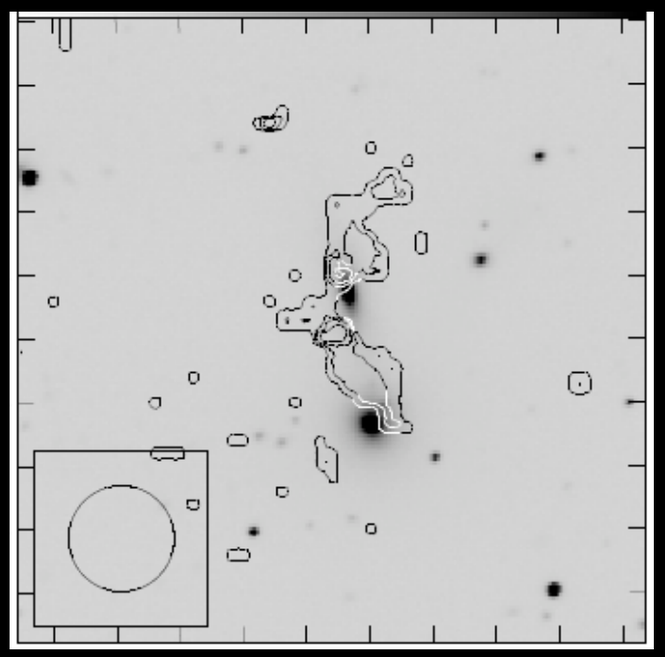
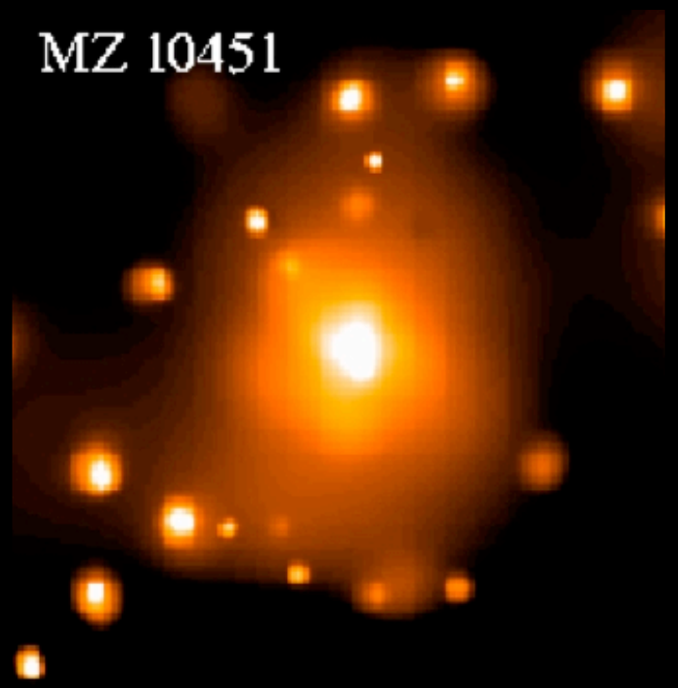
The XMM/IMACS (XI) Groups Survey

Jesper Rasmussen,
Carnegie Observatories





Collaborators:
John Mulchaey
Trevor Ponman
Somak Raychaudhury
Ali Dariush
Lei Bai

+ T. Miles, Y. Shen, C. Sengupta

XI Groups Survey: Aims

How are global group properties at $z \approx 0$
related to those of the galaxy members in **typical** groups?

↓

Need to map **baryons**, **galaxy properties, group dynamics**...
in optically selected groups

↓

XI: Multi-λ study of a statistically representative sample of
25 redshift-selected galaxy groups

The XI Sample

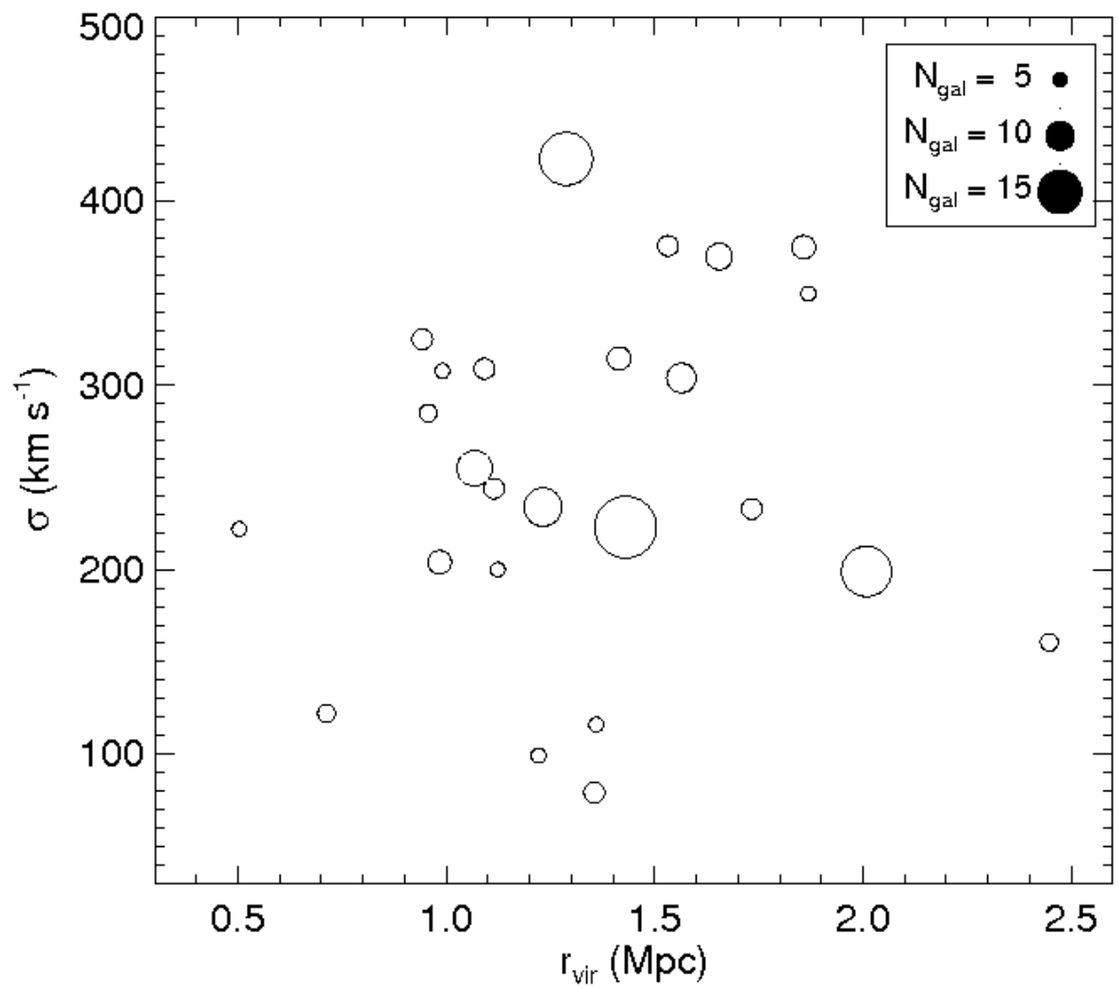
From first ('100-K') data release of 2dFGRS (Merchan & Zandivarez 02):

- $z = 0.060\text{-}0.062$
- $N_{gal} \geq 5$
- $\sigma < 500$ km/s

"Random" selection ≈ Unbiased sample

– subject to overdensity criterion in FoF analysis.

Full sample:



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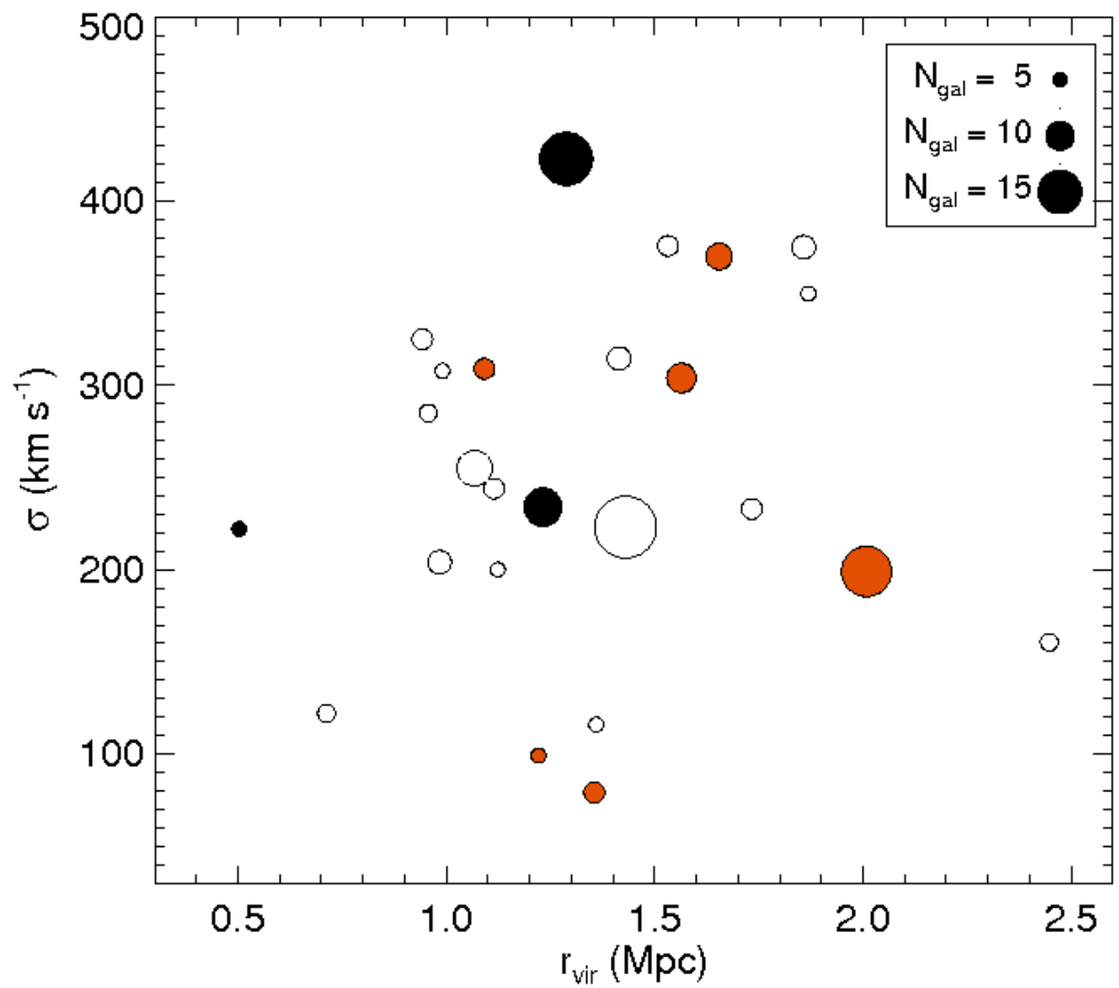
XMM observations so far:



