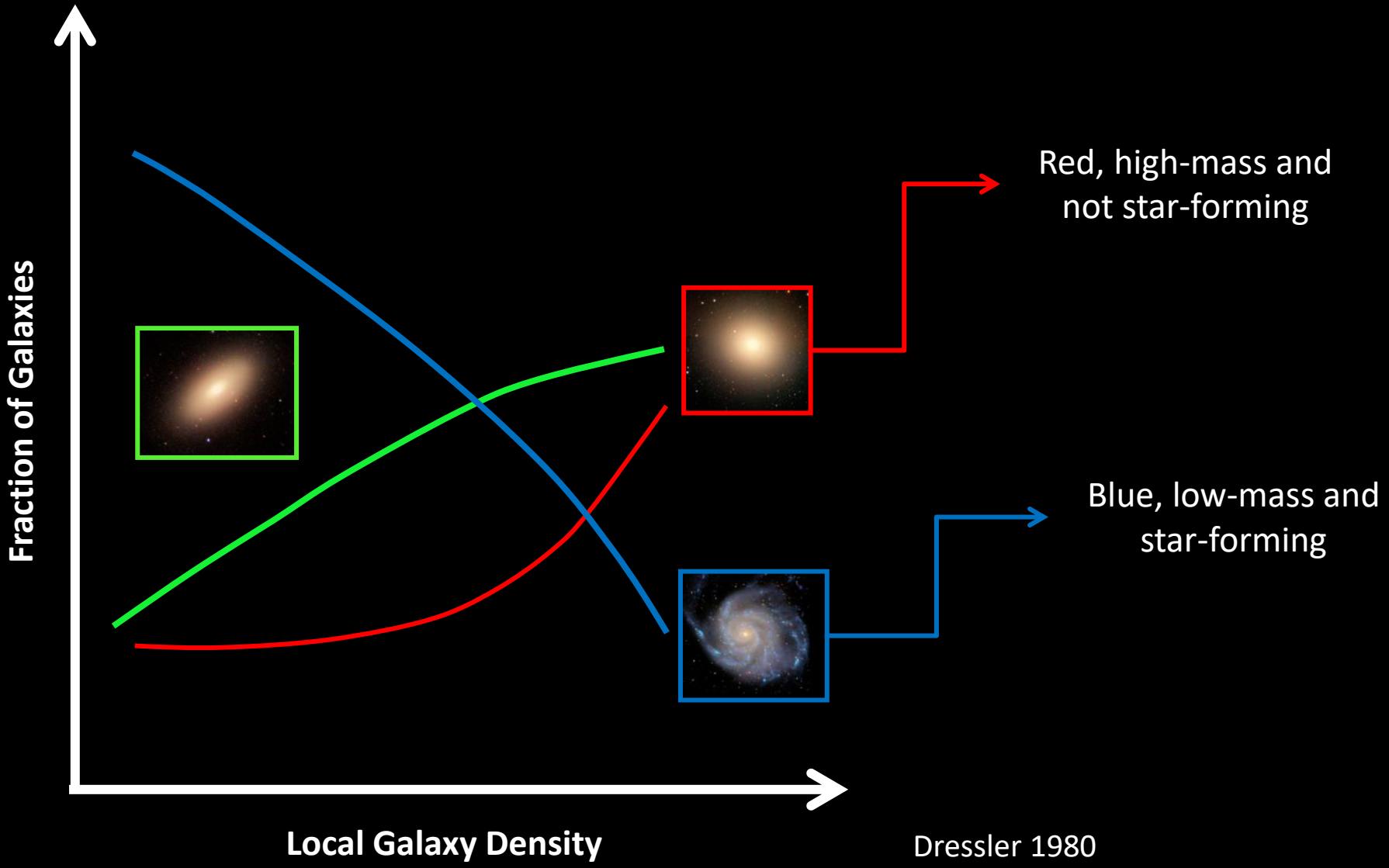
SubFind

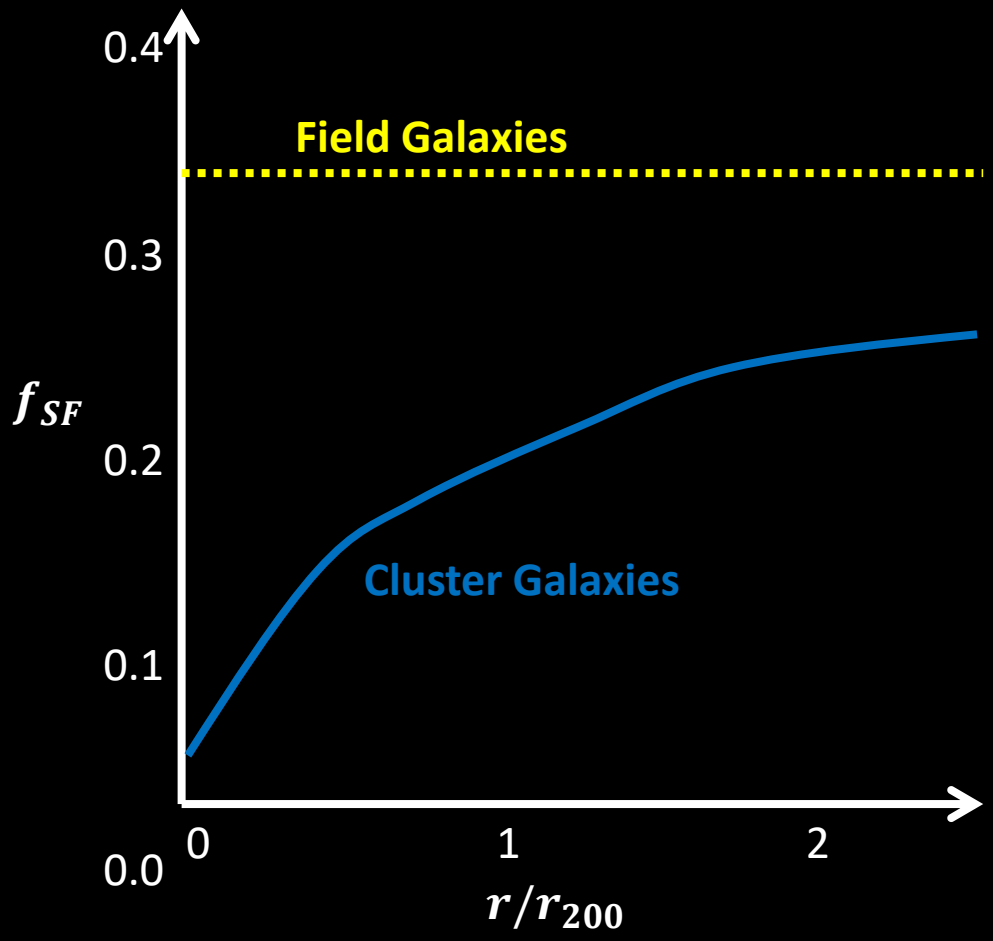
Daniela Estefanía Olave Rojas

Chile, 26 de Noviembre de 2020

Morphology-Density Relation



