The role of environment in the evolution of the SF activity up to z~1.6

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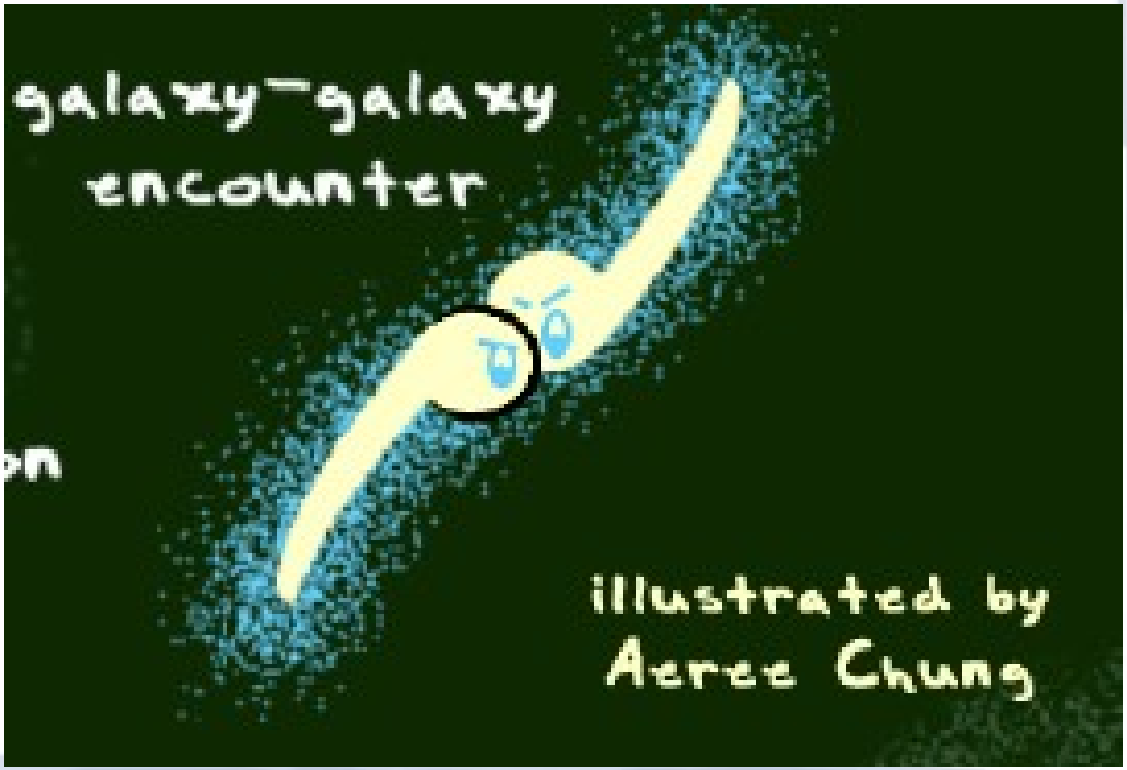

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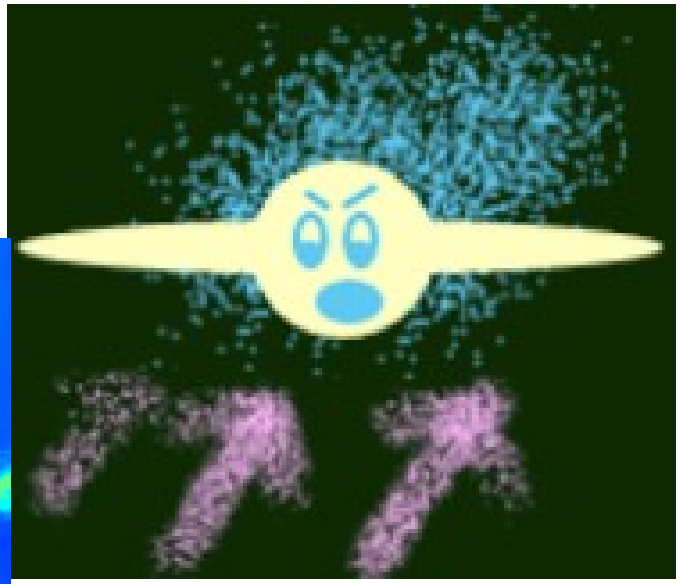

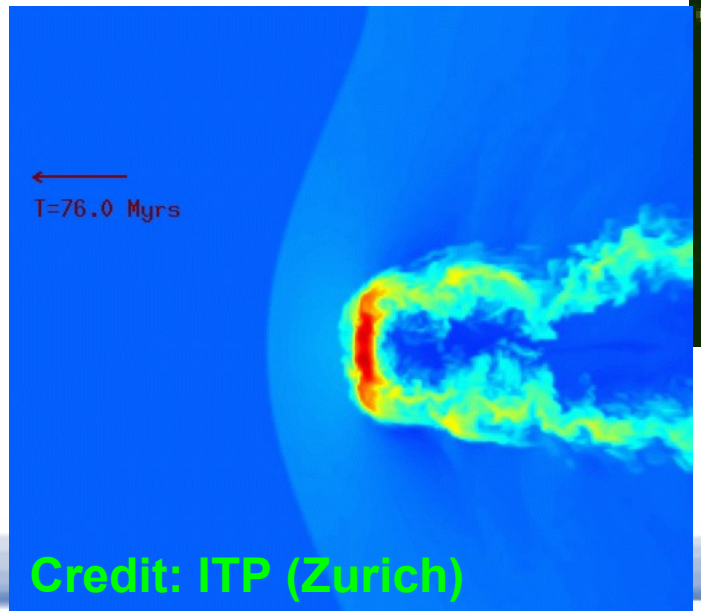

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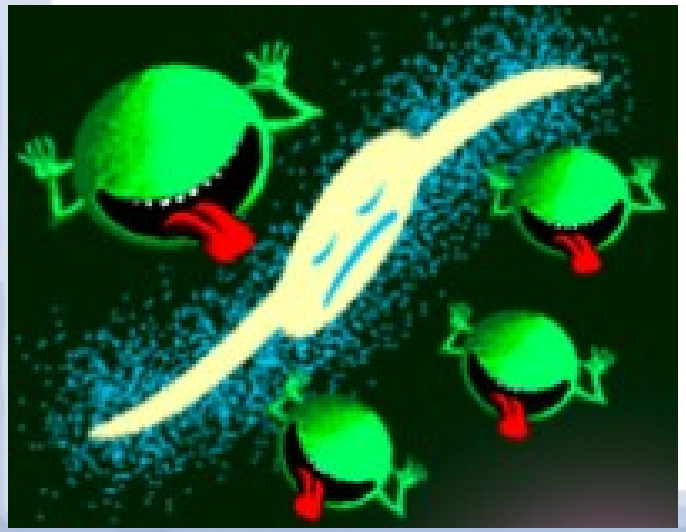

