
# Large-scale structure in the KiDS/DR3: from groups to voids

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# Summary

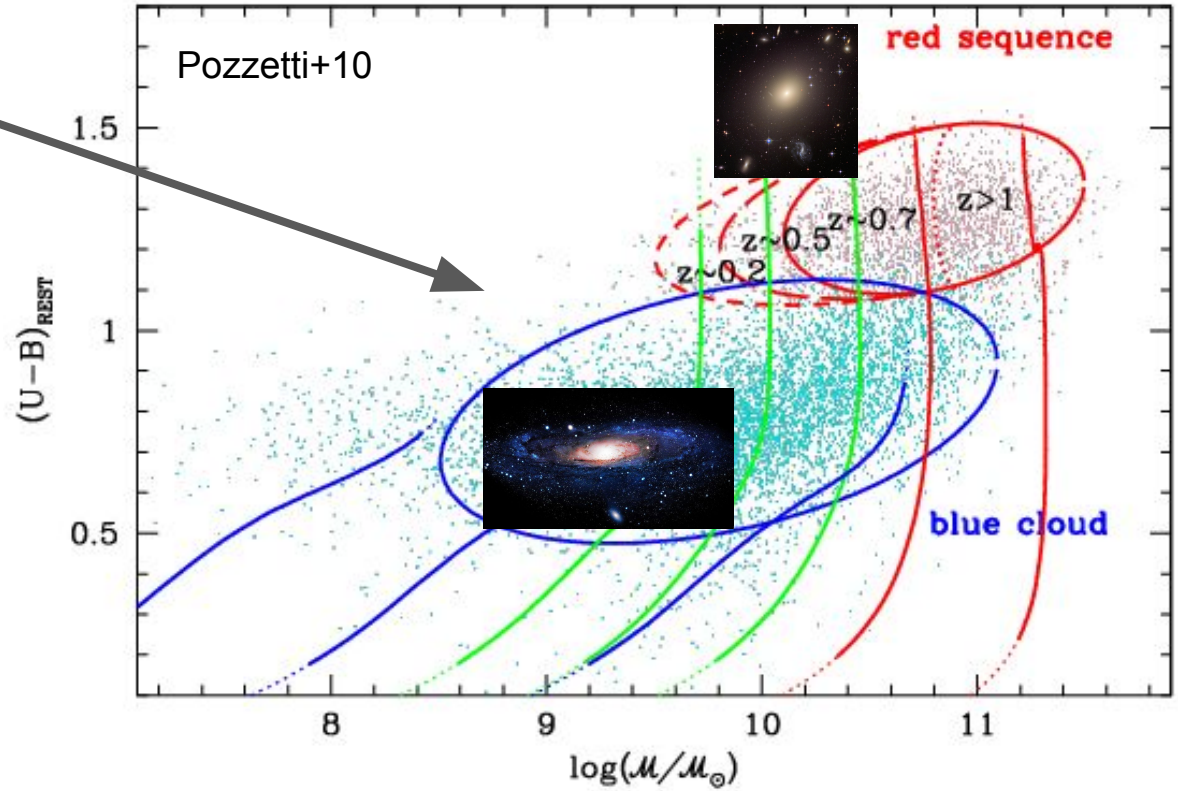
- Introduction
- GAMA and KiDS surveys
- The galaxy environment in GAMA/G3C groups using the KiDS/DR3 database
- Voids identification and weak lensing analysis (ongoing project)

# What do we observe in the local Universe?

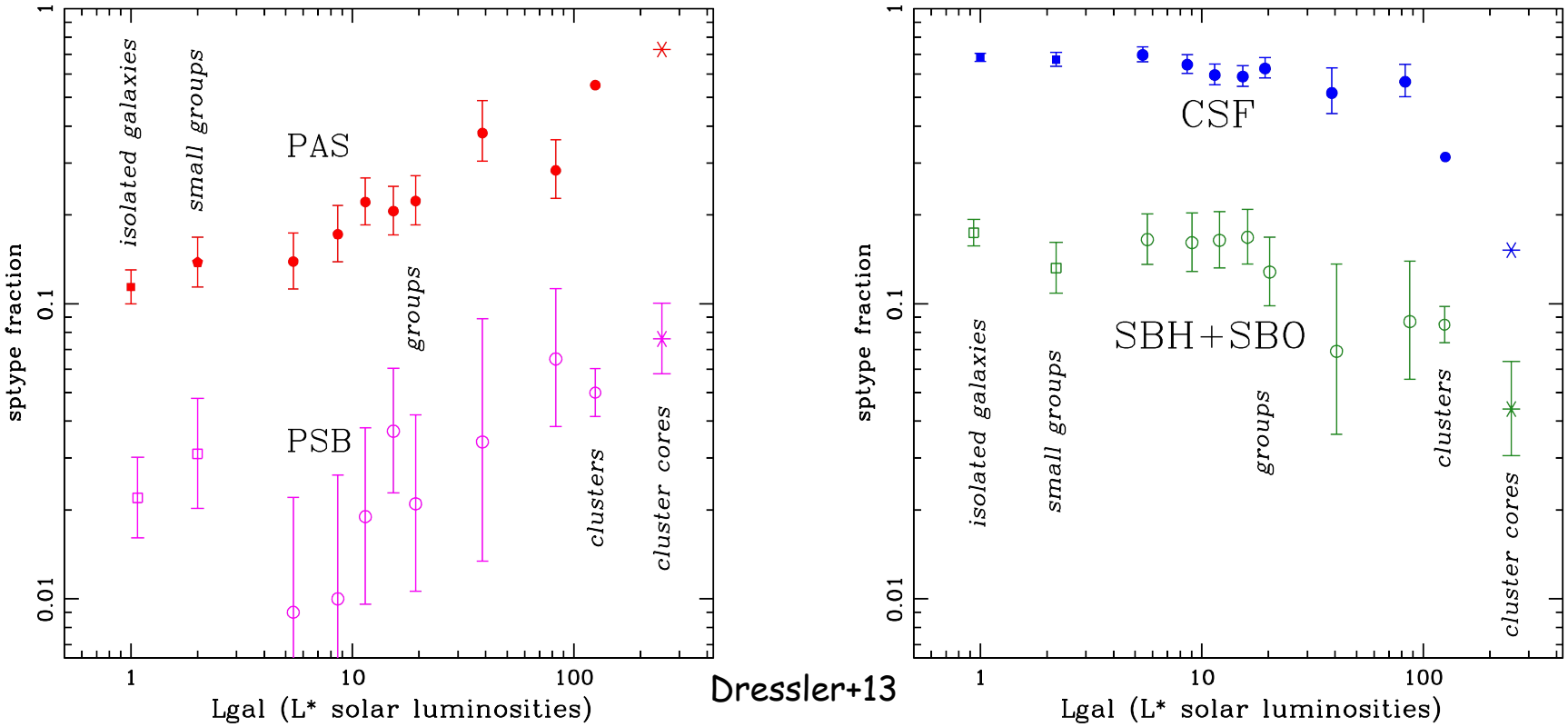
How do the galaxies go from blue cloud to red sequence?

Several mechanisms are proposed to quench galaxies.

