

Size evolution based on Tully-Fisher analysis out to $z=1.4$

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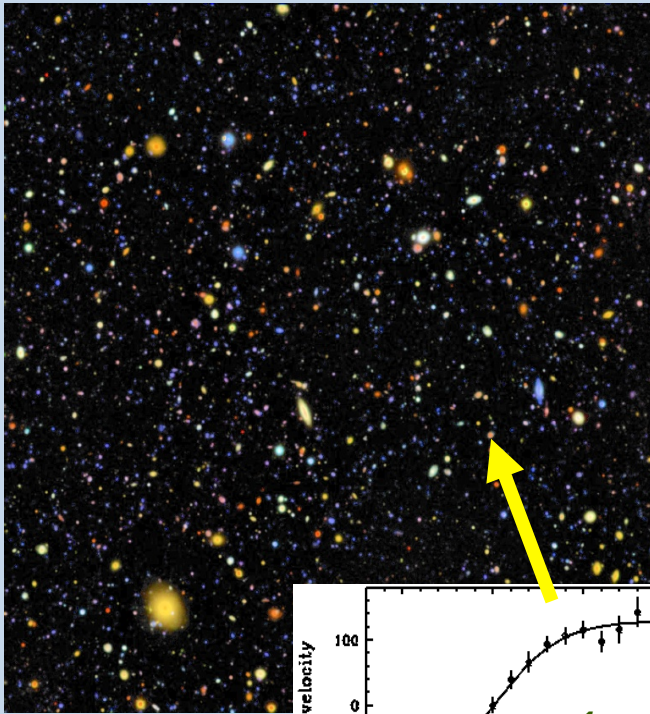
Ulrike Kuchner

Nadja Lampichler

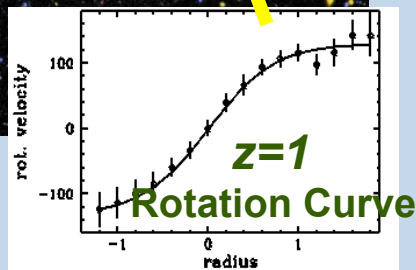
Christian Maier

Jose Perez

Miguel Verdugo



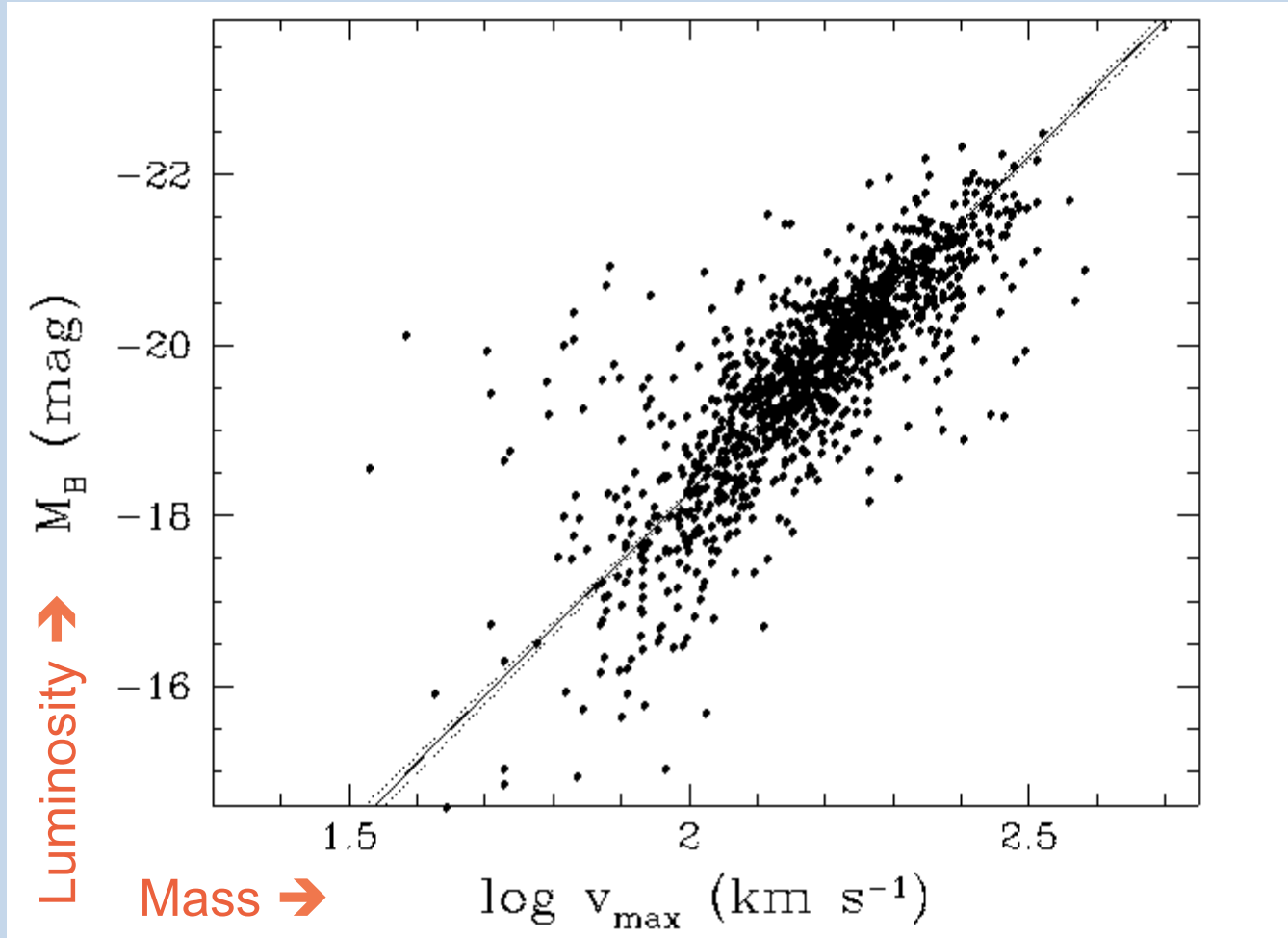
FORS Deep



XMM 2235 cluster $z=1.4$

Local Tully-Fisher Relation

Baryonic component (L_B , L_K , M_s , $M_{(s+gas)}$)

