Mapping the spatial distribution of star formation in cluster galaxies at z ~0.5 with the Grism Lens-Amplified Survey from Space (GLASS)

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in collaboration with T. Treu, K. Schmidt, B. M. Poggianti, A. Dressler

and the GLASS team

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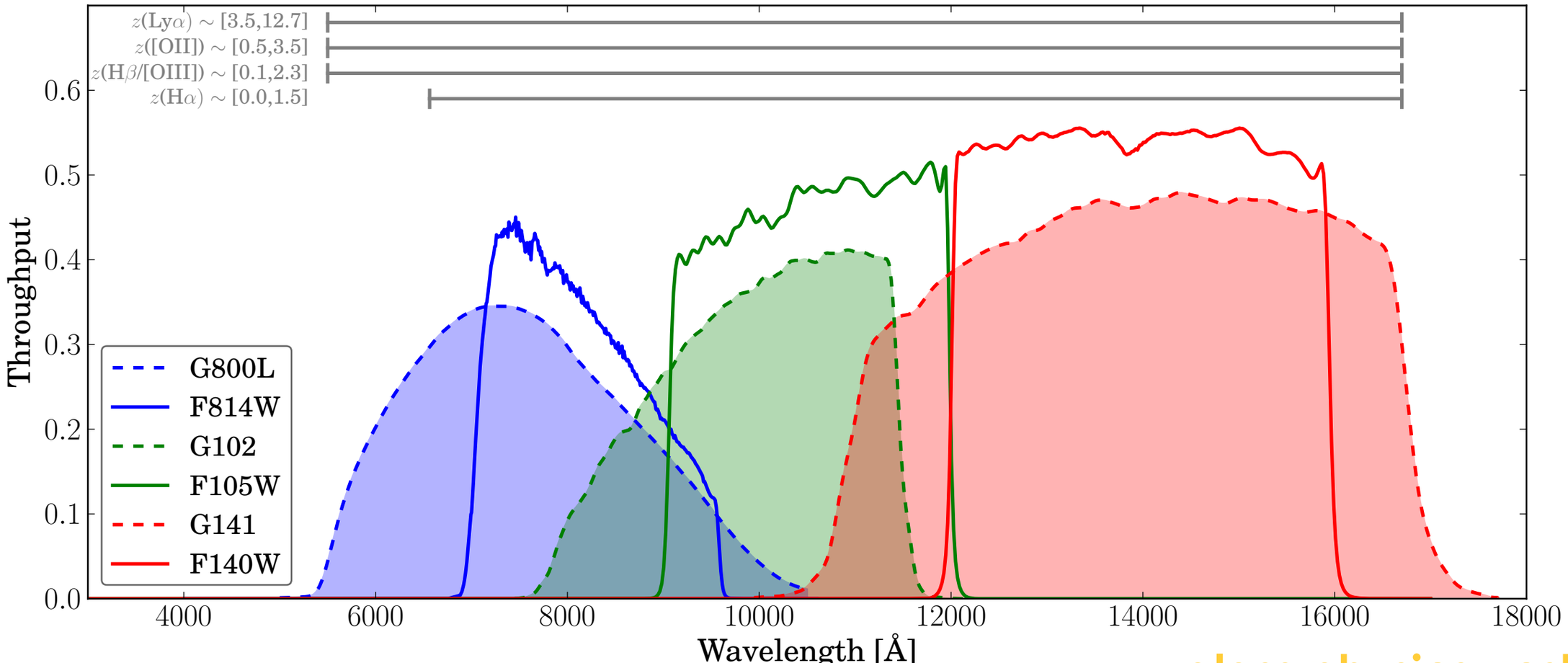
Schmidt et al. (2014)
Treu et al. (2015)

- The Grism Lens-Amplified Survey from Space (PI T.Treu, UCLA)
- 140 orbits HST grism spectroscopy of 10 massive clusters (Cycle 21) **COMPLETED**
- Clusters are selected from CLASH and Frontier Field (z=0.3-0.6)
- Spectra for ~20,000 objects (~10,000 down to m_{F140} ~24)

Parallel fields **Cluster cores** **Cluster cores**



glass.physics.ucsb.edu

Schmidt et al. (2014)
Treu, Schmidt, Brammer, BV et al. (2015)

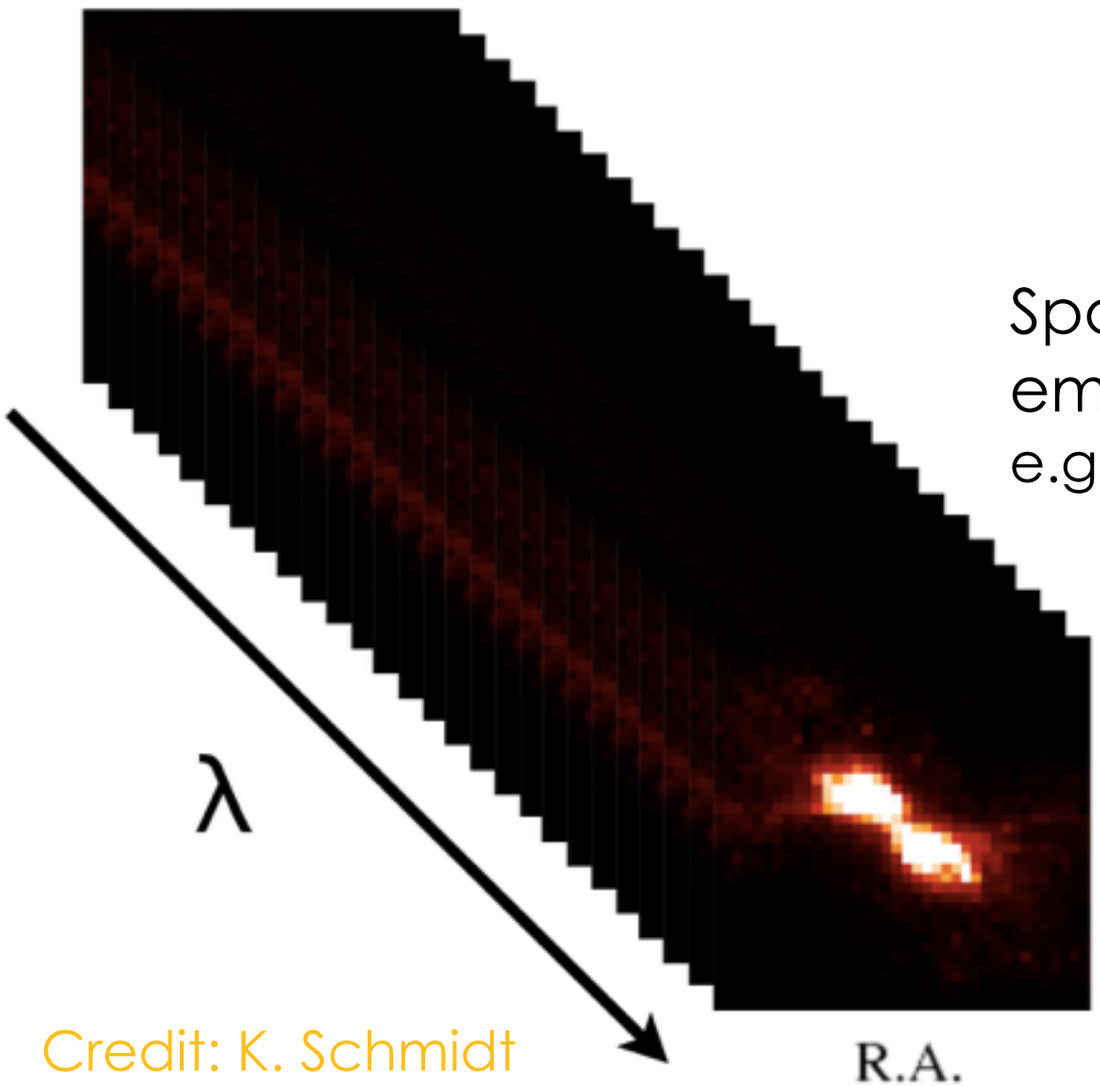
- 3D grism spectroscopy

Spatial information to create maps of emission lines
e.g. Schmidt+2013, Nelson+2012,2013

Credit: K. Schmidt

Schmidt et al. (2014)
Treu, Schmidt, Brammer, BV et al. (2015)