Internal and External processes

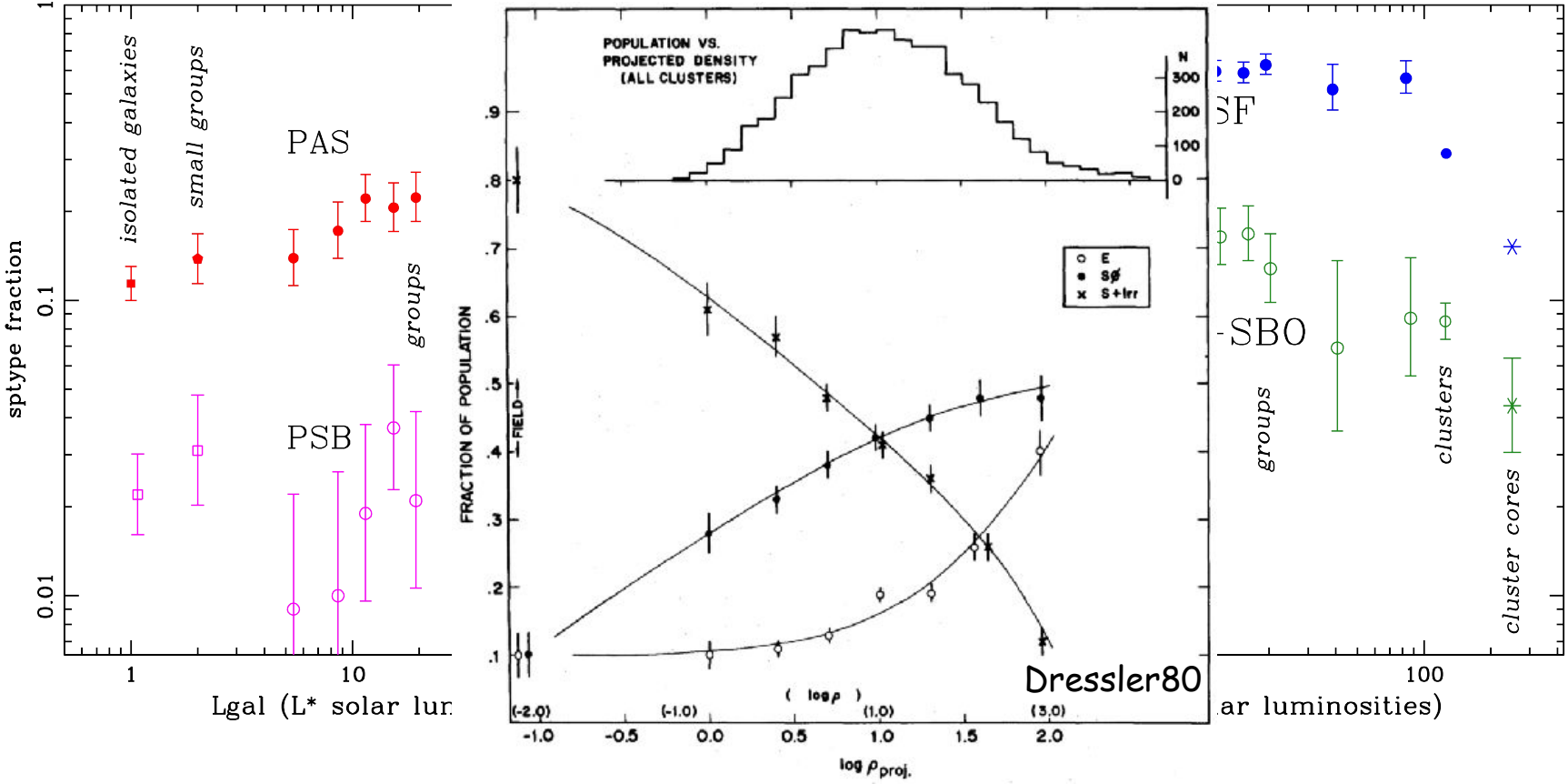


# What do we observe in the local Universe?




Dressler+13

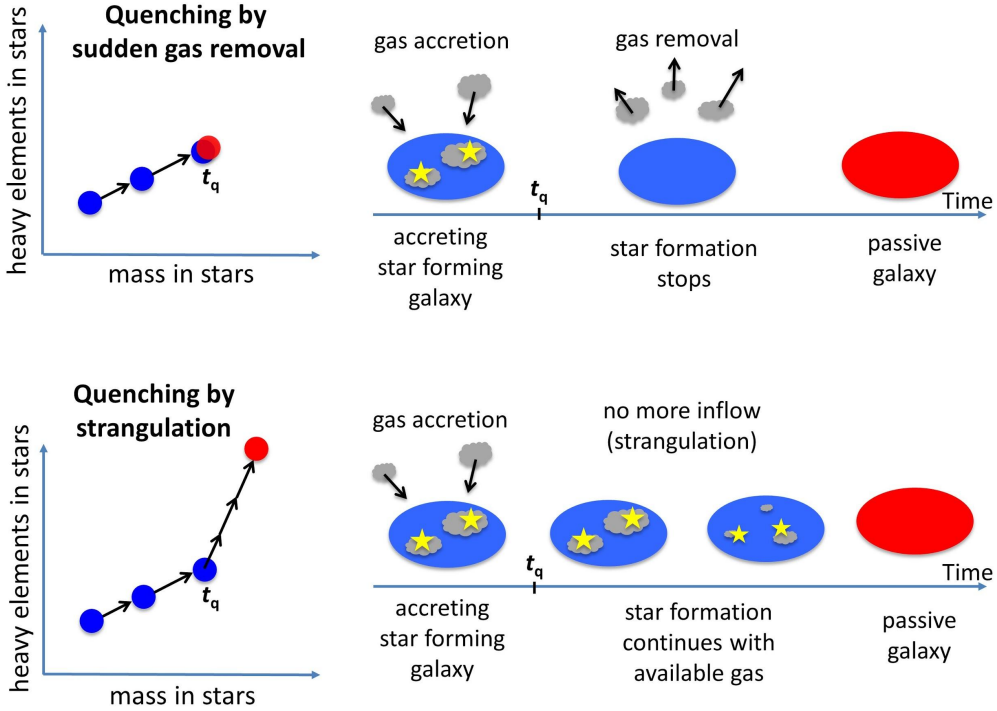
# What do we observe in the local Universe?



# And the analytical models...

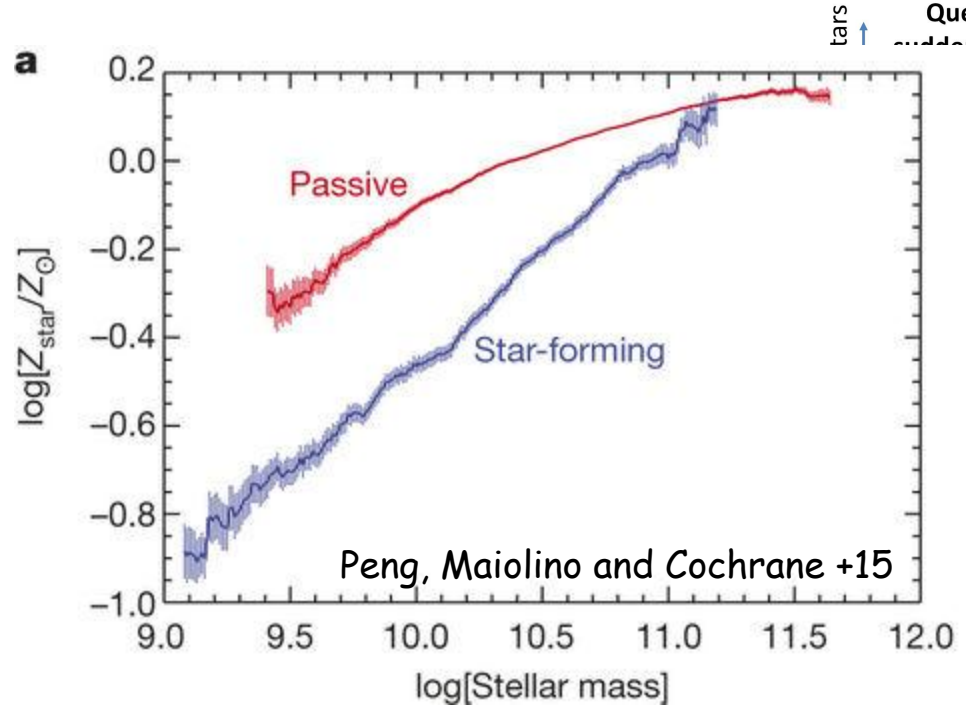
- Assuming SFR efficiency, metal enrichment and gas removal laws (as function of stellar mass), it is possible to constraint the time scales and final characteristcs of galaxies.