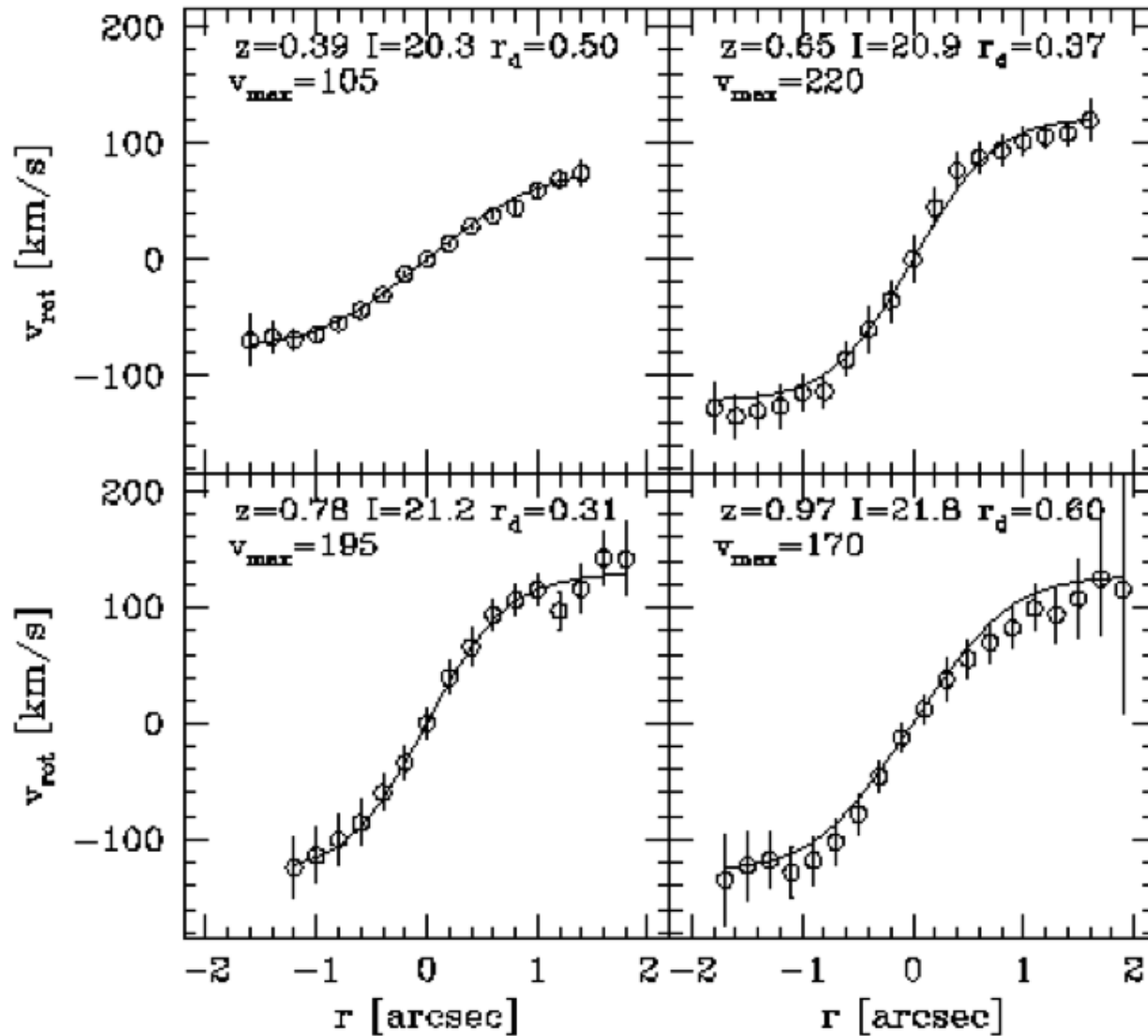


Haynes et al. 1999

1200 spiral galaxies with $cz < 12,000$ km/s

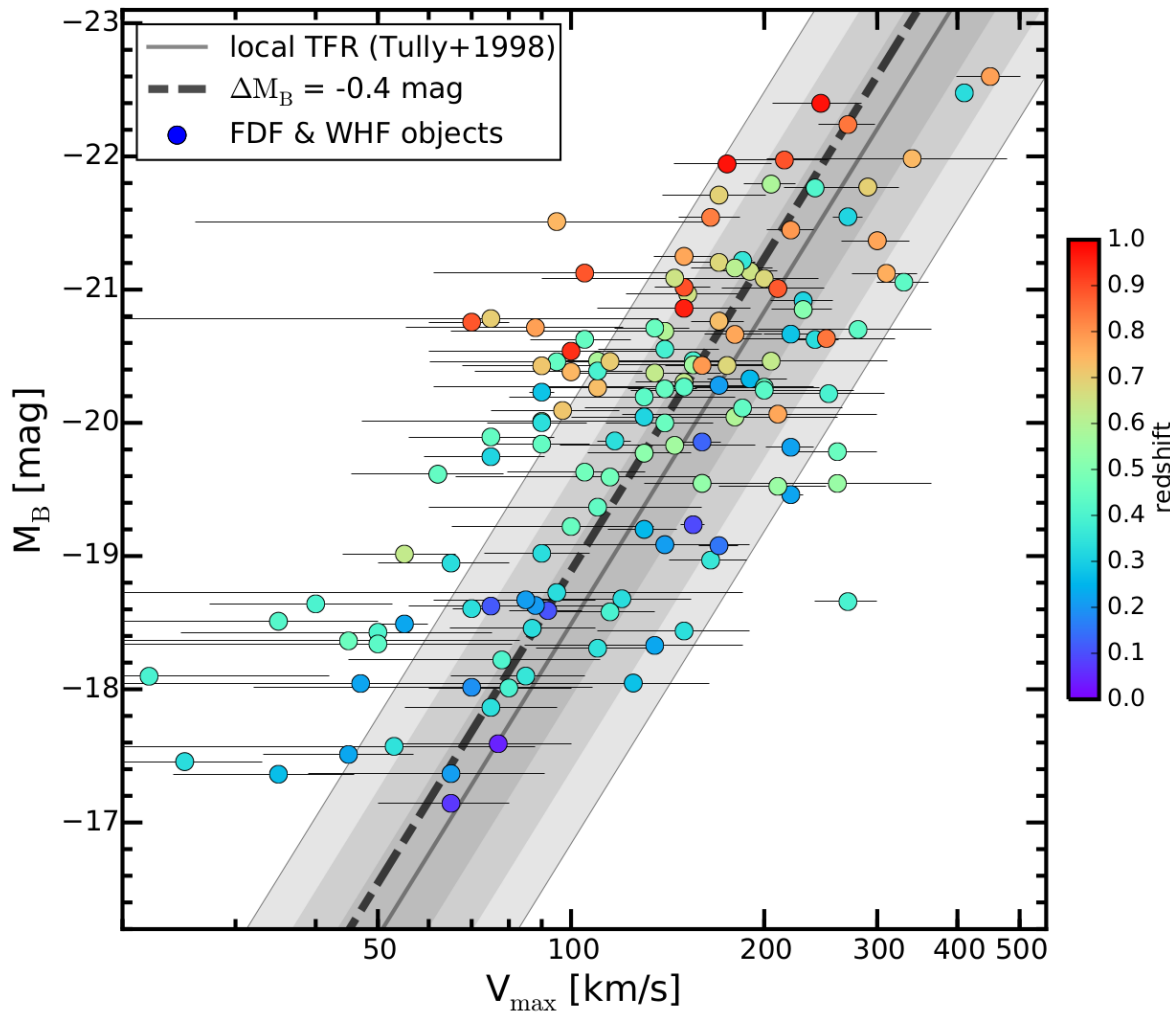
$v_{\max} \hat{=}$ proxy for total mass including Dark Matter

Rotation curves at high redshift



Even at $z=1$
smooth symmetric
rotation curves exist
with shapes similar
to local RCs
→ very massive
spirals 8Gyr ago

Tully-Fisher Relation out to $z=1$



Sample:

137 FDF & WHDF galaxies

with V_{\max}

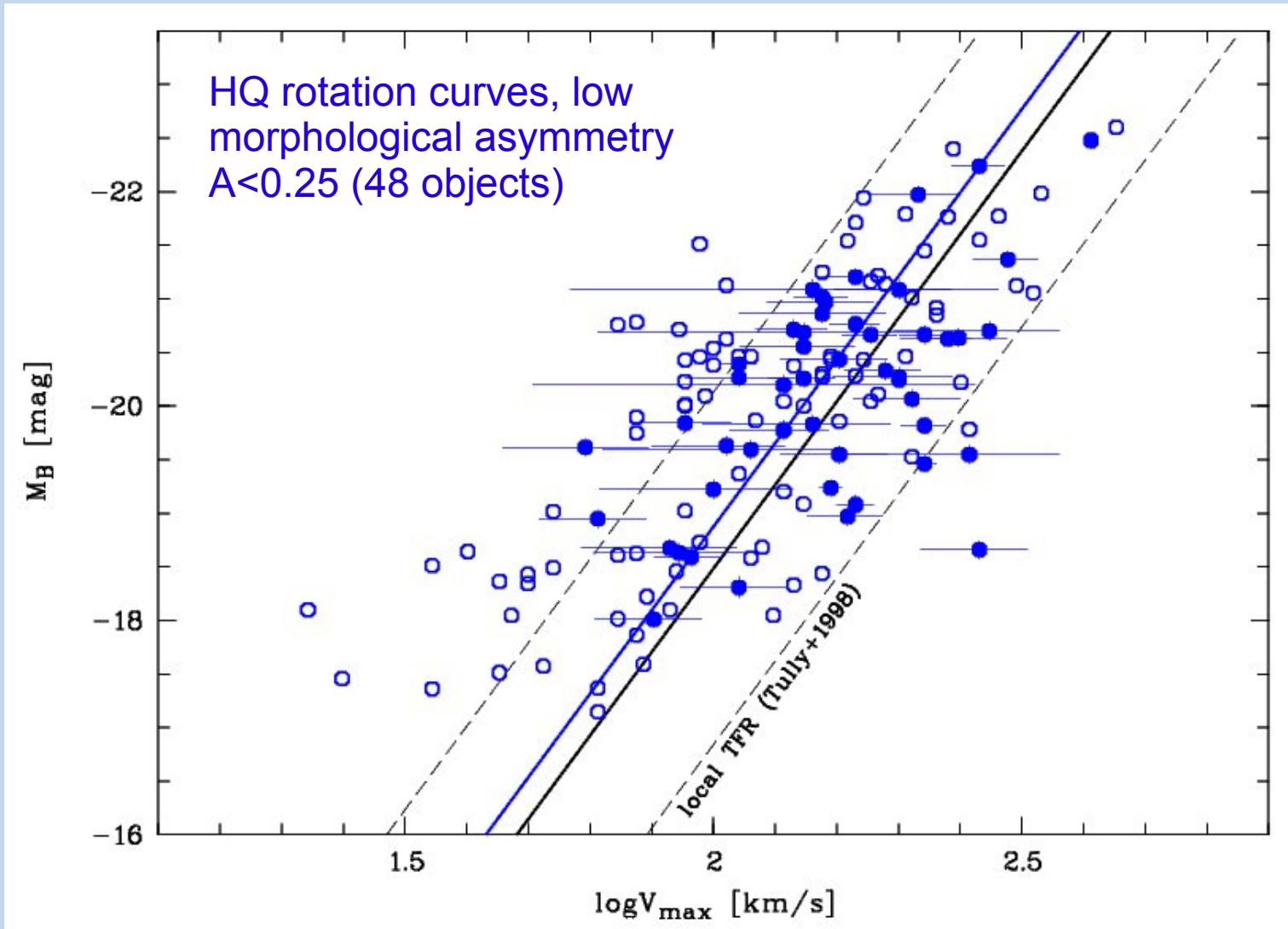
from regular, smooth RCs

with flat part probed:

$0.05 < z < 0.97$, $\langle z \rangle = 0.45$

$0.6 \text{ Gyr} < t_{lb} < 7.6 \text{ Gyr}$,
 $\langle t_{lb} \rangle = 4.5 \text{ Gyr}$

Tully-Fisher Relation out to $z=1$

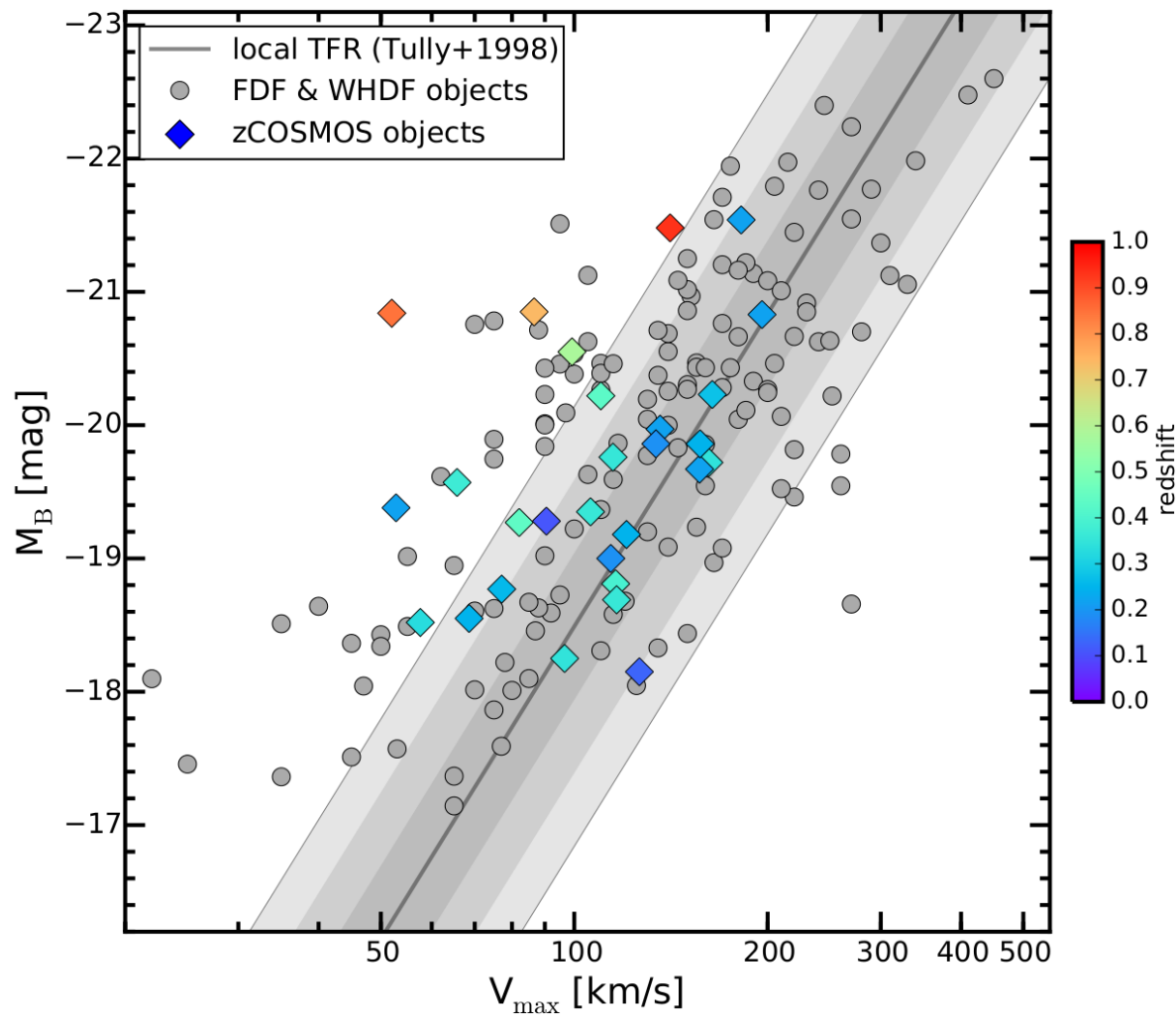


Böhm & Ziegler 2015

Distant sample: TF scatter $\sigma_{\text{TF}} = 1.15$ mag ($\sim 2\times$ local value)
Average brightening $\Delta M_B = -0.40$ mag by $z \approx 0.5$

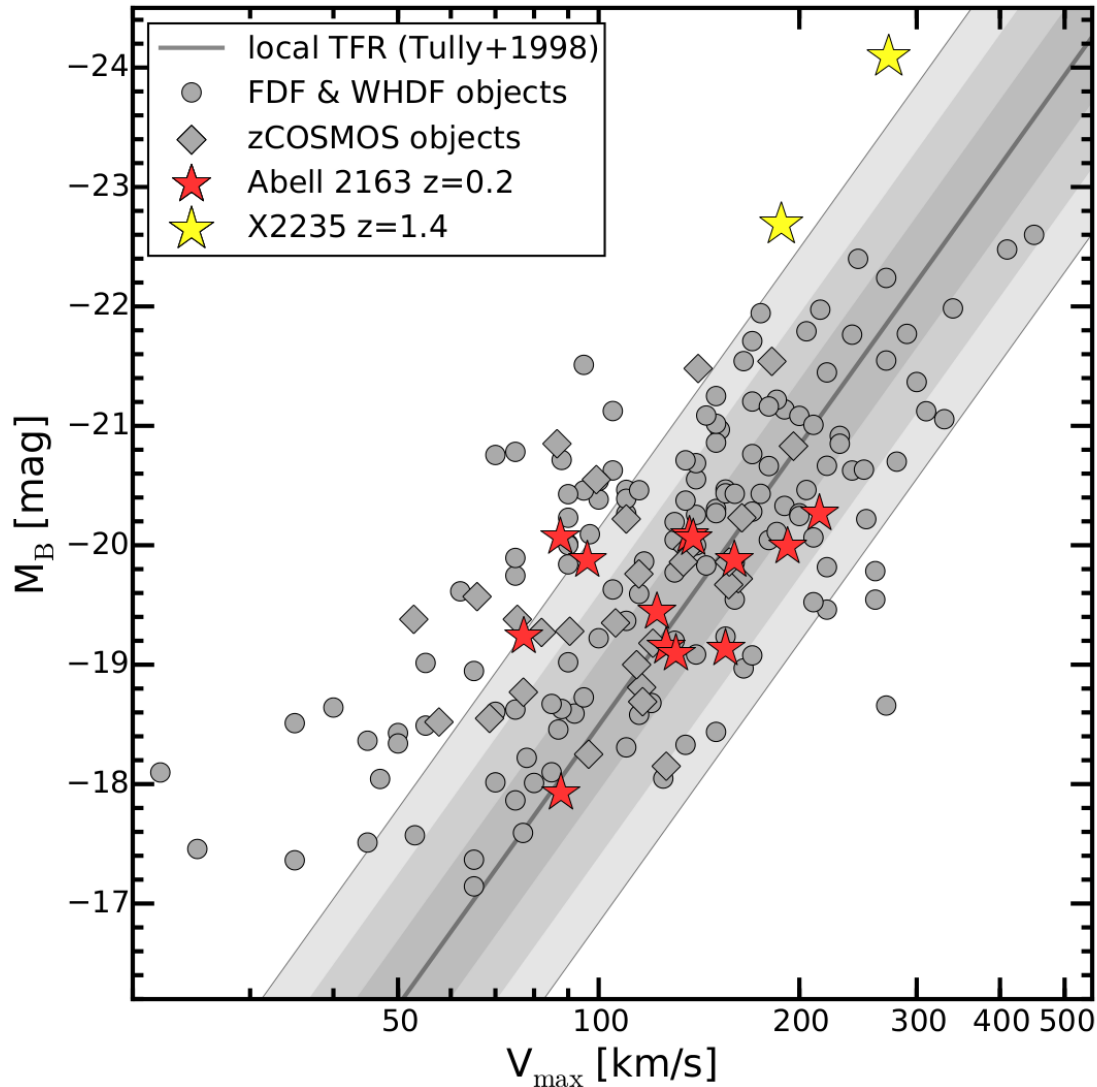
slope: full hi-z: $-7.16^{+0.71}_{-0.53}$ local: -7.79

Tully-Fisher Relation out to $z=1$



Increase Sample:
25 zCOSMOS galaxies
(Master thesis of
Nadja Lampichler
supervised by
Christian Maier)

Tully-Fisher Relation in *Clusters* out to $z=1.4$



Sample:

12 members A2163 $z=0.2$

(Master thesis of
Veronica Menacho

supervised by

Miguel Verdugo)