The Star Formation of Galaxies in Different Environments



Haines et al. 2015

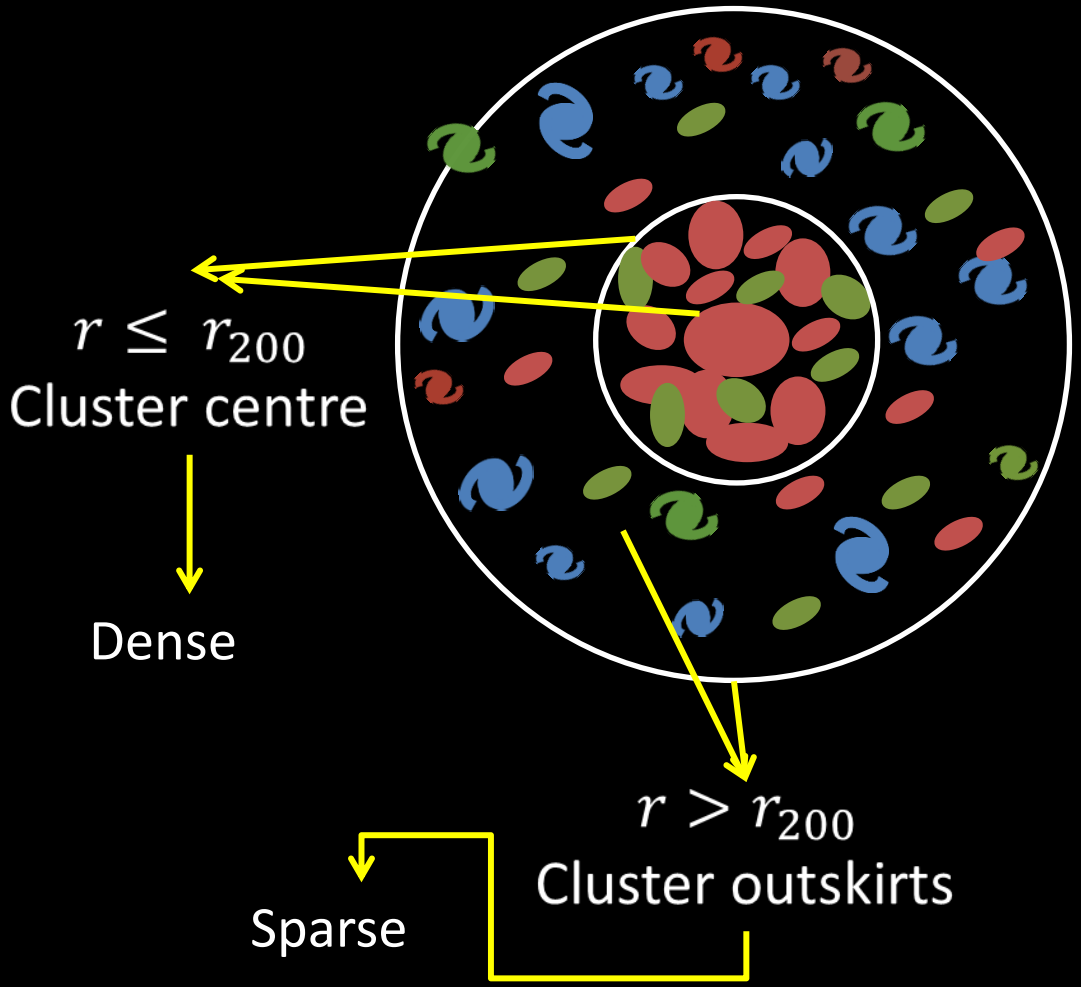
Early-type galaxies quenched their star formation 0.5 Gyr earlier in clusters than in the field (Gobat et al. 2008)