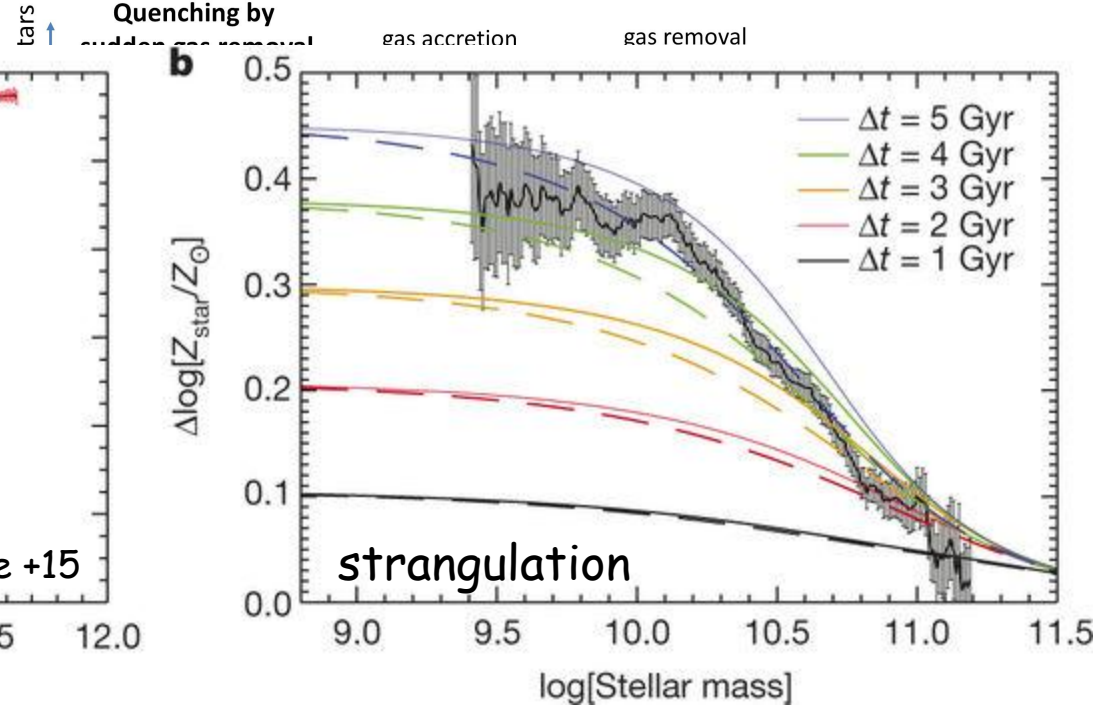
- **Strangulation or outflows?**




Peng, Maiolino and Cochrane +15

# And the analytical models...



# And the analytical models...

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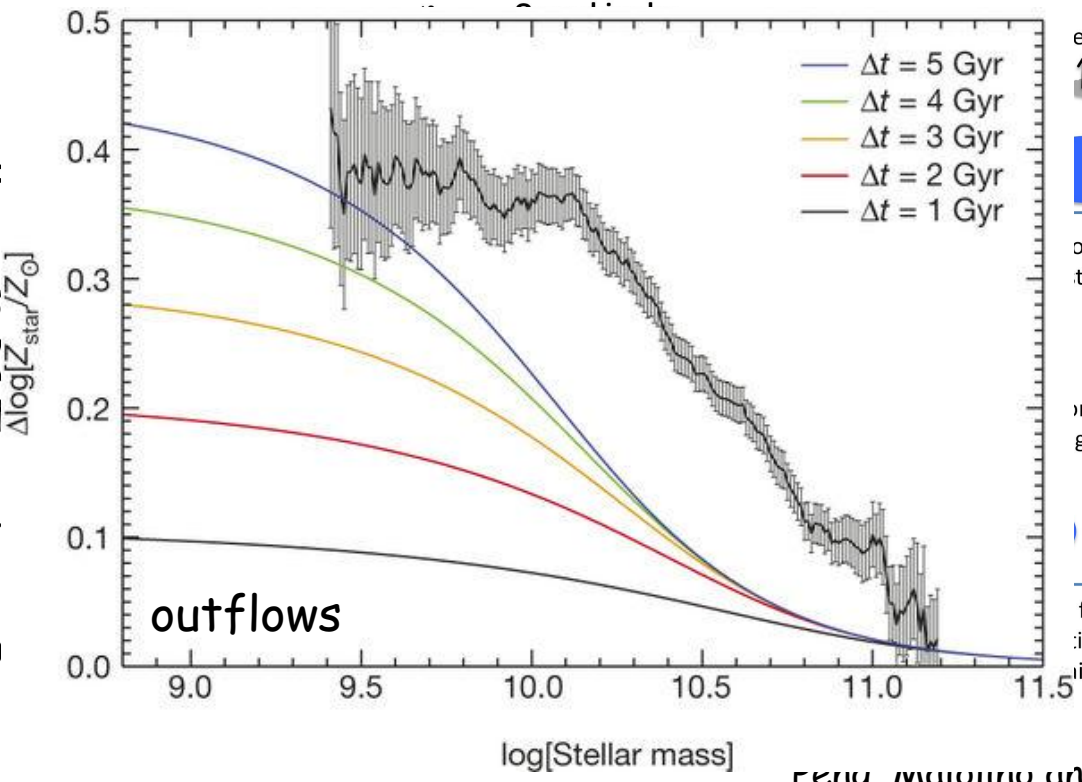
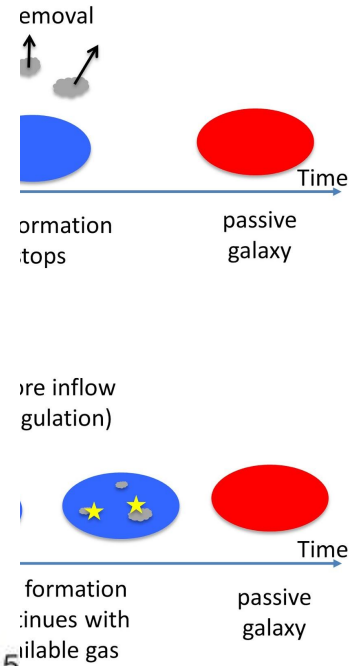
- **Strangulatio**



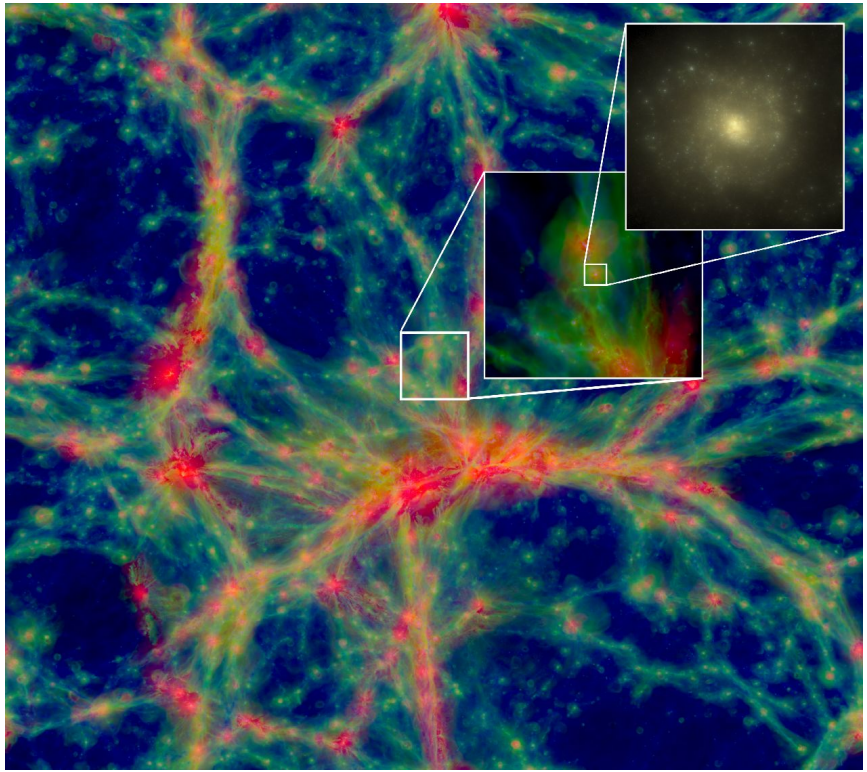

Feng, Maiolino and Cochrane +15

# And N-body simulations + gas component...

- N-body simulations are important to investigate the halo/LSS formation and evolution through cosmic time.

- The understanding of the baryonic part says how much we know about star formation, gas cooling, etc.

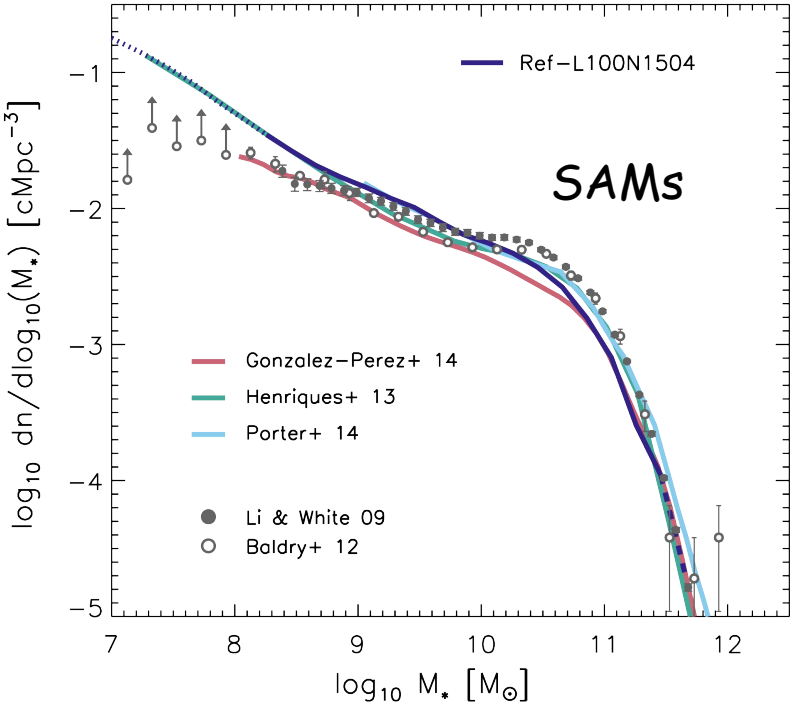
- AGN feedback, SF laws, SAMs



EAGLE Simulation (Schaye+15)

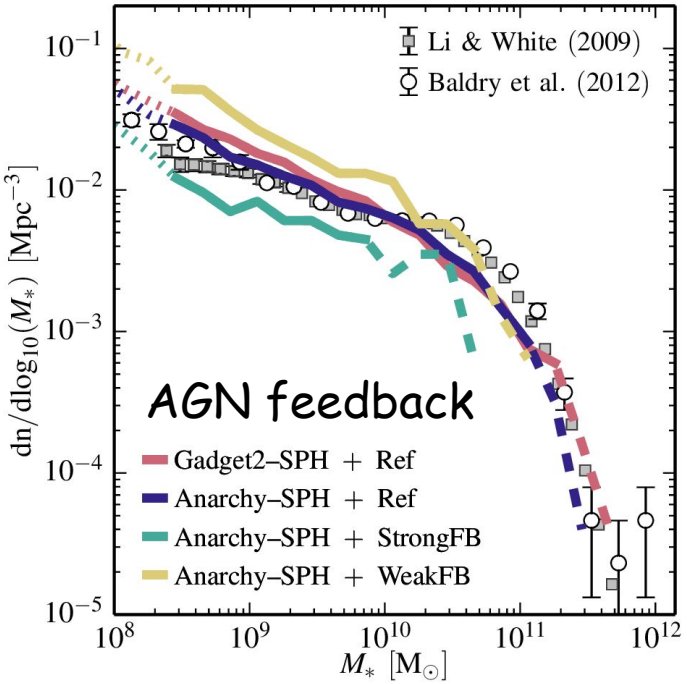
# And N-body simulations + gas component...