Multi-λ Observations: Status

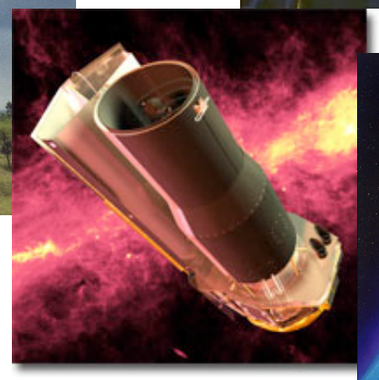
Global & hot gas properties: XMM
- 9/25 groups + 1 w/ Chandra/HST

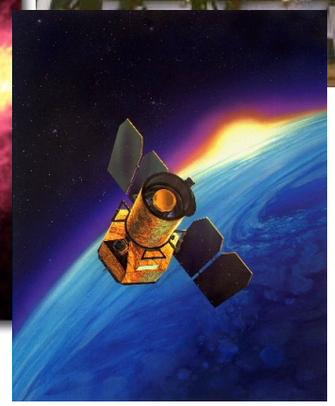
Galaxy properties & dynamics: IMACS/Magellan
- All 25 groups.
- 15,000 spectra. Fully reduced for 9 groups.
- Membership to $M_R \sim -15$, ie. ~2 mag fainter than SMC.

Cold gas: GMRT
- 3 groups

Star formation
- Spitzer/MIPS 24μm
- GALEX FUV/NUV

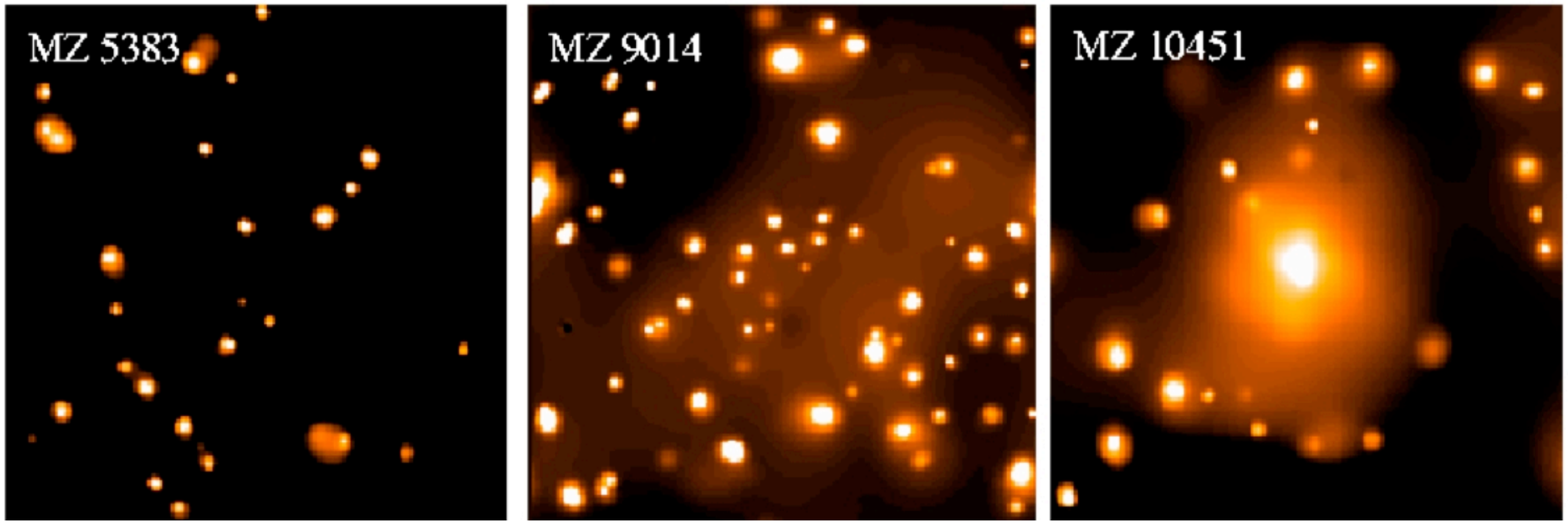
} 25 groups, to ~0.1 $M_\odot$/yr





X-ray/Optical Properties: First Results

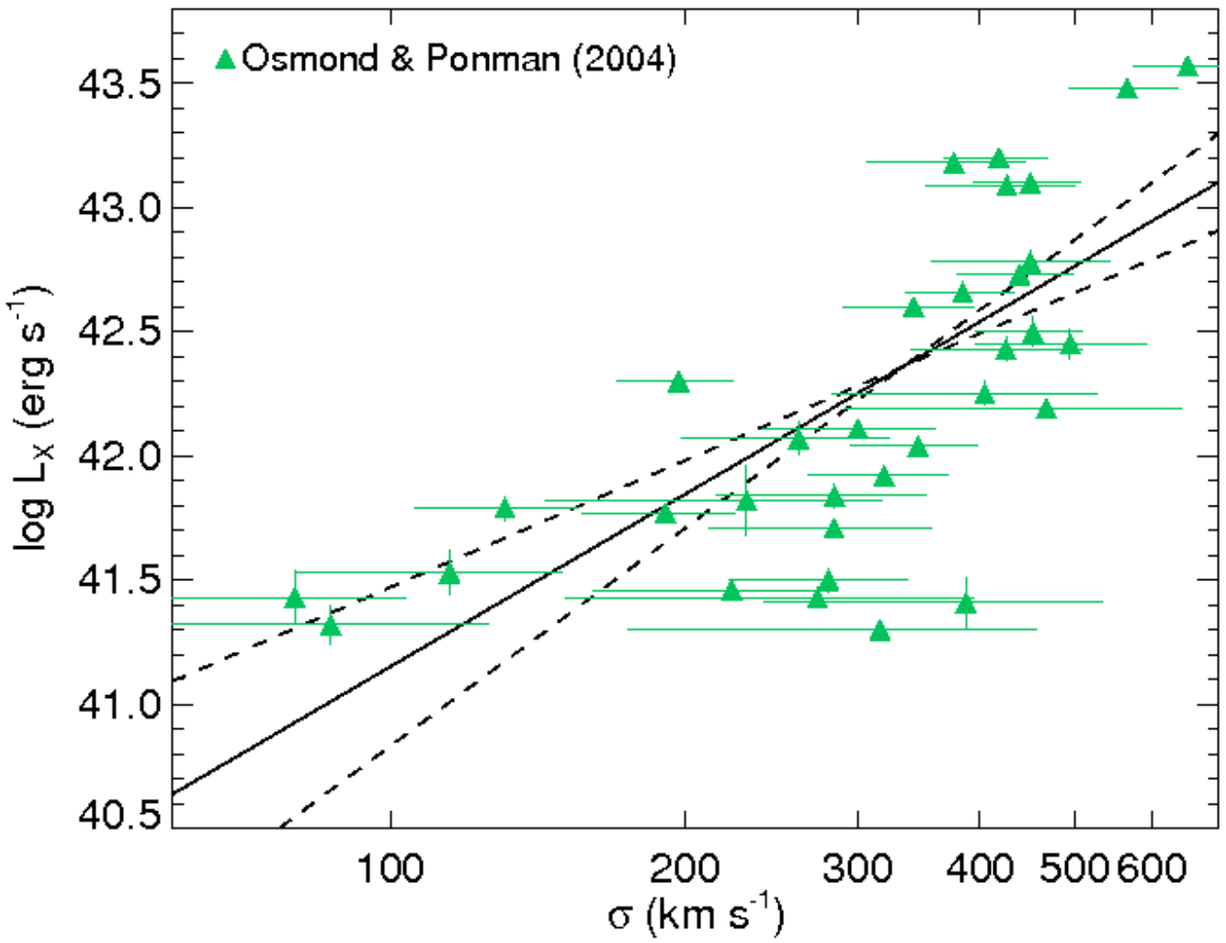
1. XMM: Diversity in hot gas properties (JR+ 06)



2. X-ray AGN fraction lower than in rich clusters (Shen+ 07).

X-ray/Optical Properties: First Results

GEMS groups (X-ray selected):



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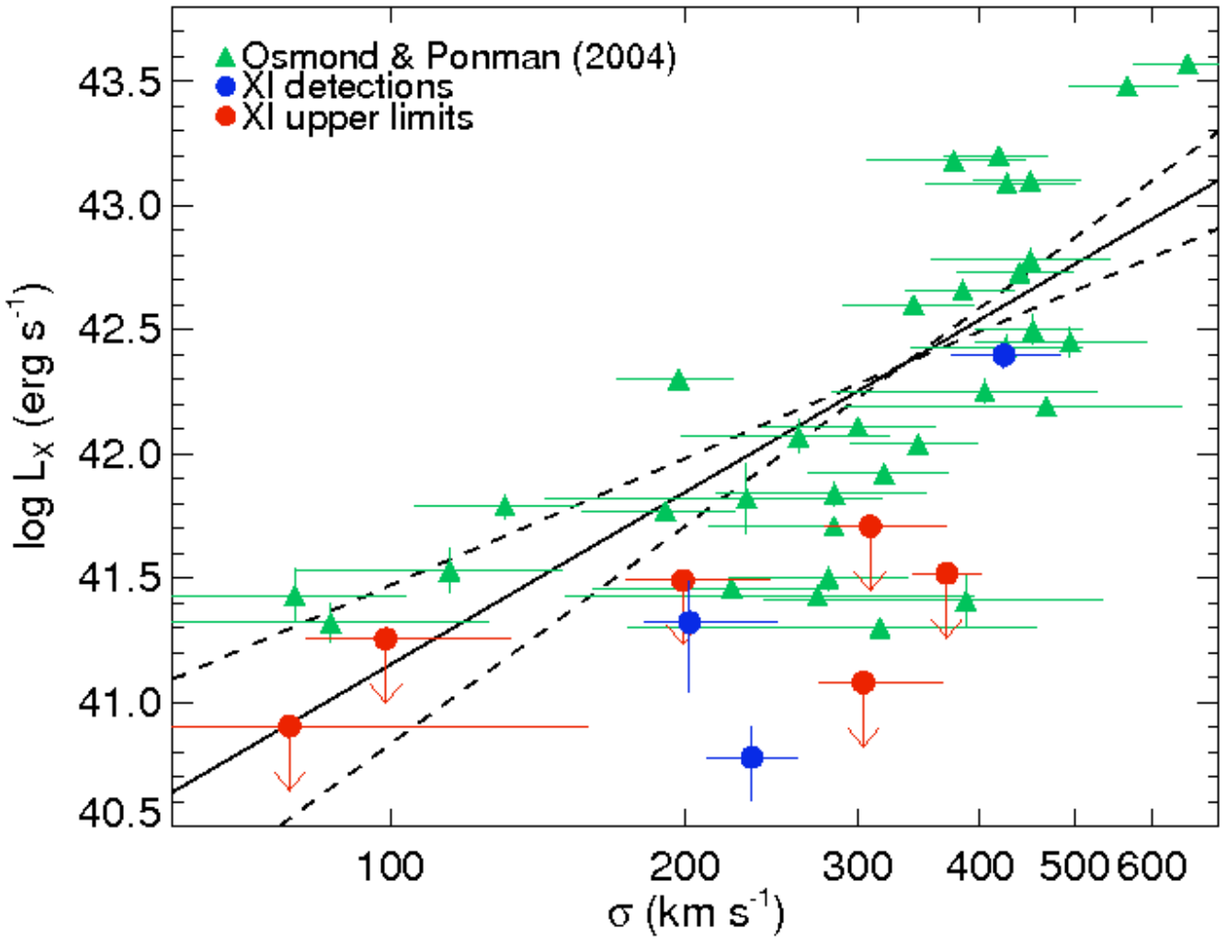

