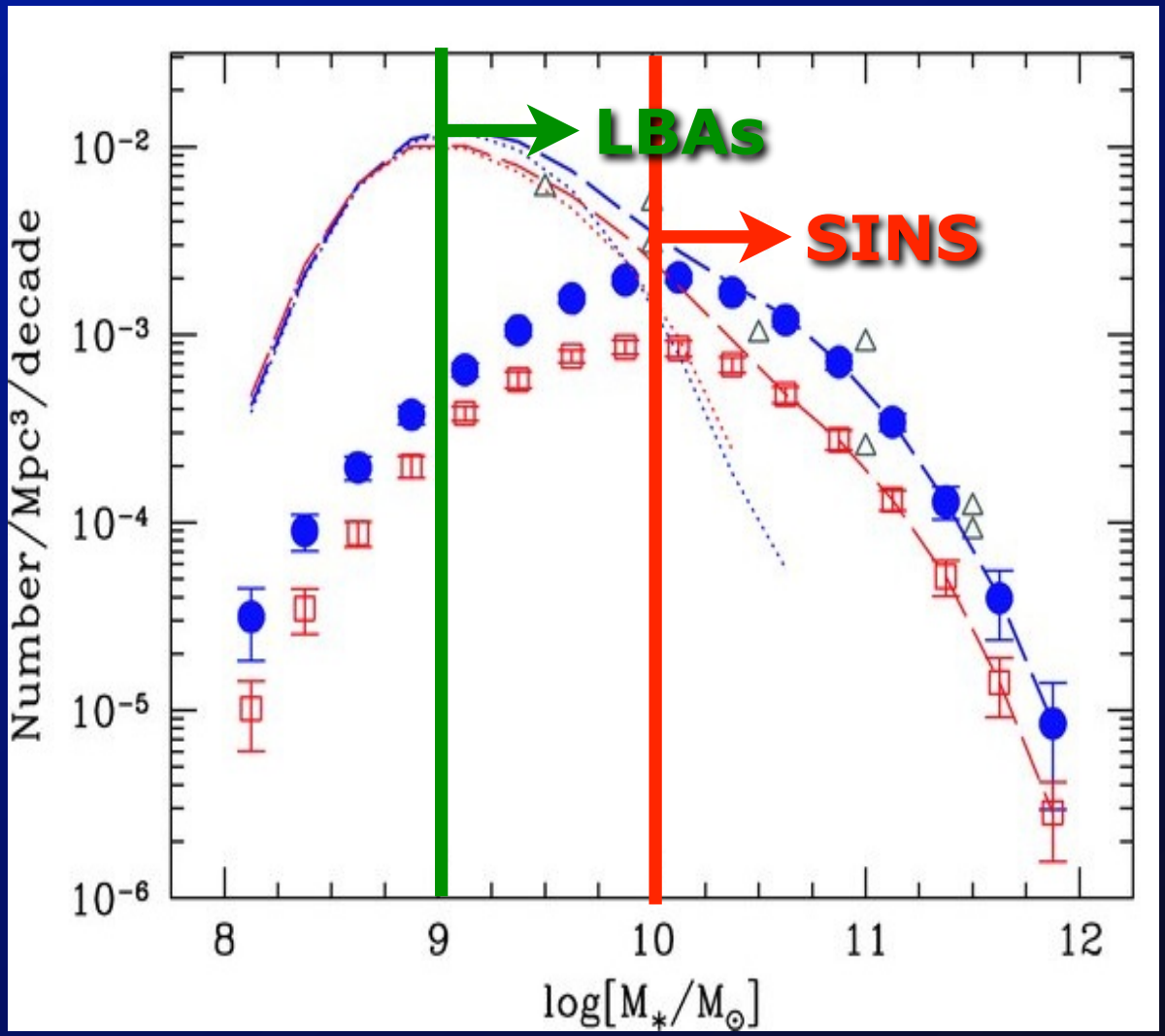
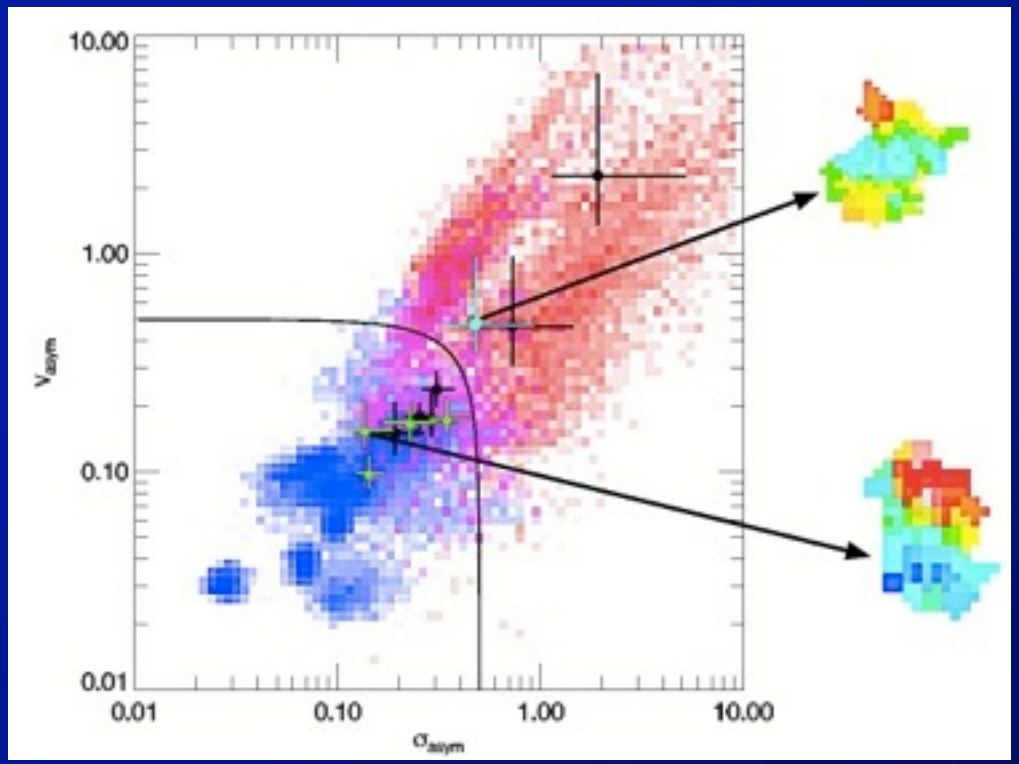
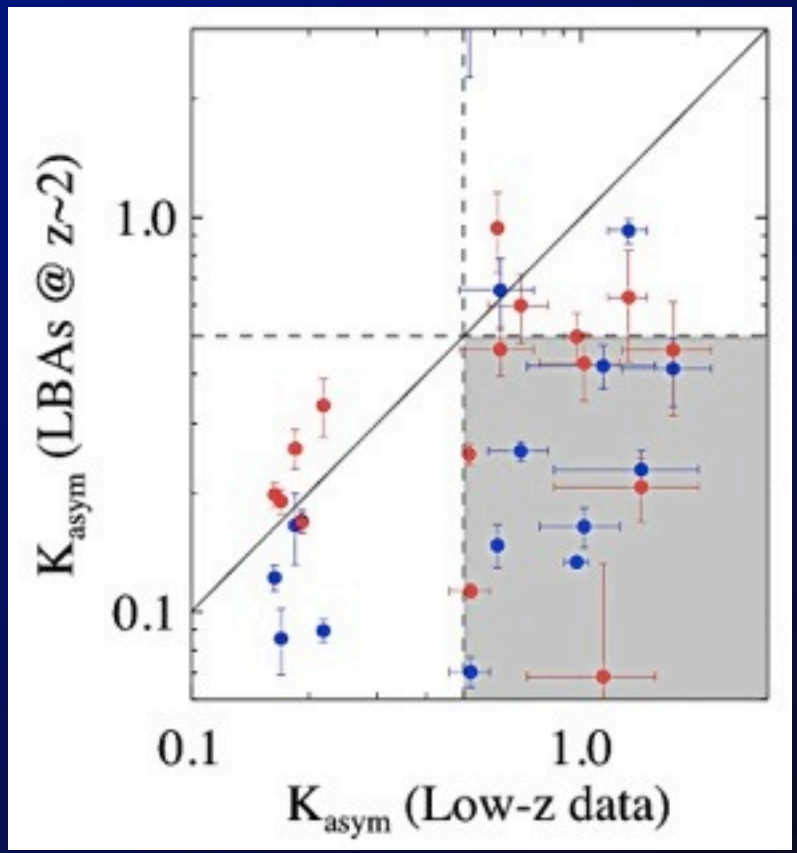


Reddy & Steidel, 2009

Mergers vs disks?