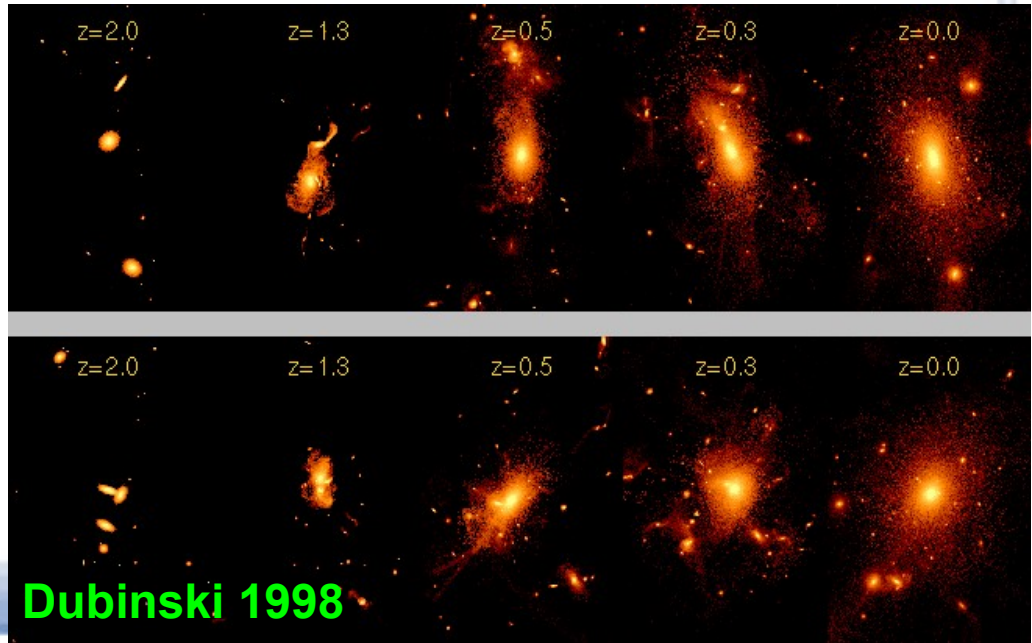

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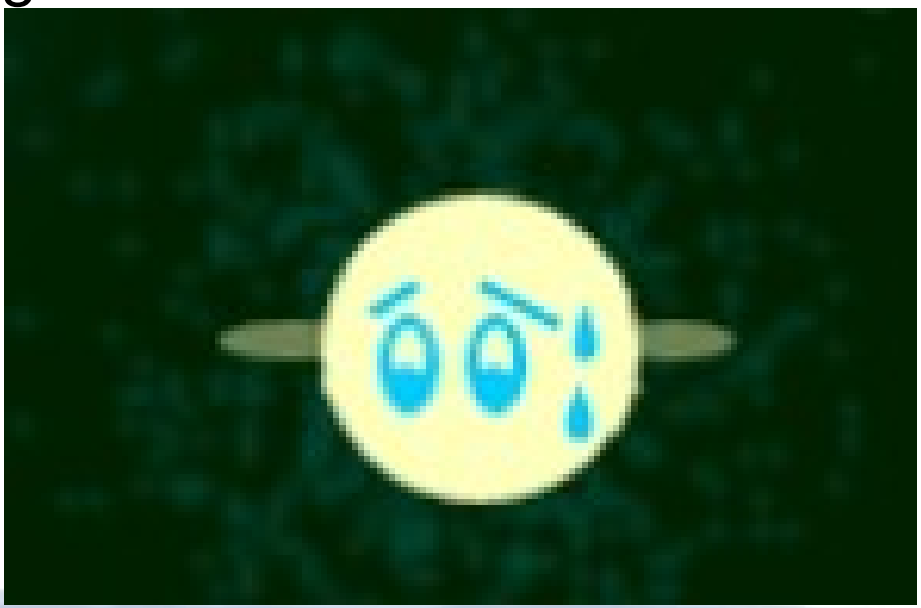

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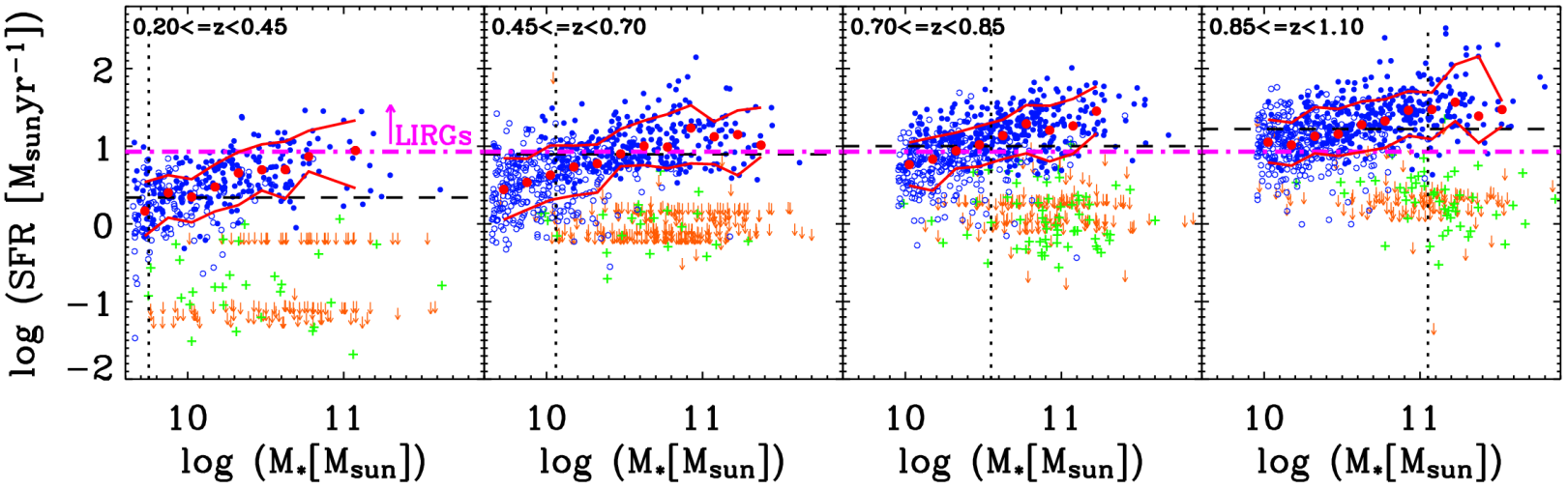
- How is the SF in the field w.r.t. the groups/clusters? Is there a reversal of the morphology-density relation?
- Which is the environmental history of groups?

SFR-Mass relation

- SFR-M relation → Main sequence of SF galaxies [Noeske+2007, Elbaz+2007, Peng+2010]



- Gas exhaustion scenario proposed [Noeske+2007]
- The MS evolves with z

Why Groups

- ☹ groups are the only structures you can find in Deep Fields
- ☺ spectroscopic richness of Deep fields is higher than in any other dedicated group survey
- ☺ 60% of present day galaxy population live in groups (only 10% in clusters)
- Faster evolution in groups since z~1 (Kovac et al. 2010)
- ☺ High redshift groups are structures in formation and allow to link structure formation and galaxy evolution

- We use ECDFS X-ray detected groups (see Alexis' talk) + 3 structures in GOODS-N (Elbaz et al. 2007, Popesso et al. 2012) and GOODS-S (Kurk et al. 2009)