- 3D grism spectroscopy



Credit: K. Schmidt

Spatial information to create maps of emission lines
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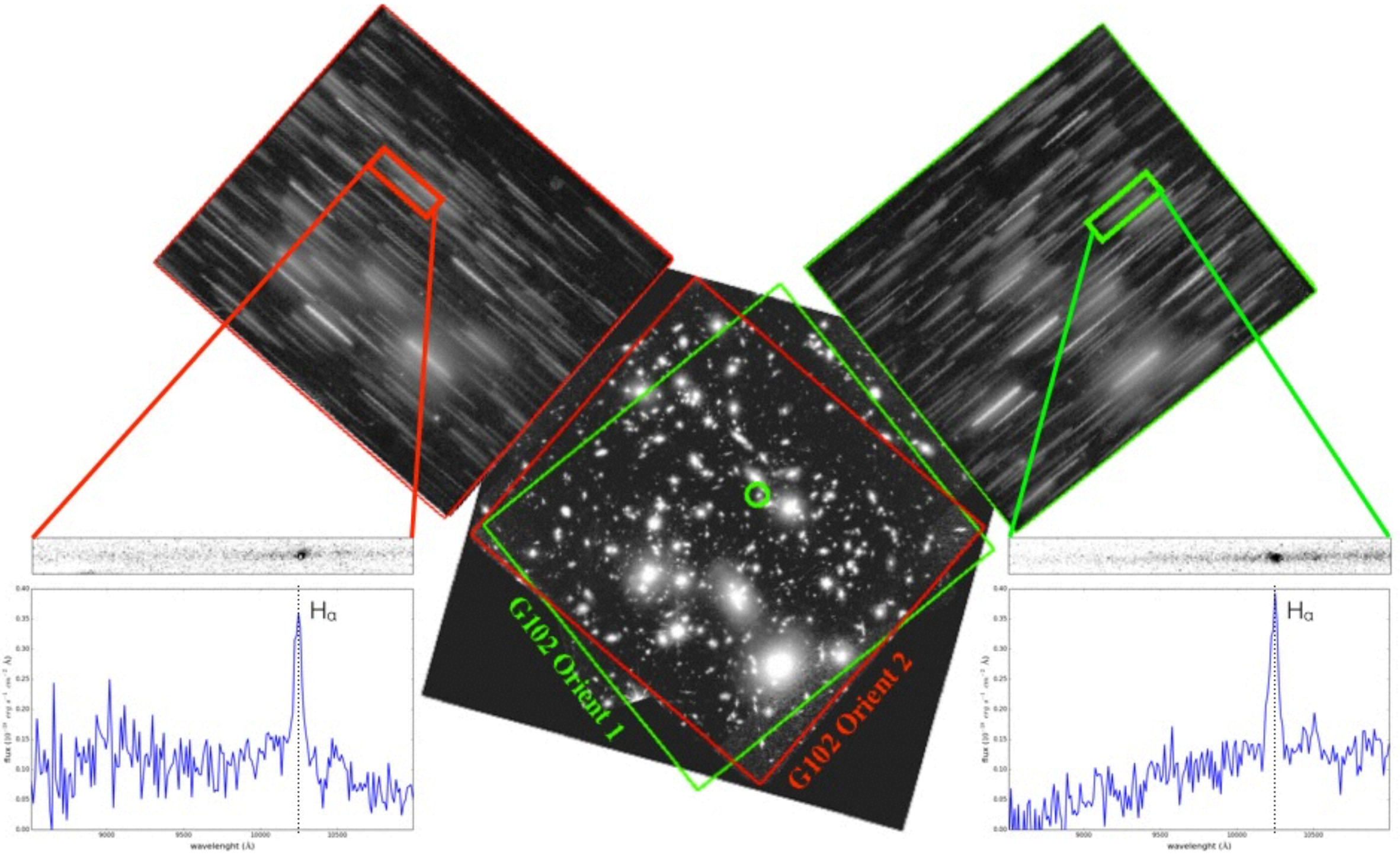
GLASS

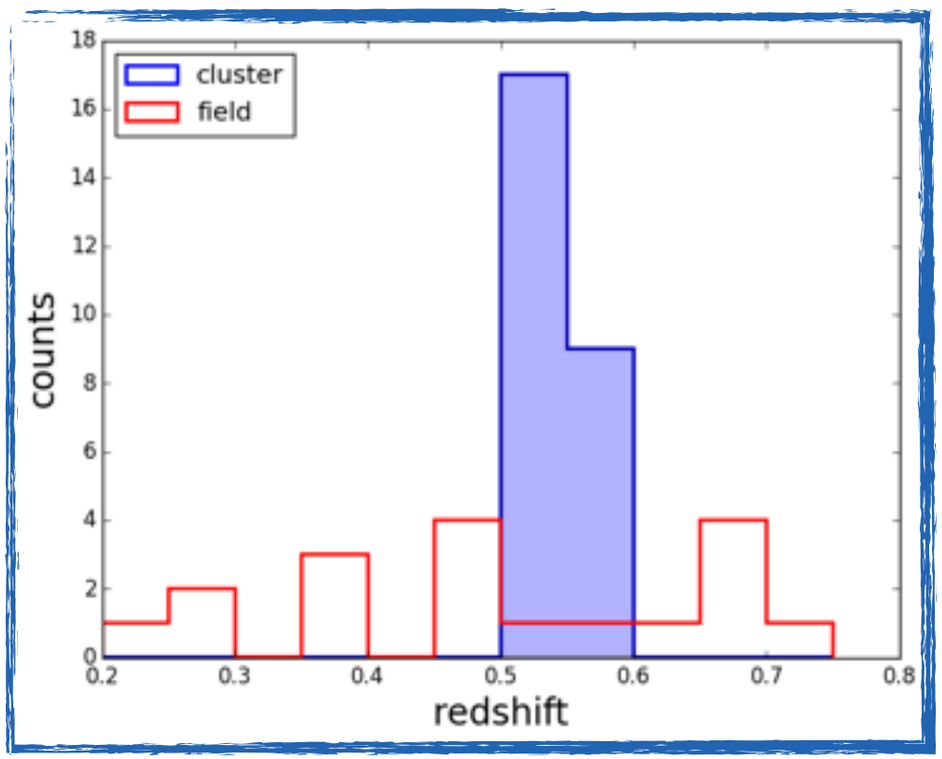


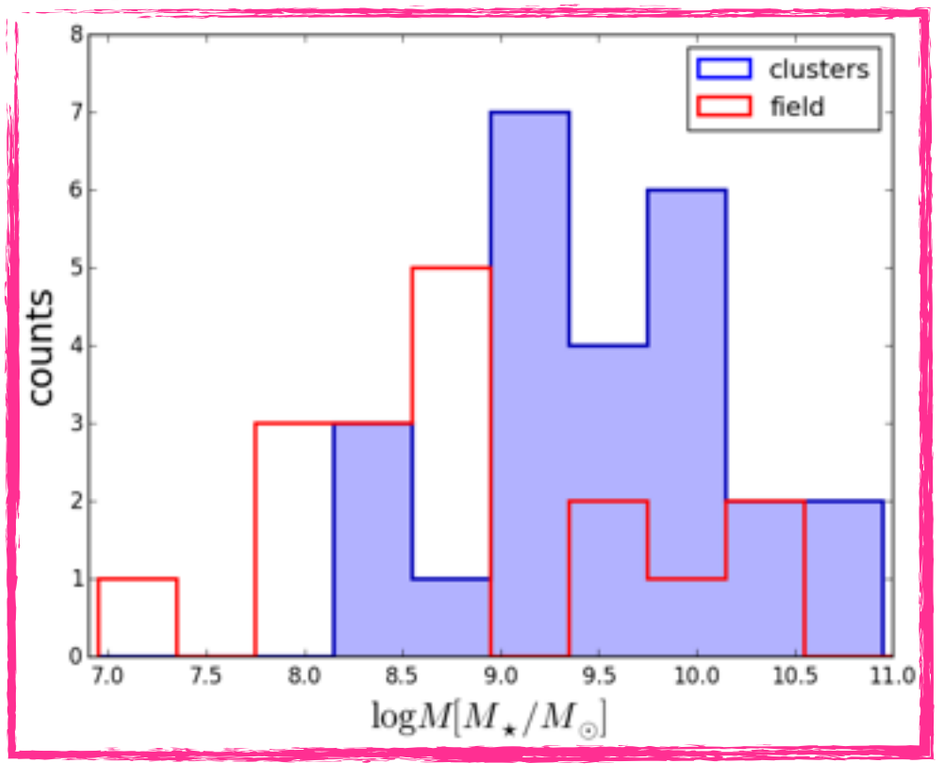
Credit: K. Schmidt

Our sample

Vulcani et al. (2015)