Galaxy Clusters

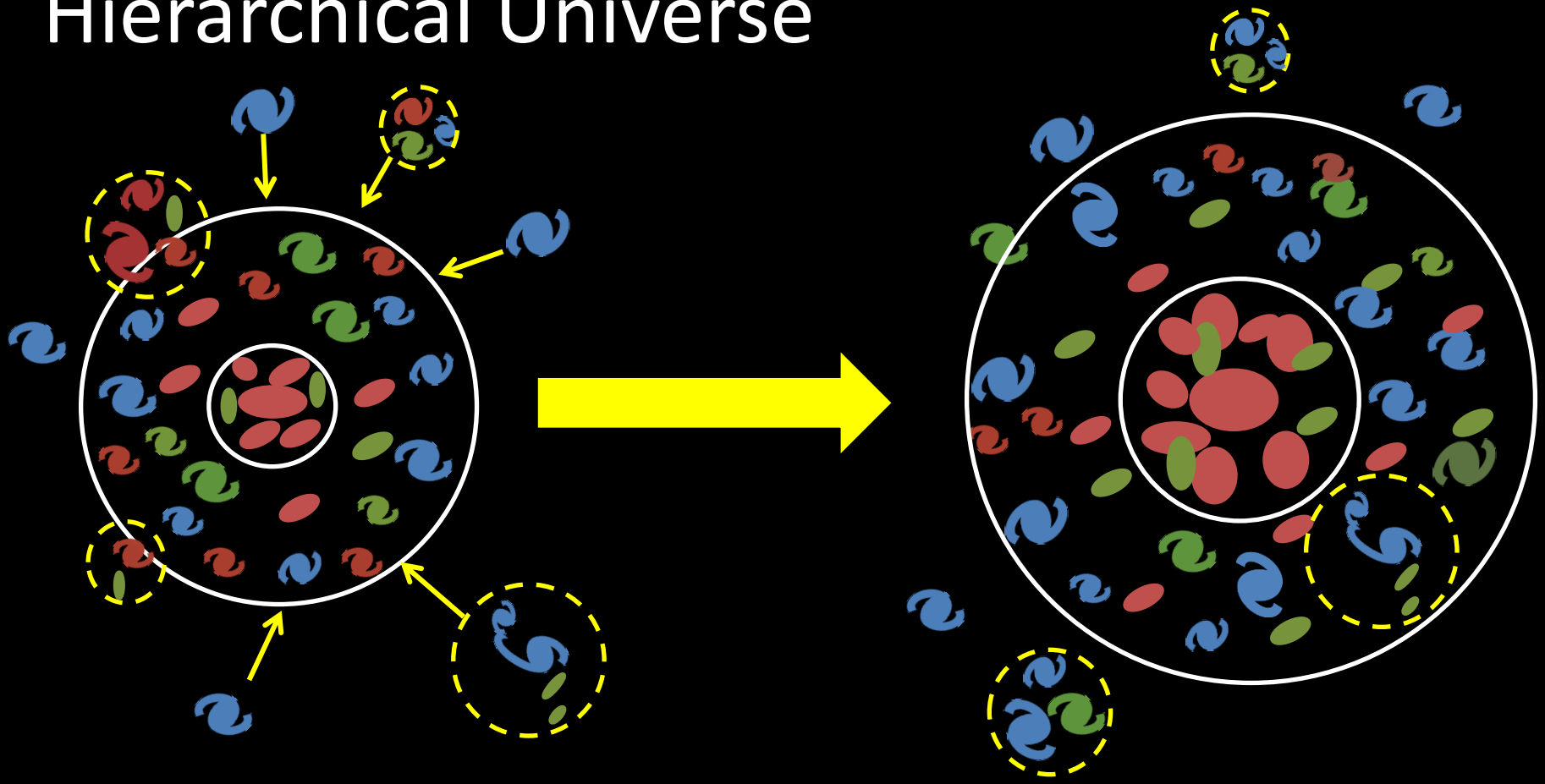
Cosmic laboratories for the study of the environmental drivers of galaxy evolution (e.g. Dressler 1980, De Lucia et al. 2007, Demarco et al. 2010, Lemaux et al. 2012, Cerulo et al. 2014).