GSMFs in EAGLE simulations




Schaye+15

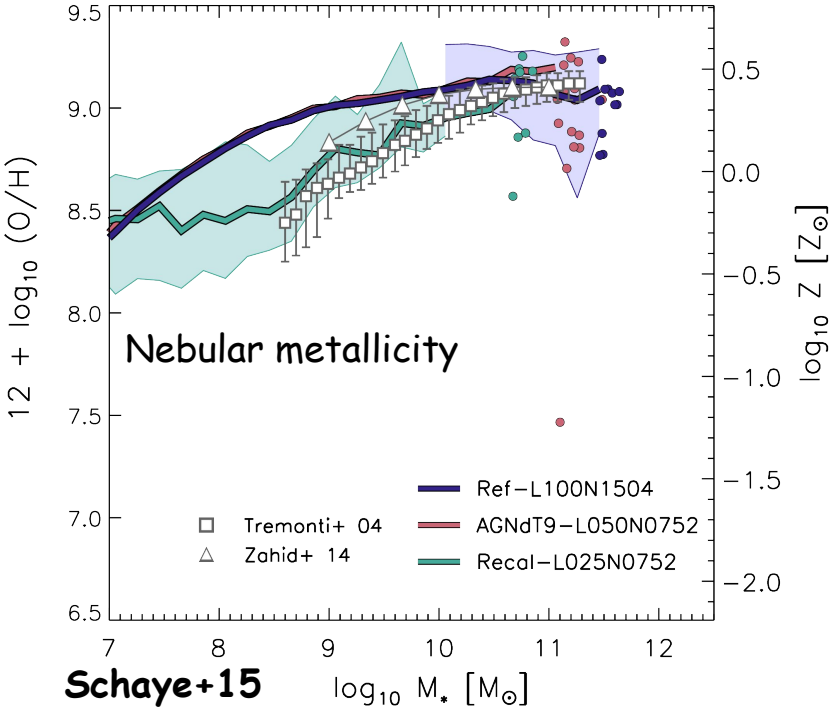
Hydrodynamical treatment



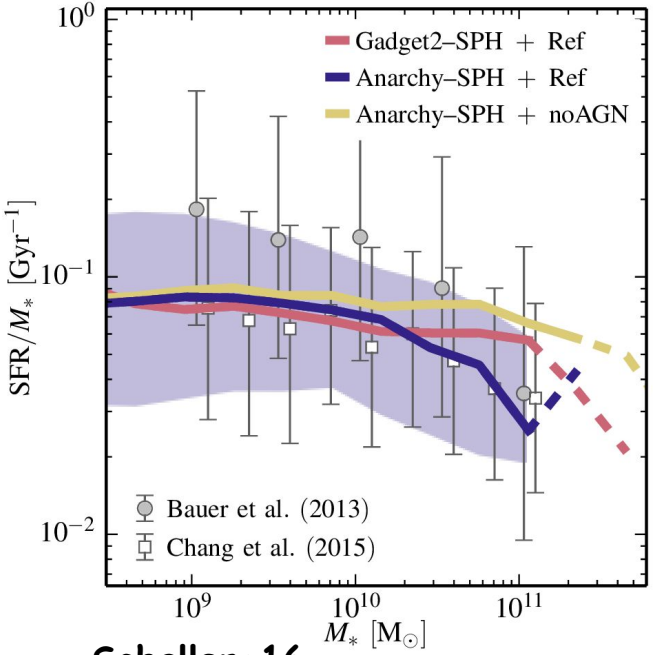

Schaller+16

# And N-body simulations + gas component...

Other galaxy properties in EAGLE simulations

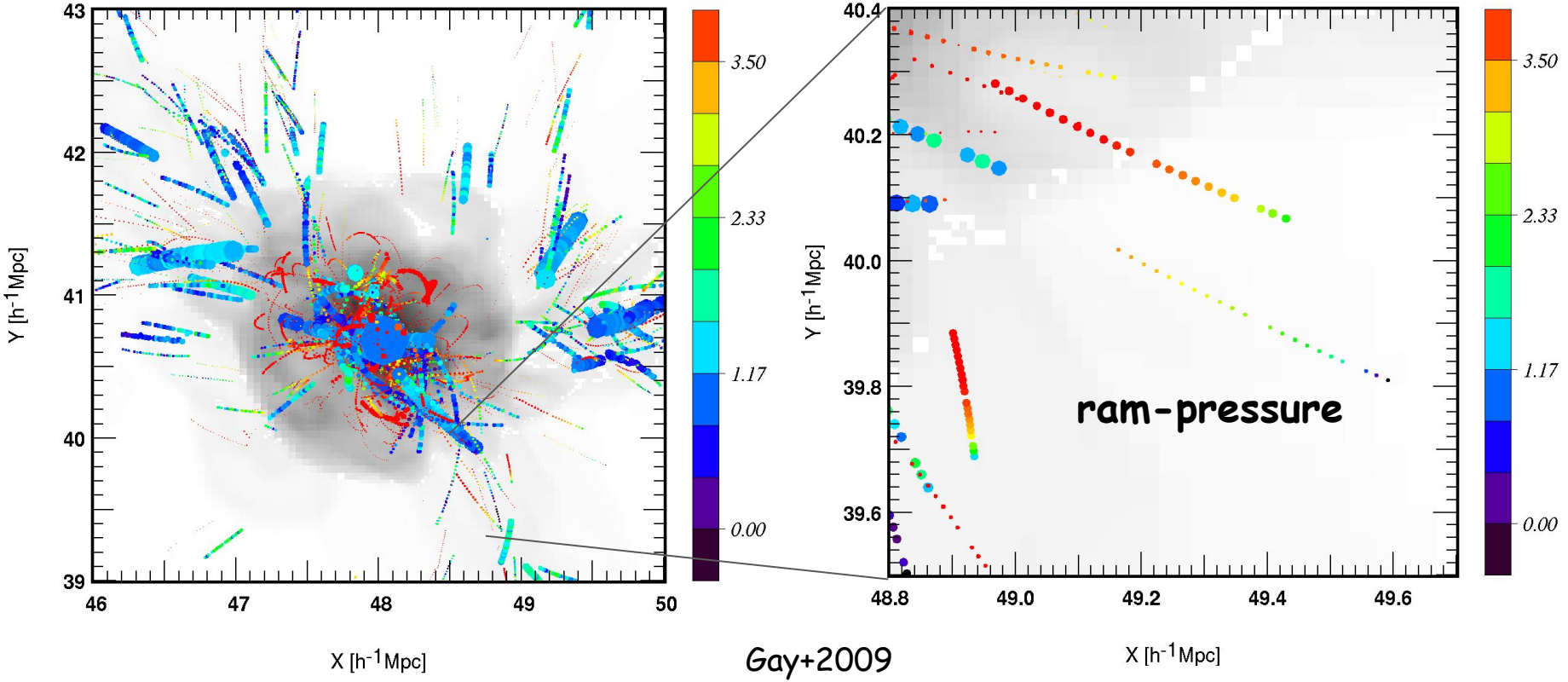



Schaye+15




Schaller+16

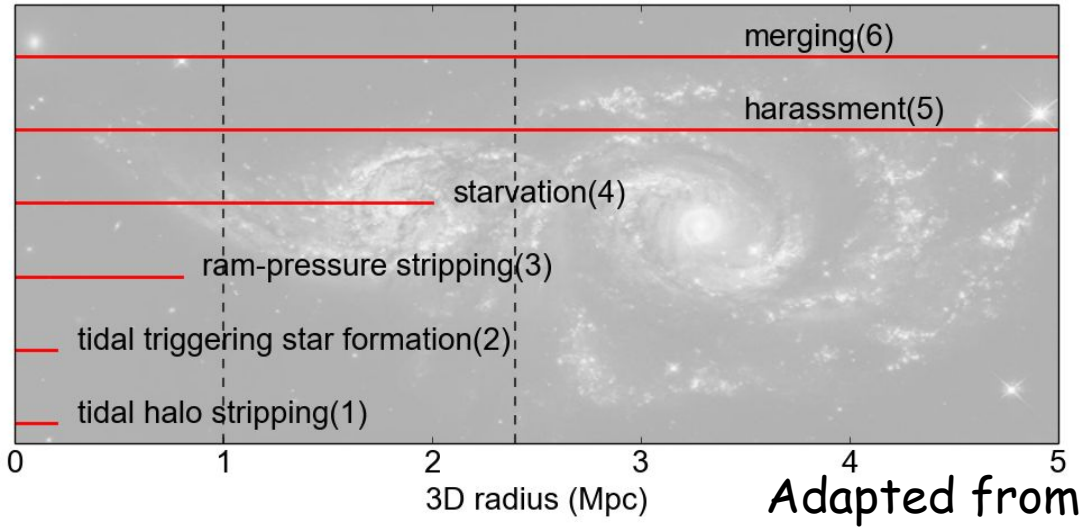
# And N-body simulations + gas component...




Gay+2009

- The galaxy evolution is mostly in agreement between observations and simulations.