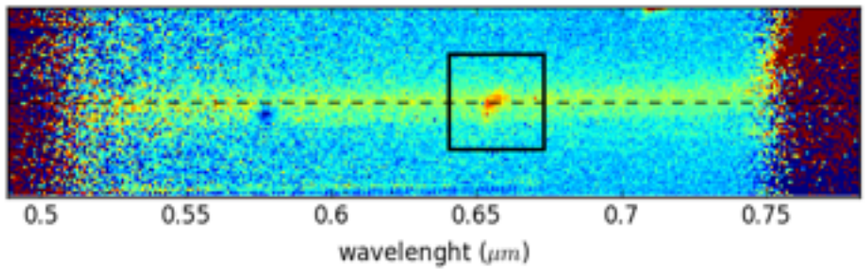
- 2 clusters: MACS0717.5+3745 z=0.548
  MACS1423.8+2404 z=0.545
- All galaxies with reliable redshift estimation and detected Hα in emission (in G102)
- 25 galaxies with z within ± 0.03 the cluster redshift: CLUSTER MEMBER sample
- 17 galaxies with z outside ± 0.03 the cluster redshift: FIELD sample
- Stellar masses from CLASH photometry using a set of templates, computed with standard spectral synthesis models (Bruzual & Charlot 2003, Fontana *et al.* 2003, 2004)
- sizes from the second order moment of the light distribution

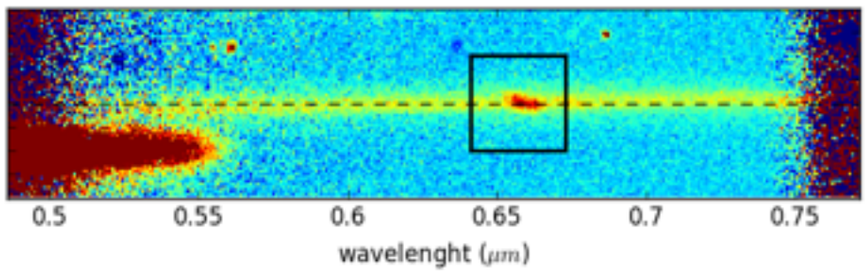




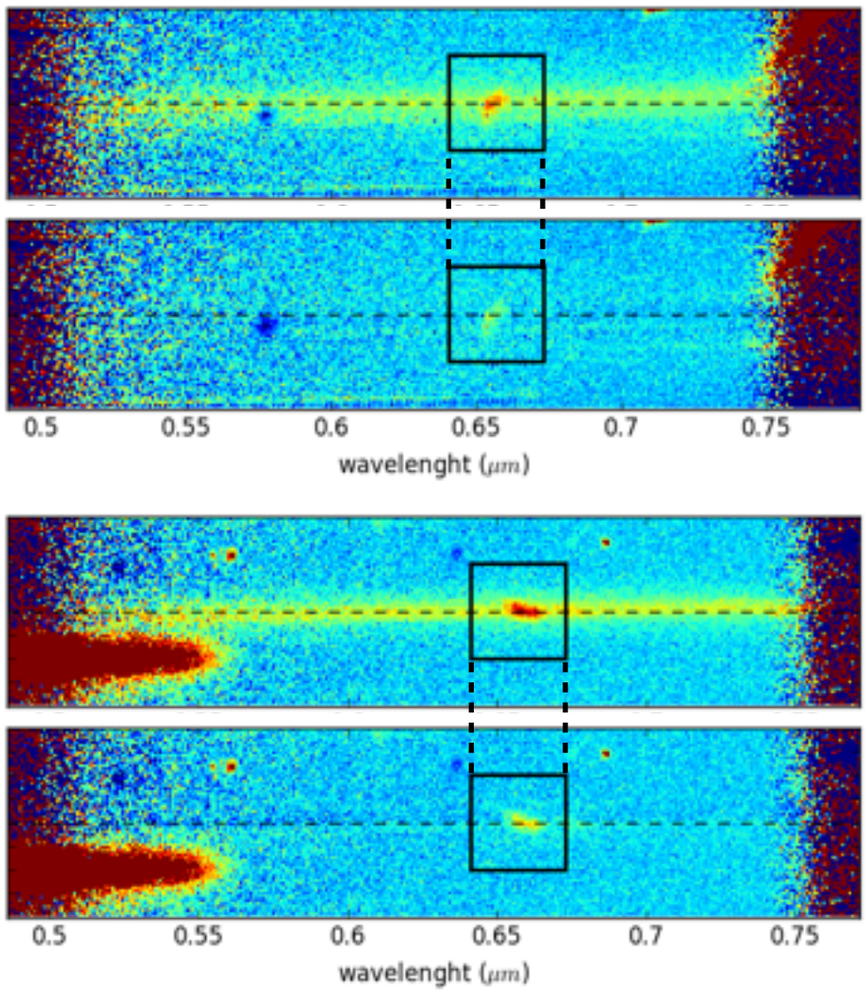
Maps of Hα

Maps of Hα

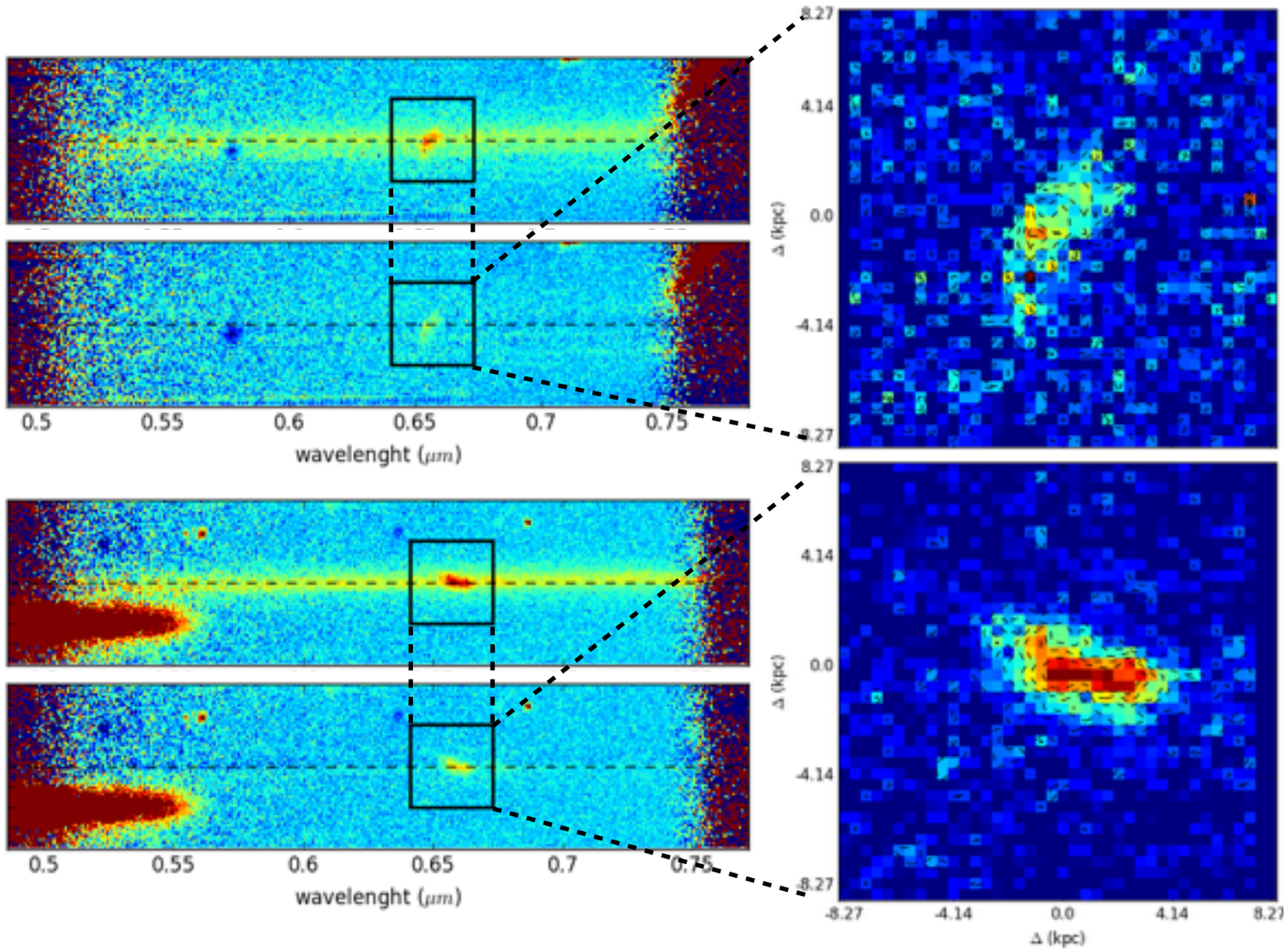

0.5
0.55
0.6
0.65
0.7
0.75
wavelenght (μm)