Galaxy Cluster MACS J1206.2–0847
Hubble Space Telescope • WFC3/IR ACS/WFC

NASA, ESA, M. Postman (STScI), and the CLASH Team STScI-PRC11-25a

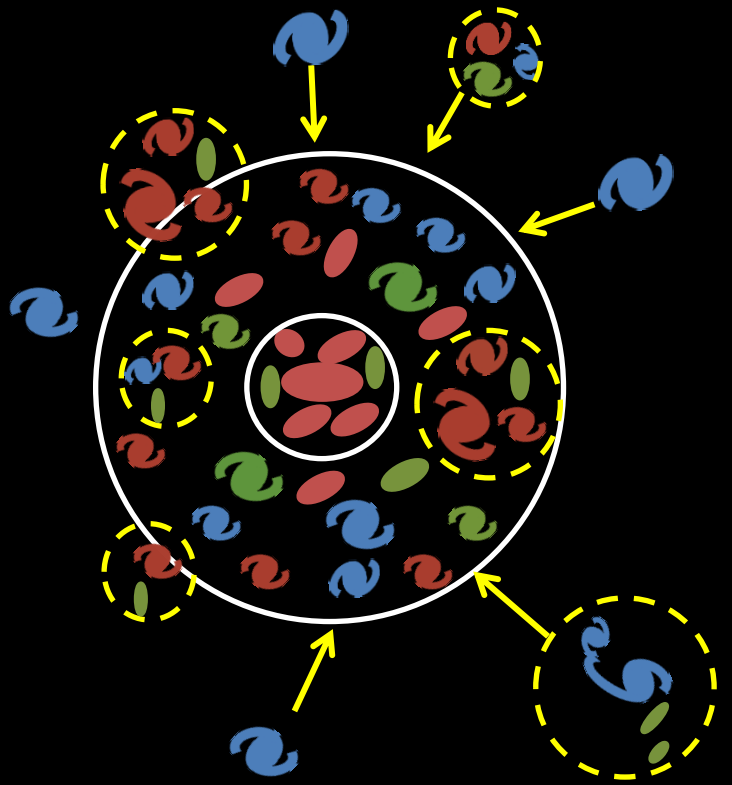


Cluster Mass Assembly in a Hierarchical Universe

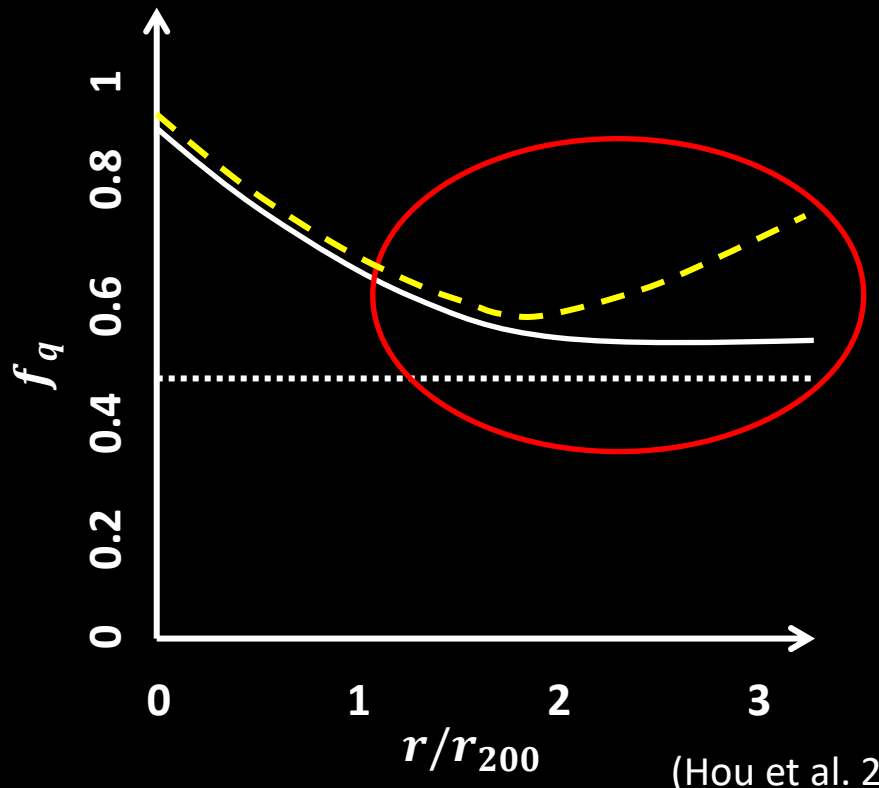


Galaxy clusters grow through accretion of less massive structures (e.g Press & Schechter 1974, McGee et al. 2009)