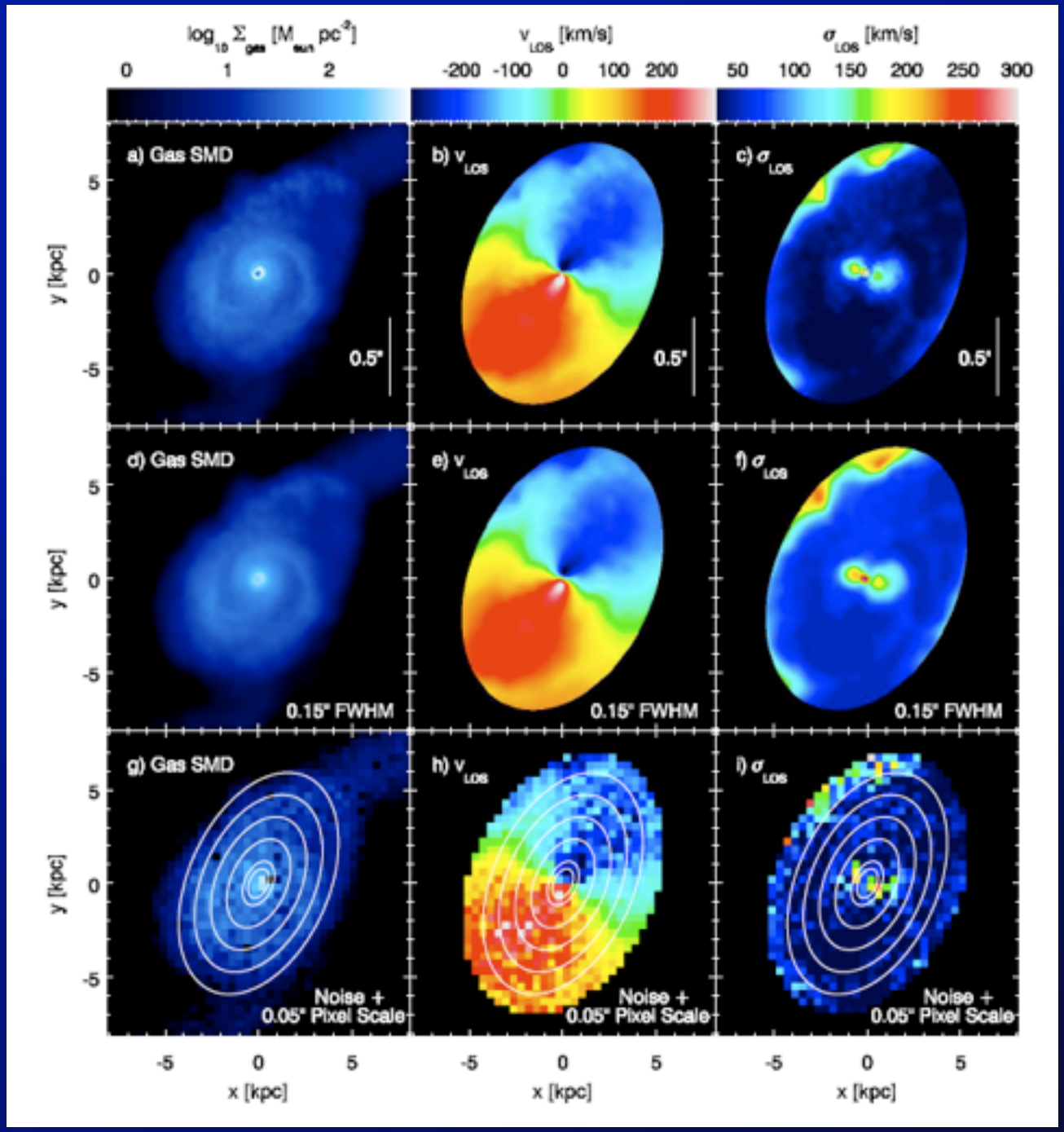


Krajnović et al. 2006
Shapiro et al. 2008

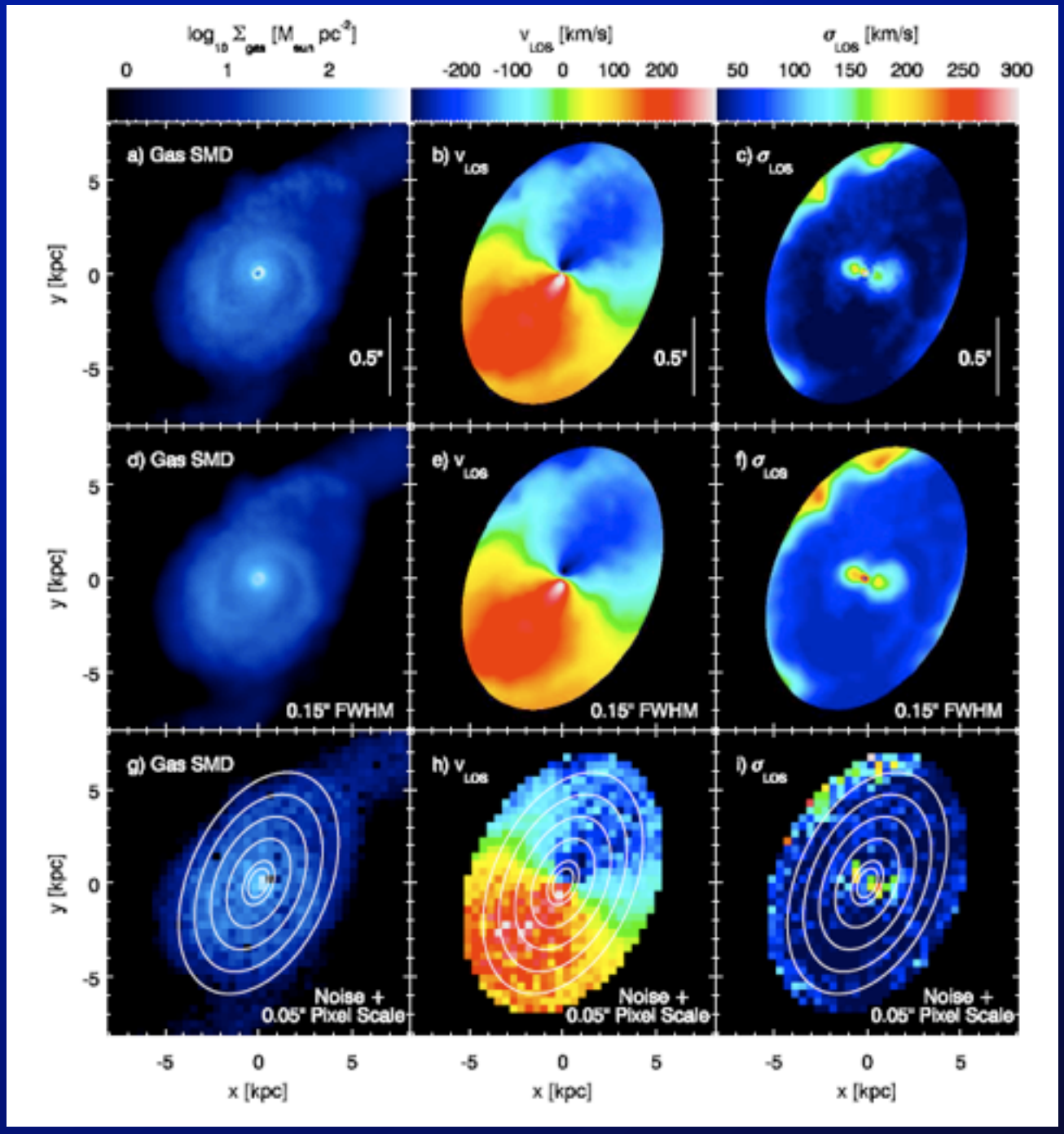


High-redshift data underestimates the asymmetry levels

Gonçalves+10



Robertson & Bullock (2008)