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- cf. optically selected clusters (e.g. Popesso+ 06)

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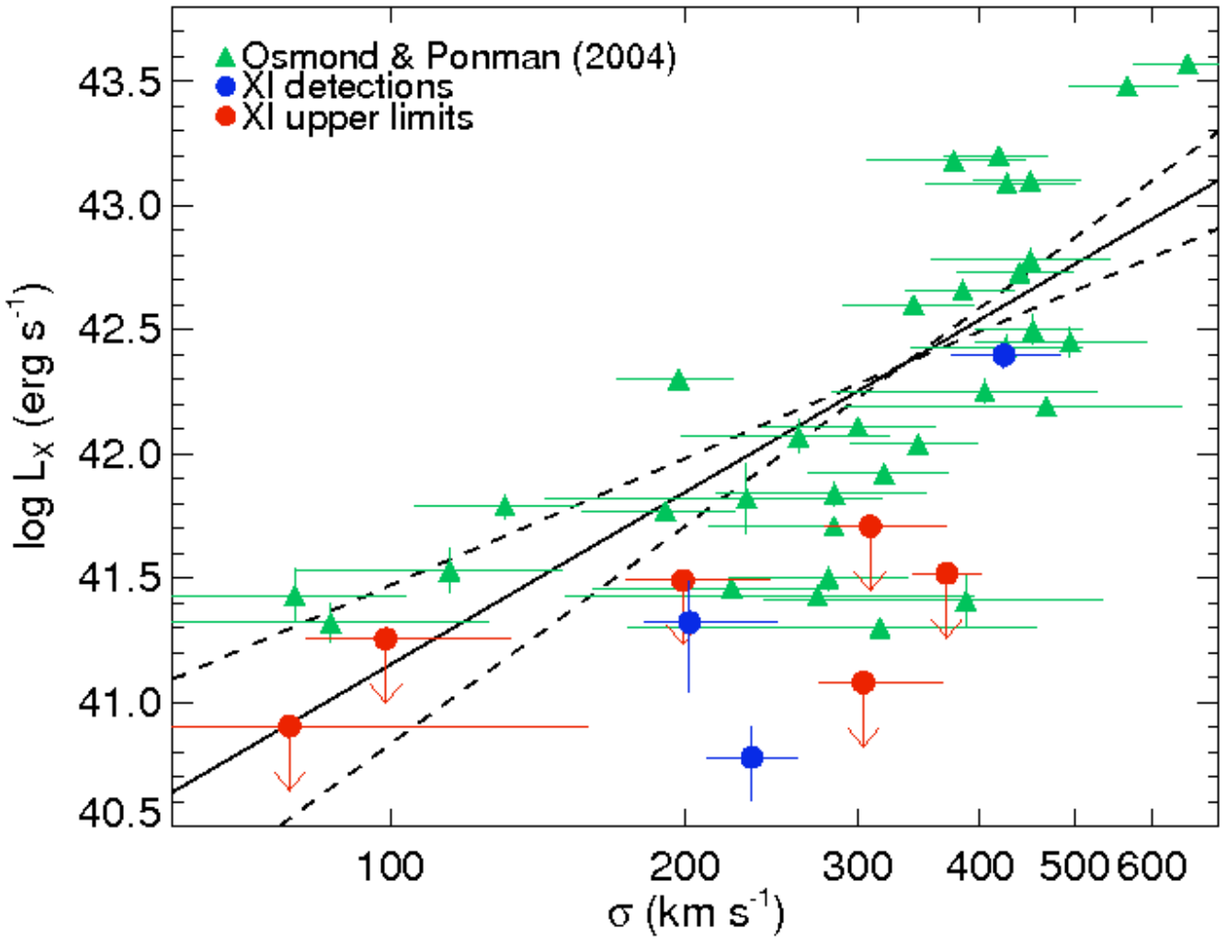