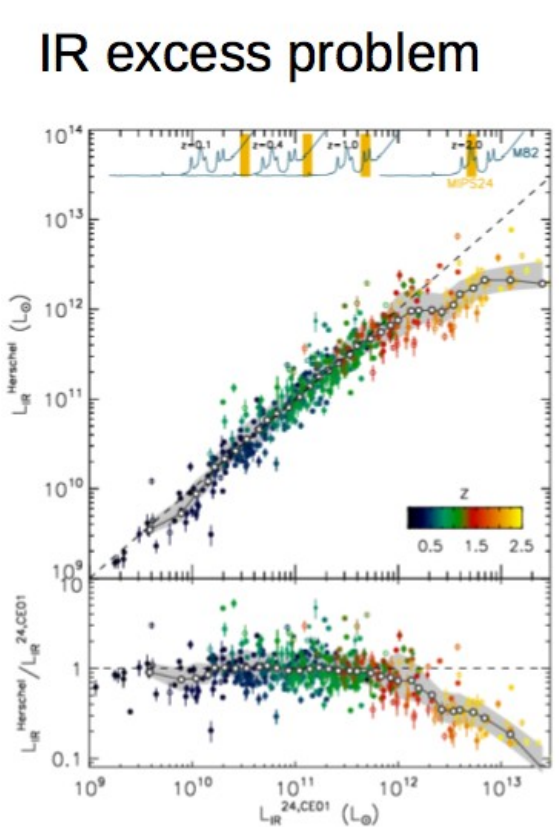
Data

- Spectroscopic catalog obtained by combining Cooper et al. (2011, Arizona Chandra Deep Field Survey), Silverman et al. (2008) and GMASS redshifts (Cimatti et al. 2005)
- Photometric catalog (with z_phot) of Cardamone et al. (2010, broad band photometry from MUSYC survey plus intermediate band photometry)
- PACS data from PEP survey ECDFS and PEP+GH GOODS observations (including deep MIPS catalogs)

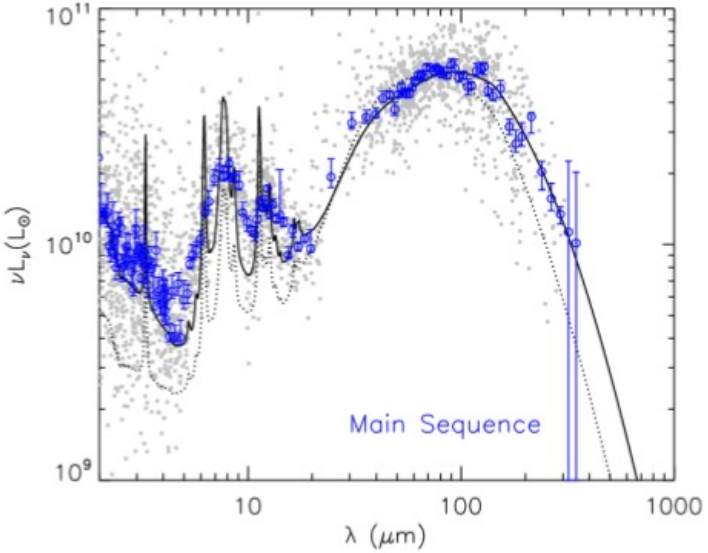
Estimated quantities:

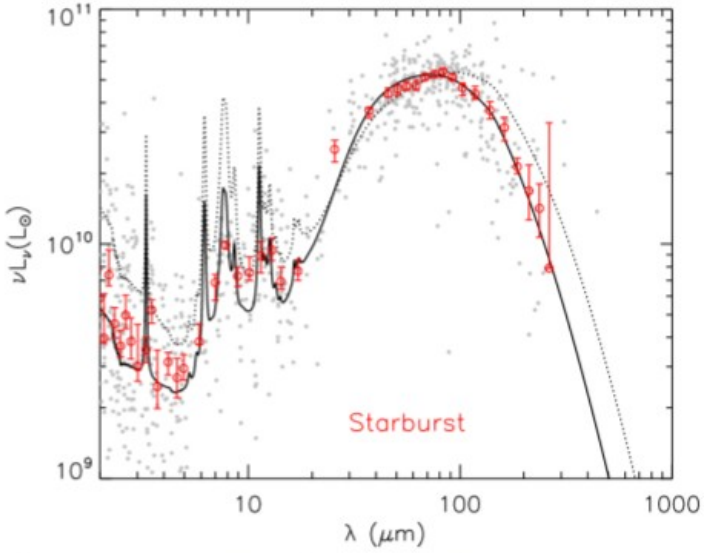
- SFR from PACS, MIPS and SED
- Stellar masses
- Local galaxy density

The infrared excess problem



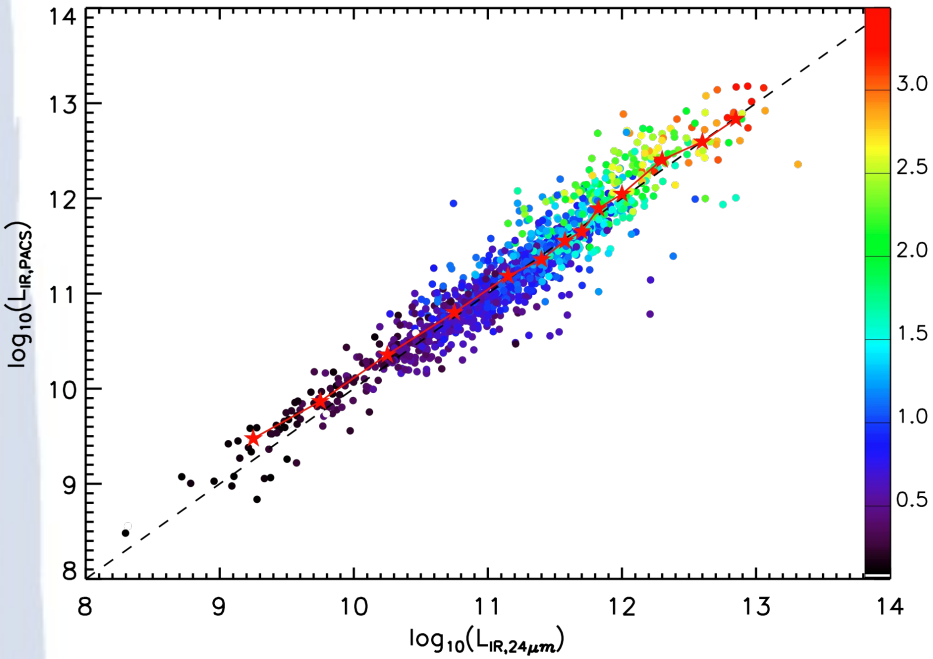
To avoid IR excess problem (Nordon et al. 2010, Elbaz et al. 2011) especially at z~1.5, we use Elbaz et al. (2011) new templates