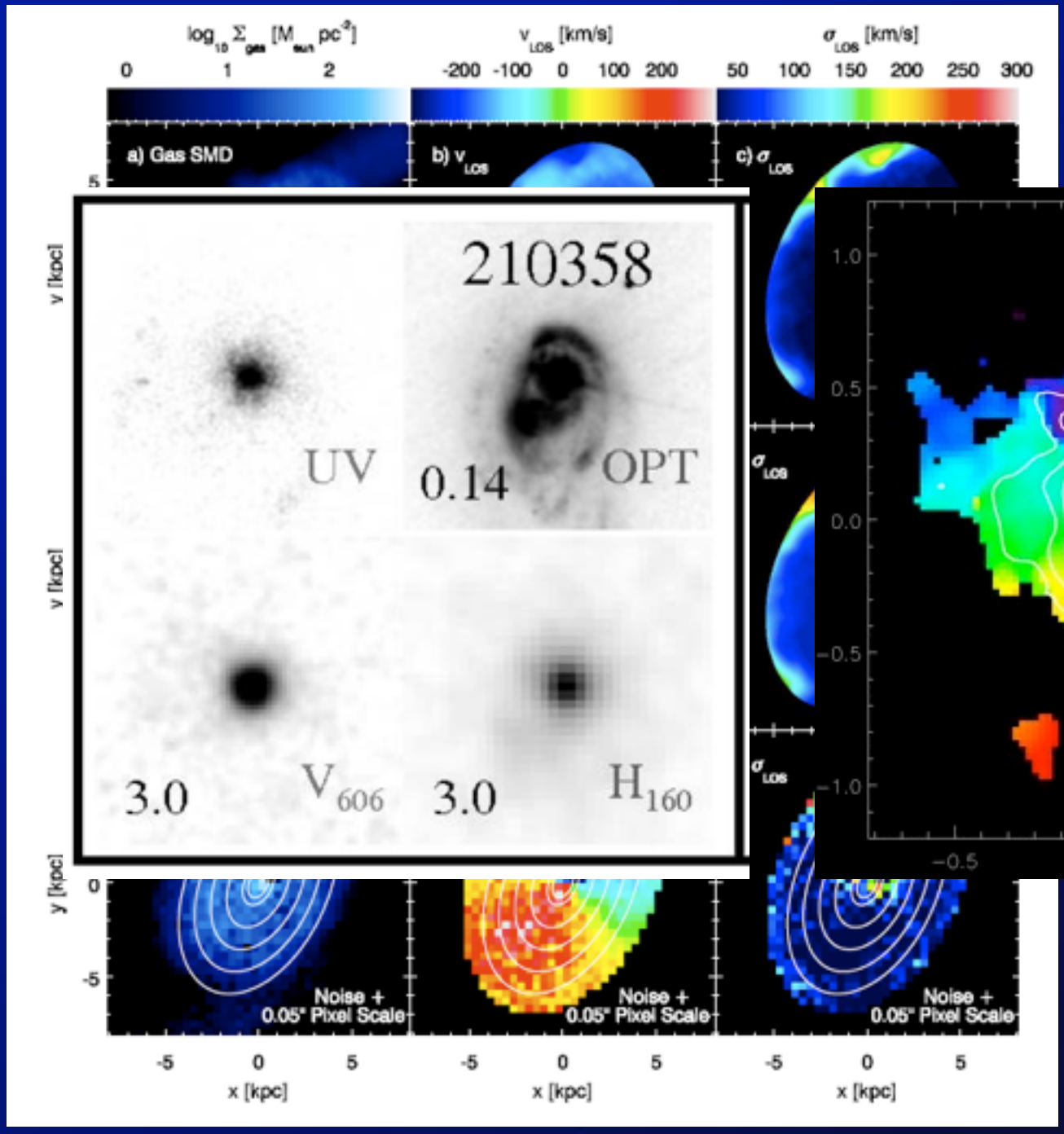


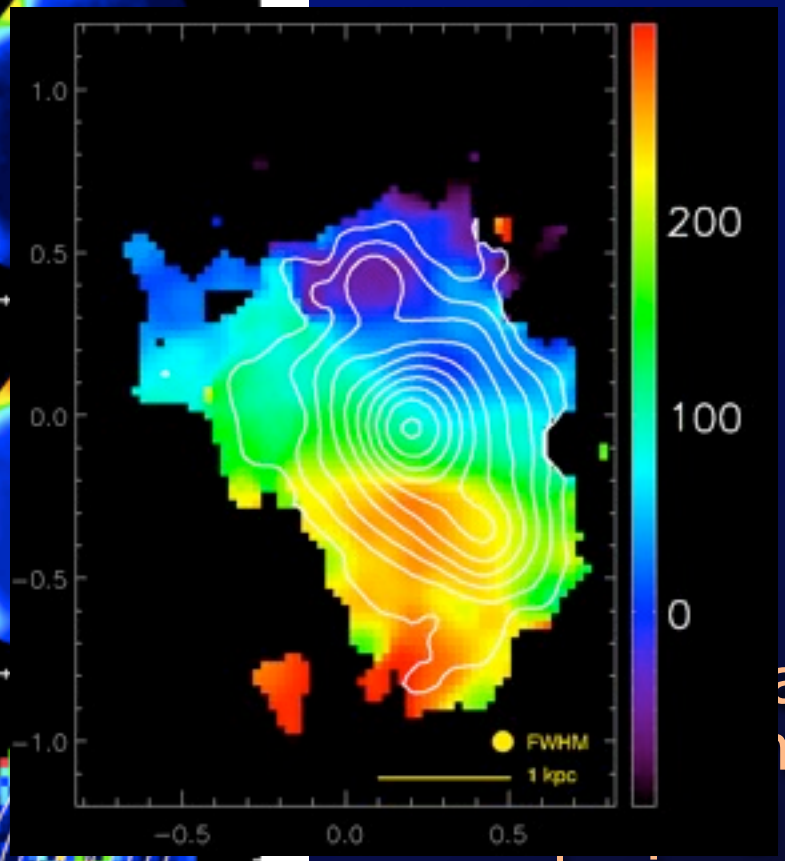
Robertson & Bullock (2008)