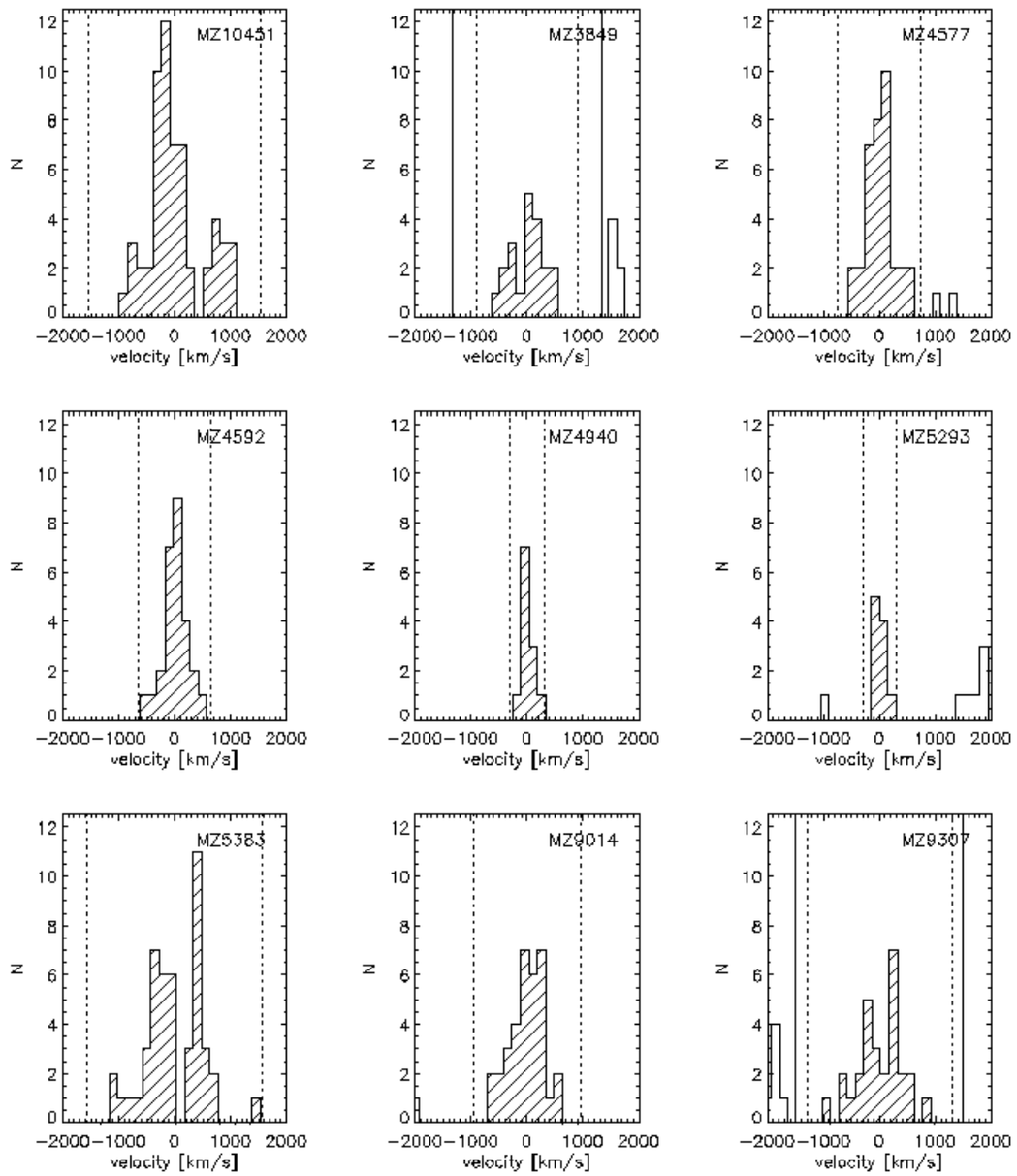

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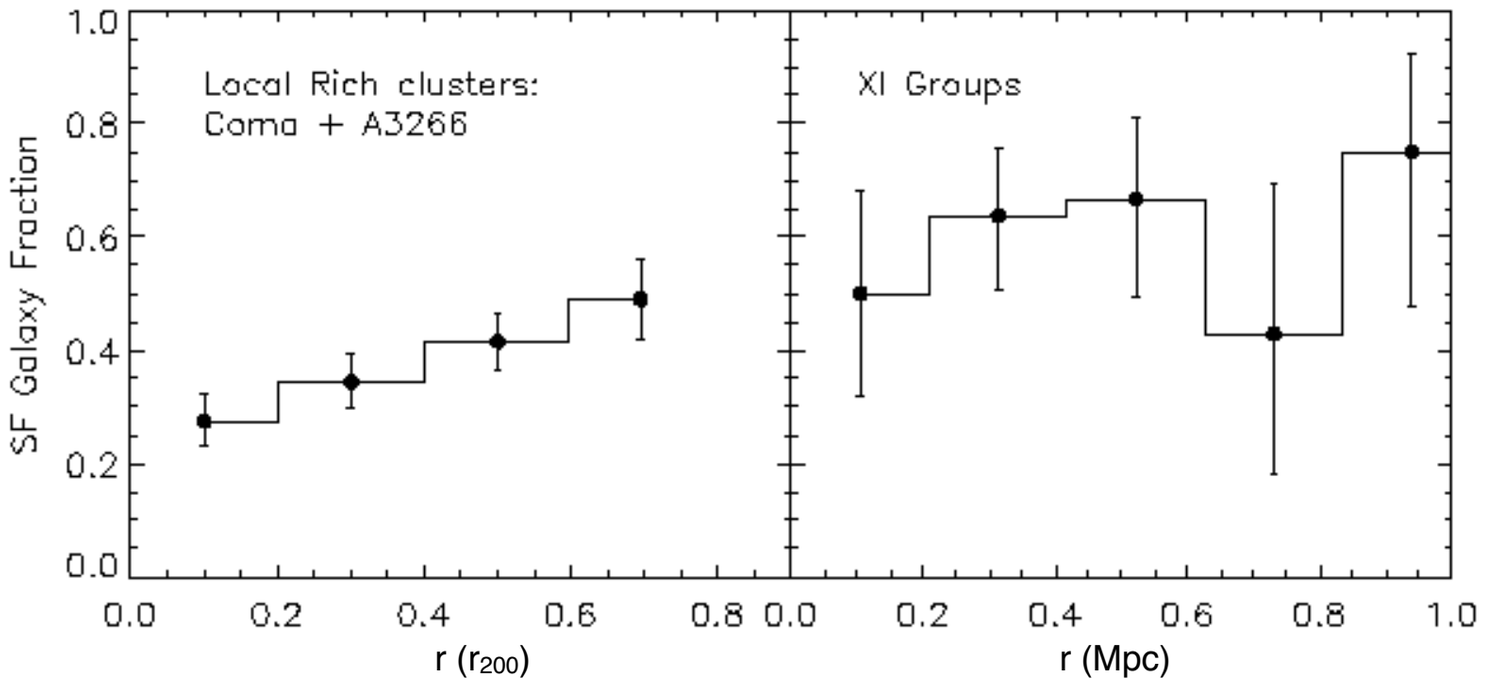
L. Bai+, in prep.

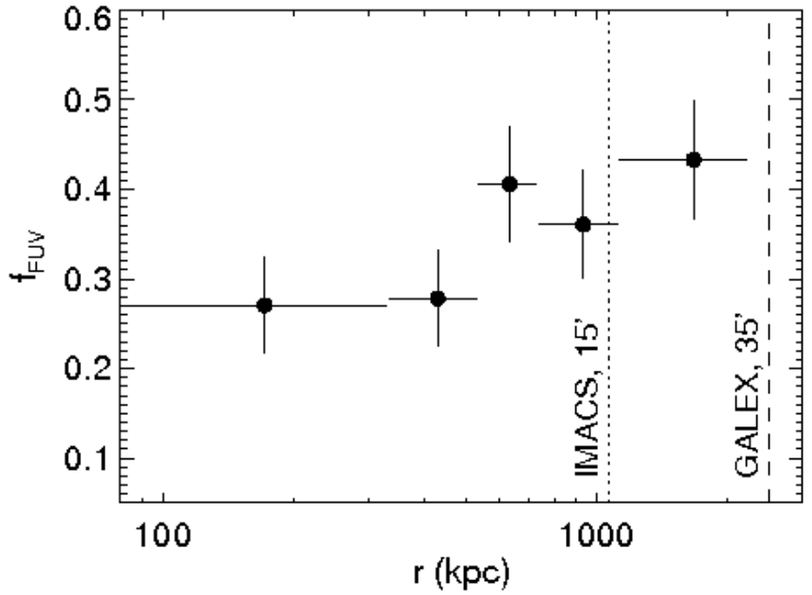
Star Formation Activity vs. Local Environment

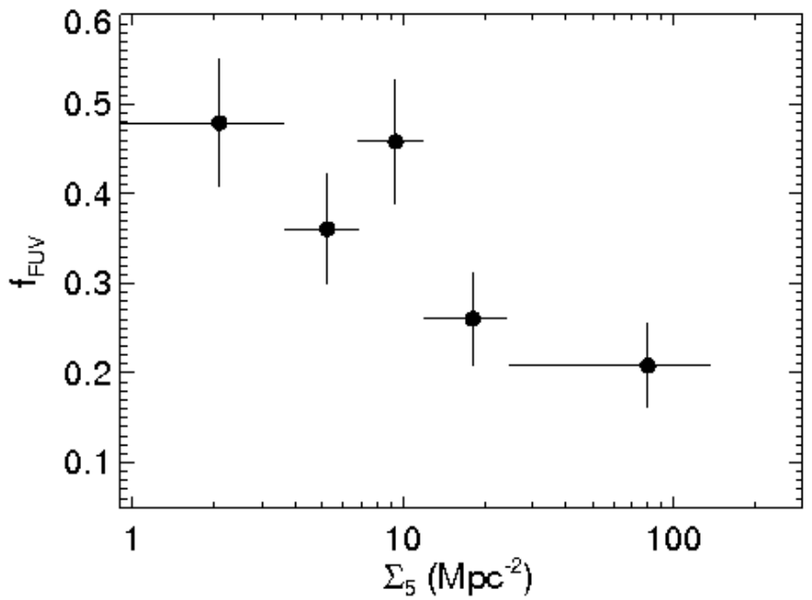
First systematic study of IR/UV star formation in $z \approx 0$ groups

Spitzer 24μm: L. Bai+ 09 (ApJ + in prep.)

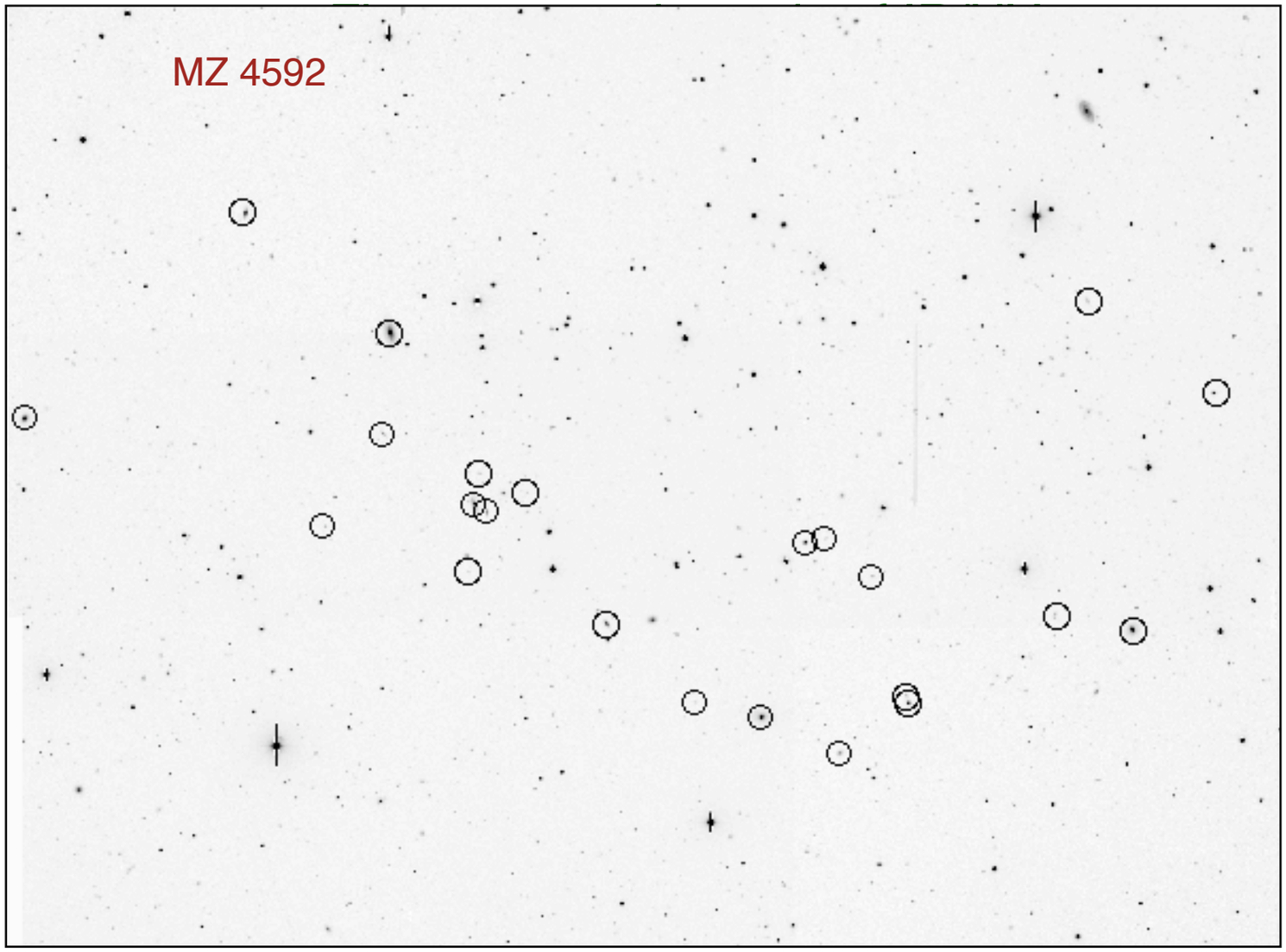


Galex FUV (JR+, in prep.)