Galaxy Pre-Processing



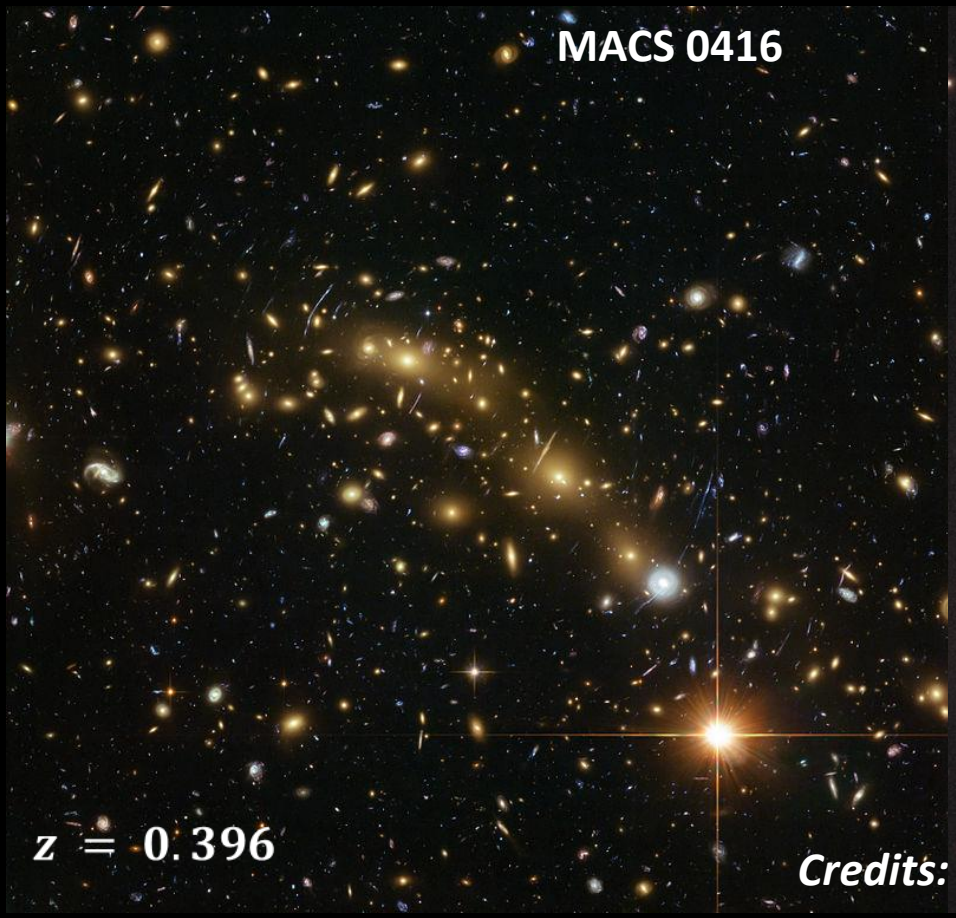
f_q in cluster outskirts ($r > r_{200}$) is higher than in the field