0.5
0.55
0.6
0.65
0.7
0.75
wavelenght (μm)

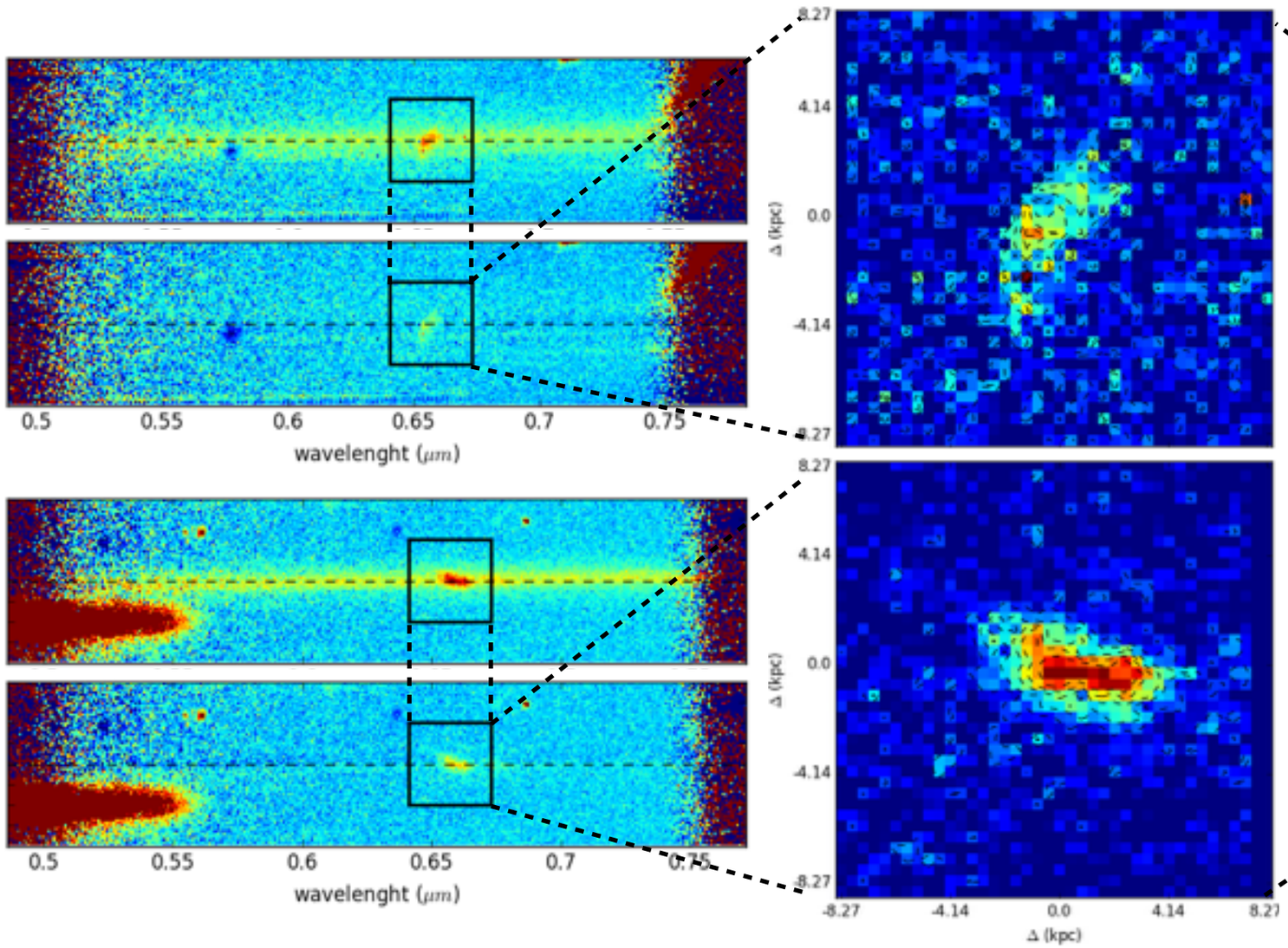
Maps of Hα

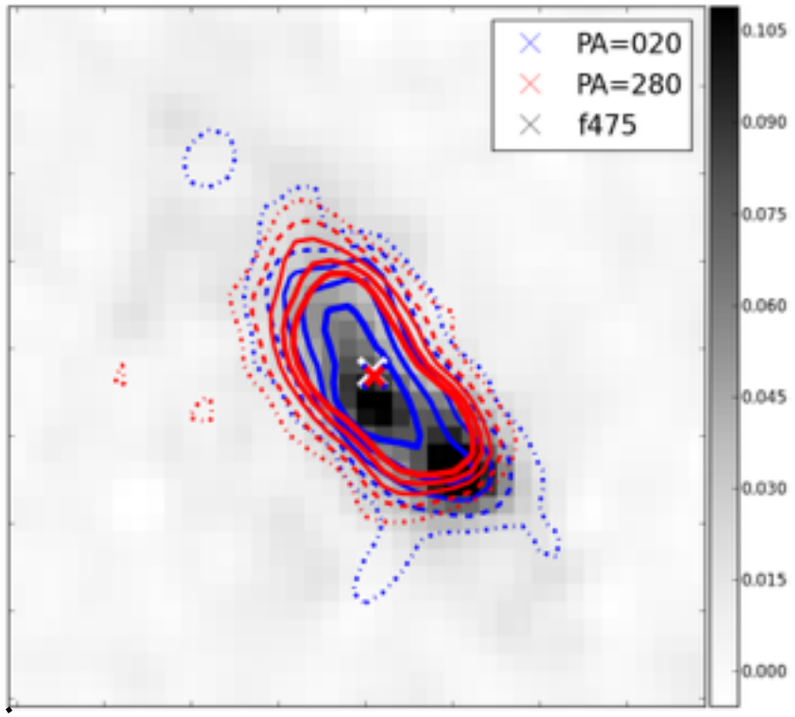

0.5
0.55
0.6
0.65
0.7
0.75
wavelenght (μm)
0.5
0.55
0.6
0.65
0.7
0.75
wavelenght (μm)