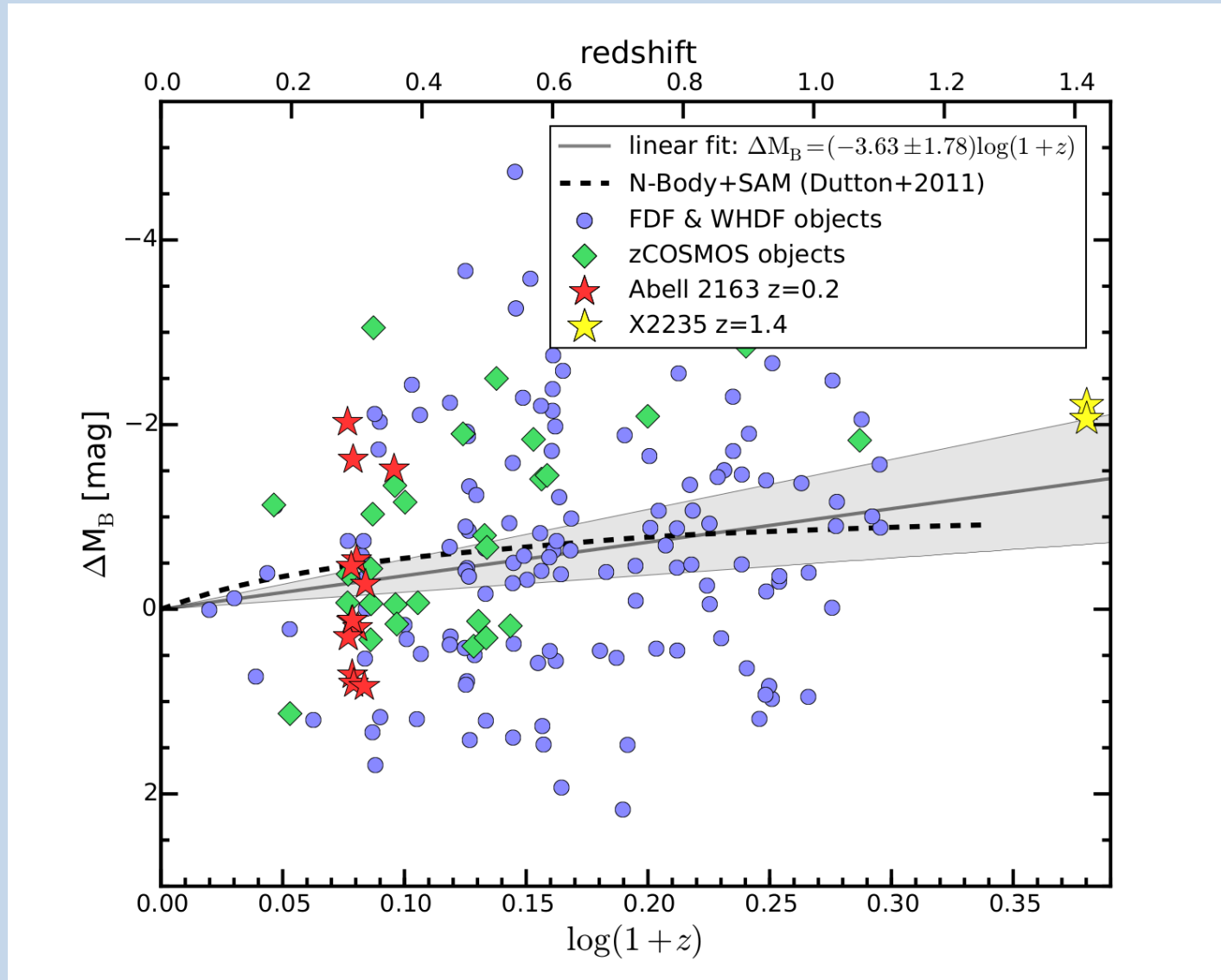
2 member XMM2235 $z=1.4$

(PhD thesis project

Jose Manuel Perez)