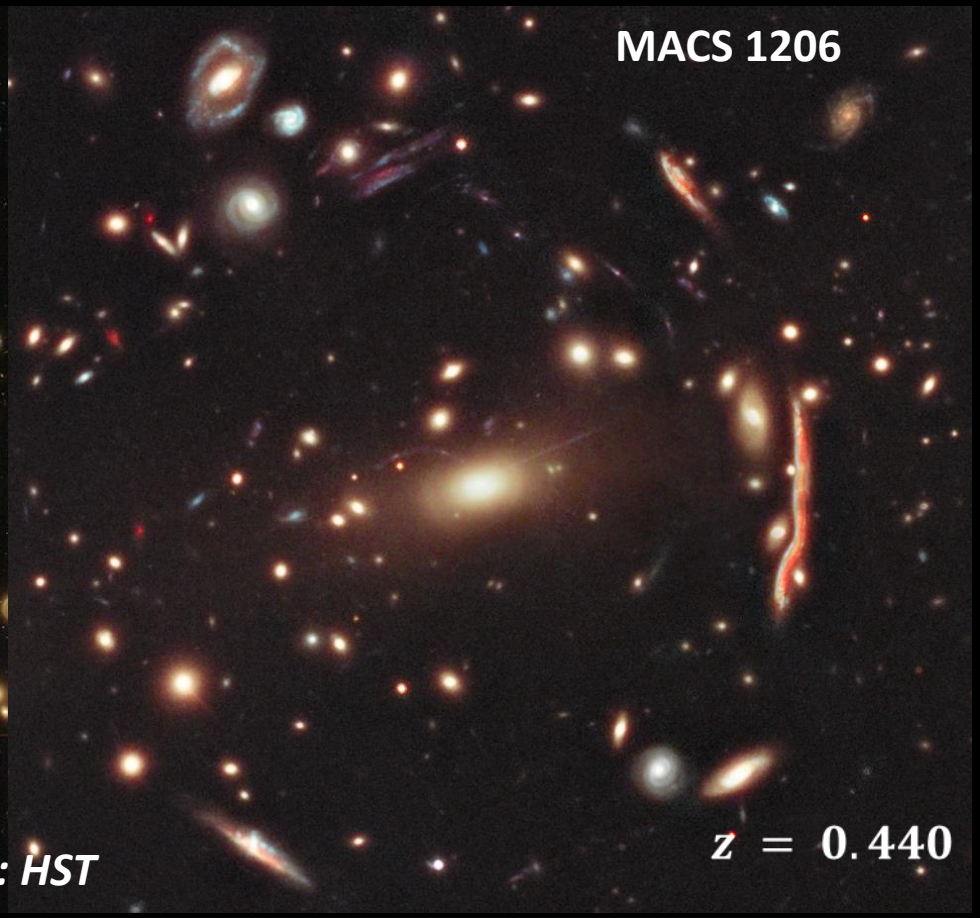


(Hou et al. 2014)

~50% of the quiescent galaxies in clusters at $z = 0$ were pre-processed (e.g. Wetzel et al. 2013)

Data

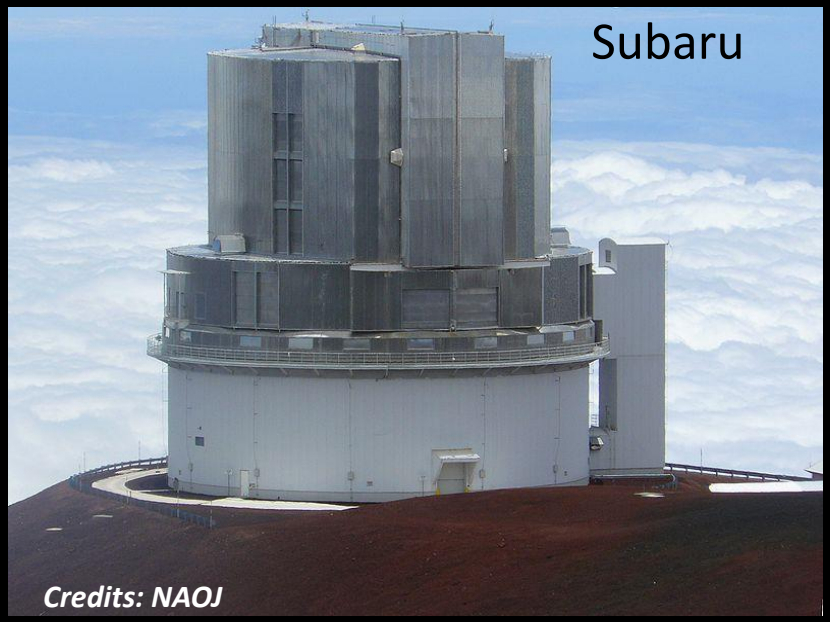




Credits: HST

CLASH-VLT: 13 massive galaxy clusters ($\sim 0.7 - 2 \times 10^{15} M_{\odot}$)
at $0.2 < z < 0.6$