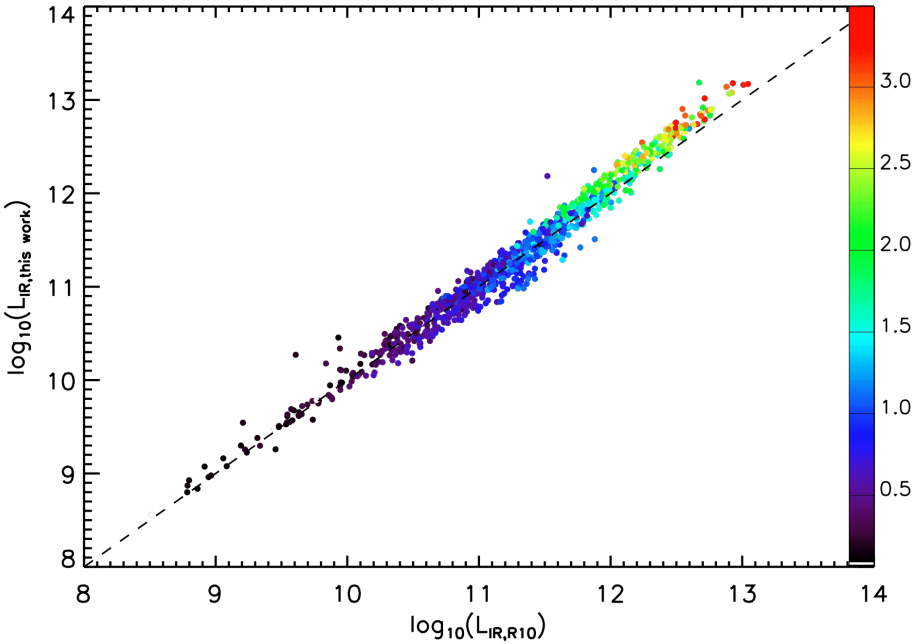




The SFR from PACS and MIPS

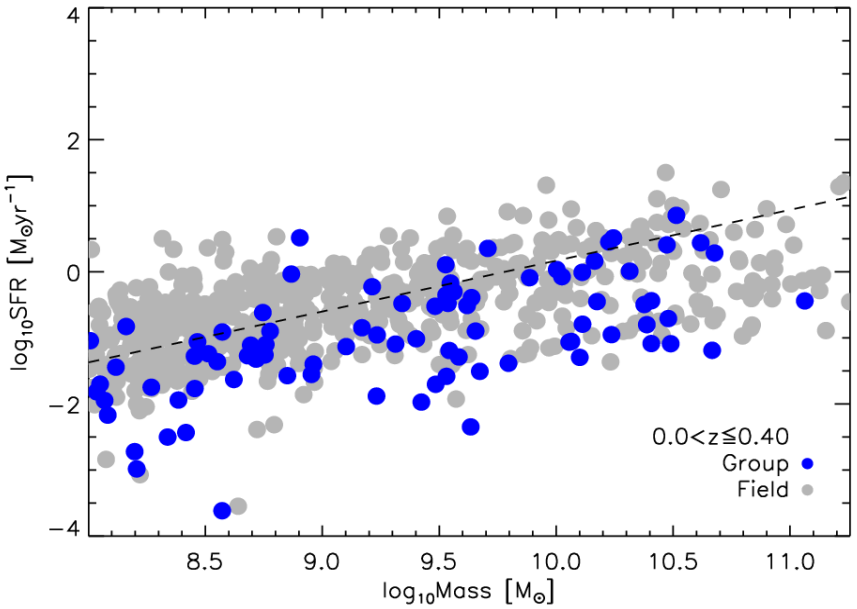
MIPS vs. PACS

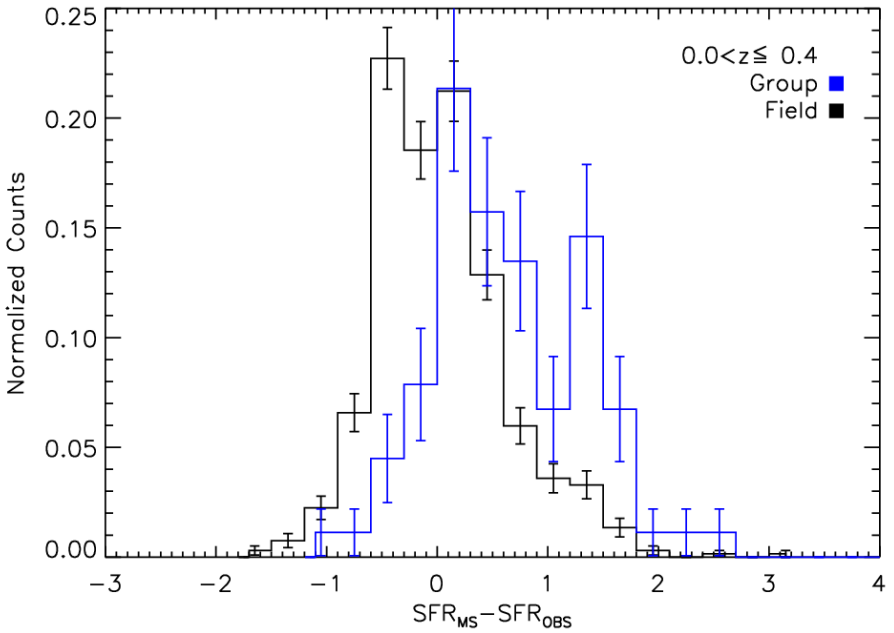




Rodighiero et al. (2010)

Group Galaxies in the SFR-M plane





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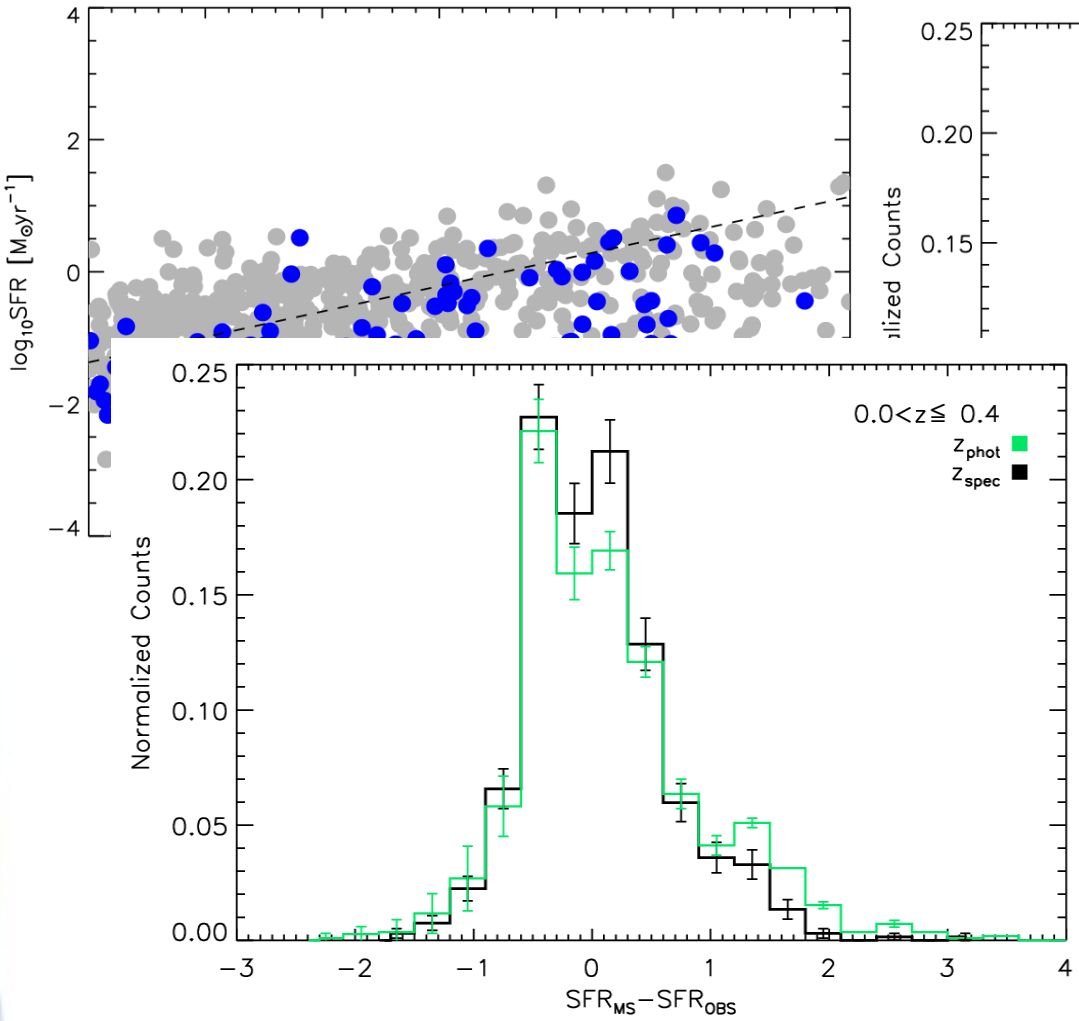