THIS IS A MERGER

Kinematic properties depend on gas fraction of the interacting galaxies

Robertson & Bullock (2008)





as
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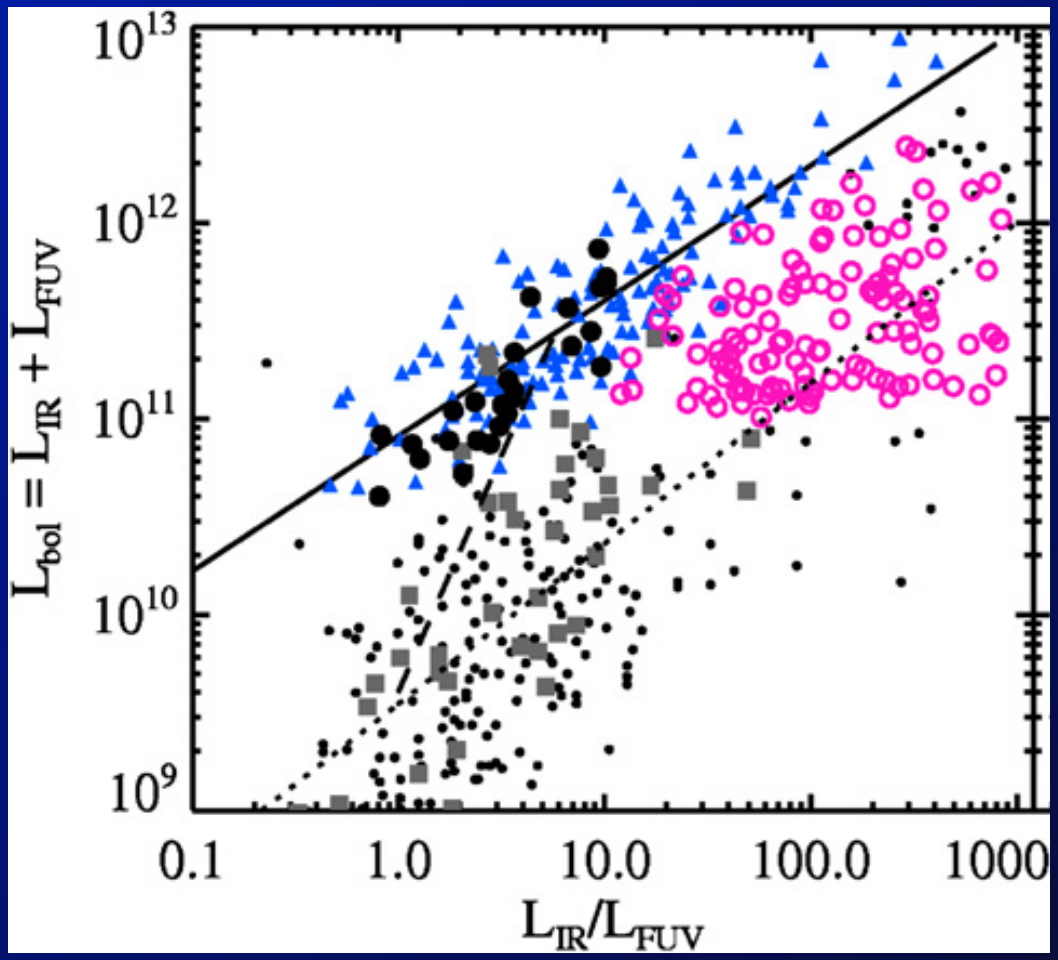
galaxies

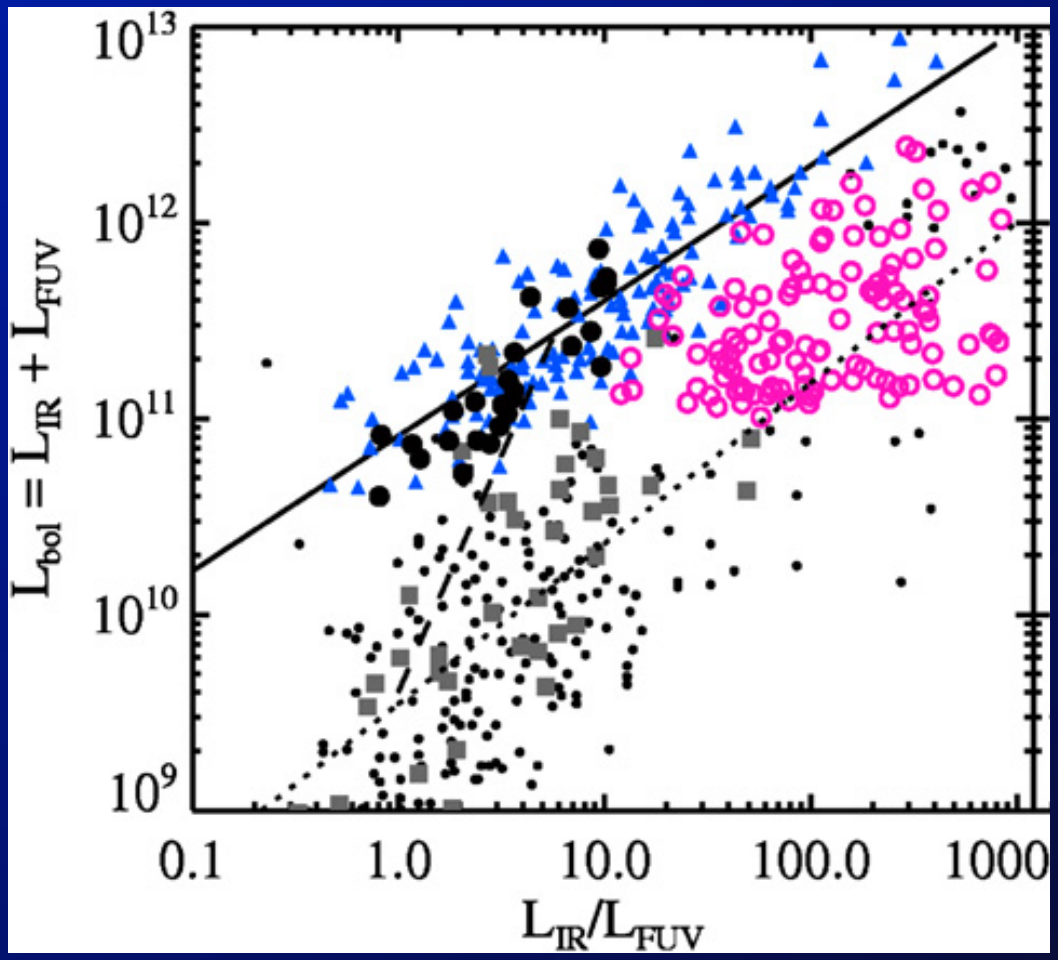
Optical IFU of starbursts

Mapping dust extinction



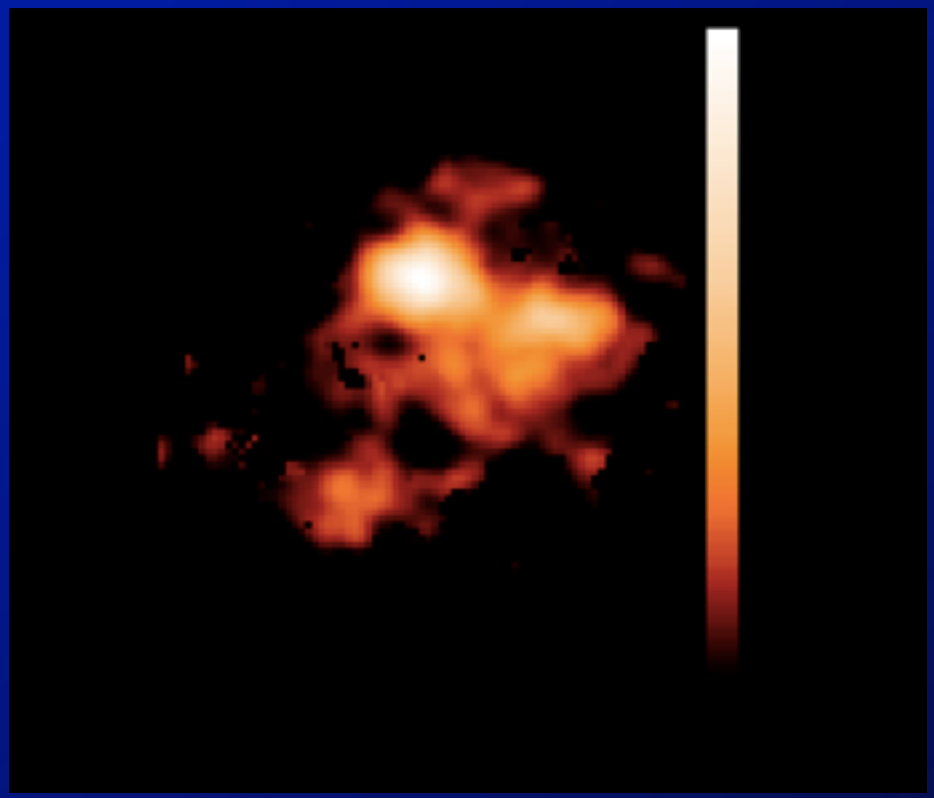
Overzier+11

Mapping dust extinction



Overzier+11

Where is the dust?