Star Formation Activity vs. Local Environment



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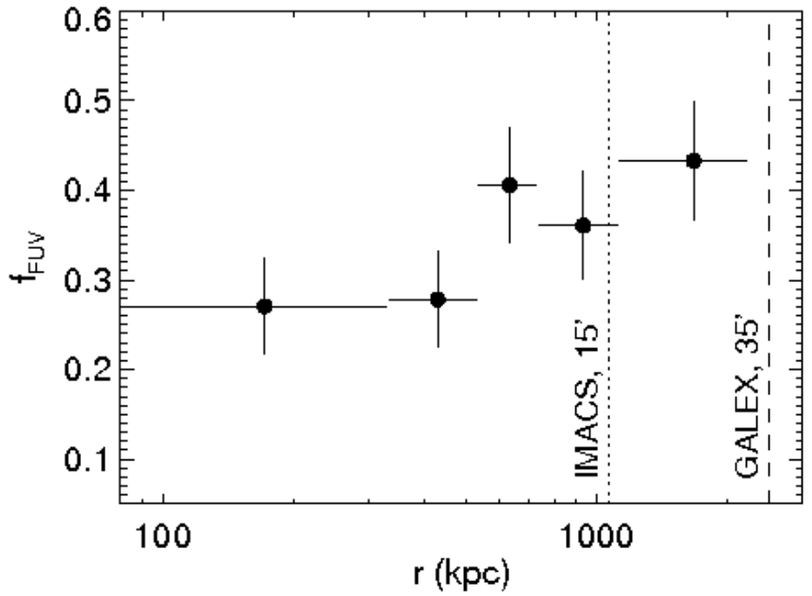
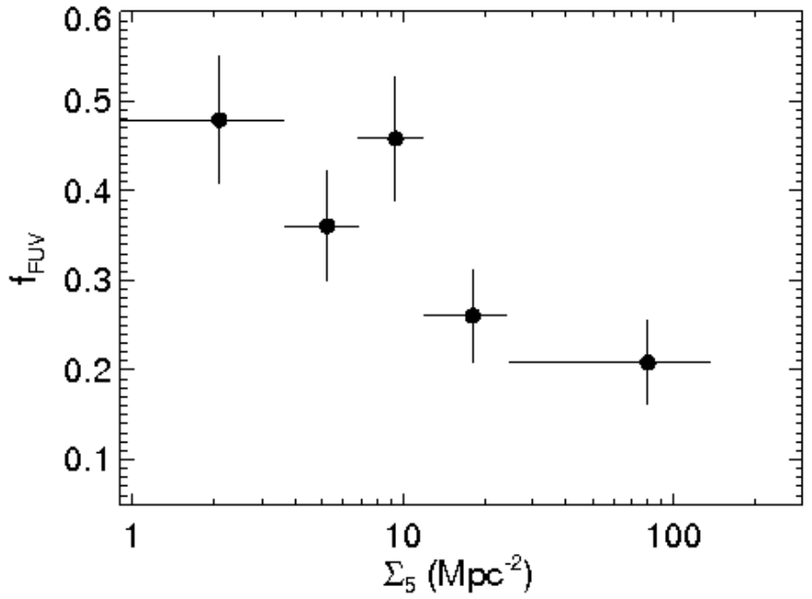
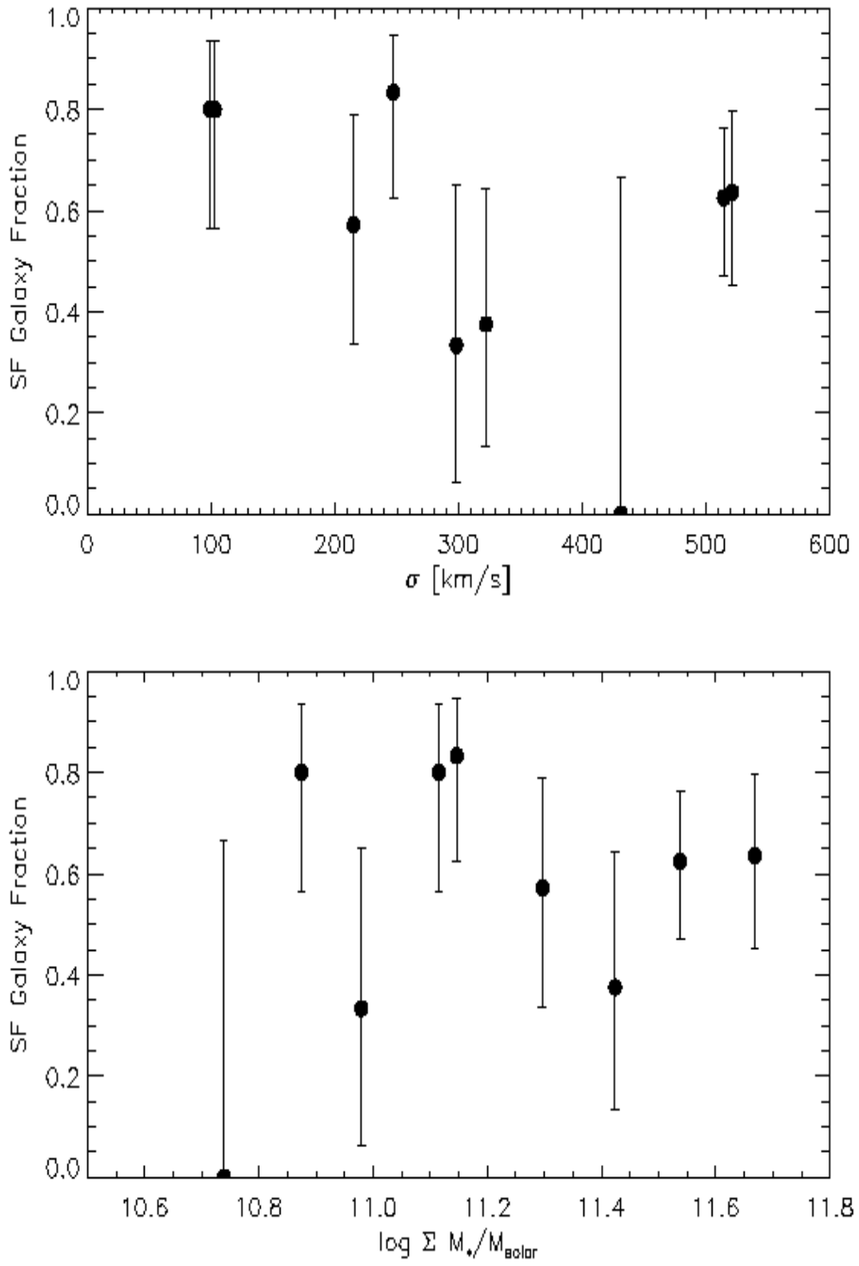


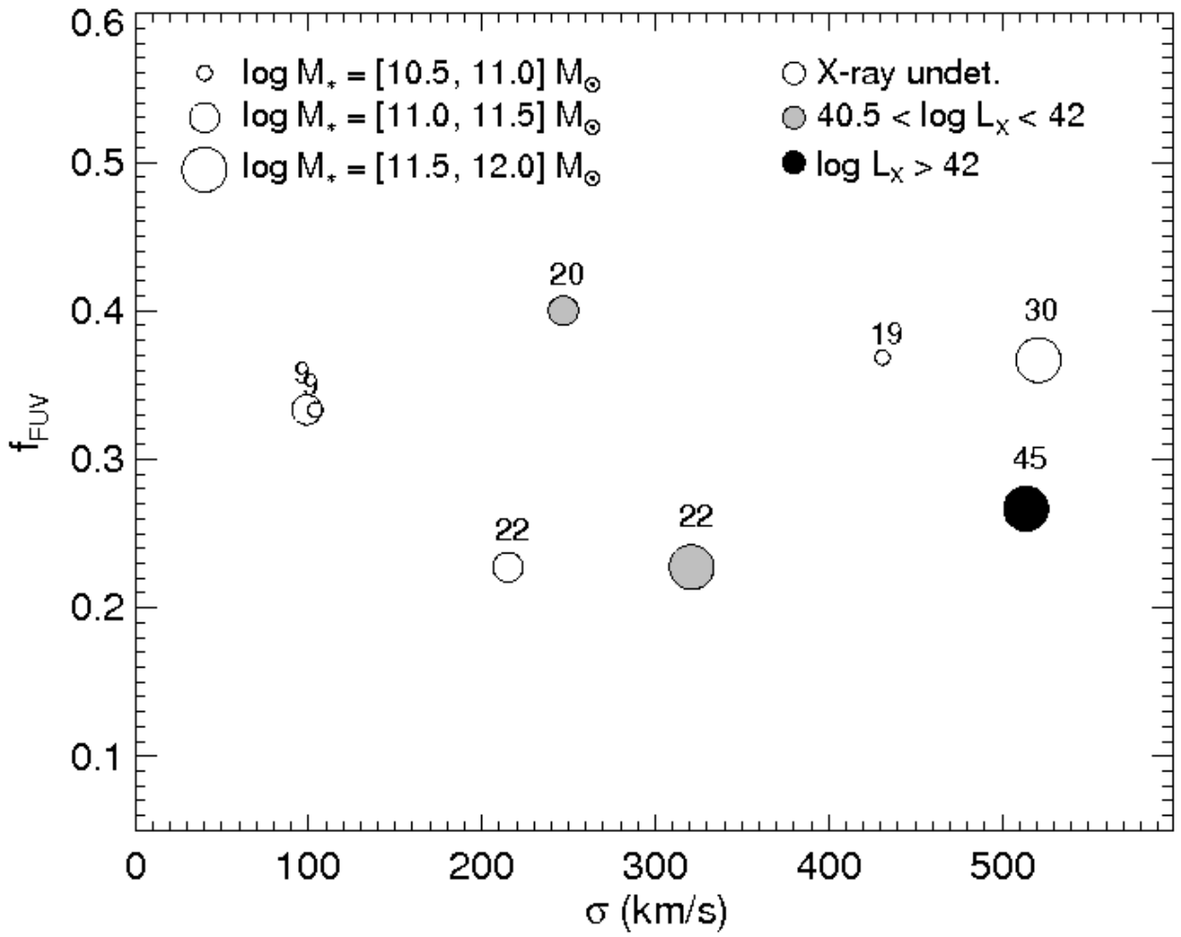


Star Formation Activity vs. Global Environment

24 μm (L. Bai+, in prep.)