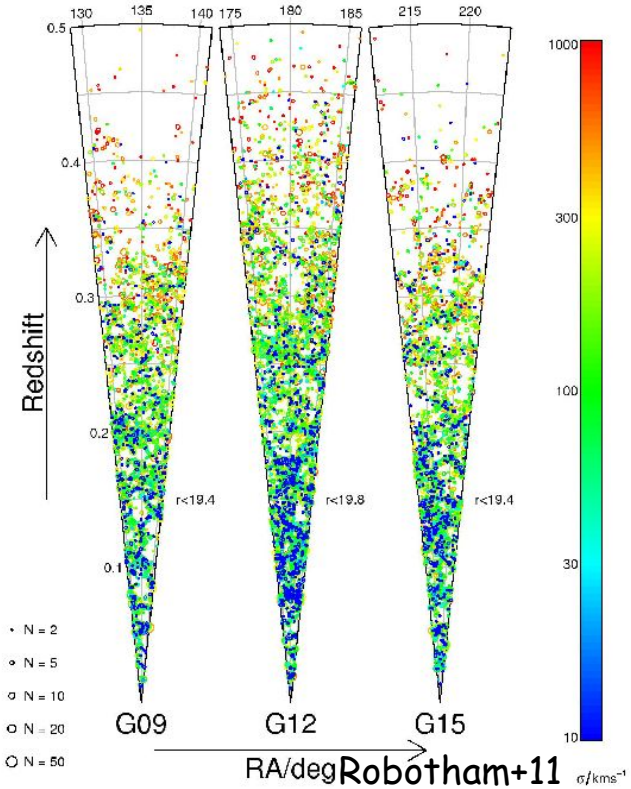
- However, it is still not defined when/where/how each quenching mechanism acts.




Adapted from Treu+09

# GAMA and KiDS surveys

# The GAMA survey is a spectroscopic survey of 300k galaxies down to r=19,8 over 286 deg$^2$.

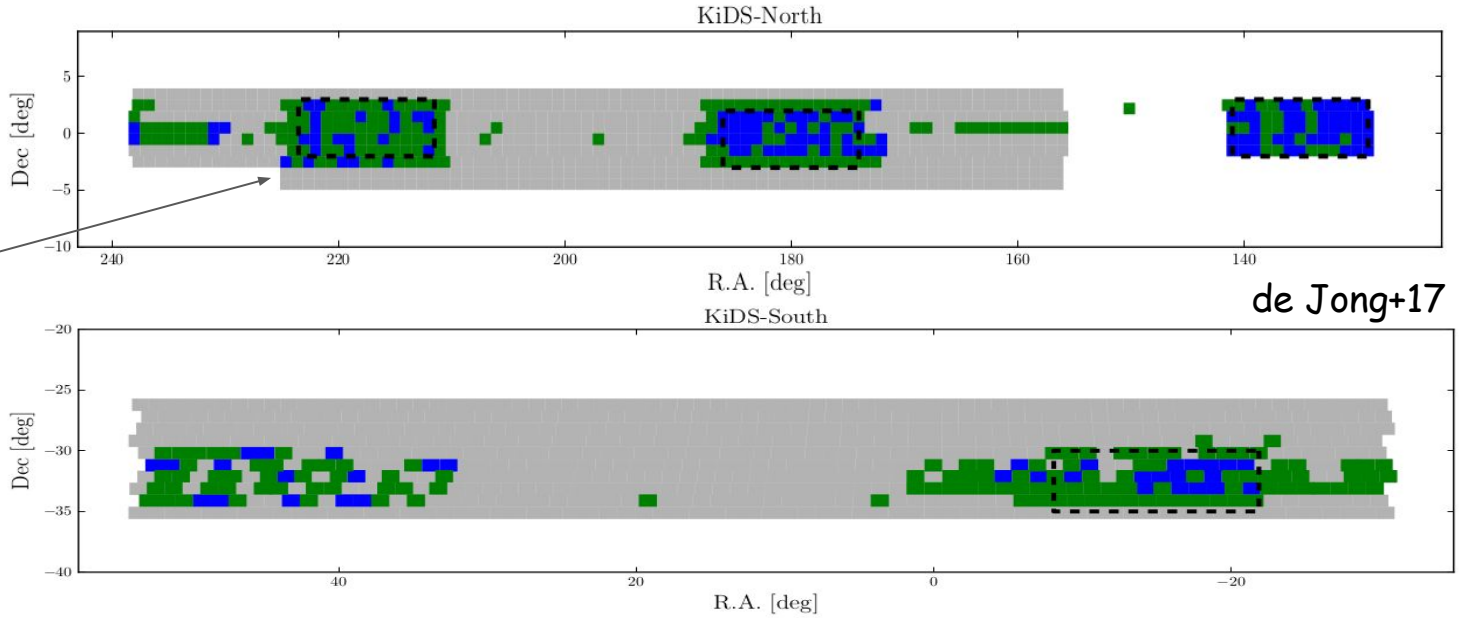



- G3C catalogue is a galaxy group catalogue which has been compiled by using an adaptive FoF algorithm.

- A galaxy population analysis of G3C groups suffers from galaxy completeness due to magnitude-limited sample.


- The KiDS survey covers ~450 sq.deg. in ugri bands down to r=25.

Overlapping with several GAMA fields




de Jong+17


- KiDS sample: volume-limited sample consists of galaxies brighter than r<22.5 and Mr<-19.3.

- Propose a galaxy environment technique adapted to include PDF(z).

- Apply it on KiDS database and investigate the G3C galaxy population as function of the environment.

# The galaxy environment technique

- Galaxy environment is defined as local density of galaxies within a certain volume.

- The k-Nearest Neighbour (kNN) technique is adapted to include the PDFs.

- Neighbours -> Probability of being a neighbour

- We consider a cylinder which its length follows the photo-z uncertainties of KiDS photo-zs.

- Test this technique on KiDS mock catalogue

$$\sigma(R_0, z_0) = \frac{S_k}{\pi R^2_{\mathrm{kNN}}}.$$

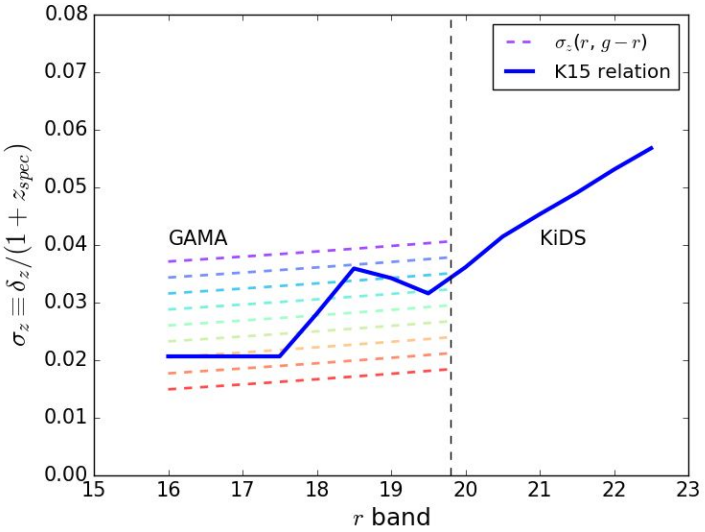
$$P_i = \int_{z_0-\Delta_z(1+z_0)}^{z_0+\Delta_z(1+z_0)} PDF(z)dz.$$

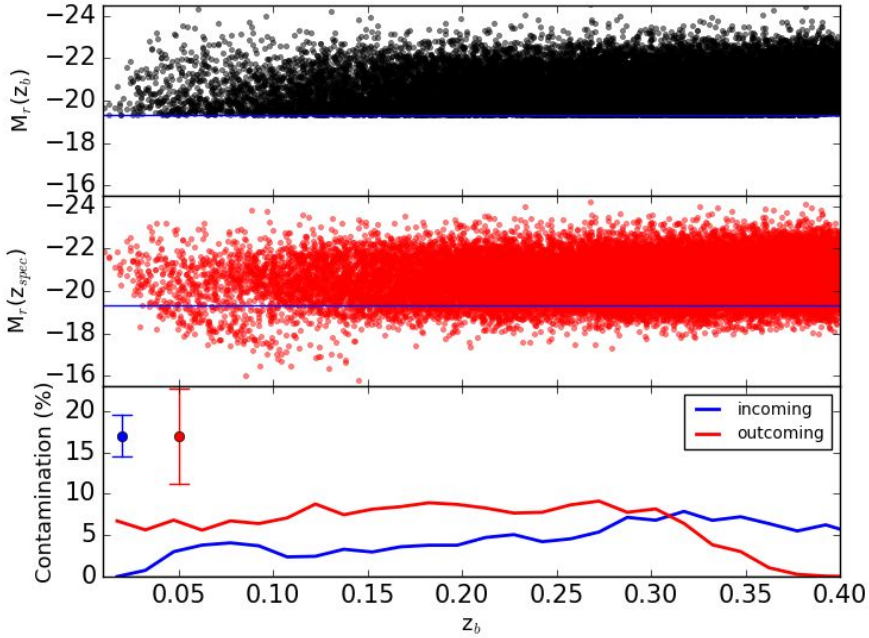
# KiDS mock catalogue

- KiDS-like sample extracted from Merson+12 lightcones.

- The photo-zs are generated by using the match GAMA/KiDS.