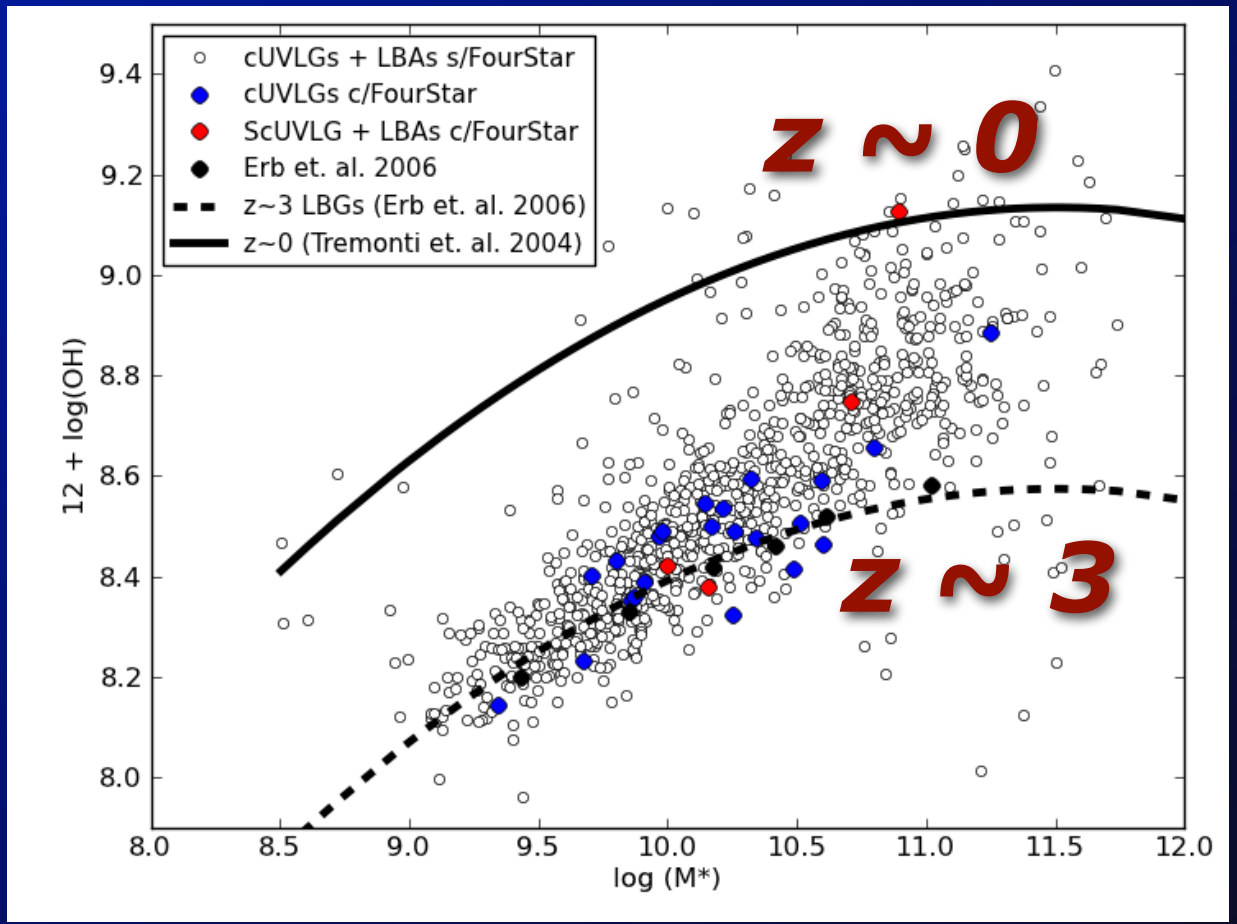


Is dust abundance correlated with clump properties?

Mapping Ha/Hb can provide the answer

Metallicity gradients

Mass-metallicity relation is offset from local galaxies



Carolyne Santos de Oliveira &
Karín Menéndez-Delmestre

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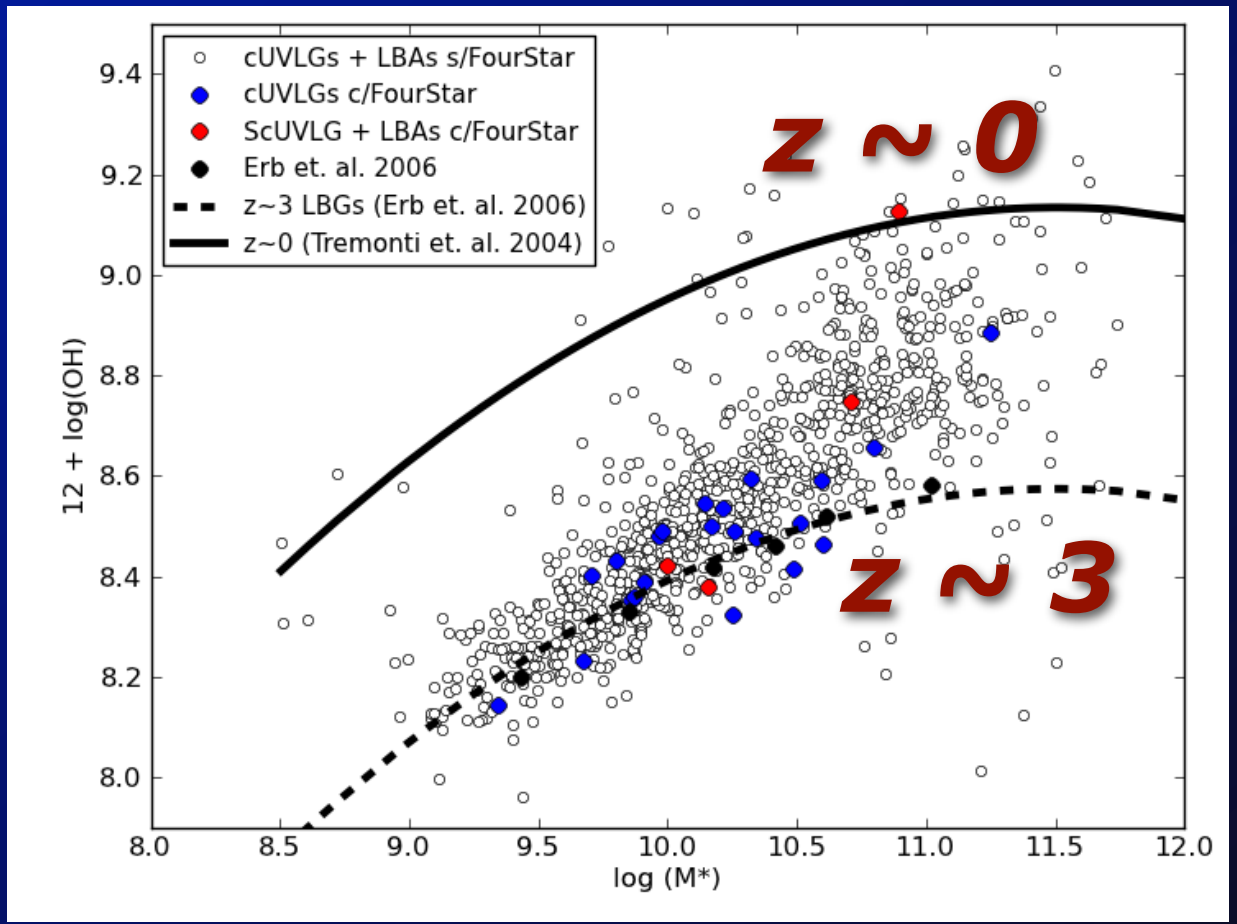

