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

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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 $m_{F140} \sim 24$)

![Throughput plot](glass.physics.ucsb.edu)
- 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)
Our sample

- 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 H\(\alpha\)
Maps of Hα and continuum emission

- \( r(\text{H}\alpha) > r(\text{cont}) \)
  - ~60% both in clusters and field

- \( r(\text{H}\alpha) = r(\text{cont}) \)
  - ~30% in clusters
  - ~20% in the field
OFFSET BETWEEN THE EMISSION IN THE CONTINUUM AND THE H\(_{\alpha}\) EMISSION

SIZE RATIO
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

\[ r(\text{H}\alpha) > r(\text{cont}) \]
\[ r(\text{H}\alpha) = r(\text{cont}) \]
\[ r(\text{H}\alpha) < r(\text{cont}) \]

Similar results obtained with the surface mass density.
Peak of H\(\alpha\) emission and position within the clusters

similar results obtained with the surface mass density
SFR-Mass relation

![Graph showing the SFR-Mass relation with data points for different categories.

Legend:
- EDisCS clusters blue EL+ IR
- EDisCS clusters red EL
- AEGIS field blue EL+ IR
- AEGIS field red EL
- GLASS clusters
- GLASS field

The x-axis represents log($M_\star [M_\odot]$), while the y-axis represents log(SFR [M_\odot yr^{-1}]).]
Environmental processes are expected to act on cluster galaxies, leaving a recognisable signature

- Both in clusters and field 60% of the galaxies have $r(\text{H} \alpha)$ larger than $r(\text{continuum})$ —> SF occurring in galaxy outskirts
- In clusters some examples of $r(\text{H} \alpha) >> r(\text{continuum})$ —> sign of ongoing stripping?
- Both in clusters and field there the $\text{H} \alpha$ 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 $\text{H} \alpha$ disk larger than continuum
Thanks for your attention!

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