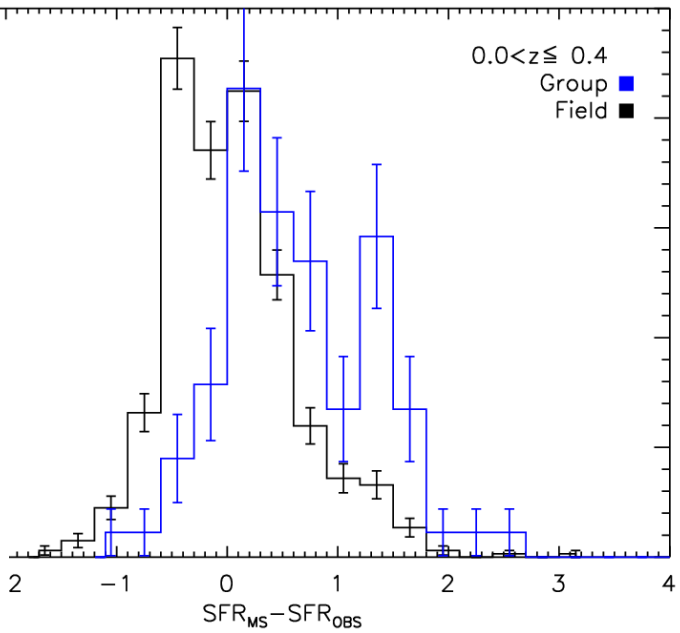

Spectroscopic sample of the field unbiased w.r.t. the photometric one

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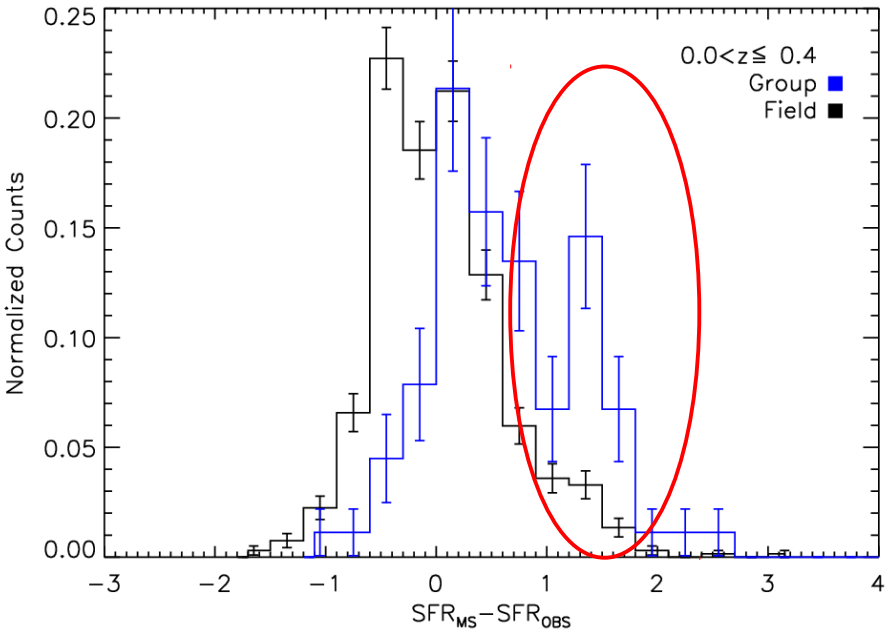