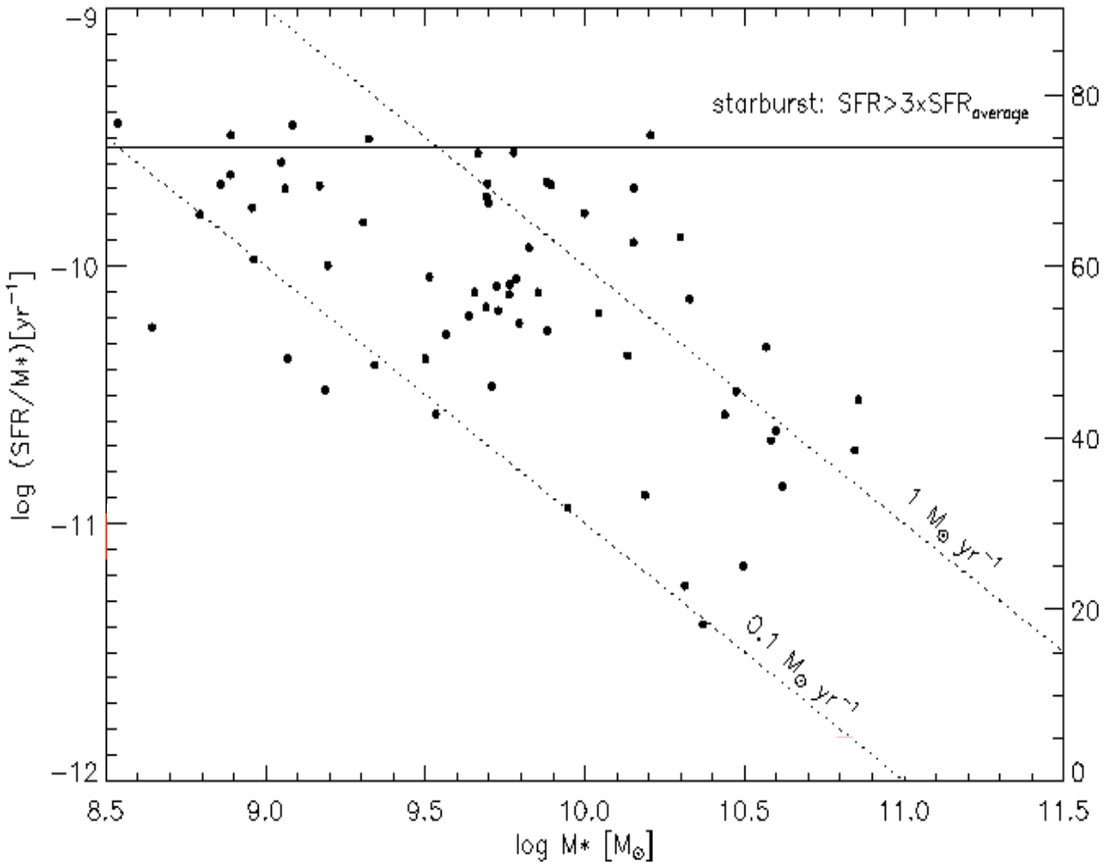


FUV



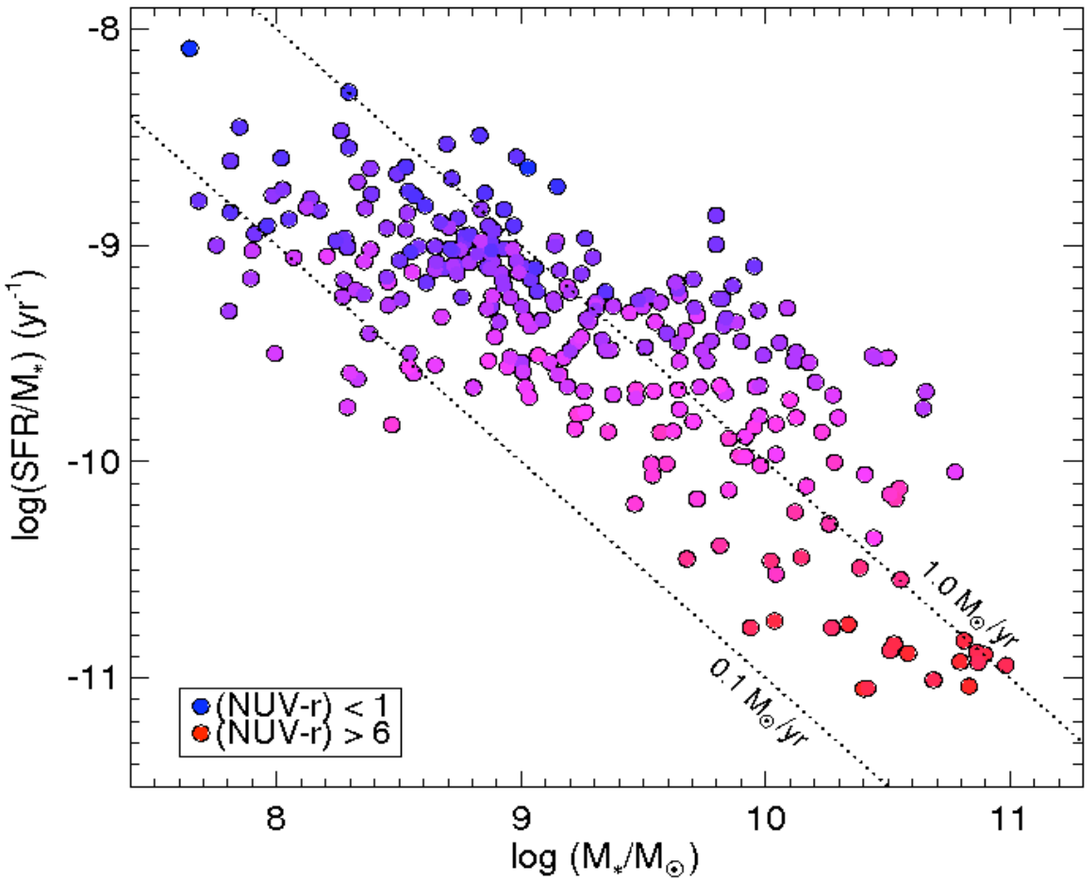
24μm & UV Specific Star Formation Rates

24 μm



SFRs based on Rieke+ 09.

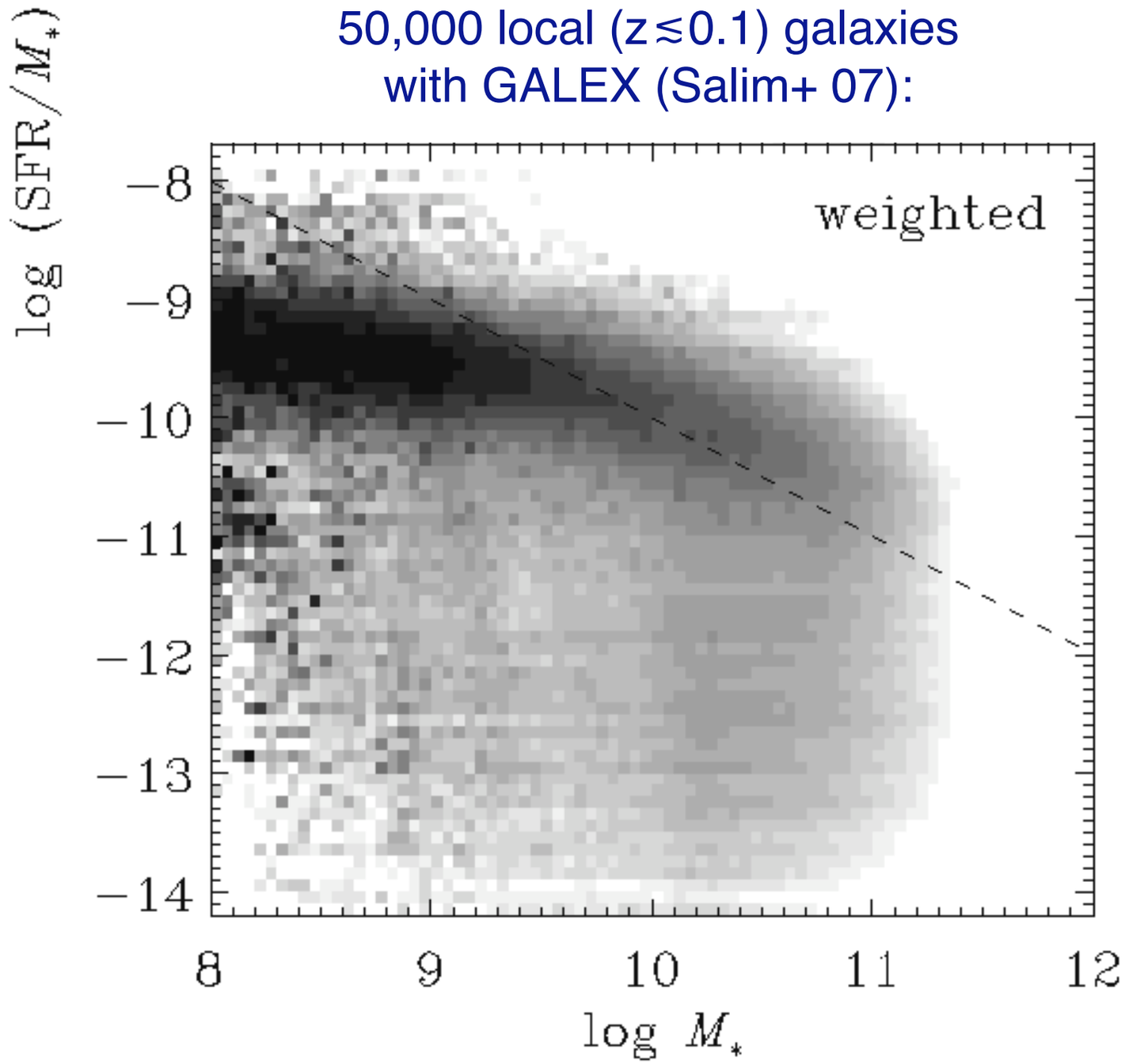
FUV (dust-corrected)



SFRs based on Salim+ 07.

UV Star Formation Rates: Groups vs. “Field”

50,000 local ($z \lesssim 0.1$) galaxies
with GALEX (Salim+ 07):



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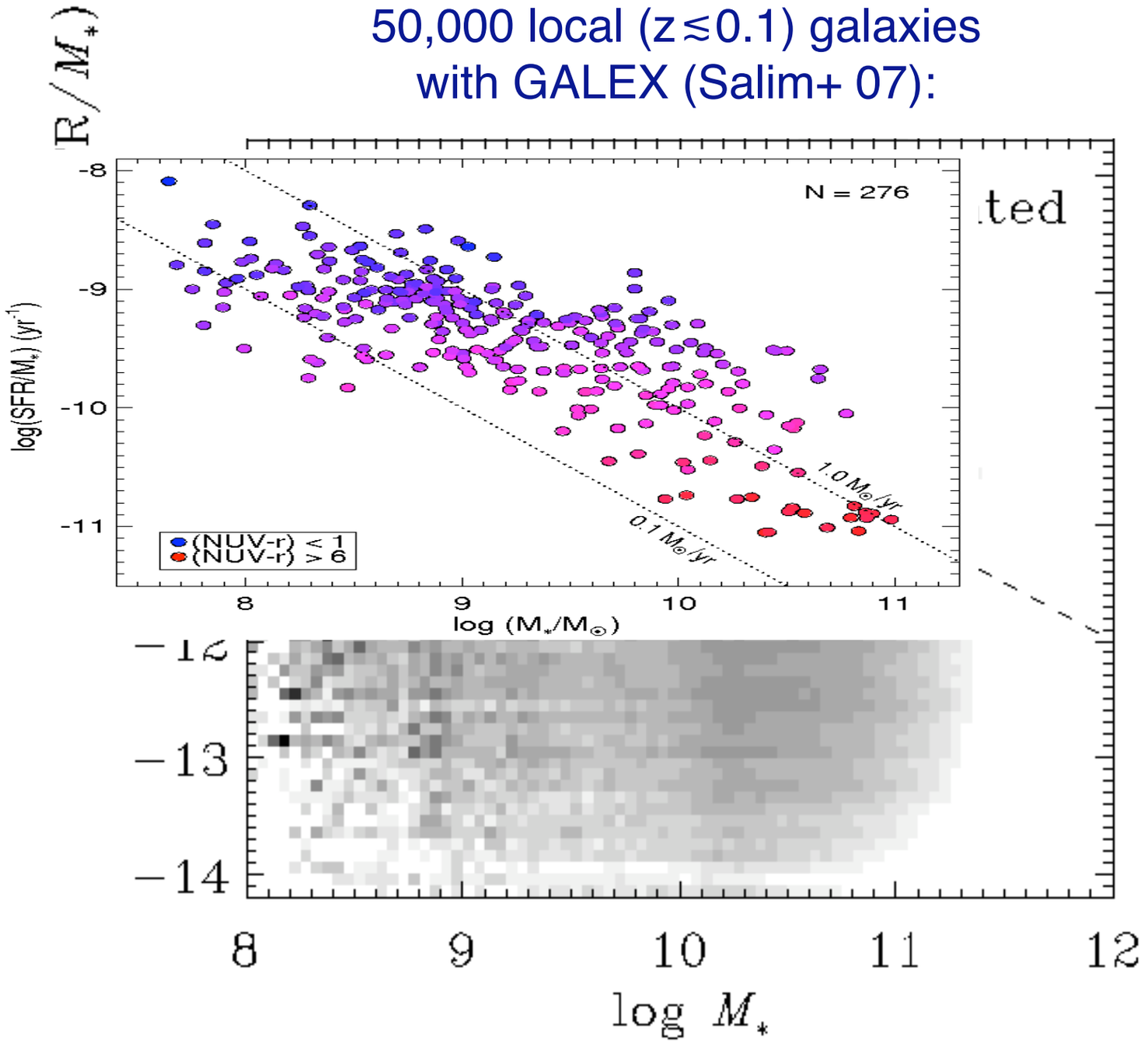