Maps of Hα



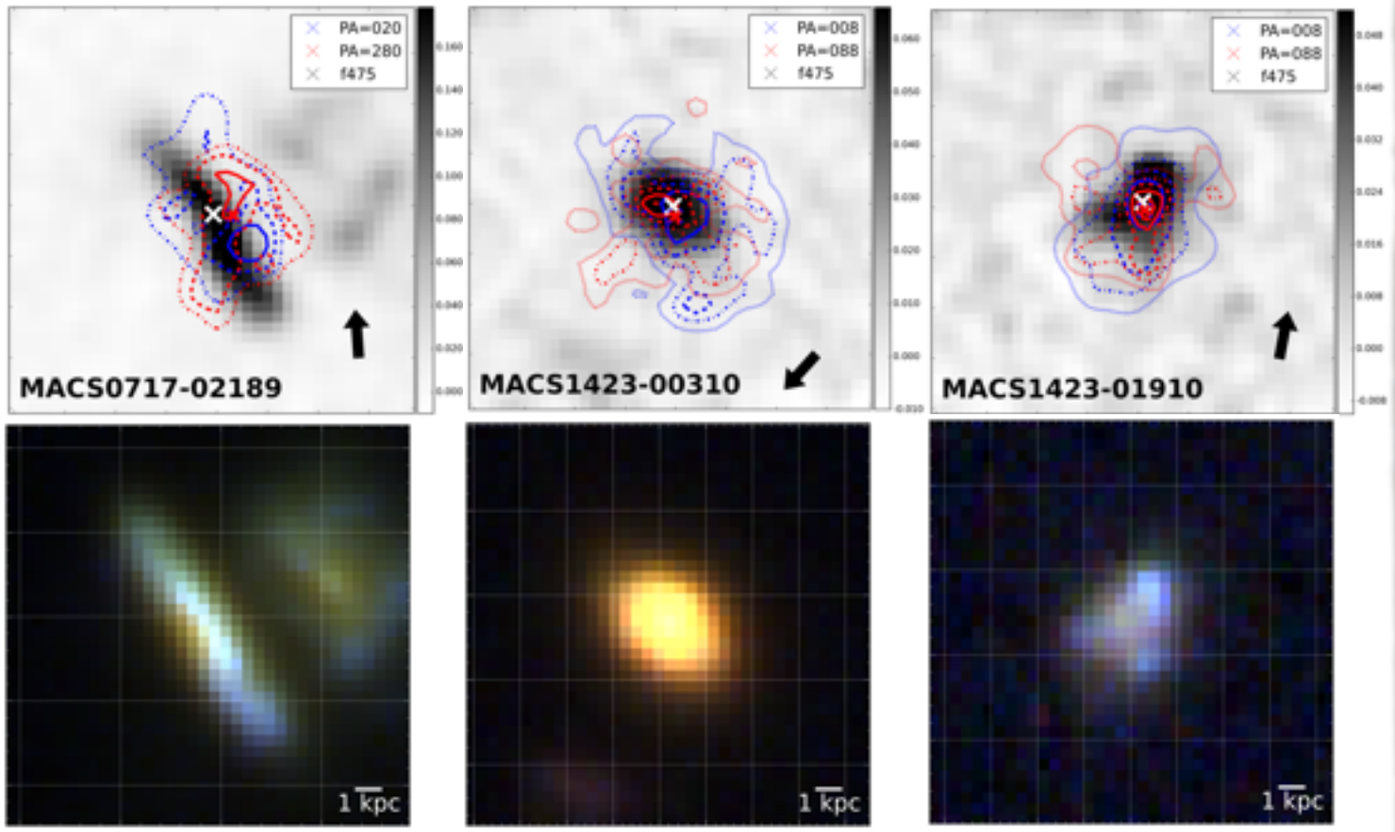
Maps of Hα


0.5
0.55
0.6
0.65
0.7
0.75
wavelenght (μm)
8.27
4.14
0.0
-4.14
-8.27
Δ (kpc)


PA=020
PA=280
f475
0.105
0.090
0.075
0.060
0.045
0.030
0.015
0.000

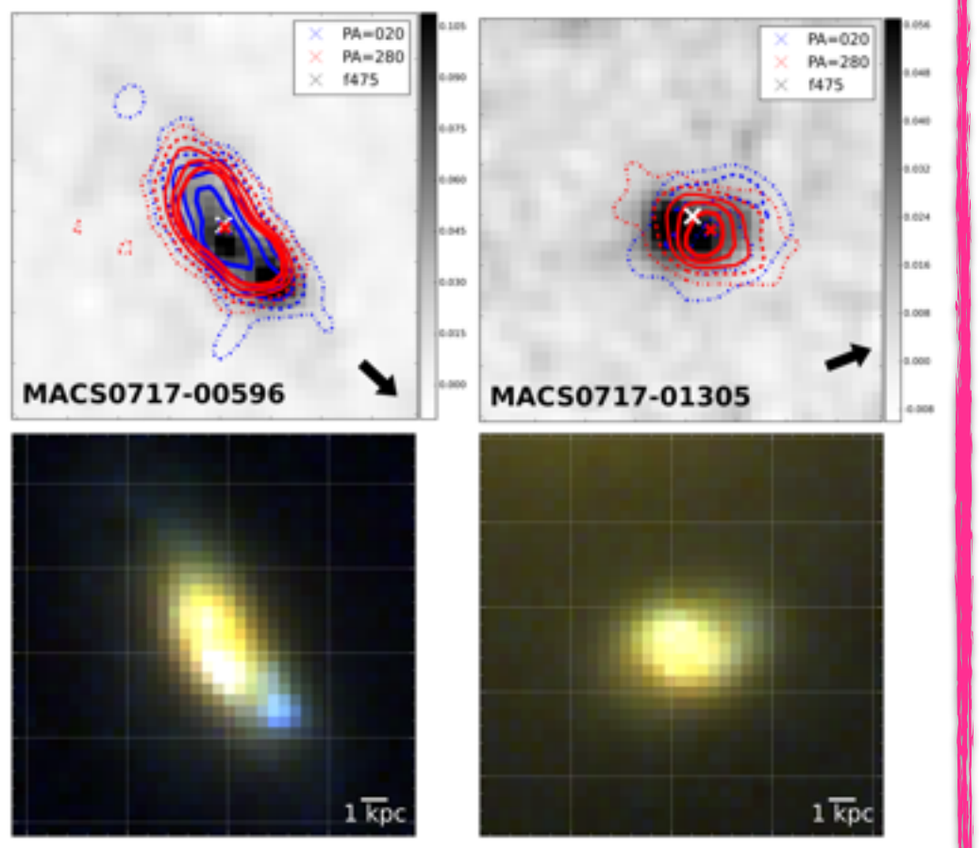
Maps of Hα and continuum emission

- r(Hα)>r(cont)



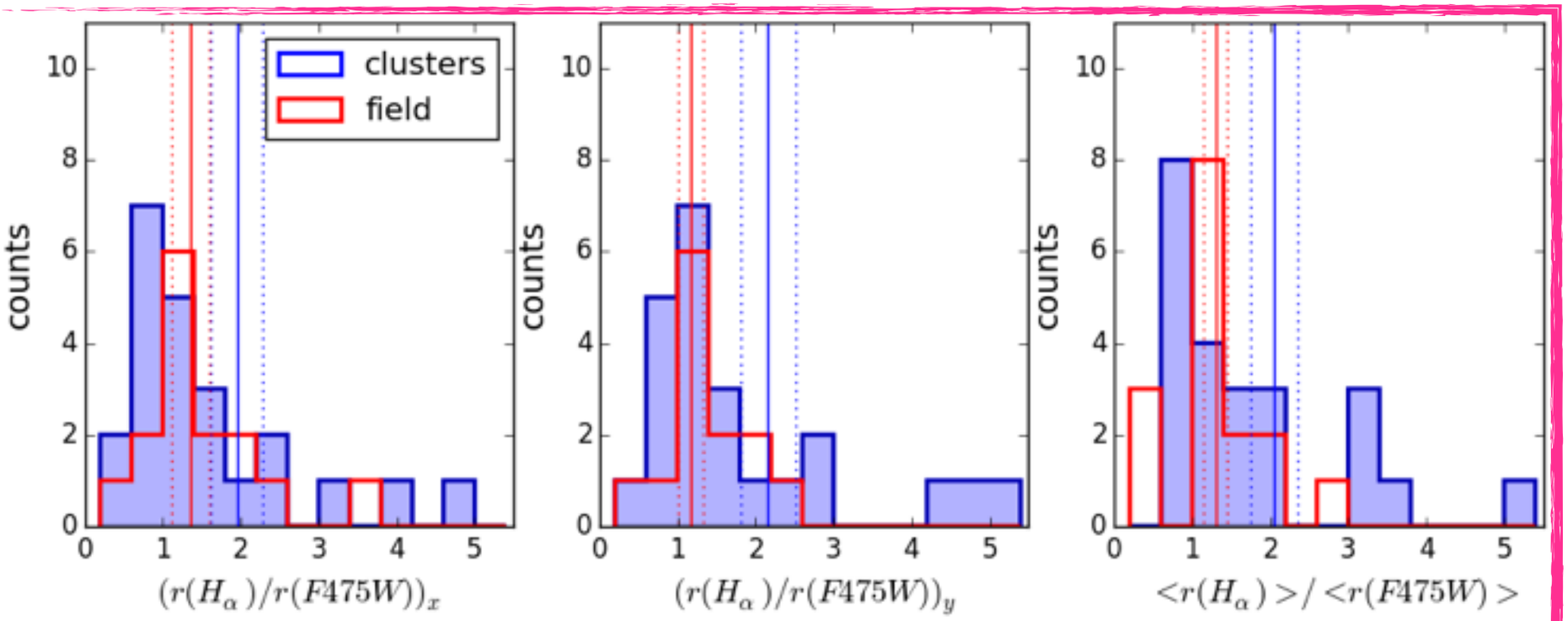
~60% both in clusters and field

- r(Hα)=r(cont)