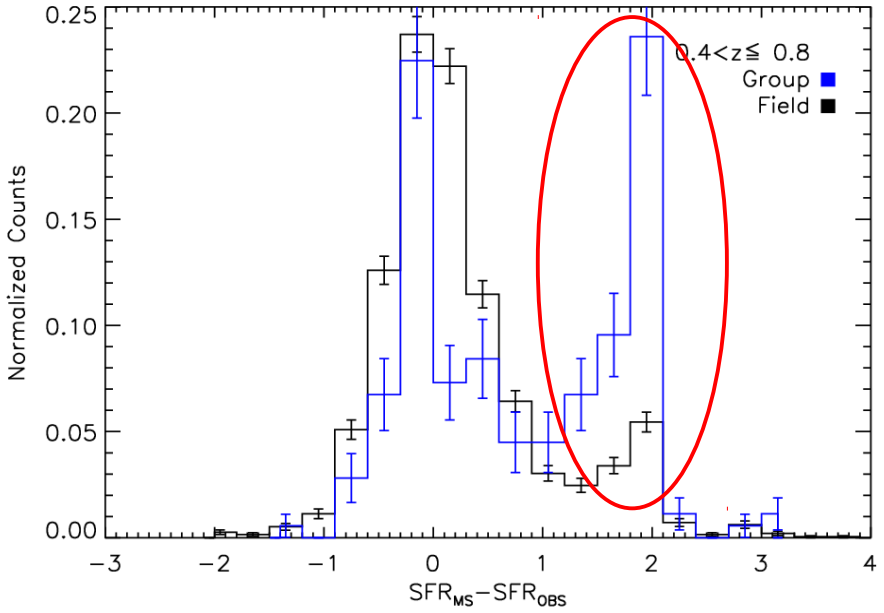

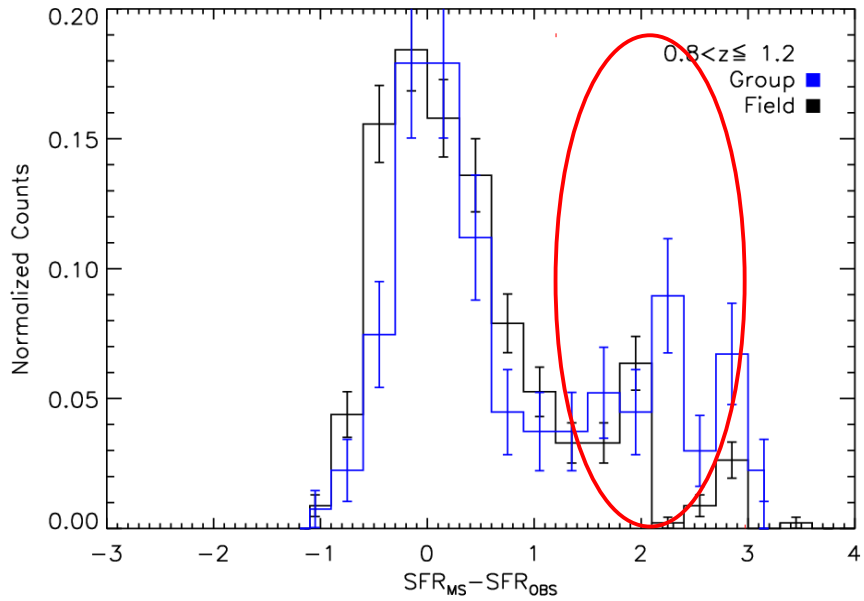

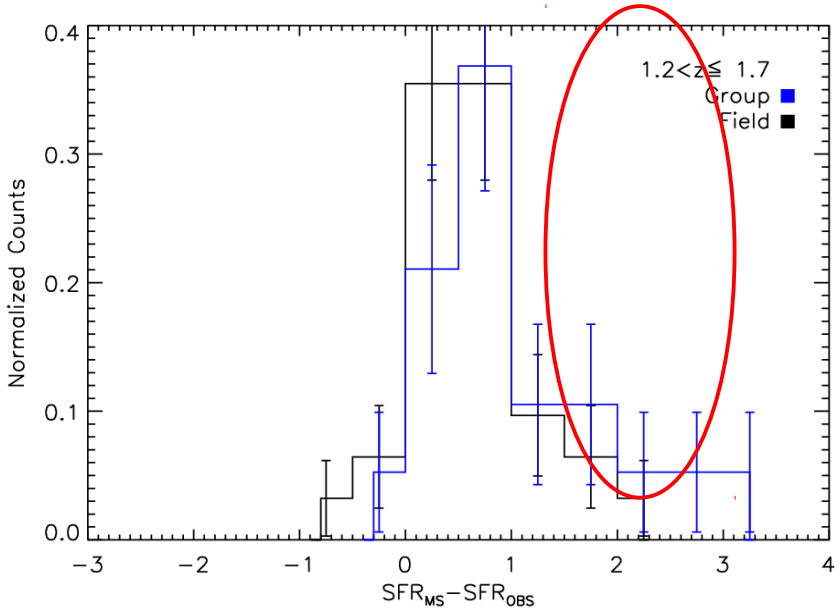

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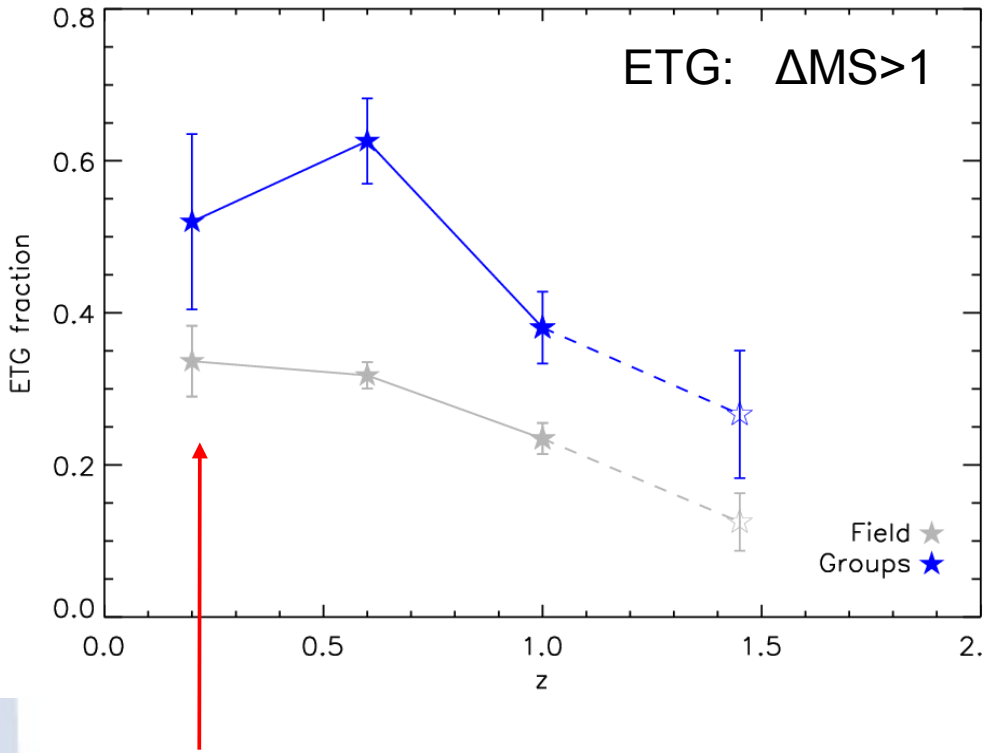
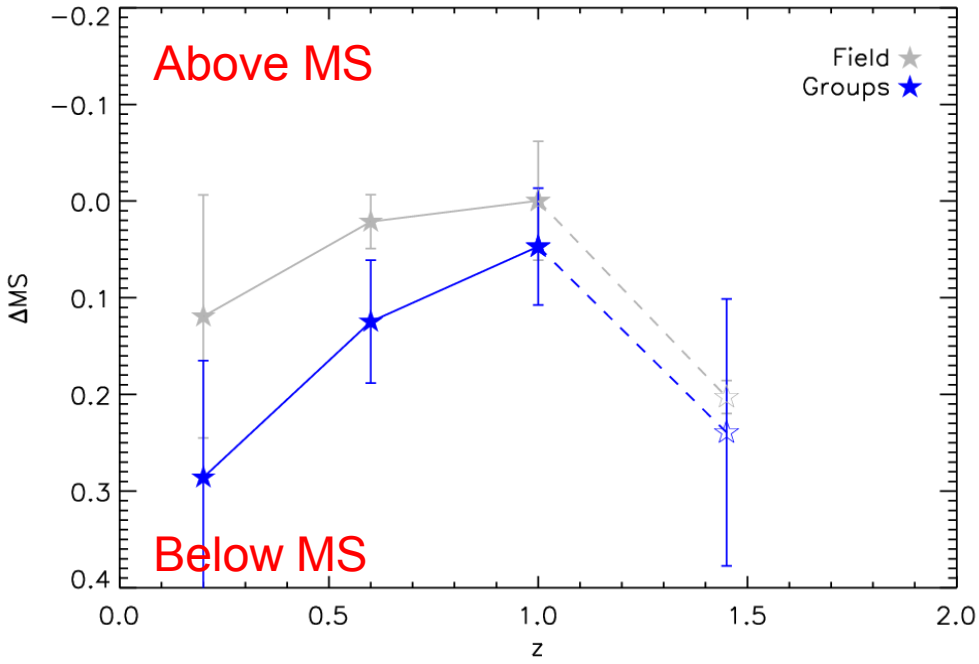
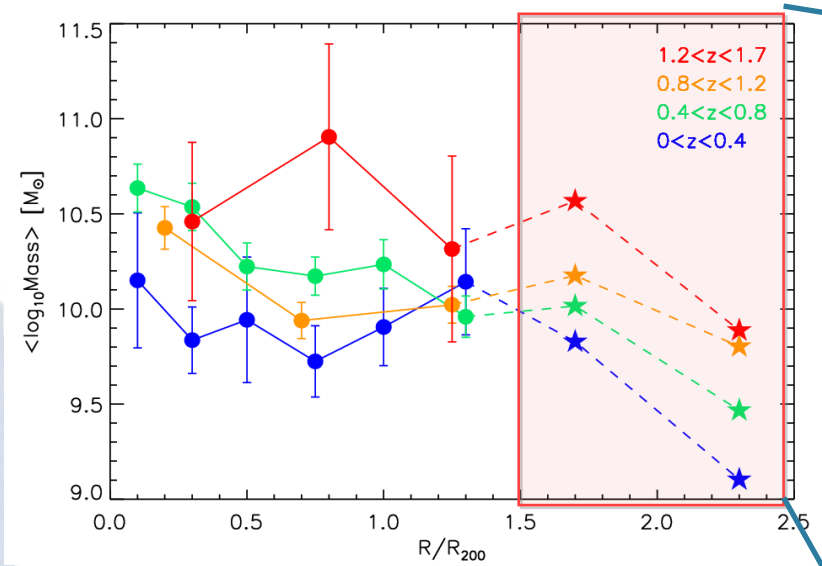
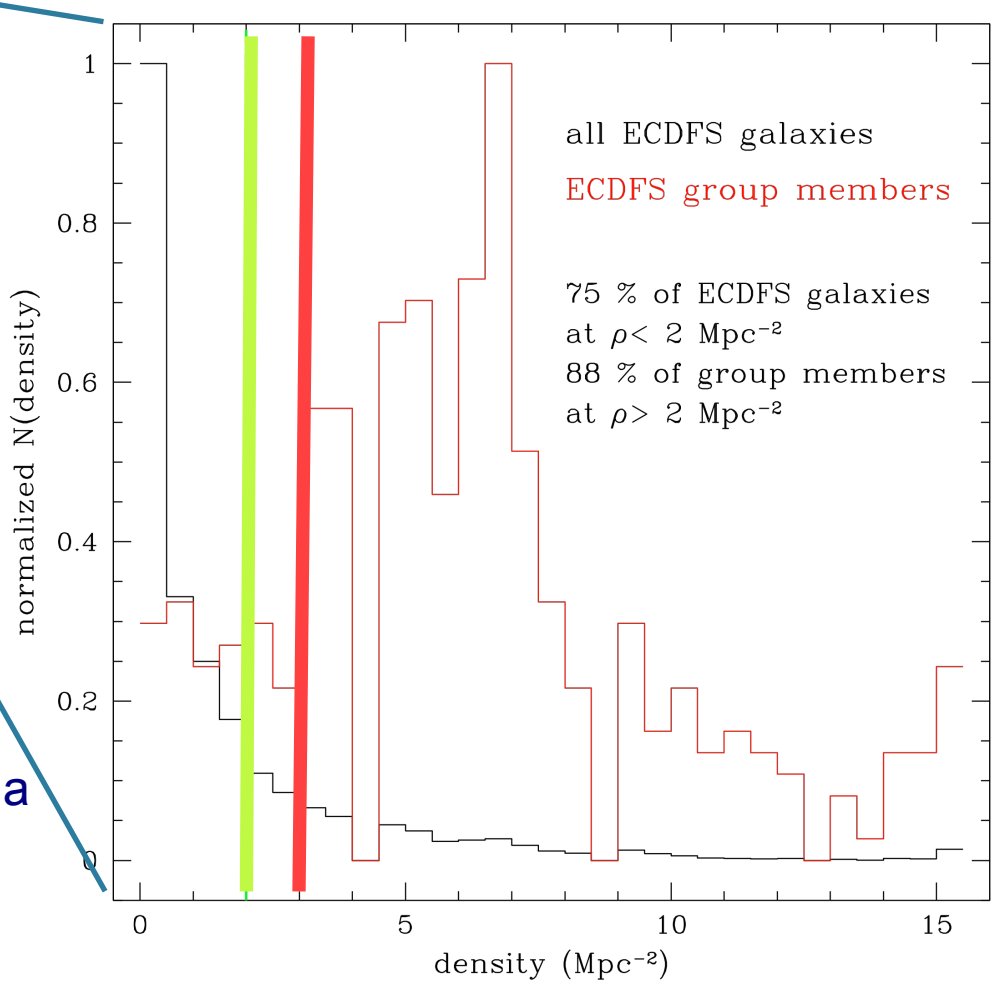