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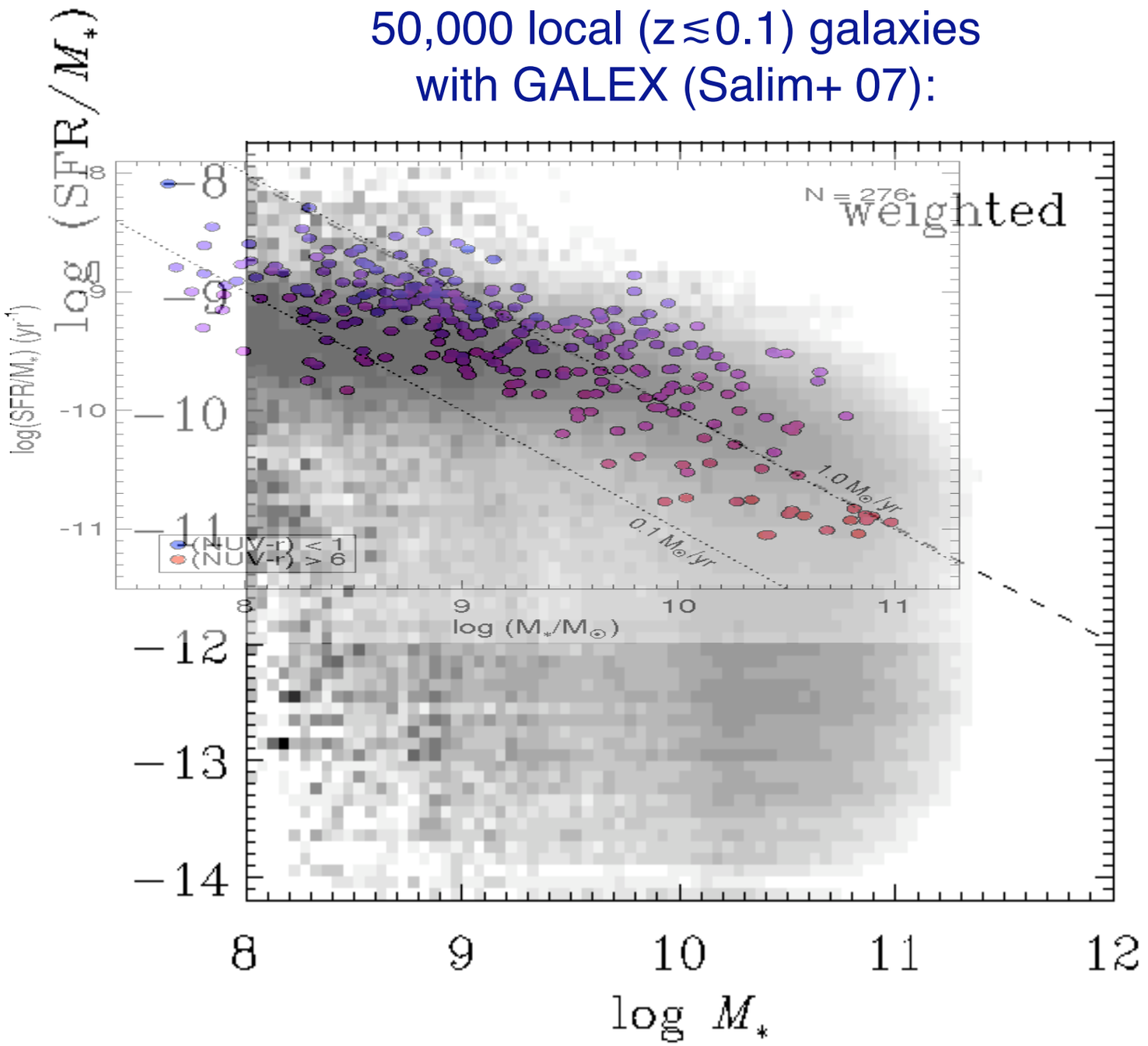
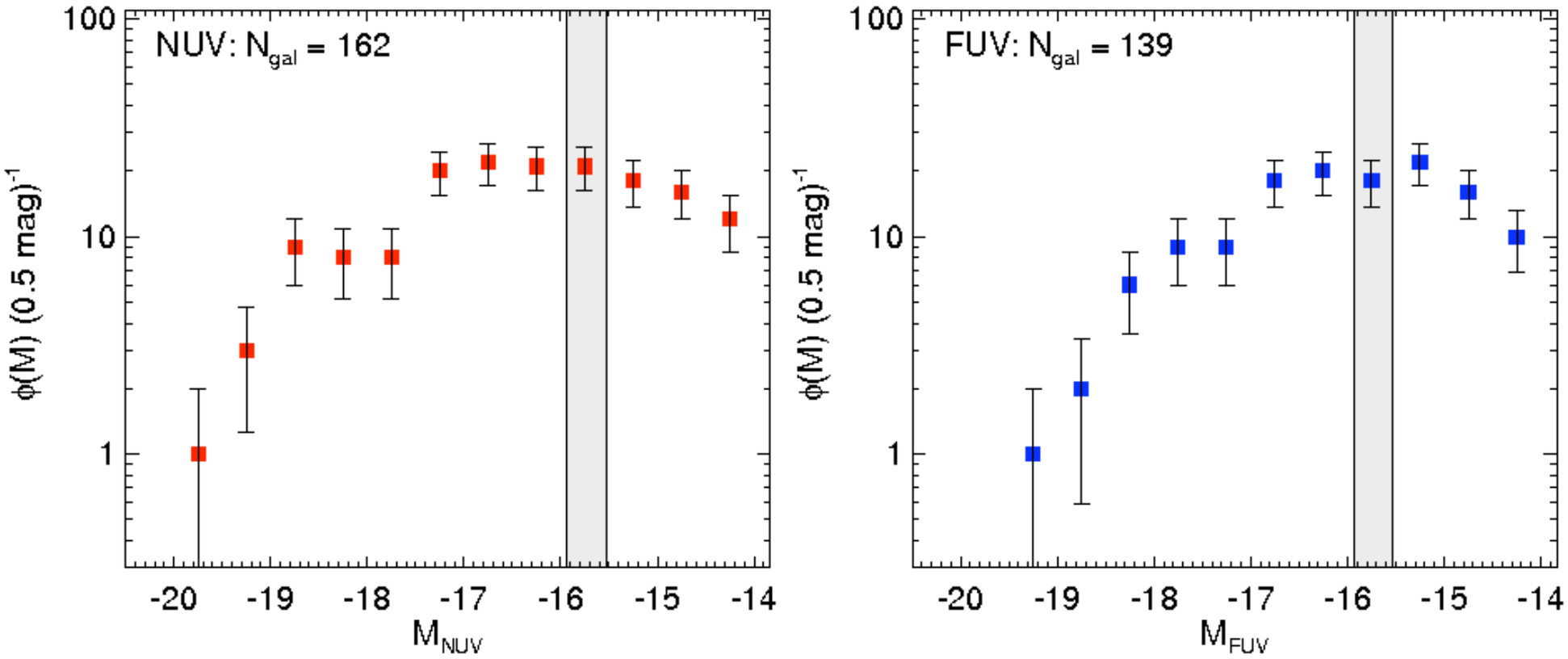


UV Luminosity Function of Groups



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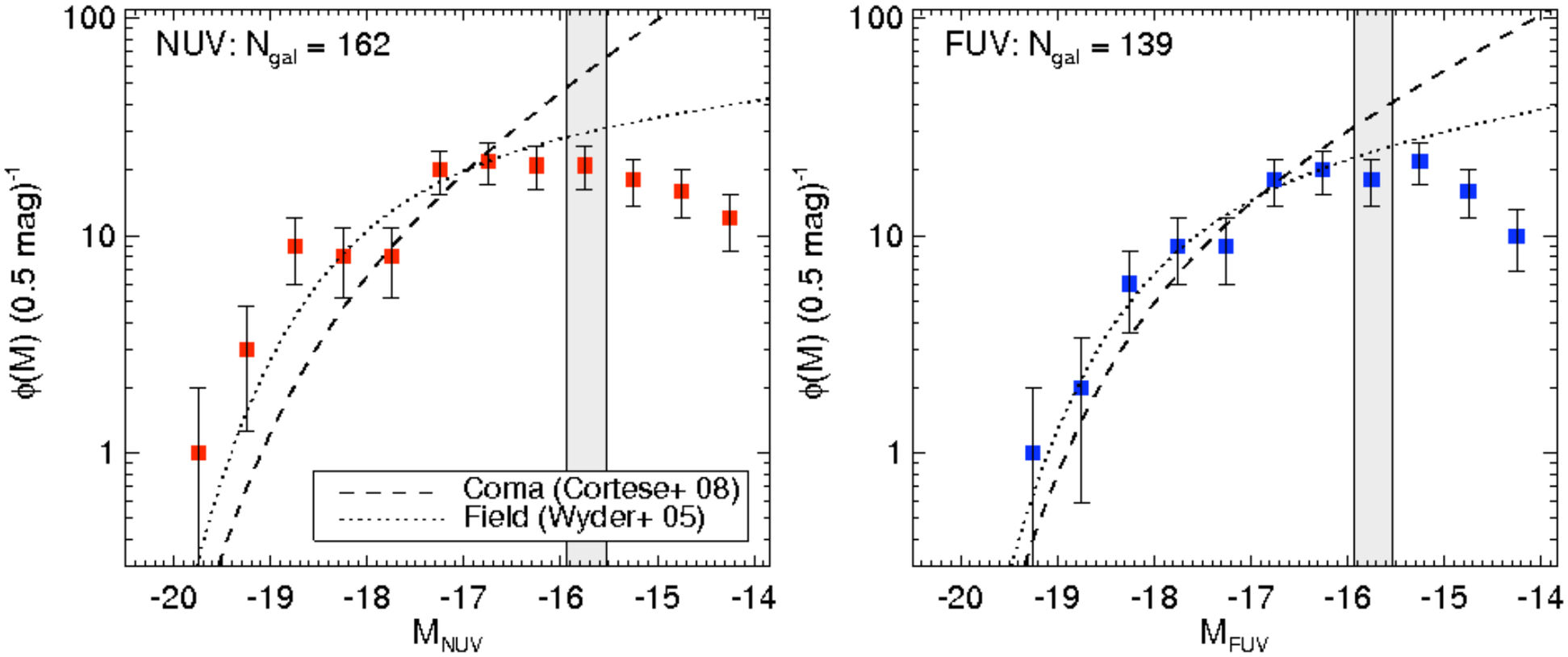