Evolution of Blue TFR out to z=1

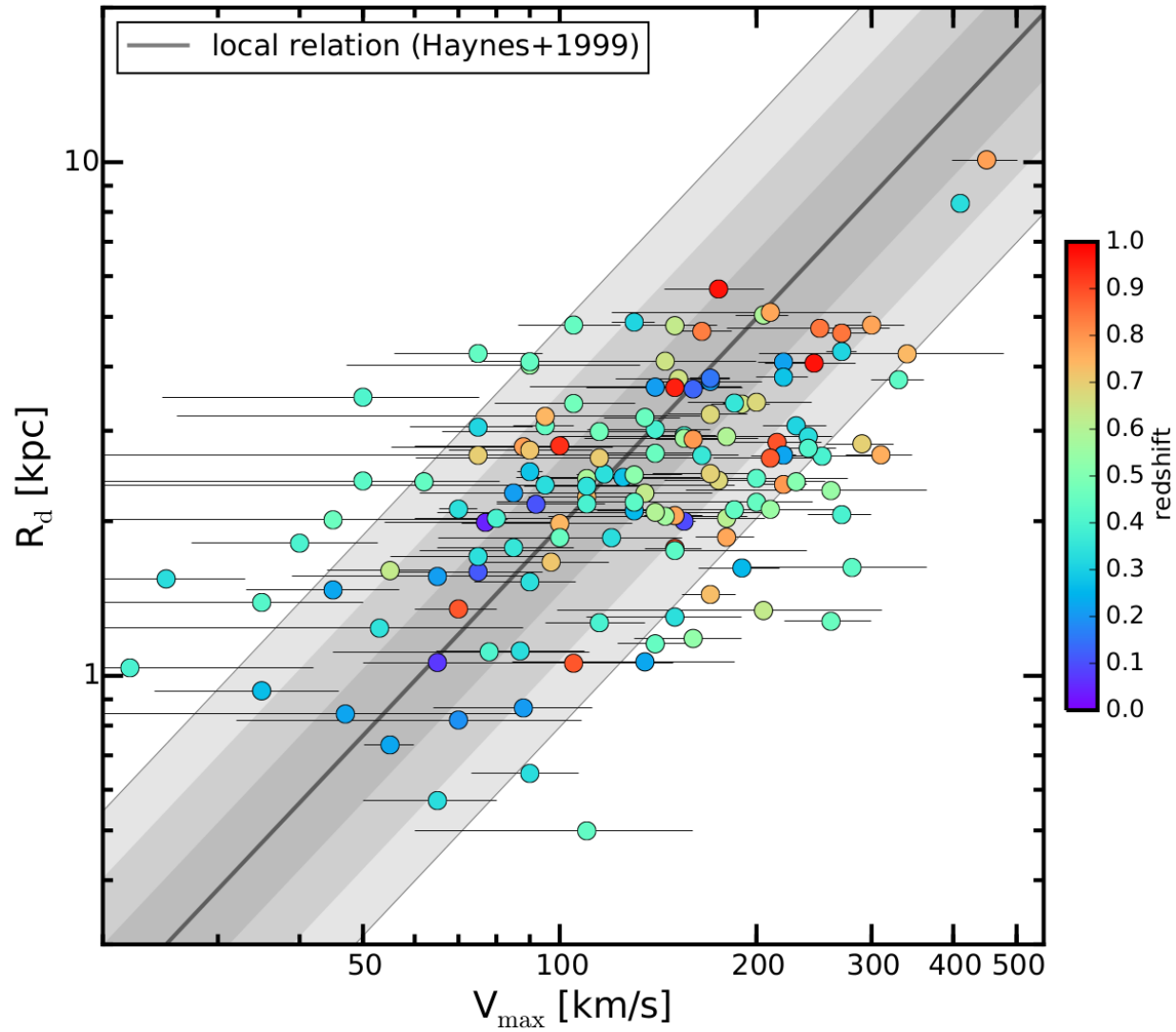
Böhm & Ziegler 2015



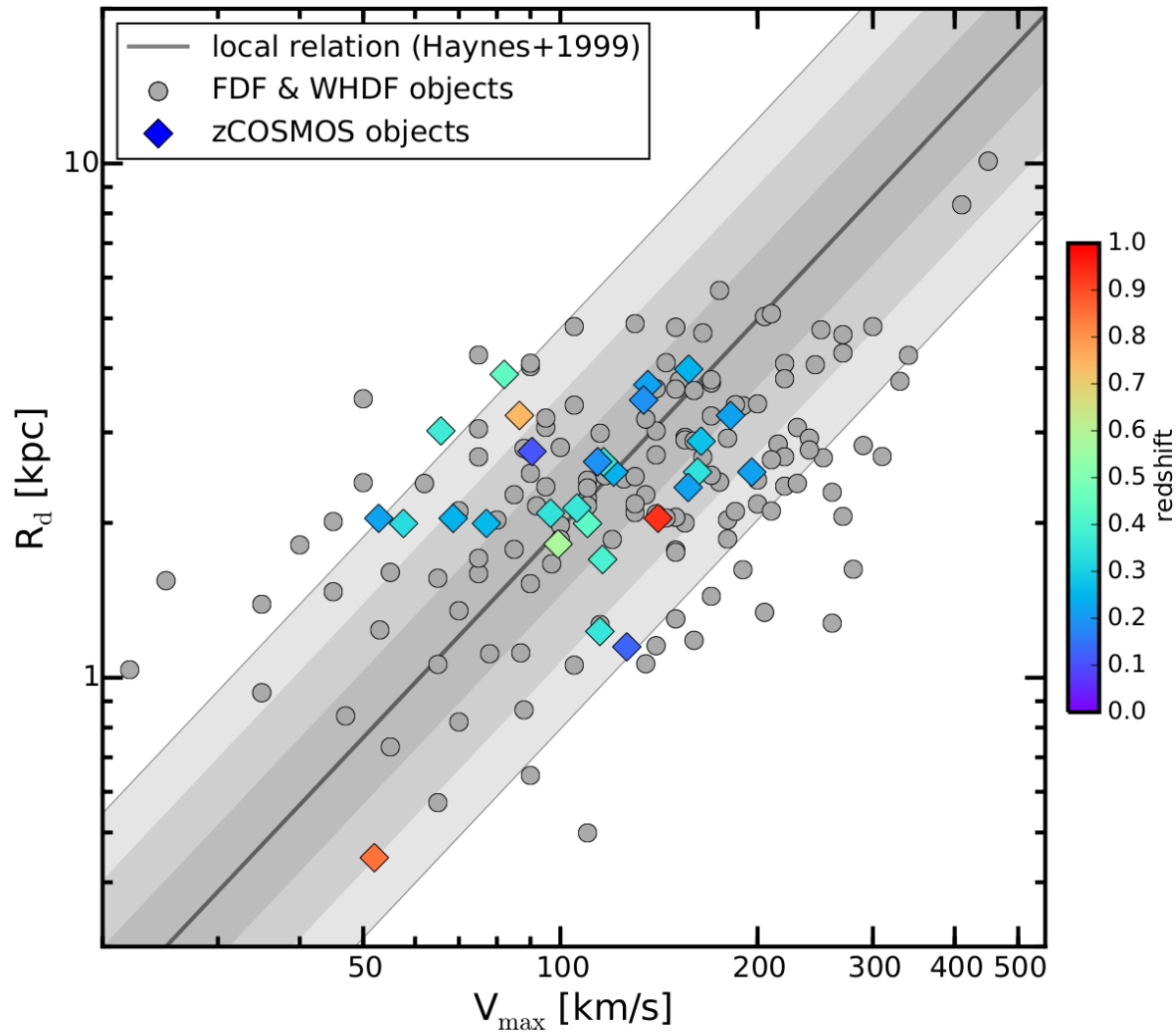
Brightening: $\sim 1.1 B_{\text{mag}}$ at $z=1$ for given $V_{\text{max}} \rightarrow$ younger stellar populations
in accordance with model predictions

Velocity-Size Relation out to $z=1$

Böhm & Ziegler 2015

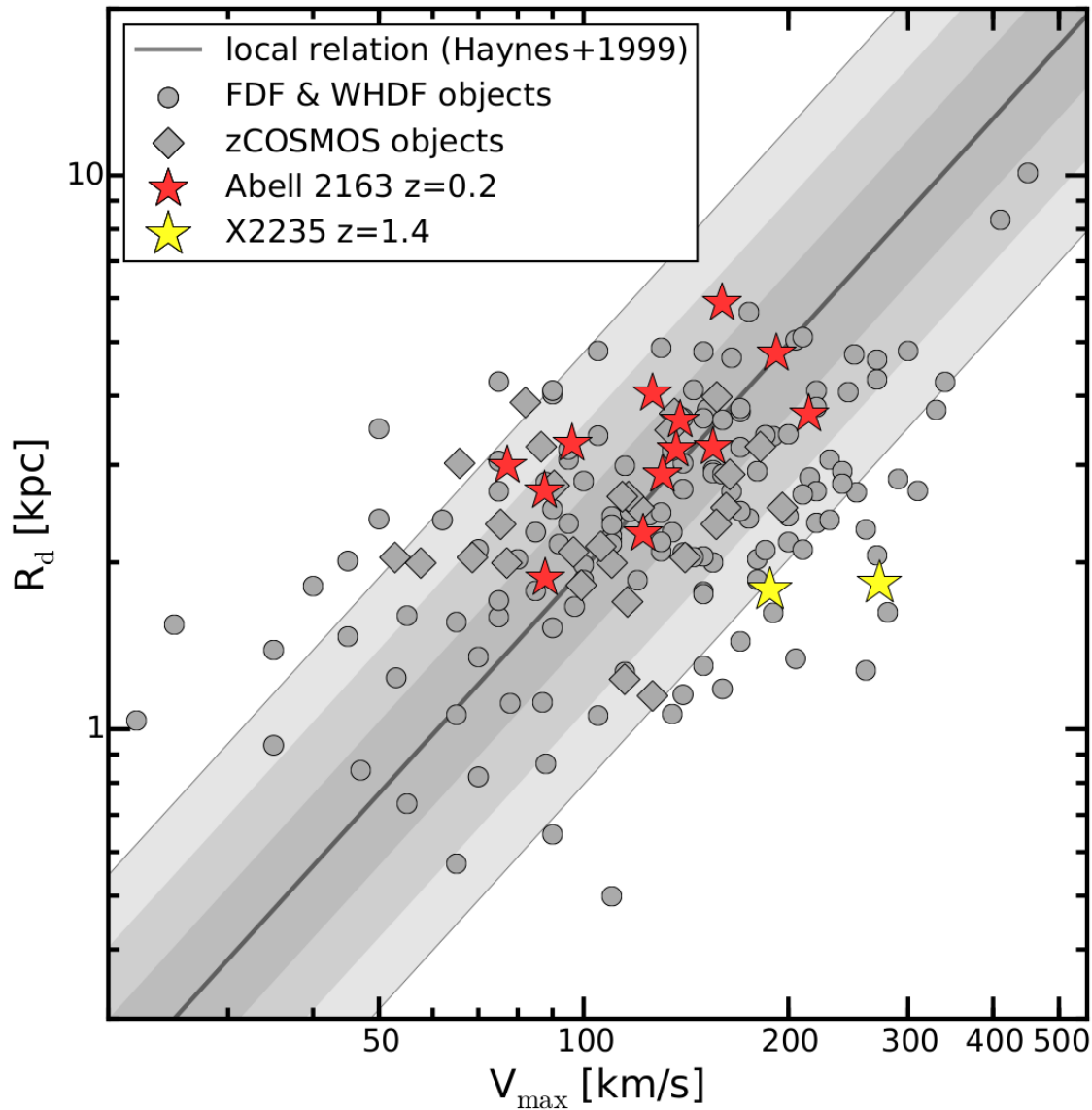


Velocity-Size Relation out to $z=1$



Increase Sample:
zCOSMOS galaxies
(Master thesis of
Nadja Lampichler
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Velocity-Size Relation out to $z=1.4$



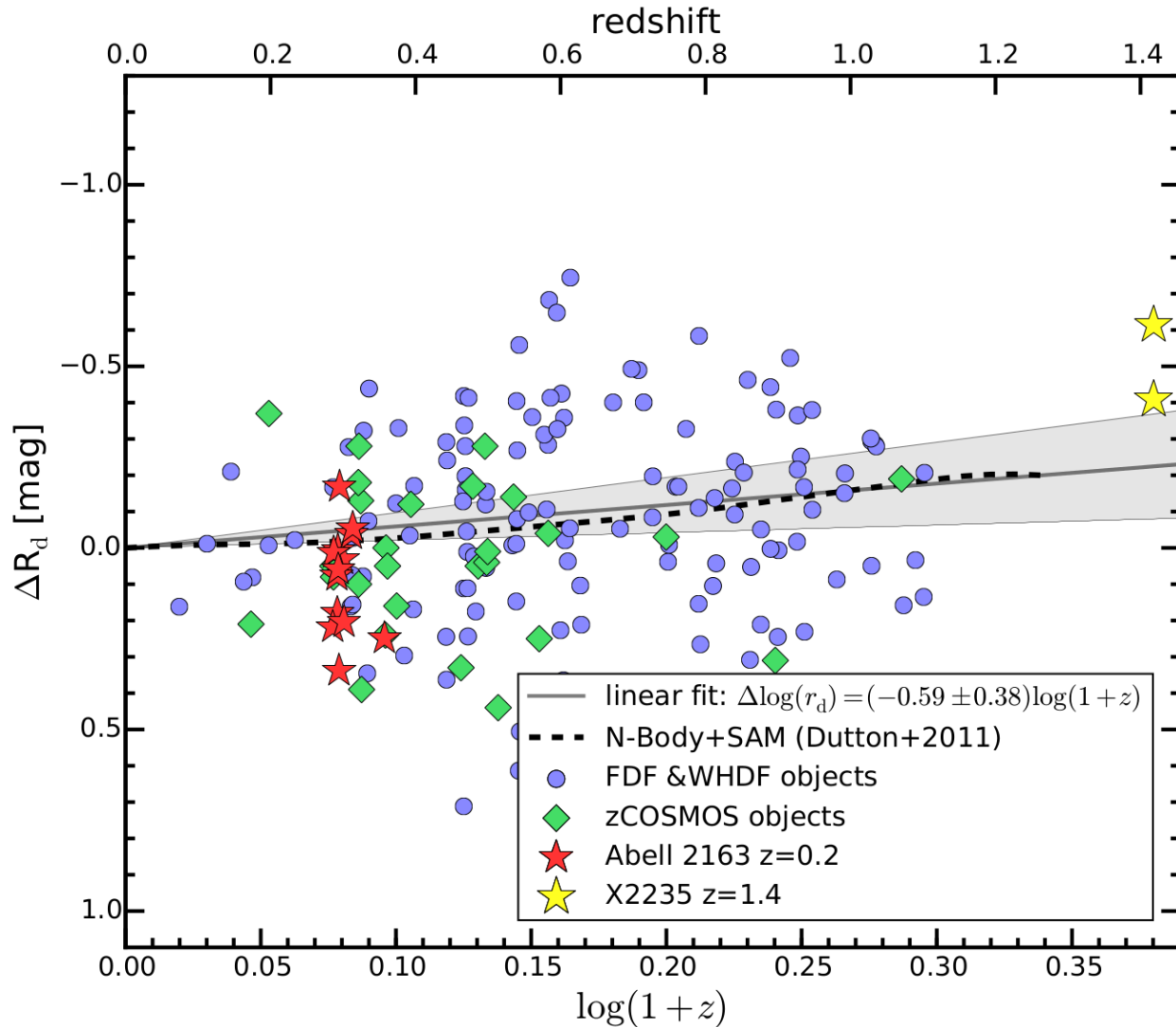
Sample:

12 members A2163 $z=0.2$
(Miguel Verdugo)

2 member XMM2235 $z=1.4$
(PhD thesis project
Jose Manuel Perez)

Evolution of VSR out to z=1

Böhm & Ziegler 2015



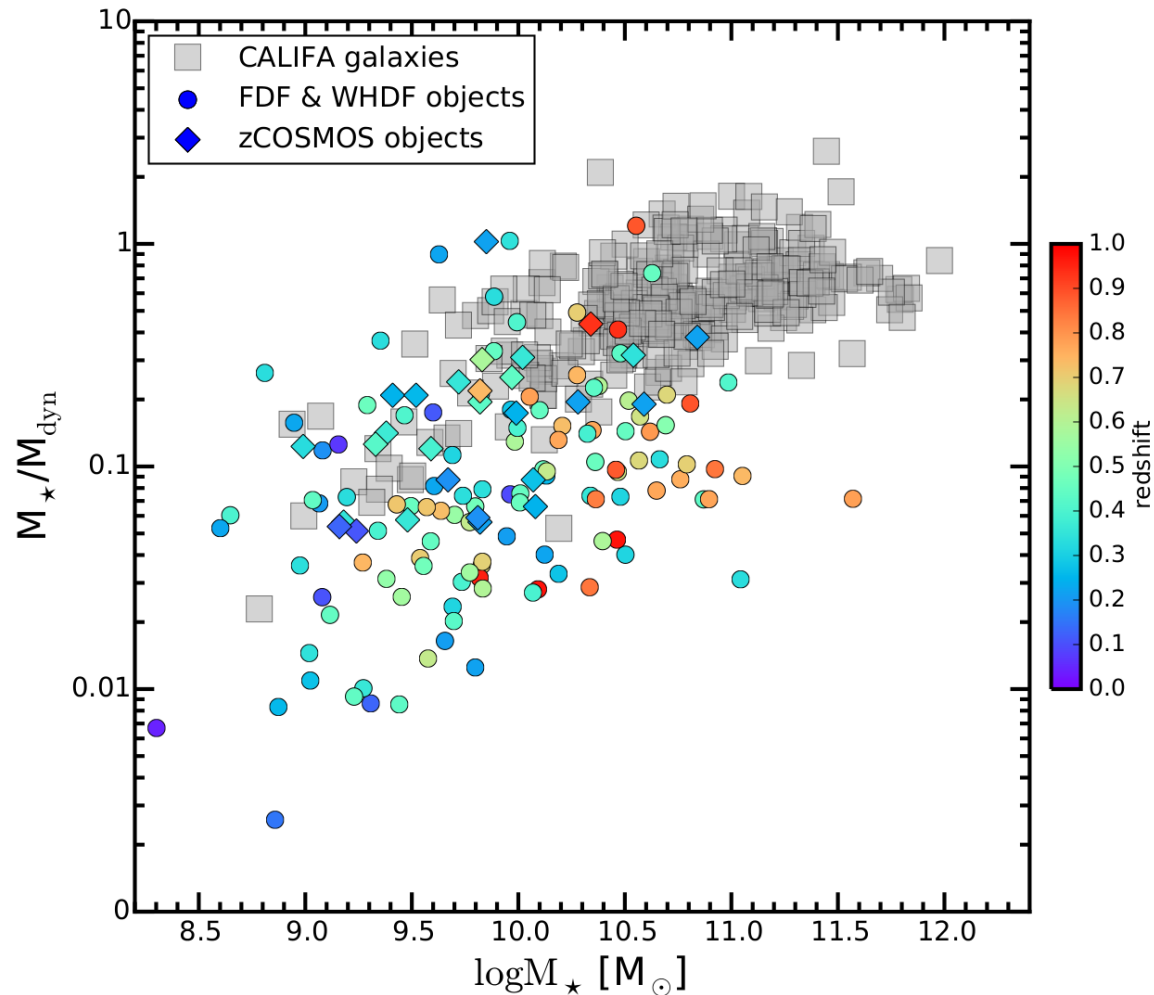
↑ local → smaller than local
 ↓ larger than local →

Disk sizes at given V_{\max} decrease towards higher redshifts (smaller by ~60% at z=1)

in accordance with model predictions

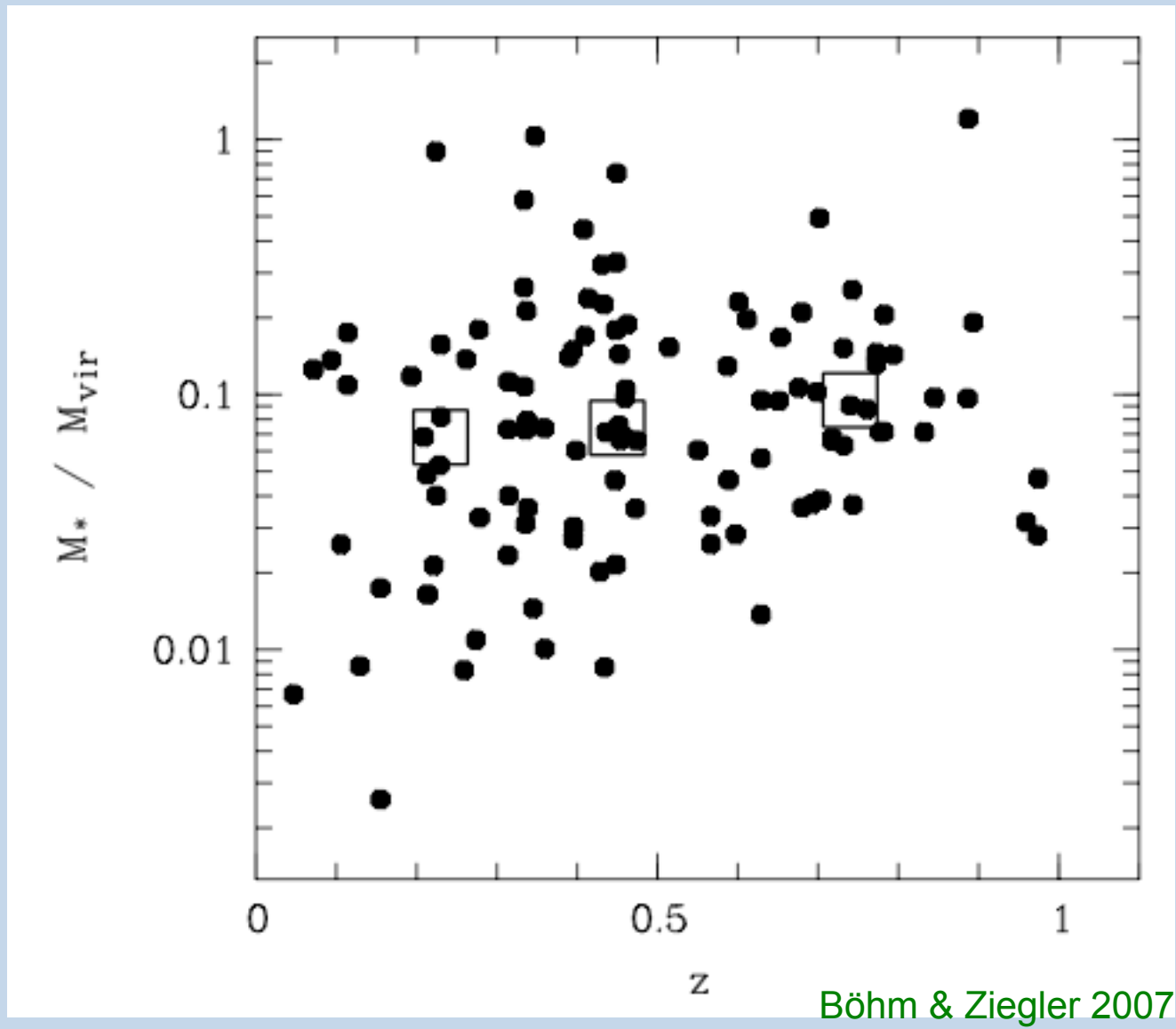
Evolution of stellar mass fraction

CALIFA team
M. Lyubenova
G. van de Ven
J. Falcon Barroso



Large variation (mass-dependent?) due to differences in SF efficiency, gas fraction, cosmic flows?