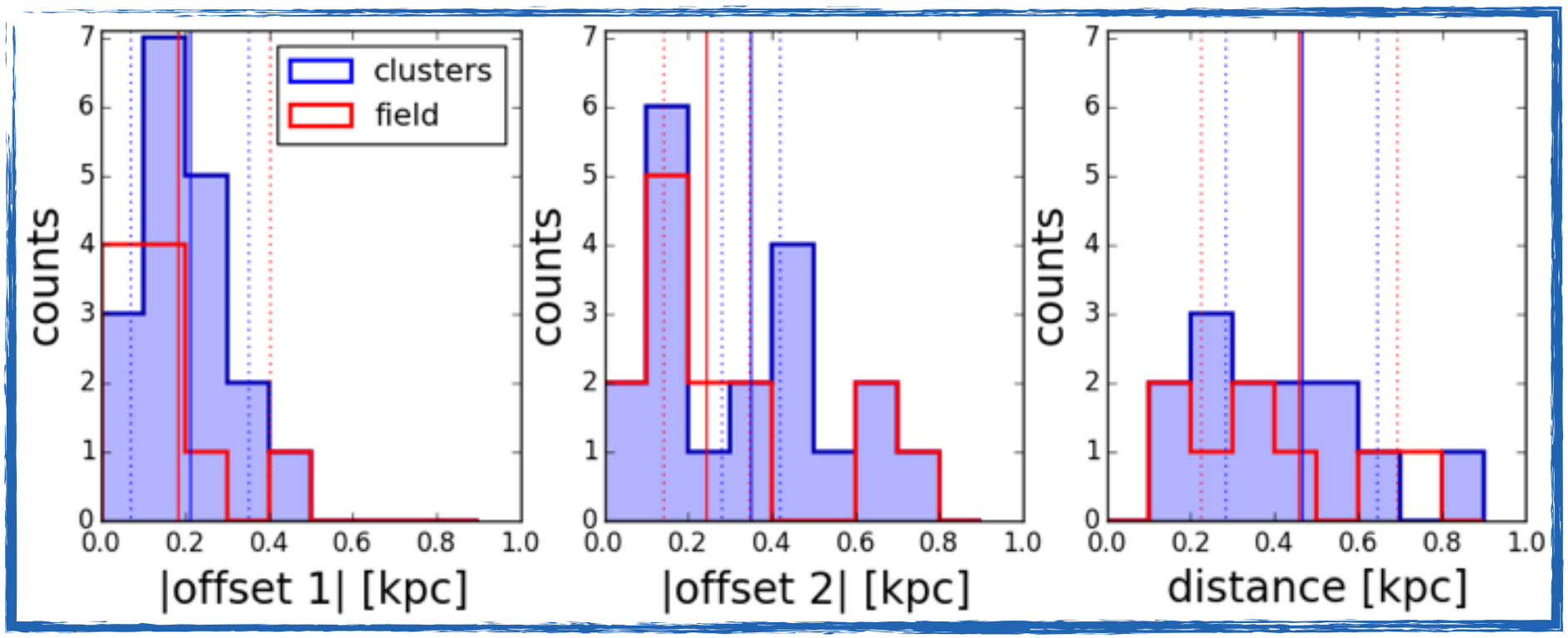


~30% in clusters
~20% in the field

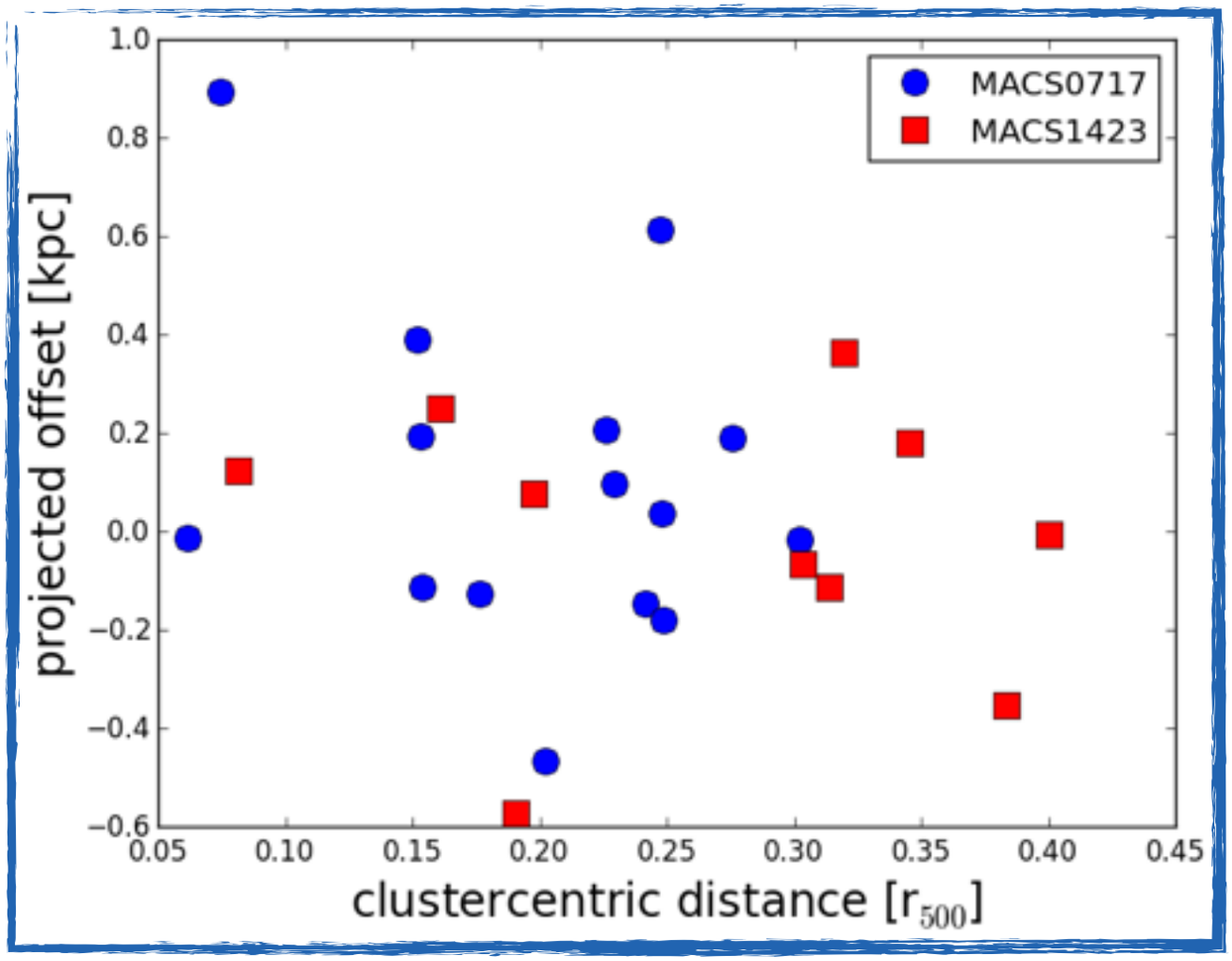
- SIZE RATIO



- OFFSET BETWEEN THE EMISSION IN THE CONTINUUM AND THE Hα EMISSION



