Enhancement of rapidly quenched galaxies in distant clusters at 0.5<z<1.0

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Socolovsky et al. (submitted)
Socolovsky et al. (submitted)

- Does environment have an effect on how galaxies evolve? What is it?

- Which galaxies are being quenched? What are their masses?

- How does environmental quenching proceed? Timescales.
PSBs = Rapidly quenched galaxies

Population in transition.

Galaxies whose star formation activity was rapidly truncated after an extended period forming stars.

They may be the smoking gun to understand the quenching mechanisms.
Super-Colour (SC) classification

Principal Component Analysis (PCA). Wild et al. (2014).

It is able to characterise a broad range of SEDs.

Provides a clean separation between the known populations.

Points out three new populations.
Super-Colour spectroscopic confirmation

- 60-80% of the PSB candidates show the characteristic spectral signature.

- 33 spectroscopically confirmed PSB galaxies.

See Wild et al. (2014) and Maltby et al. (2016)
1. Galaxy and Cluster sample

- 8th data release of the UKIDSS Ultra Deep Survey.
- Detected using a FoF based algorithm.
- 37 galaxy clusters candidates.
- 11 of them spectroscopically confirmed
- In good agreement with previous studies studying galaxy clusters in the same field.
Environmental quenching in clusters

In clusters the overall galaxy population is shifted towards the passive evolving regime.
Environment quenches low-mass galaxies

Environment preferentially quenches low-mass galaxies!
The low-mass excess is due to young galaxies

- The excess of low-mass passives is exclusively produced by recently quenched galaxies.
Result 1: Excess of low-mass passive galaxies in clusters
Excess primarily *recently quenched*
Passive and PSB galaxies prefer cluster cores

Young star-forming galaxies (SF1) avoid the central region of clusters. Fast quenching.

Moderate star-forming galaxies (SF2) show a flat radial profile. Slow quenching.

PSB galaxies found throughout the inner Mpc. They last ~ 1 Gyr.
Result 2: Very young galaxies undergo rapid quenching while moderate galaxies experience slow quenching.
Evolution across the SC-diagram

Models from Wild et al (2016)
No starburst in cluster post-starbursts

In order to produce the observed PSB signature the quenching timescale must be short:

\[ \tau \lesssim 400 \text{ Myr} \]

All clusters PSBs lie within this region
Result 3: PSBs in clusters are likely to be rapidly quenched galaxies which have undergone no strong starburst.
Conclusions

1. Excess of low-mass passive galaxies in clusters
   Excess primarily recently quenched

2. Very young galaxies undergo rapid quenching
   while moderate galaxies experience slow quenching.

3. PSBs in clusters are likely to be rapidly quenched galaxies which had undergone no strong starburst.