Data



MACS 0416: B, R and *z*
MACS 1206: B, V, R, I and *z*

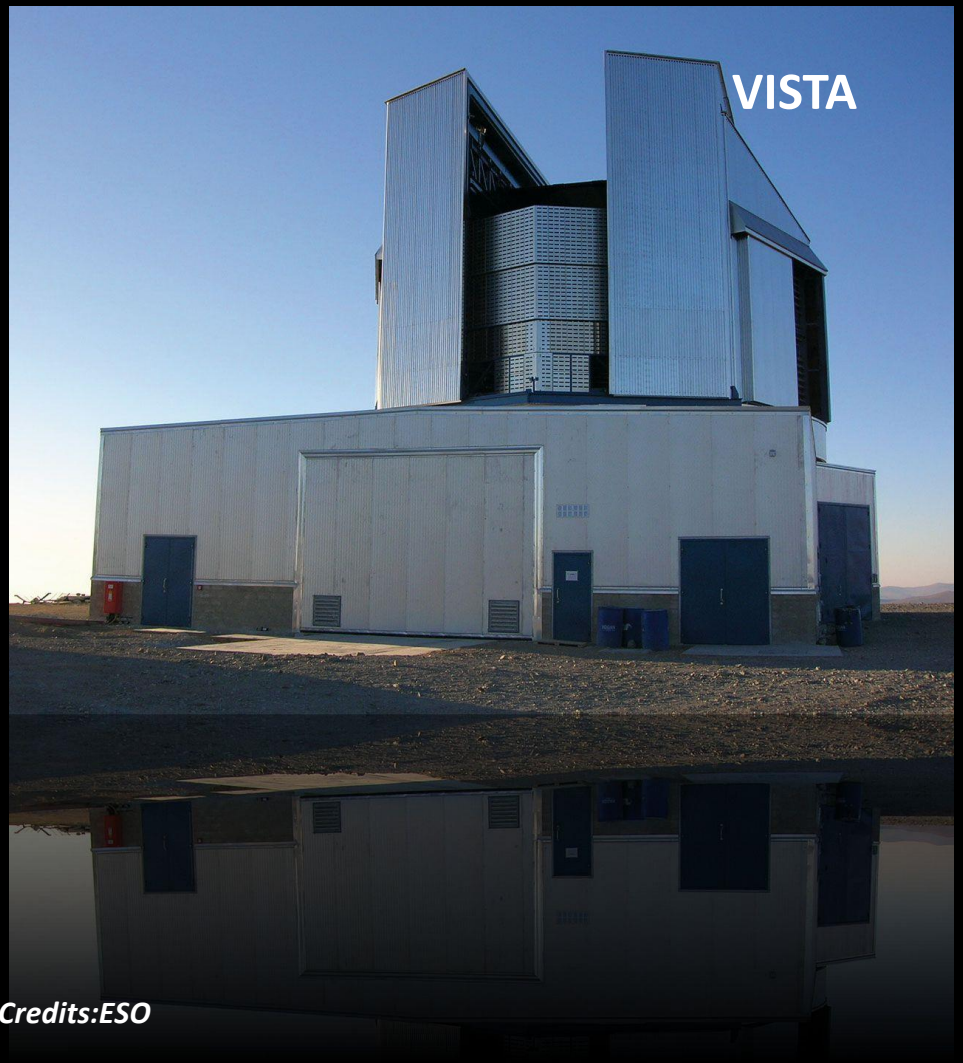
MACS 0416: B, V, R and I

$\sim 3.5 r_{200}$

Data

Spectroscopic data from the CLASH-VLT project (Rosati et al., 2014).

Data



Credits:ESO

3.166 field galaxies at
$0.36 < z < 0.46$

COSMOS/UltraVISTA catalogue
(Muzzin et al. 2013)