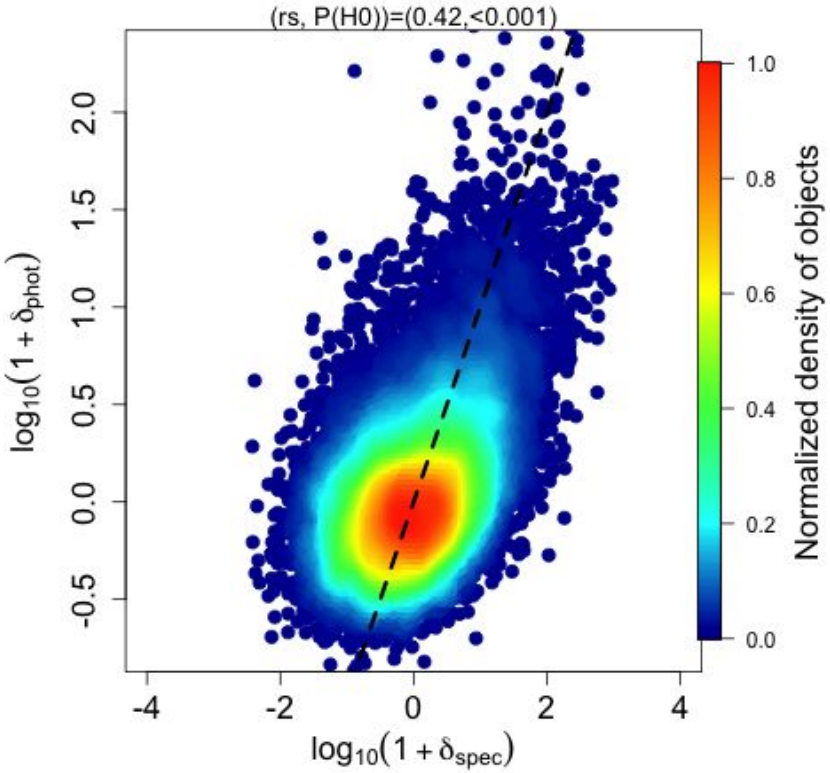
- Contamination due to photo-z uncertainties and border effects are taken into account.

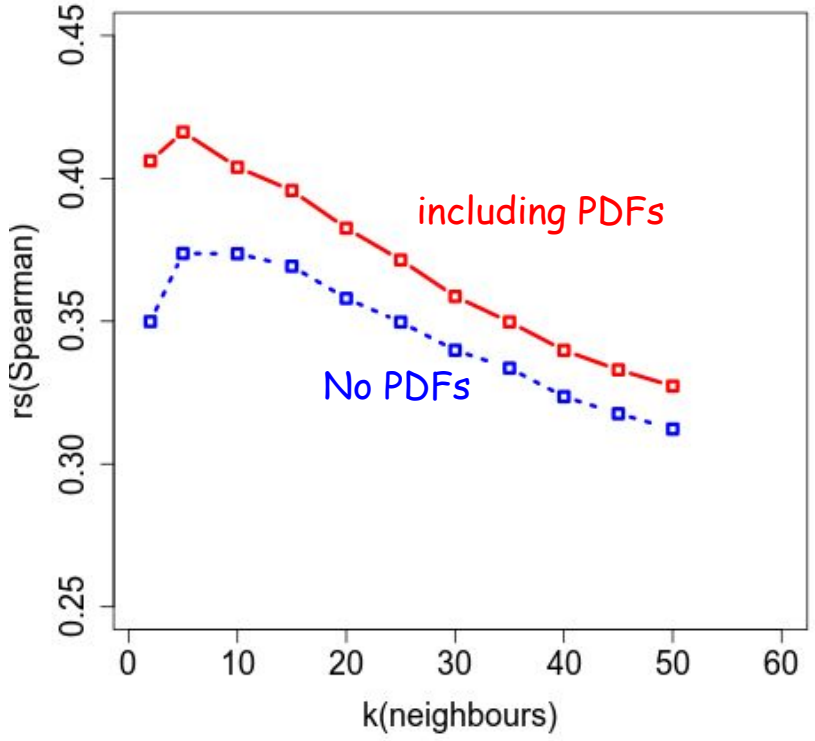


# The galaxy environment technique

Results of KiDS mock catalogues



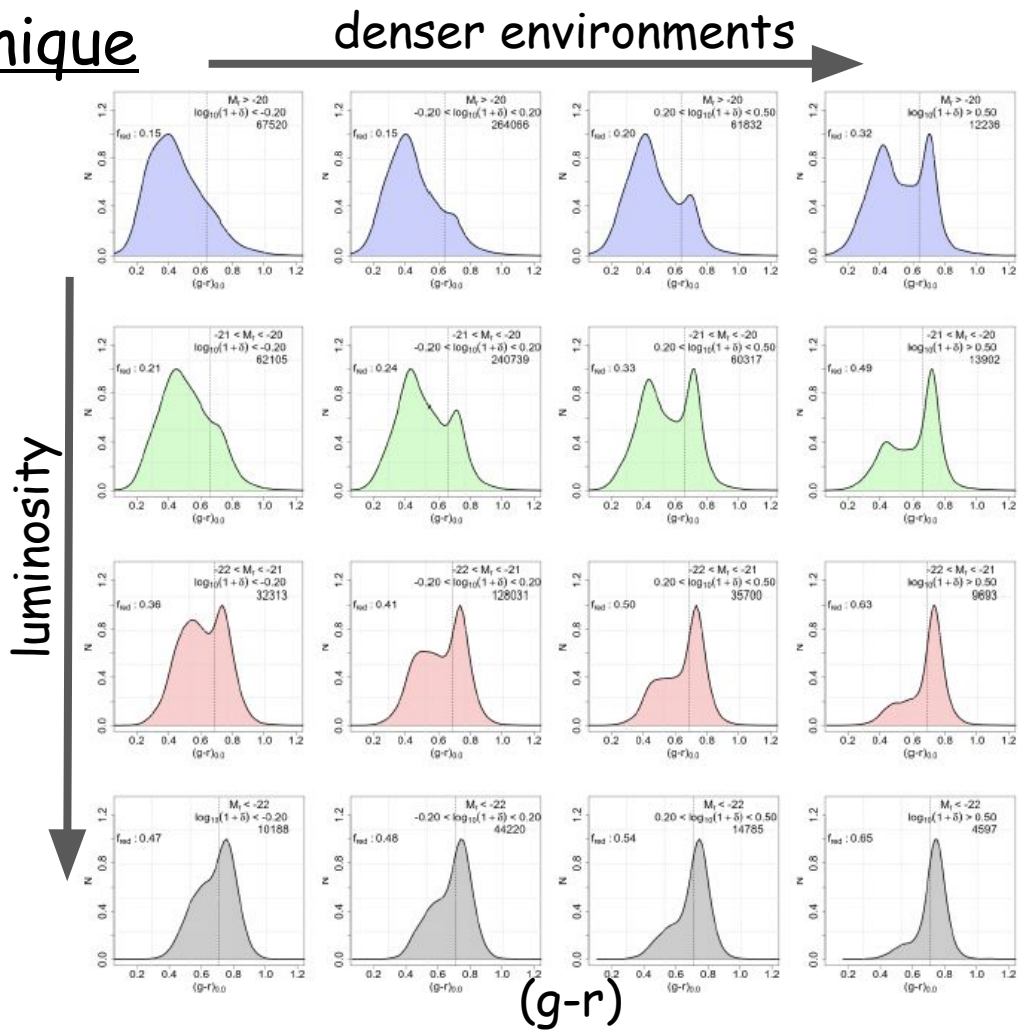




z.