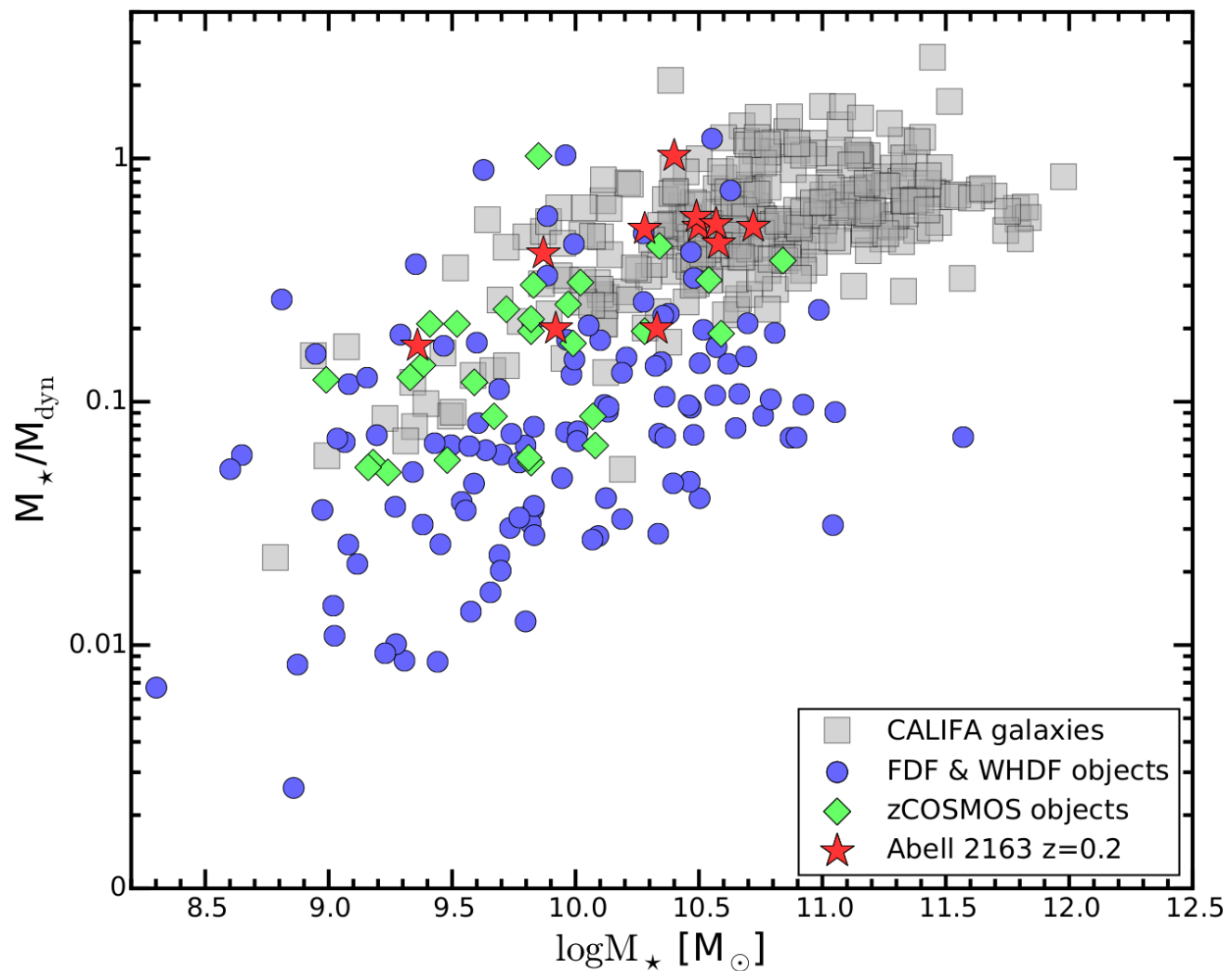
Evolution of stellar mass fraction



Median values in 3 redshift bins hardly change

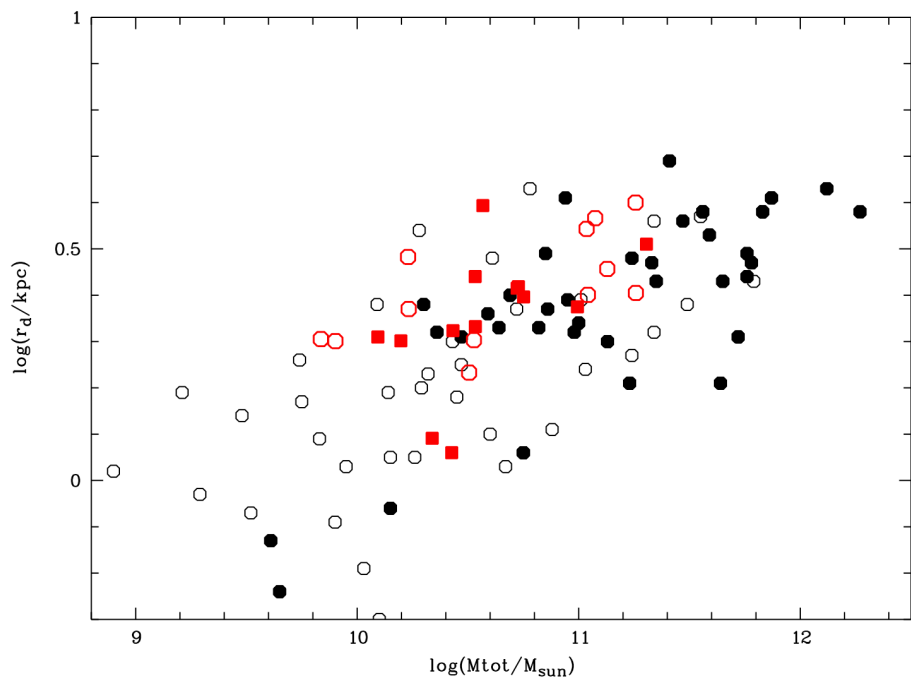
Evolution of stellar mass fraction

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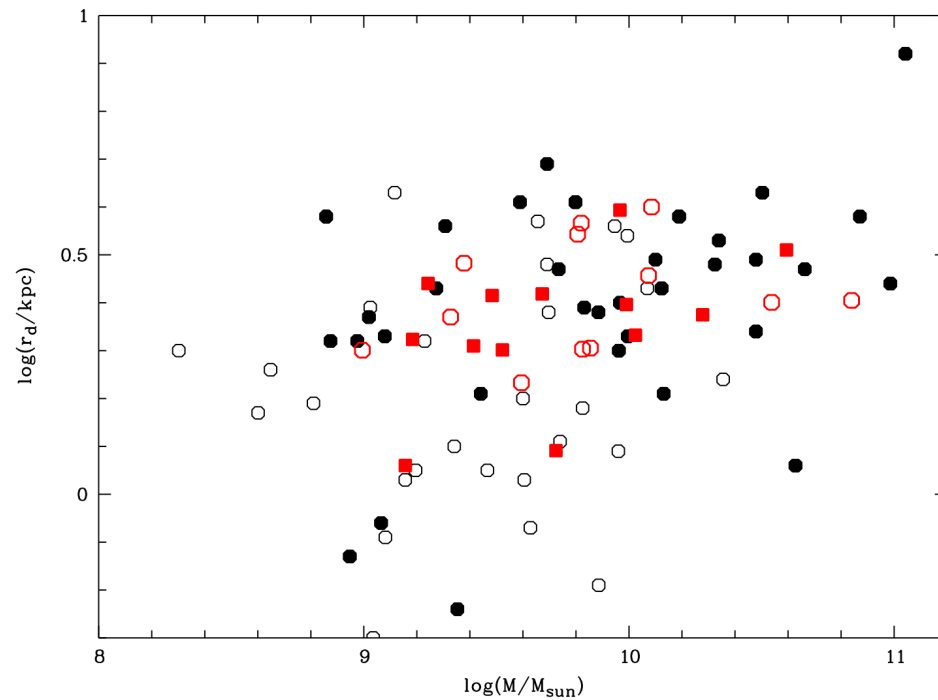