- We are missing passive galaxies at 0<z<0.4
- Adding COSMOS will remove this bias



SF activity vs R/R200 and more...





Density computation:

Same method used as in Popesso et al. 2011 (number of galaxies with $M > M_{lim}$ in a cylinder of 0.75 Mpc around each galaxy and with $|\Delta z| < 3000$ km/s, corrected for incompleteness)

Field from group galaxies nicely separated

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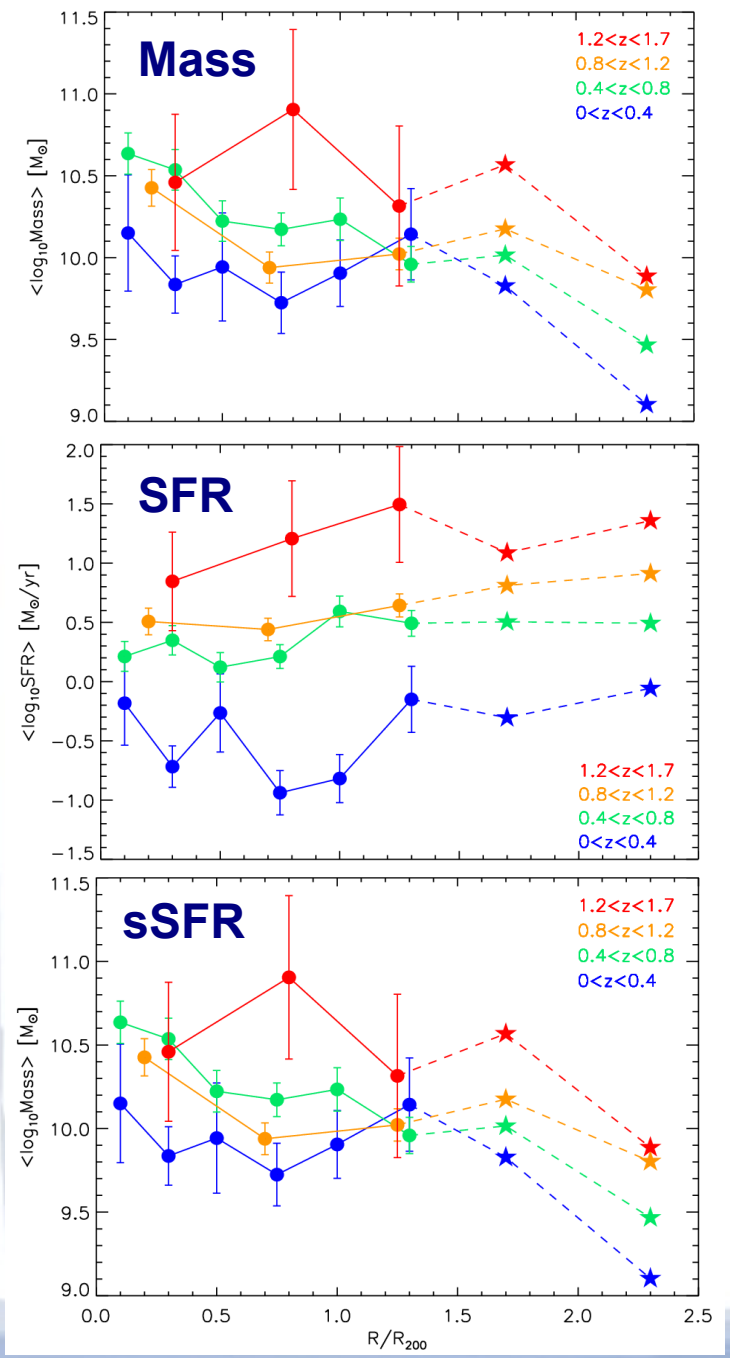
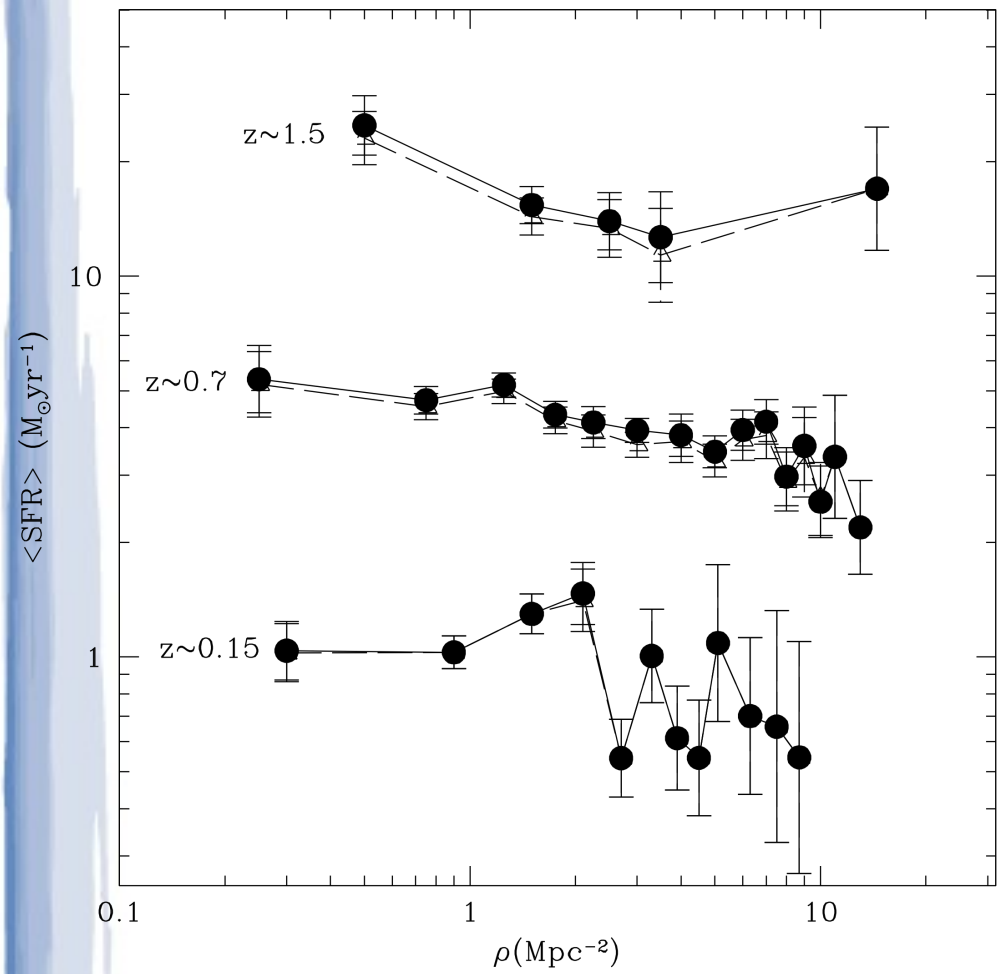