Carolyne Santos de Oliveira &
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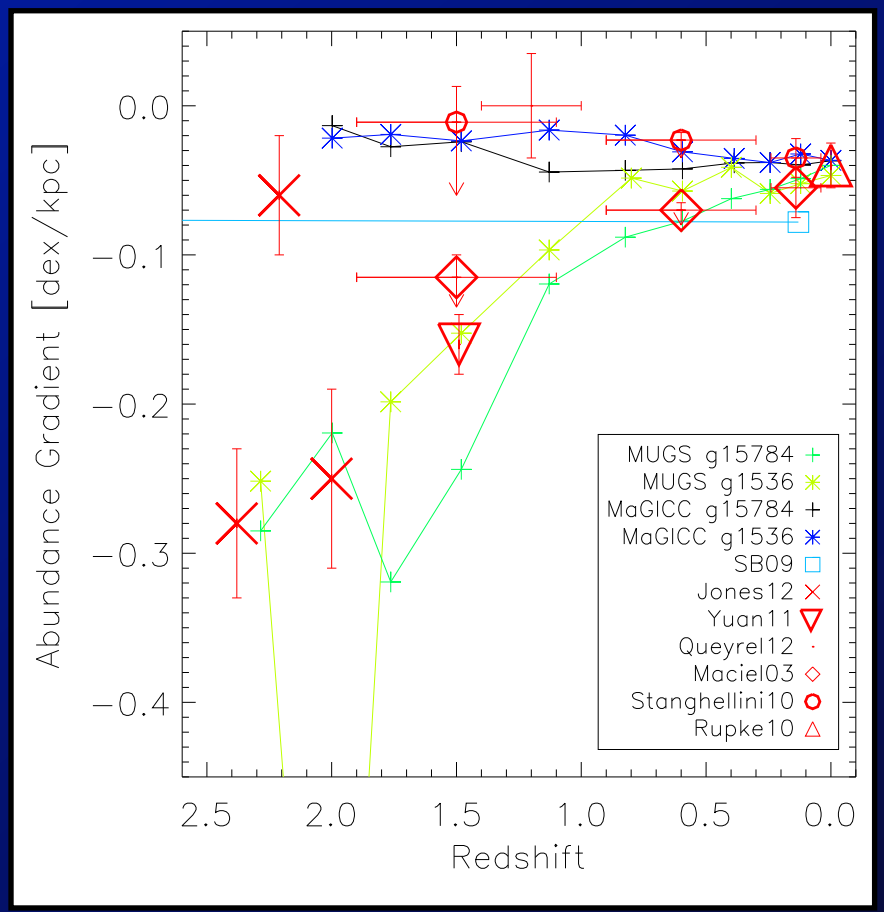
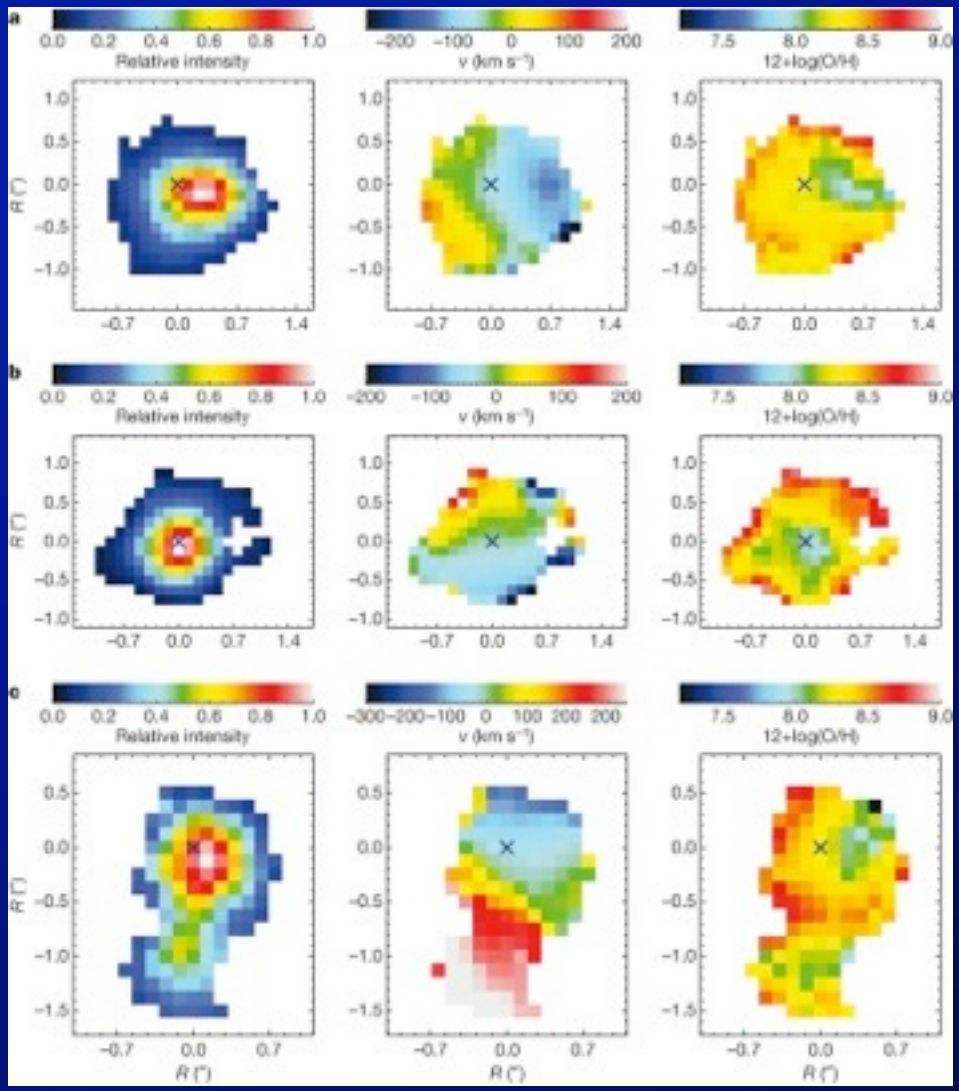
Metallicity gradients provide a constraint for feedback models



Gibson et al. 2013

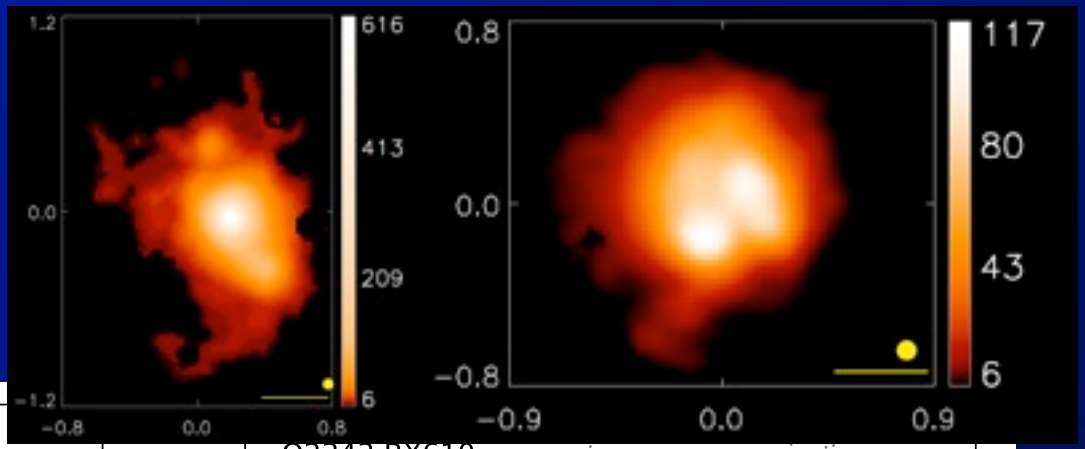
Inverse metallicity gradients?