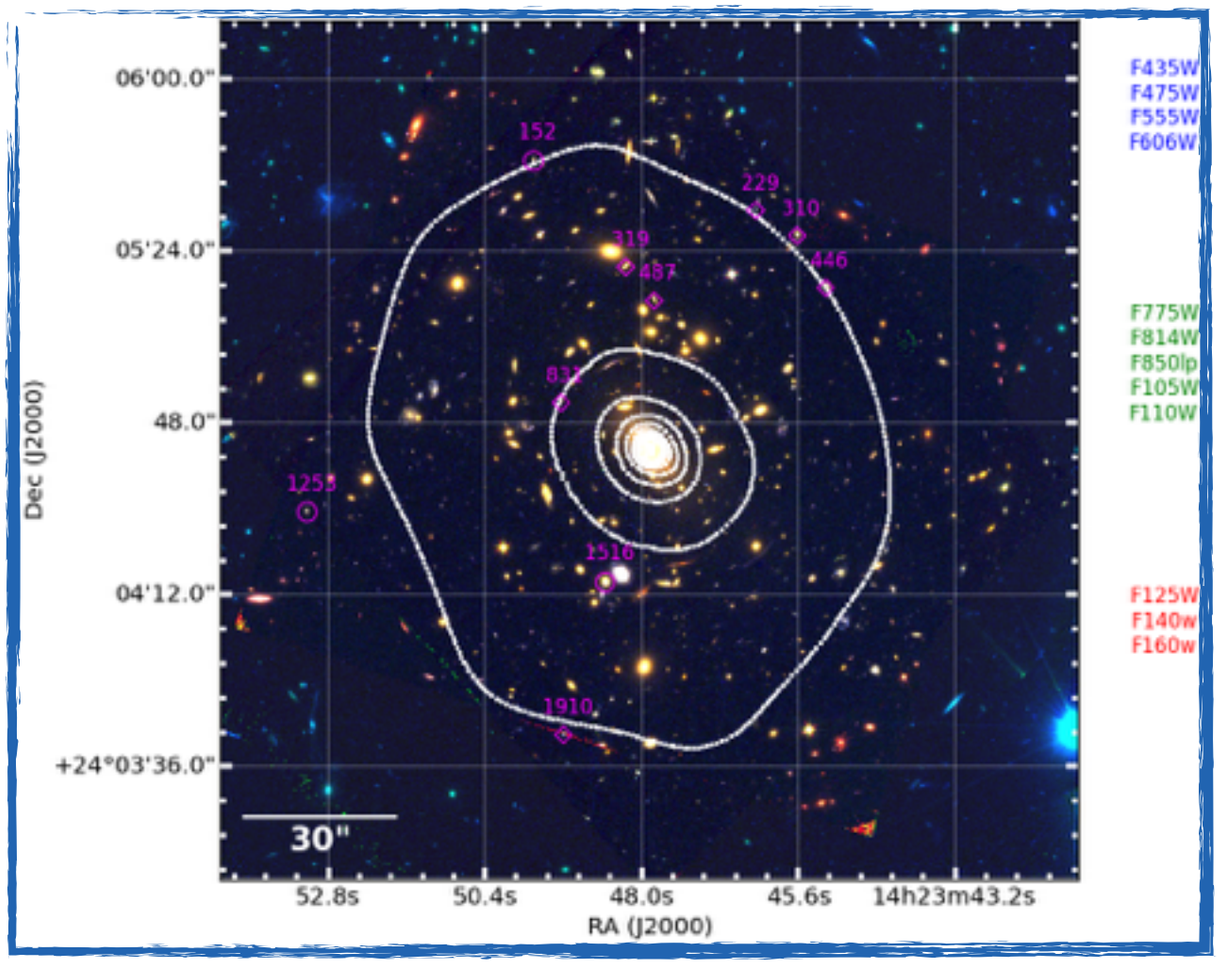
Peak of Hα emission and position within the clusters



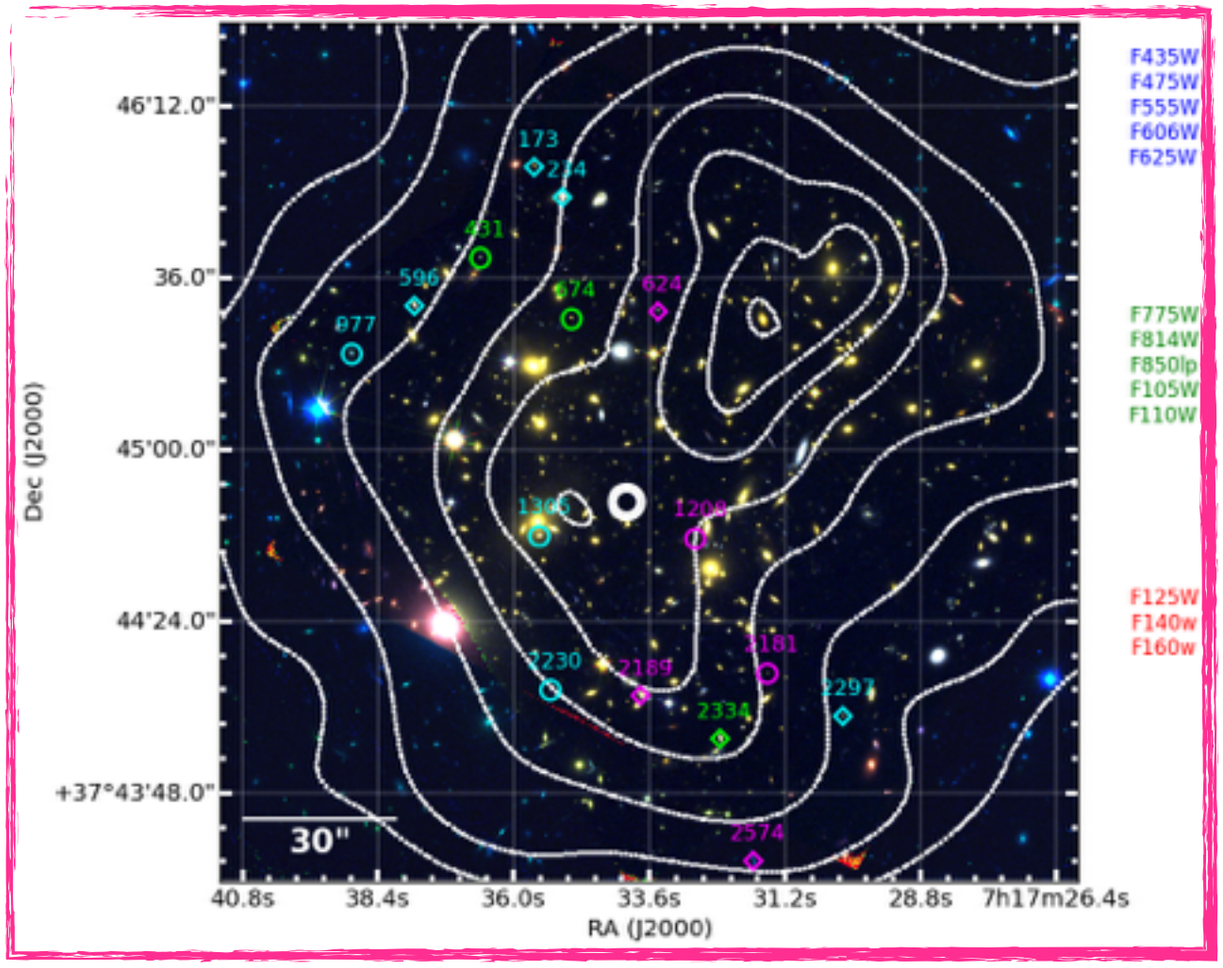
Maps of Hα and position within the clusters

- LOCAL GAS DENSITY (X ray emission)