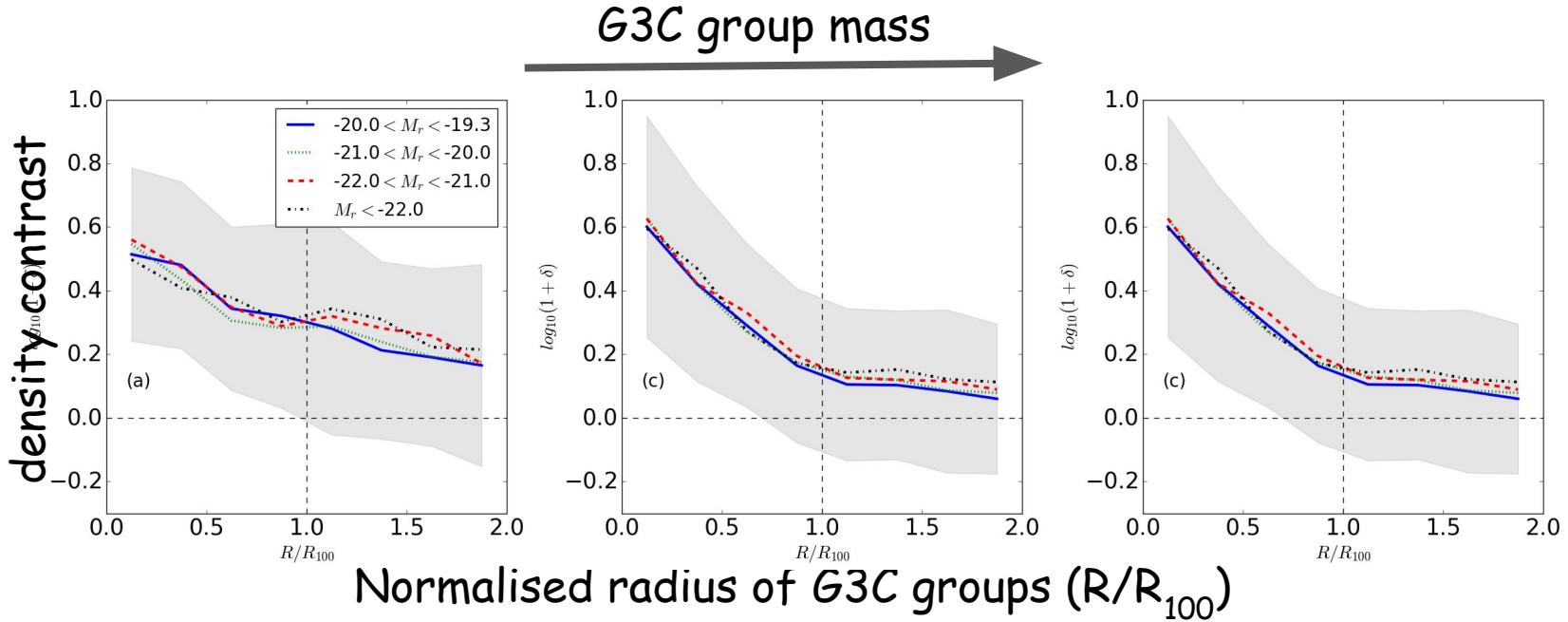
# The galaxy environment technique

- This technique was able to recover the relation between the luminosity, local density and (g-r).

- Denser environments present higher fraction of red galaxies for a certain luminosity bin.



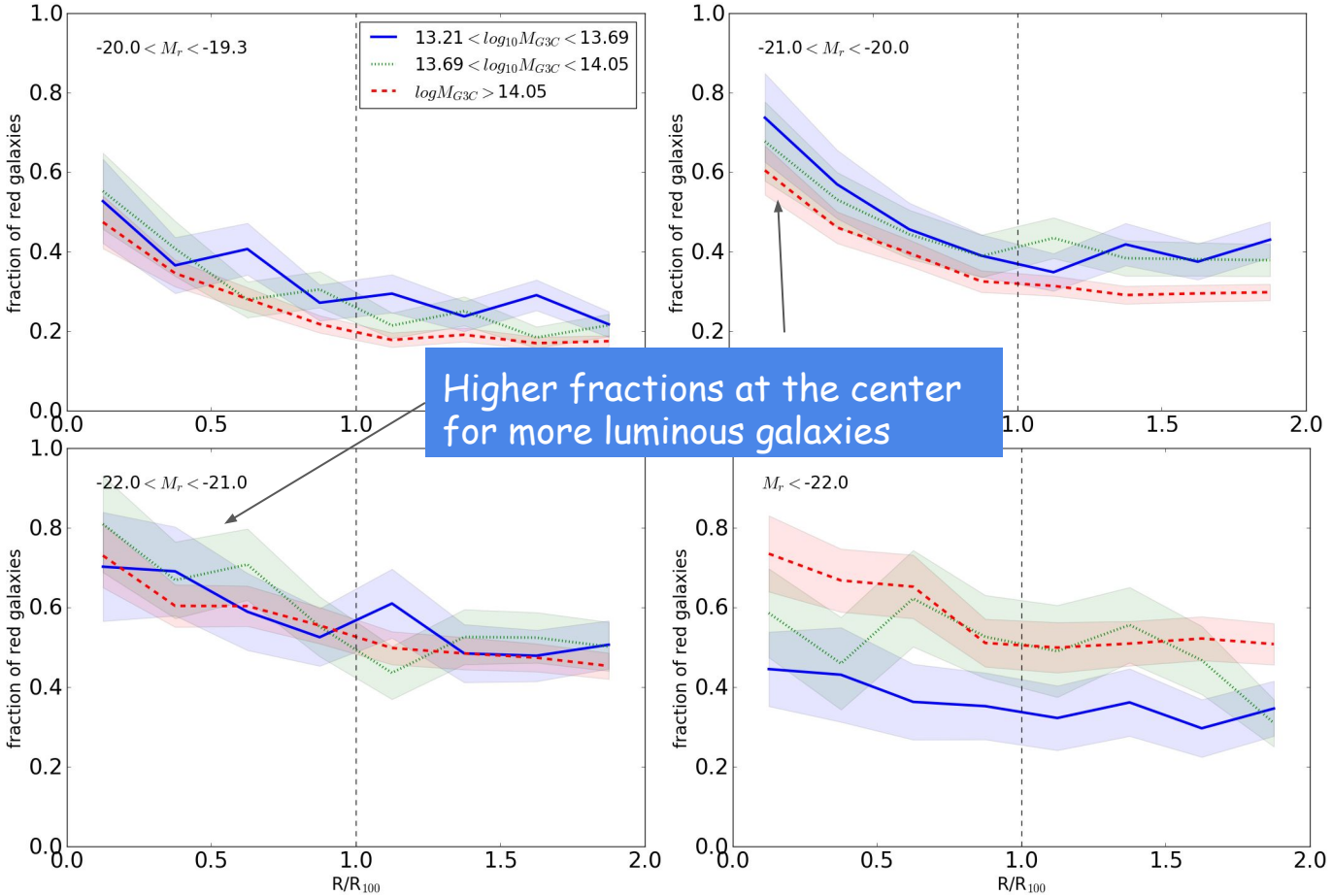
# The G3C galaxy population analysis




- The density profiles of G3C groups becomes more prominent for higher group masses.

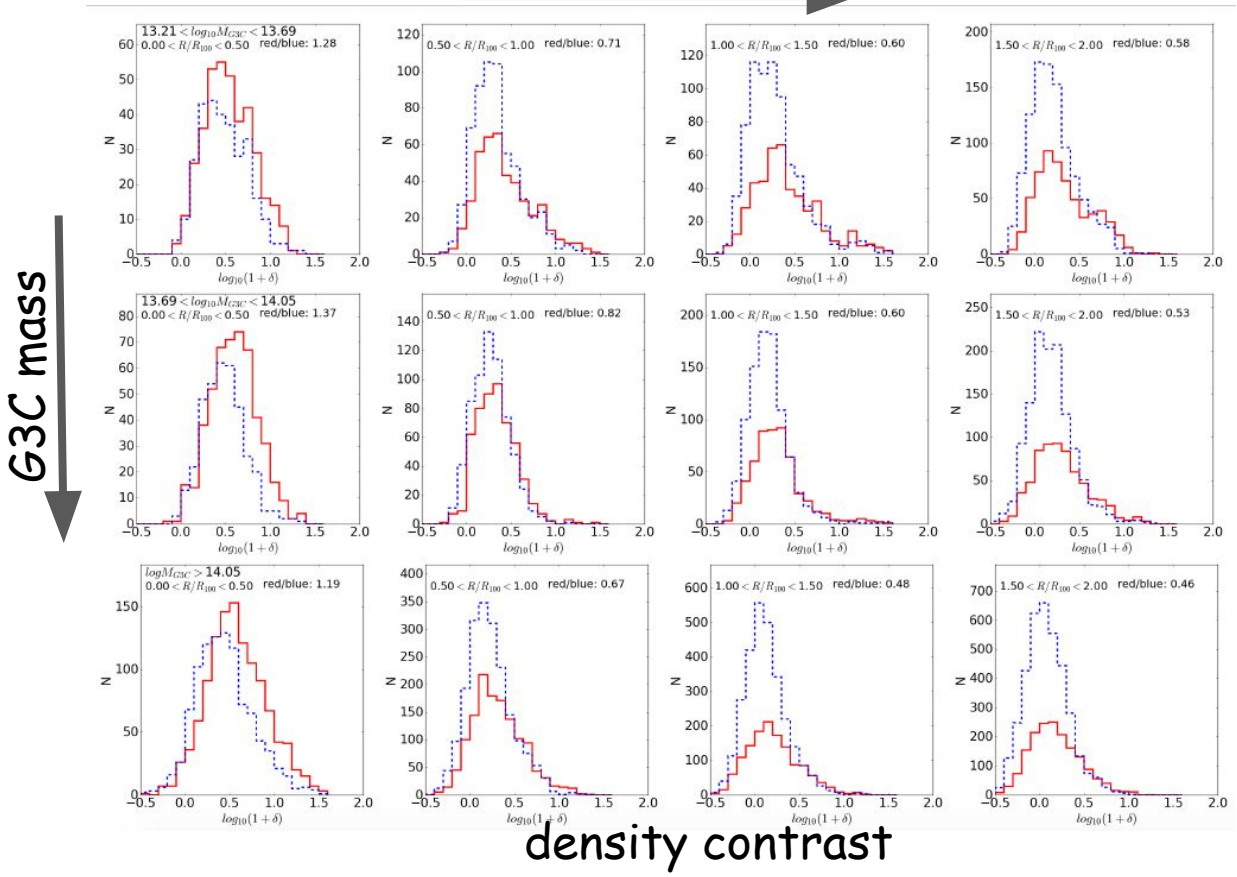
# The G3C galaxy population analysis

- Higher fraction at the center for more luminous galaxies.
- Most luminous bins -> few number statistics
- Our analysis is limited by the photo-z uncertainties.



# The G3C galaxy population analysis

- High dominance of red galaxies up to $R/R_{100}<0.5$.
- Small shift in density contrast at the center, between blue and red galaxies
- At $0.5<R/R_{100}<1$, blue galaxies start being predominant.
- On the outskirts, blue galaxies are the majority (~2:1).
- Projection effects will be taken into account.