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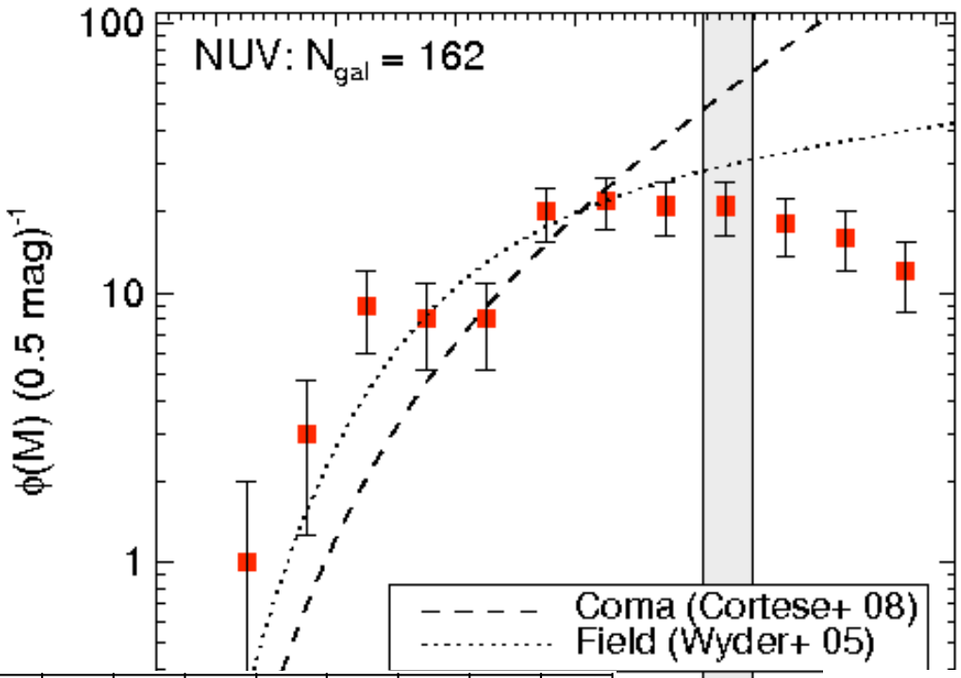

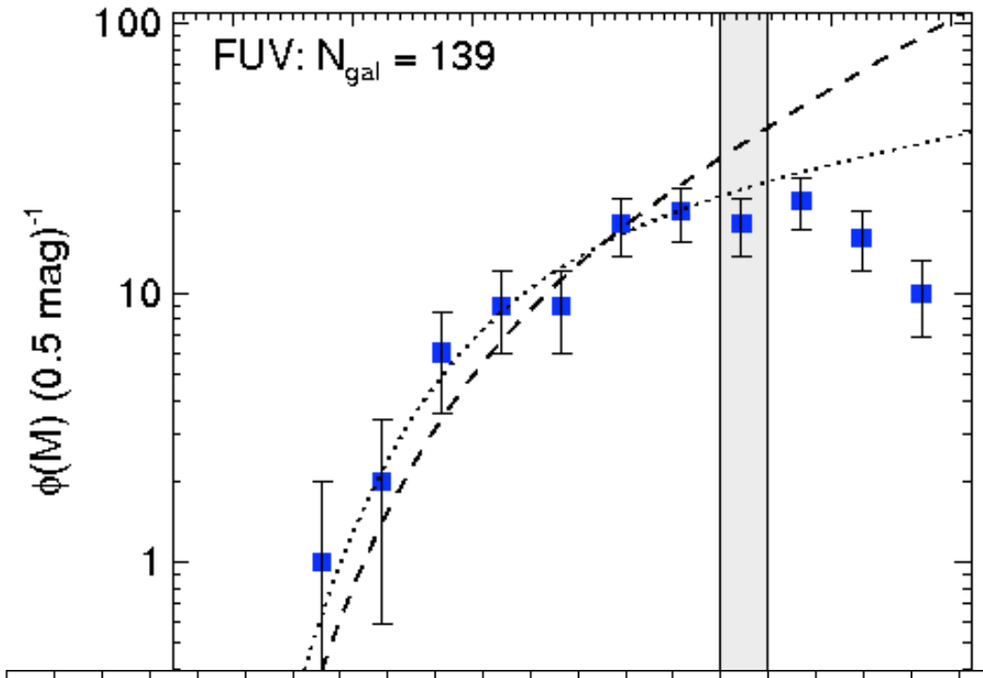

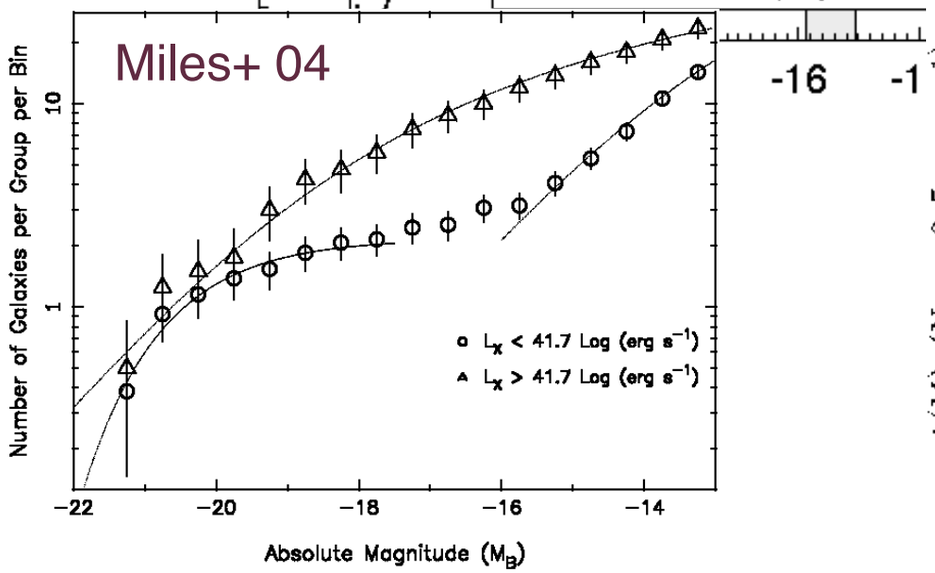

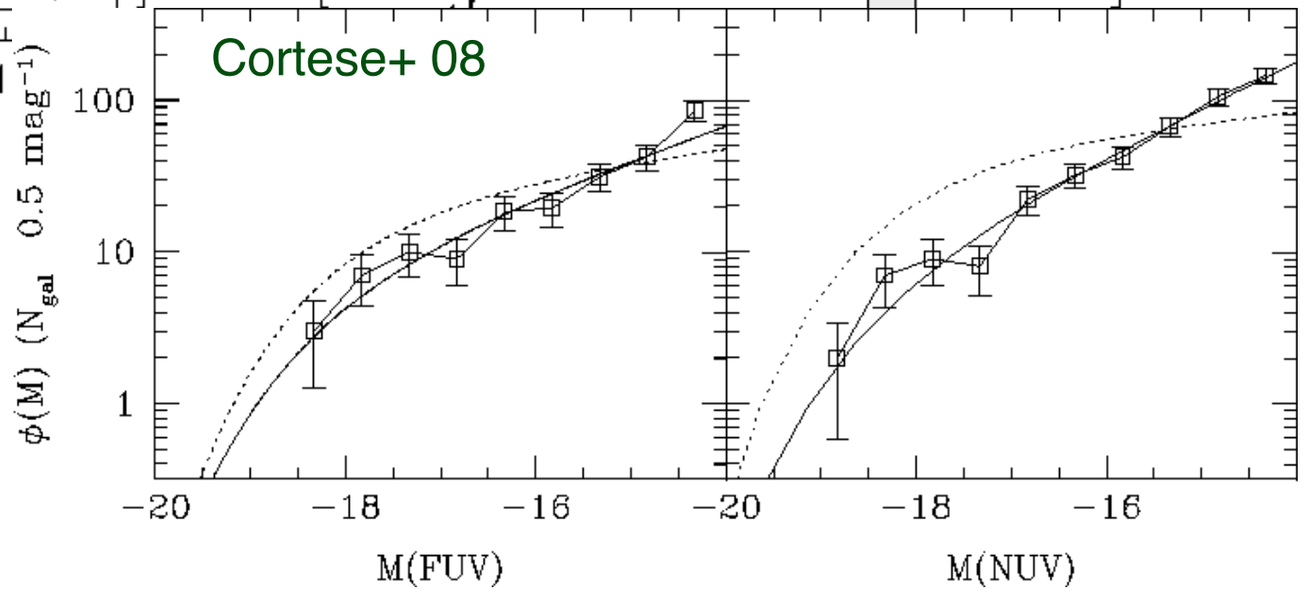

Dip due to enhanced SF? Dynamical friction? $t_{inf} \propto \sigma^3$

XI: Summary

XMM/IMACS: Probing the full (evolutionary?) range of groups

Strong diversity in X-ray and dynamical properties

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First systematic IR/UV study of "nearby" groups

- SF fraction in cores ~ cluster outskirts
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- But *local* galaxy density plays a role.

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Plenty on the to-do list...

Morph.–dens., AGN activity, UV SFR at r ~1–2 Mpc, etc.