MACS1423



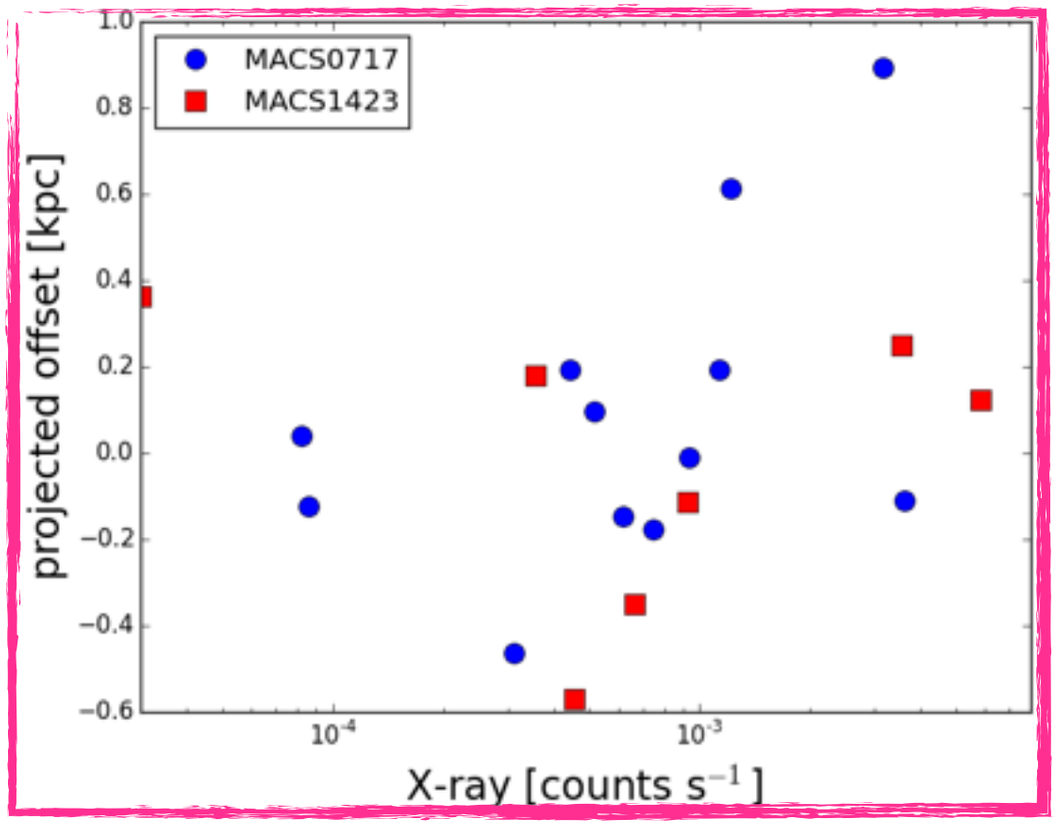
MACS0717

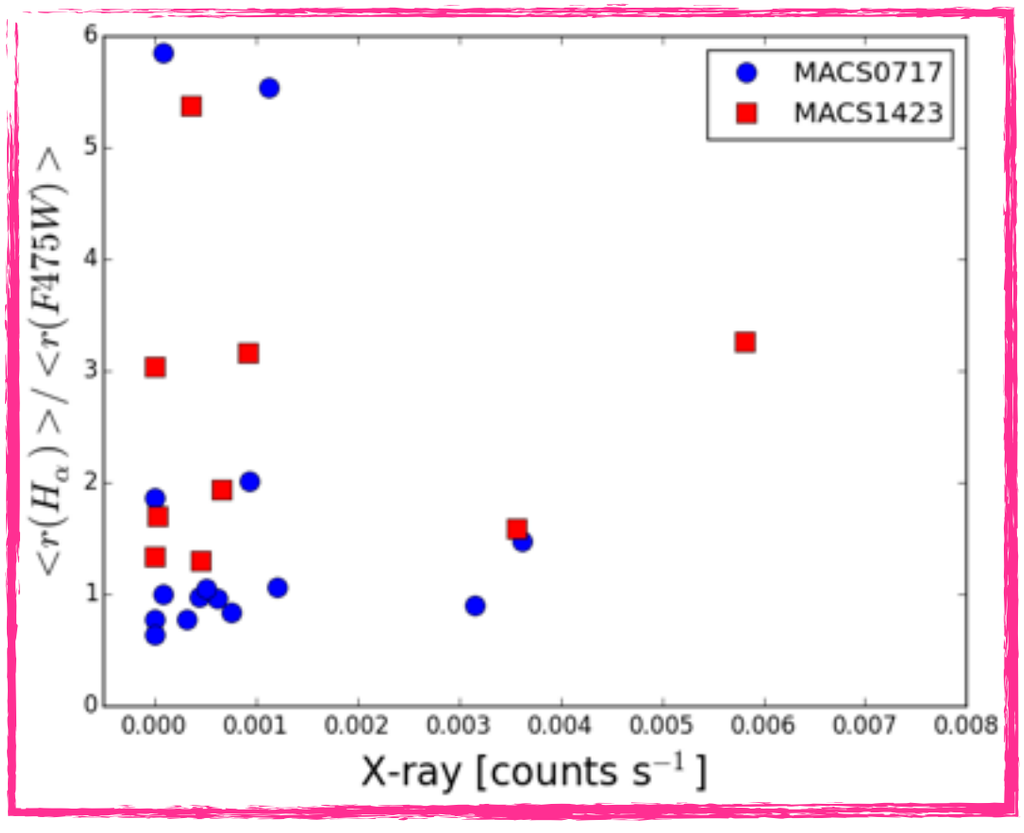


r(Hα)>r(cont)
r(Hα)=r(cont)
r(Hα)<r(cont)

similar results obtained with the surface mass density

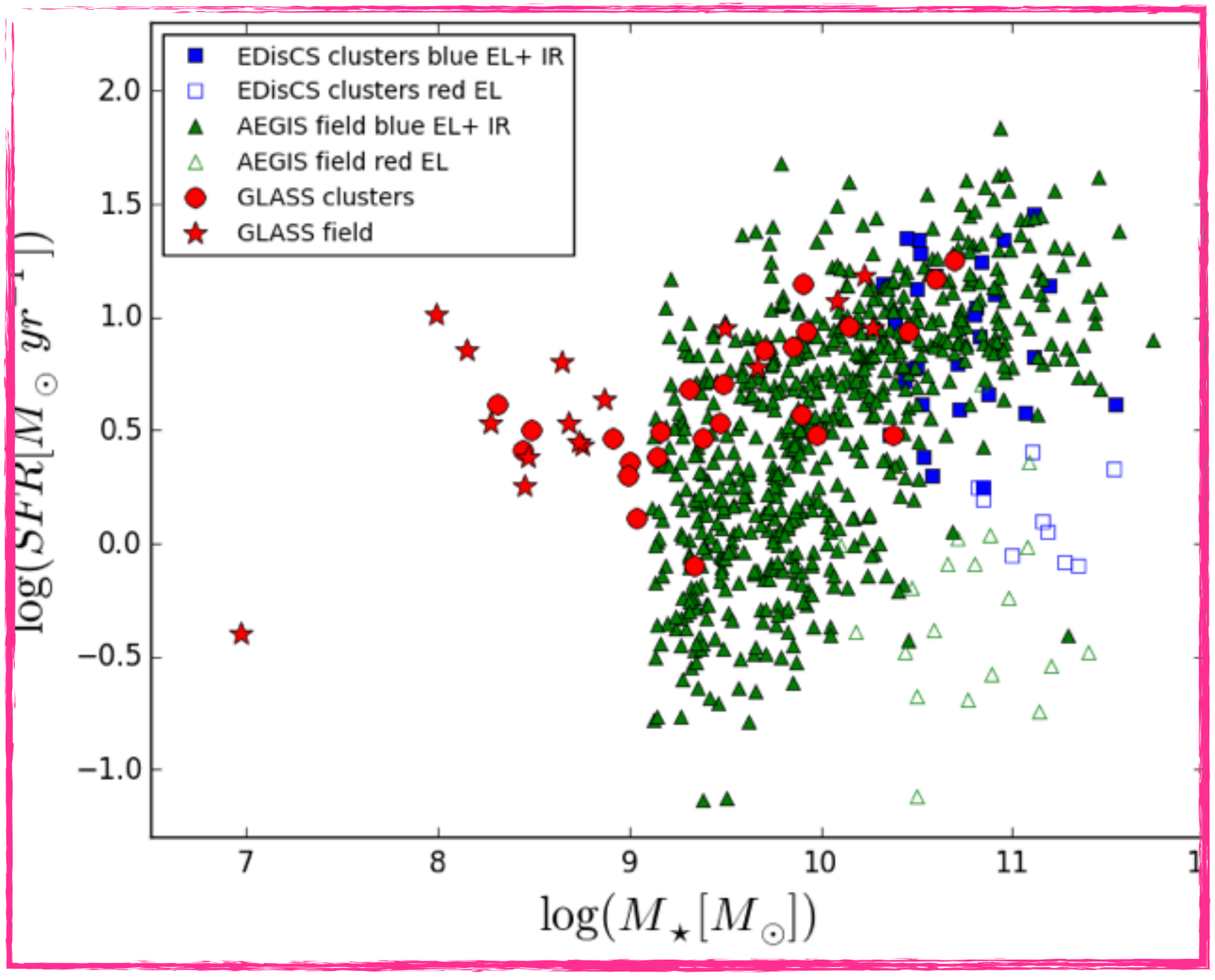
Peak of Hα emission and position within the clusters





similar results obtained with the surface mass density

SFR-Mass relation



Summary

Environmental processes are expected to act on cluster galaxies, leaving a recognisable signature

- Both in clusters and field 60% of the galaxies have r(Hα) larger than r(continuum) —> SF occurring in galaxy outskirts
- In clusters some examples of r(Hα) >> r(continuum) —> sign of ongoing stripping?
- Both in clusters and field there the Hα emission is offset with respect of the continuum emission —> bulk of SF not occurring in galaxy cores
- In clusters offset correlate with X-ray emission —>sign of ongoing stripping?
- MACS1423 is more relaxed than MACS0717 and all galaxies have Hα disk larger than continuum

Thanks for your attention!

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