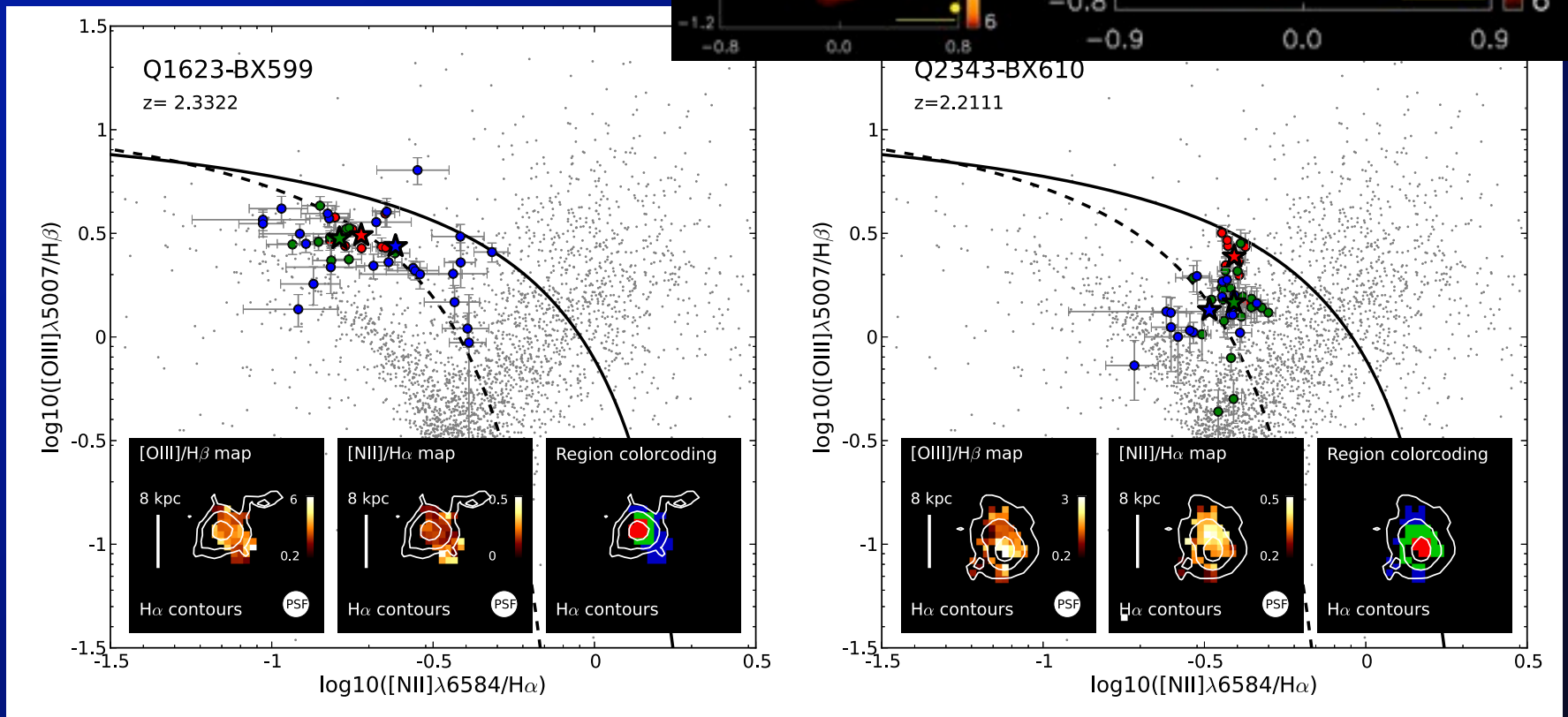


Cresci et al. 2010

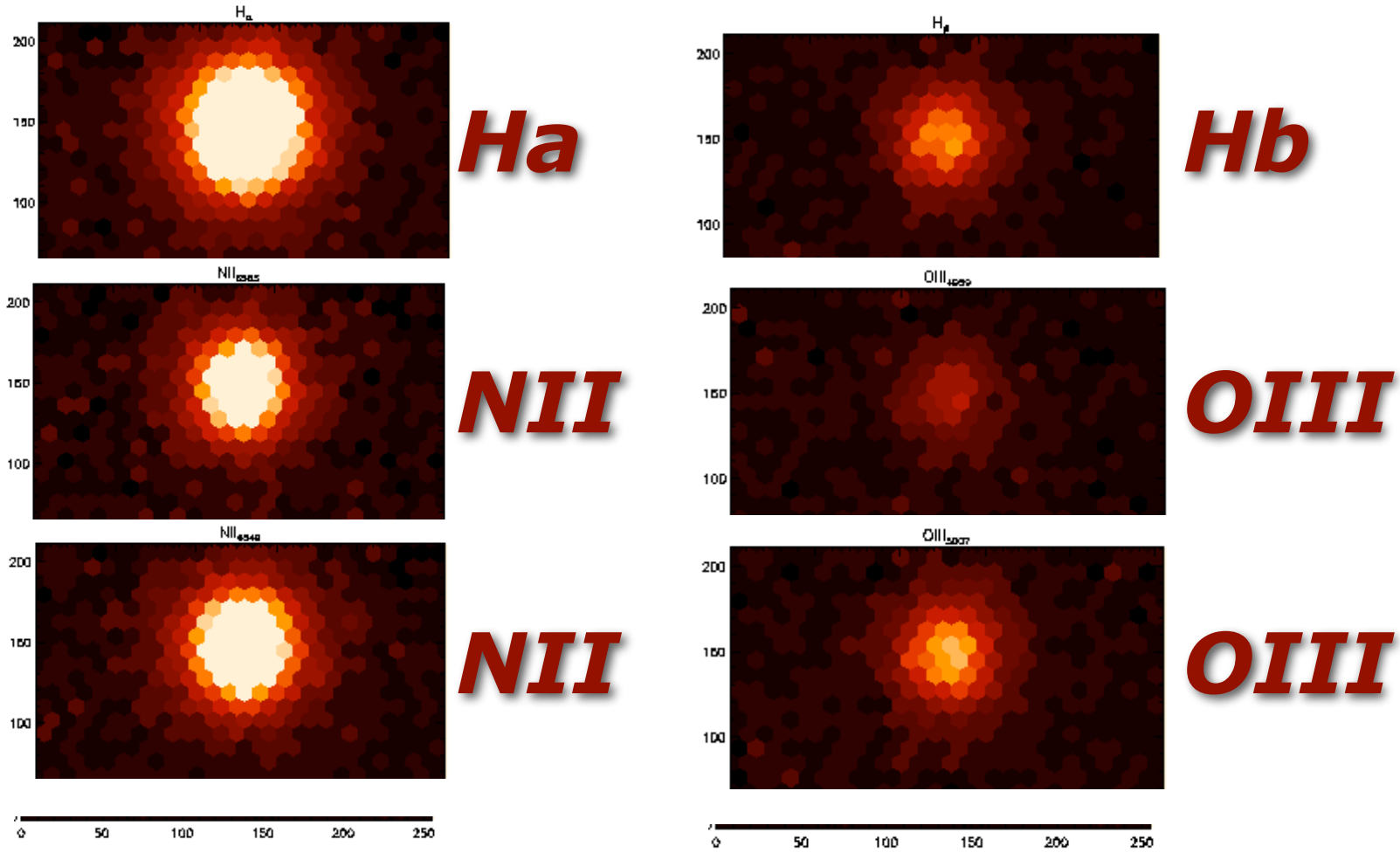
Arguably support the cold flow hypothesis