# Conclusions

- We demonstrated the capability of the adapted k-NN technique to recover the galaxy environment in G3C groups using a (deeper) KiDS sample.

- Systematically higher fraction of red galaxies at central regions of more massive G3C groups ($R/R_{100} < 0.5$), indicating more intense environment.

- The density contrast distribution for red galaxies present an excess of high density regions when compared to the blue one.

- However, our results were limited by the KiDS photo-z uncertainties.

- Perspective: projection effects will be taken into account using PDFs of galaxies.

- Apply this technique in other photo-z surveys: J-PAS, S-PLUS and J-PLUS.

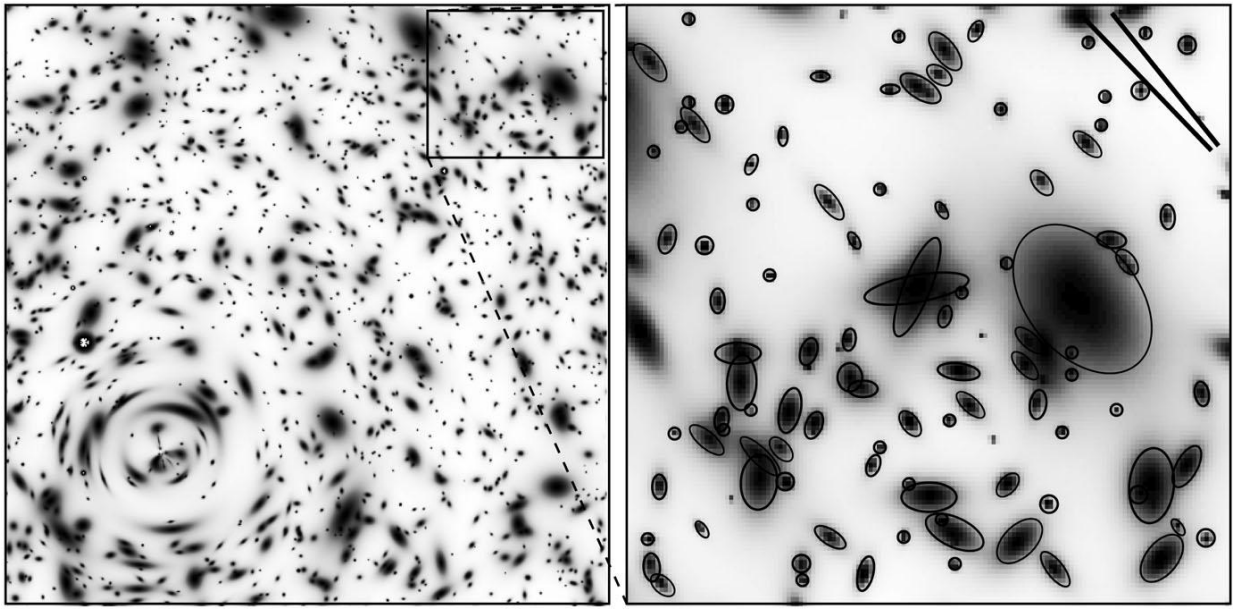
# A weak lensing study of troughs using the KiDS, GAMA and MICE galaxy catalogues

Browers et al., in preparation

# Ongoing project...

- Troughs -> projected underdensities regions in the galaxy density field.

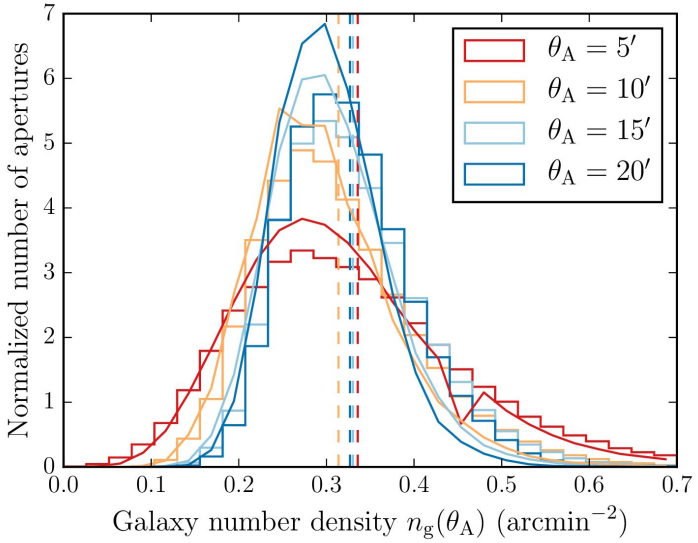
- Weak lensing analysis using GAMA and KiDS volume-limited samples.

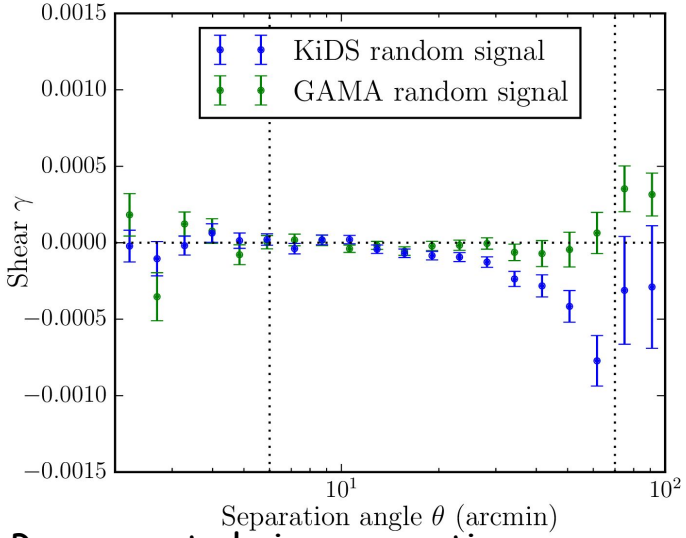


Mellier99

# Ongoing project...

- Troughs -> projected underdensities regions in the galaxy density field.
- Weak lensing analysis using GAMA and KiDS volume-limited samples.
- Ridges and Troughs are identified using fixed apertures in the sky.




Browers et al., in preparation

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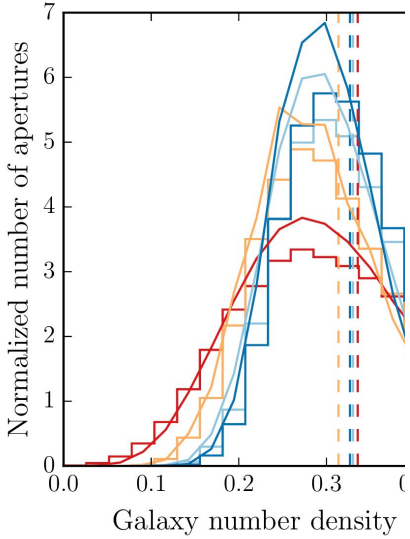


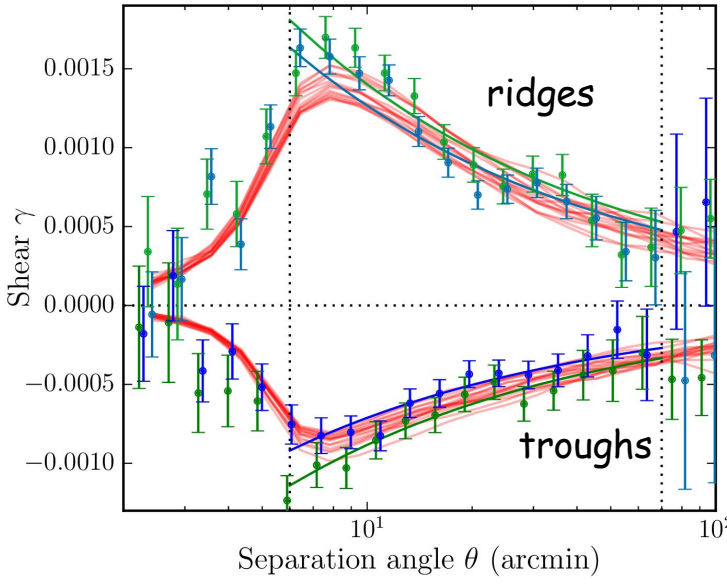


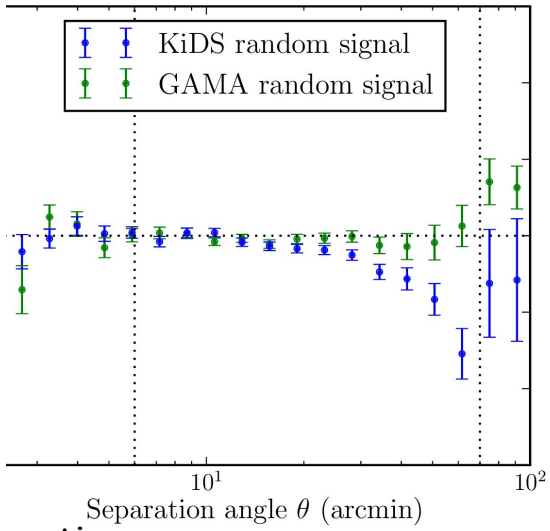


Browers et al., in preparation