Cluster galaxies at $z=0.2$ already reached local fraction 3 Gyrs ago

Mass – Size in Field $z \sim 0.5$



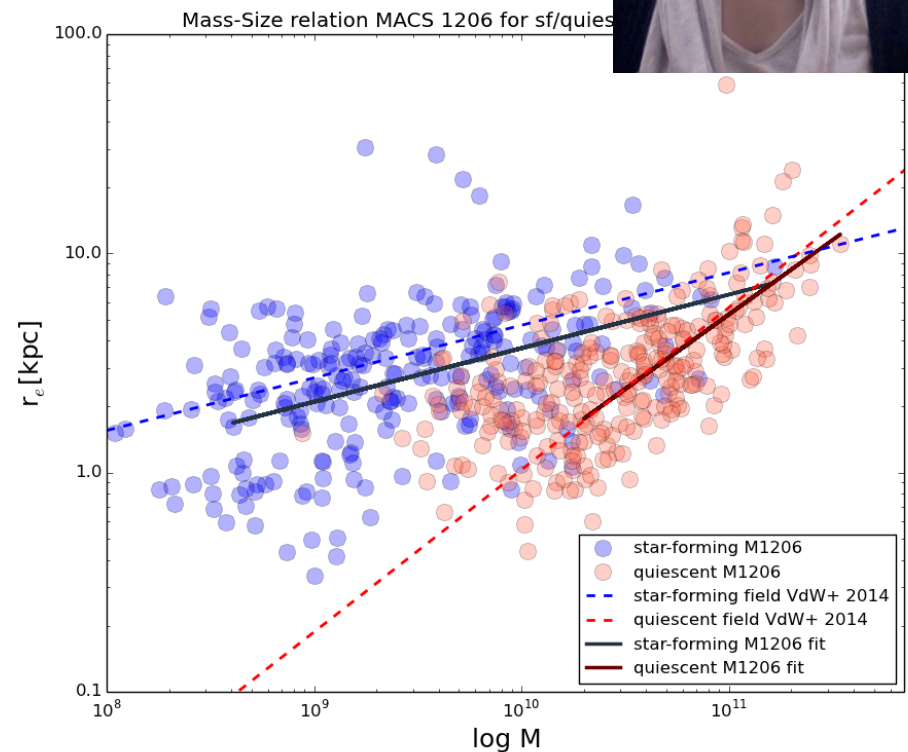
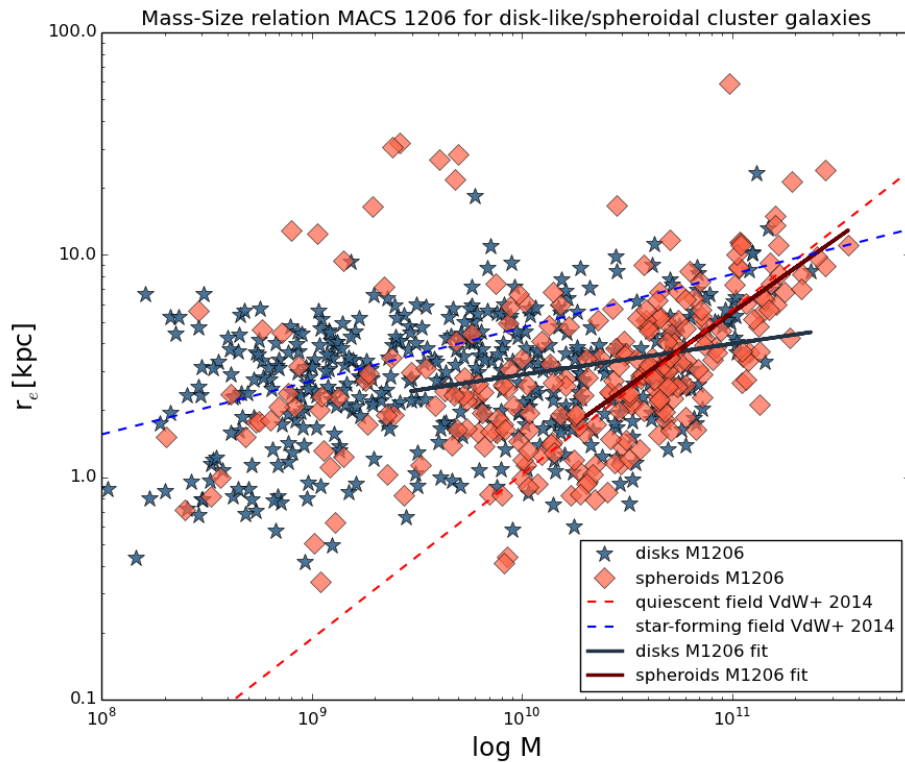
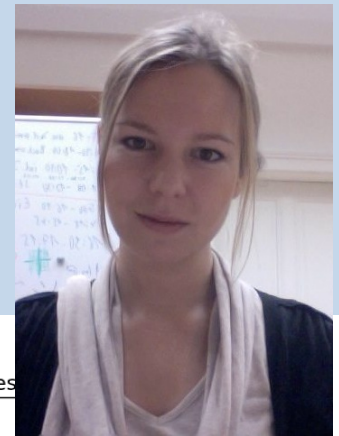
Halo Mass



Stellar Mass

Mass – Size in Cluster $z \sim 0.5$

Ulrike Kuchner: Poster S3.22



Kuchner et al. 2015

Disks vs Spheroids (Sersic)

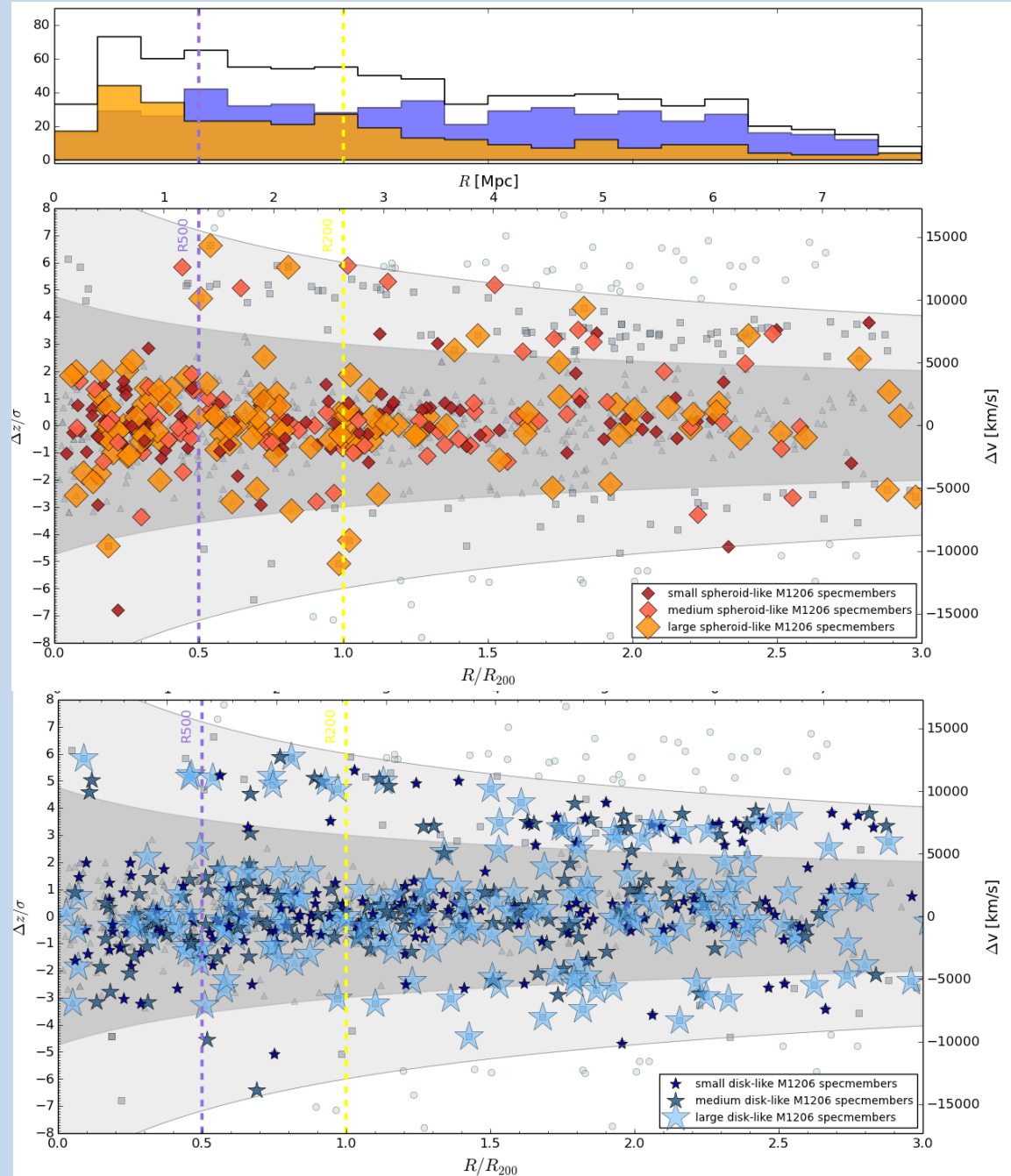
Star forming vs Quiescent

Disk sizes in cluster environment smaller than in the field

Morphology - Density in Phase Space at $z \sim 0.5$ out to $3R_{vir}$

Ulrike Kuchner:
Poster S3.22

Spheroids



Disks

Summary

- Weak increase of luminosity with z for given total mass
1.1 Bmag at $z=1$
- Scatter at $z\sim 0.5$ twice local scatter
- Weak decrease of stellar size with z for given total mass
60% smaller at $z=1$
- Cluster galaxies smaller in cluster environments
- Most cluster members have distorted rotation curves
- Galaxies in early stage of cluster assembly more luminous
and smaller (?)