AGN contribution





Newman+13



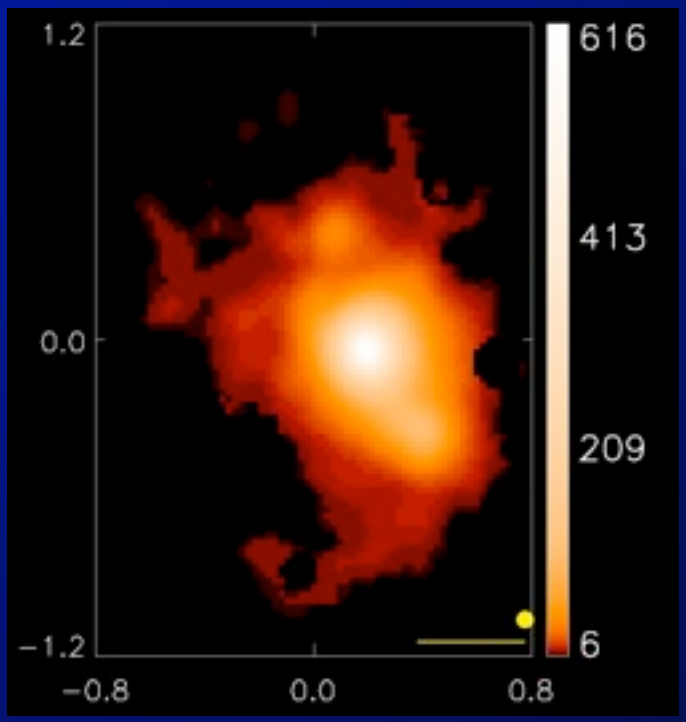
IMACS-IFU

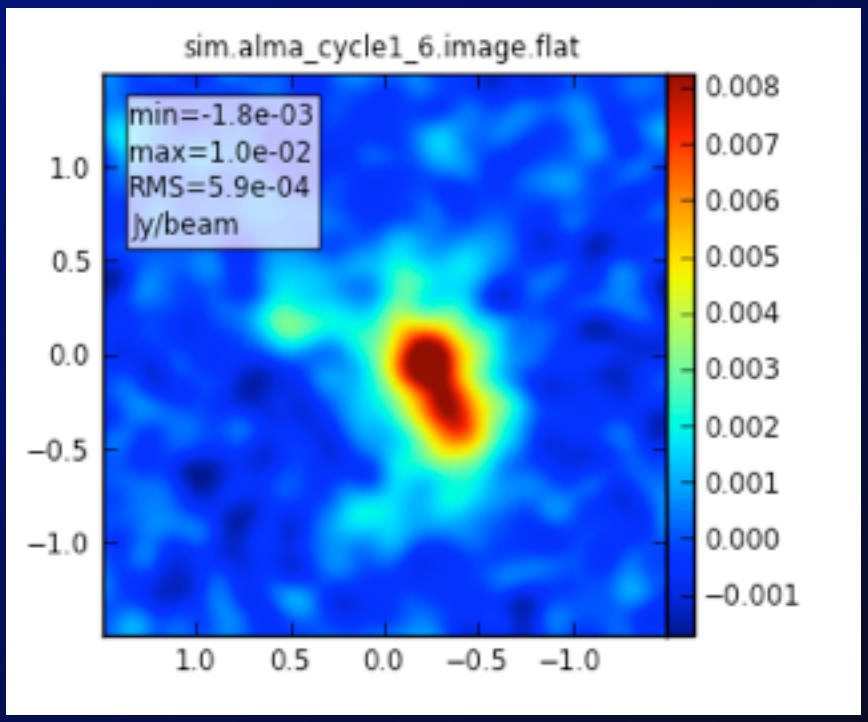
PI: Menéndez-Delmestre

The (near) future...

MUSE

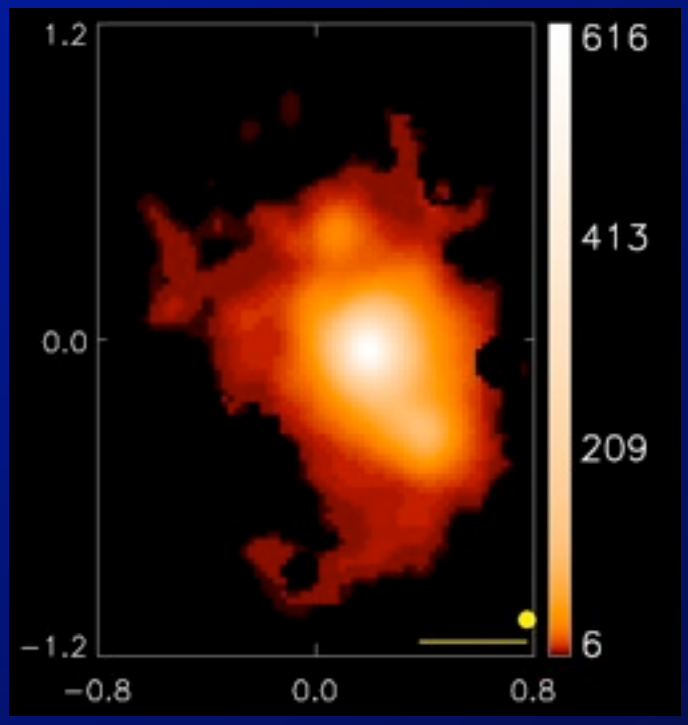
High resolution imaging: resolved SK law!

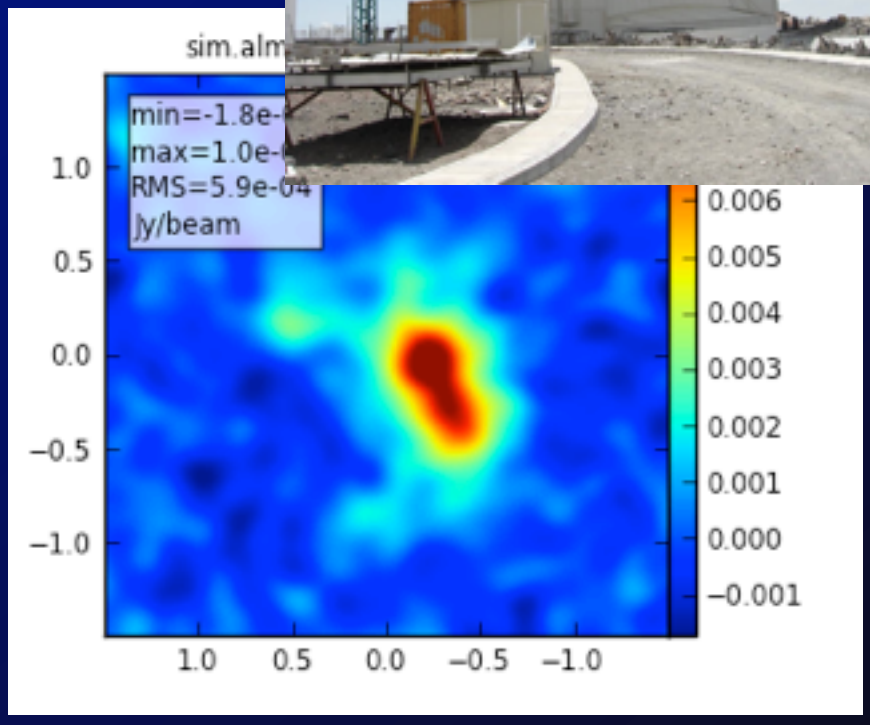




ALMA

High re g:
res





Summary

- LBAs are very unusual starburst galaxies in the low-z universe, more akin to high-z LBGs
- More massive galaxies present disk-like properties
- Loss of resolution and surface brightness can lead to misinterpreting the data

Three main goals in the optical:

- Mapping the dust emission and correlate with clump properties
- Mapping the metallicity distribution and measuring gradients, constraining formation models
- Line emission diagnostics at high resolution

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