- Mass segregation at every z bin
- Incompleteness for early type galaxies at 0<z<0.4
- SFR seems to be similar for groups and field with a slight increase towards higher groupcentric distances
- sSFR decreases with group centric distance
- 1.2<z<1.6 group in formation (Kurk+2009) used as comparison but not much statistics

SFR-density distribution



- Mean based on all galaxies with SFR > 1 $M_{sun}yr^{-1}$
- Error bars based on Monte Carlo Simulations
- Spearman test provides 7σ anti-correlation
- removing AGN (catalog provided by V. Mainieri based on 4Ms, dashed line) does not change the SFR-density relation

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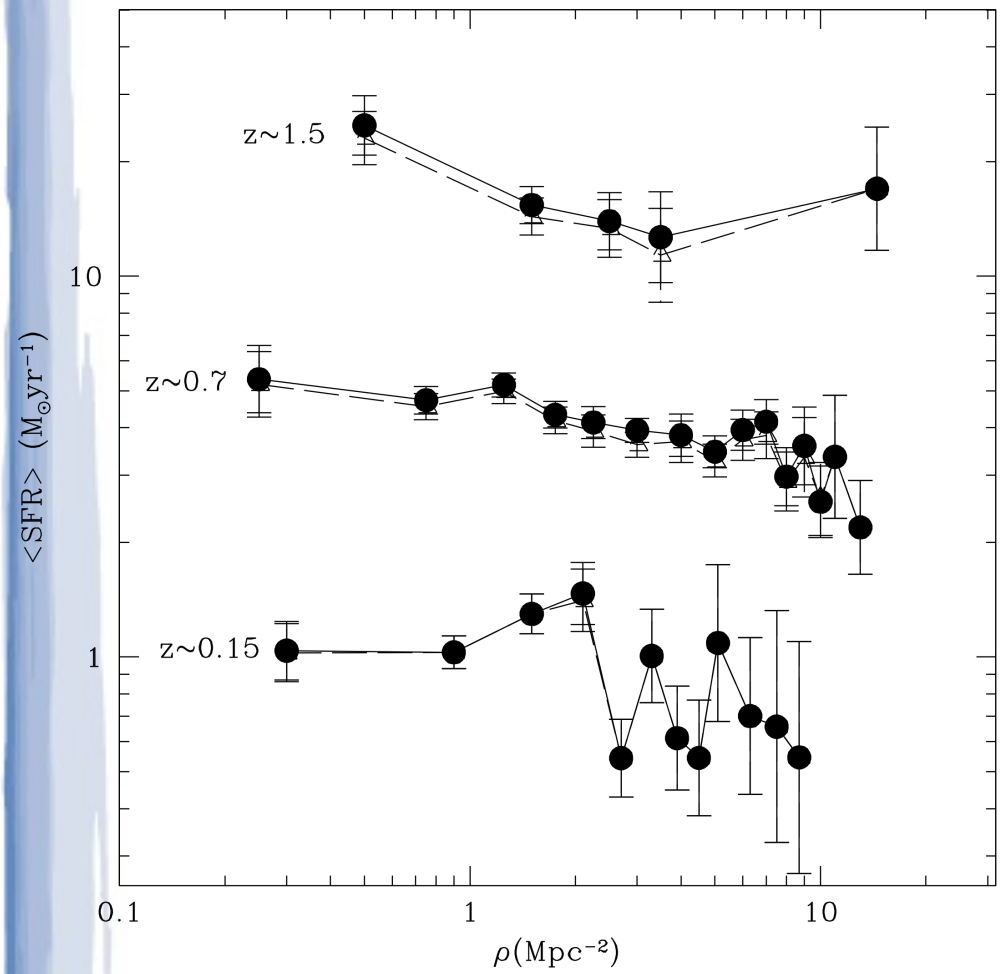

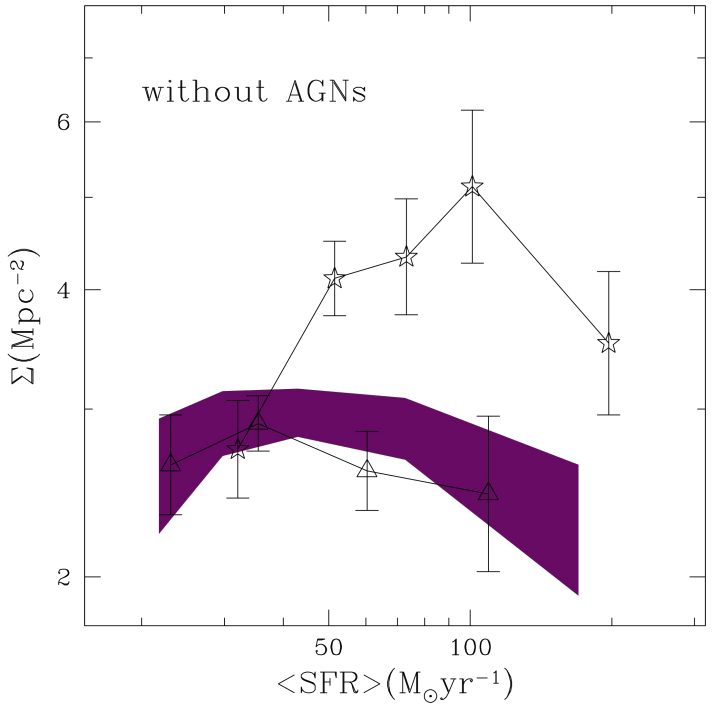

Popesso et al. 2011: removal of AGN destroys the so-called reversal of the sfr-density relation in GOODS fields (where AGN are 17% of the sample). In ECDFS AGN are only 3%

Conclusions

We study the SF activity in ECDFS+GOODS groups as a function of redshift and environment. We find:

- ETG fraction decreases with z, however incompleteness of passive galaxies at low z
- SF activity comparable in groups and field
- More massive galaxies in groups at any redshifts
- SFR-density relation holds, no reversal (neither after removing AGNs)