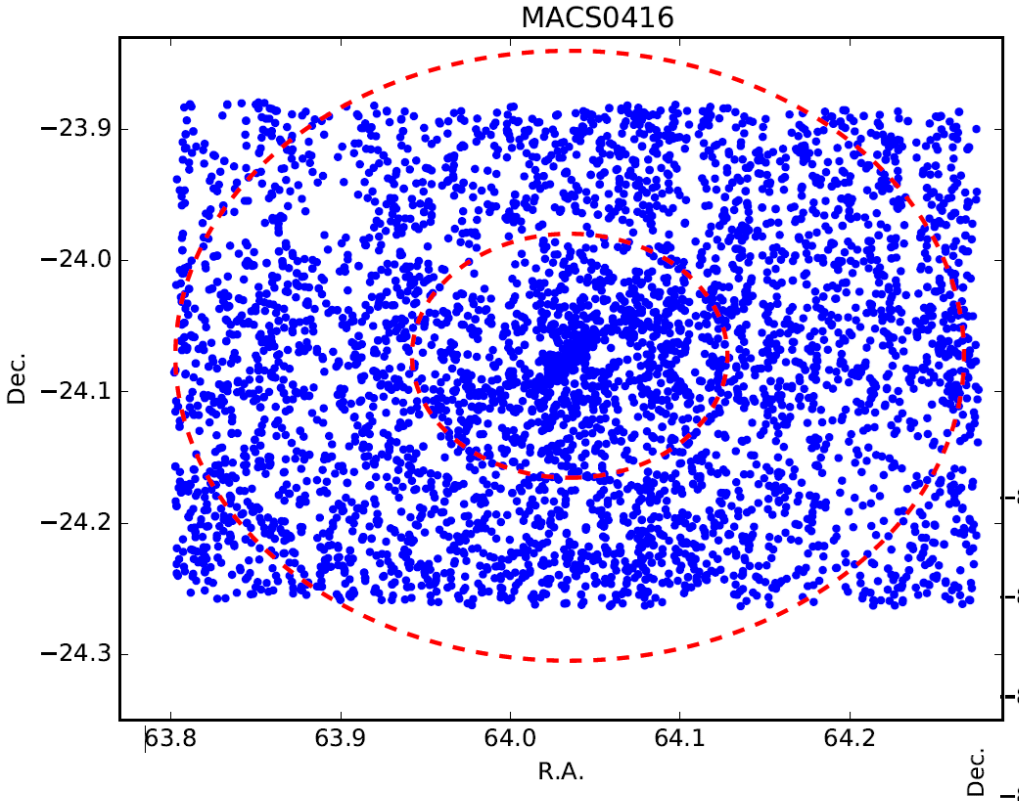
↓

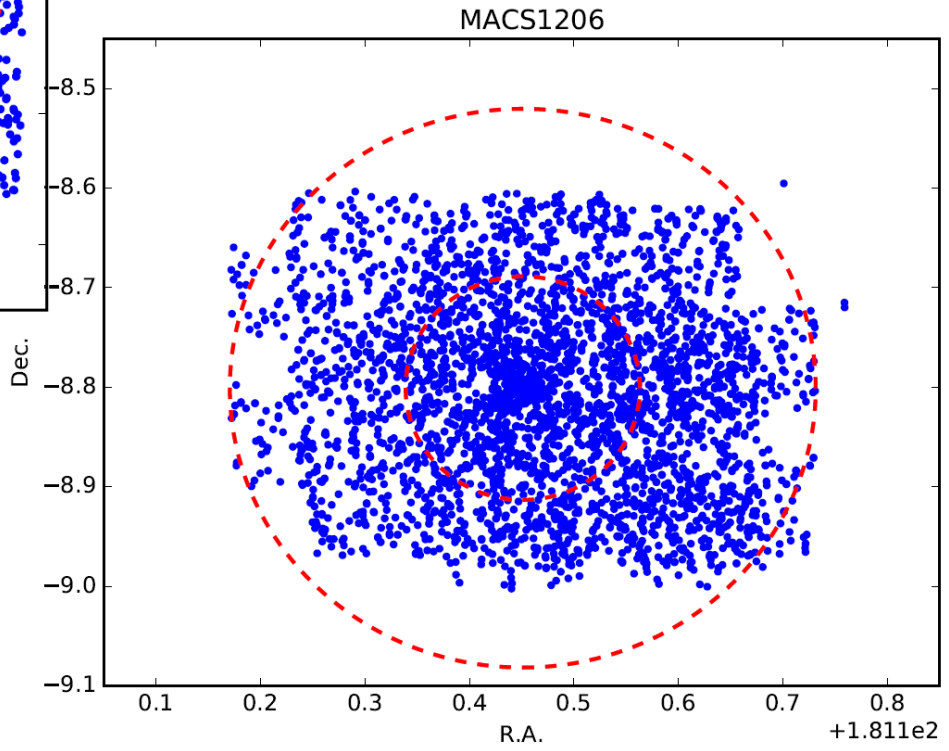
262.615 sources

↓

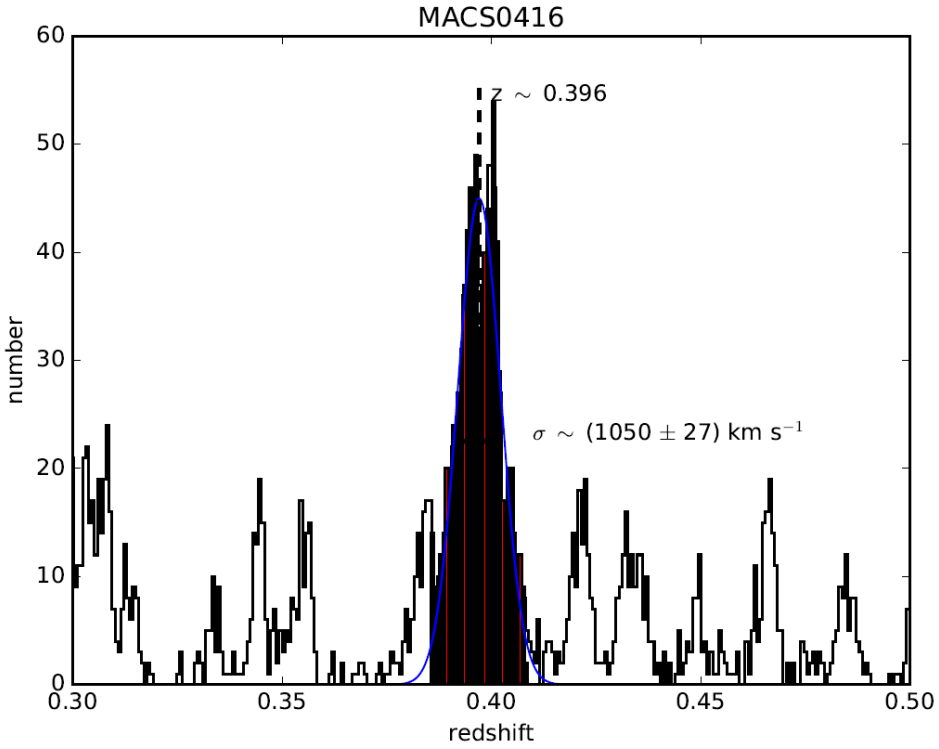
30 photometric bands, z_{phot}, $M_\star$ and rest-frame U, V, and J photometry

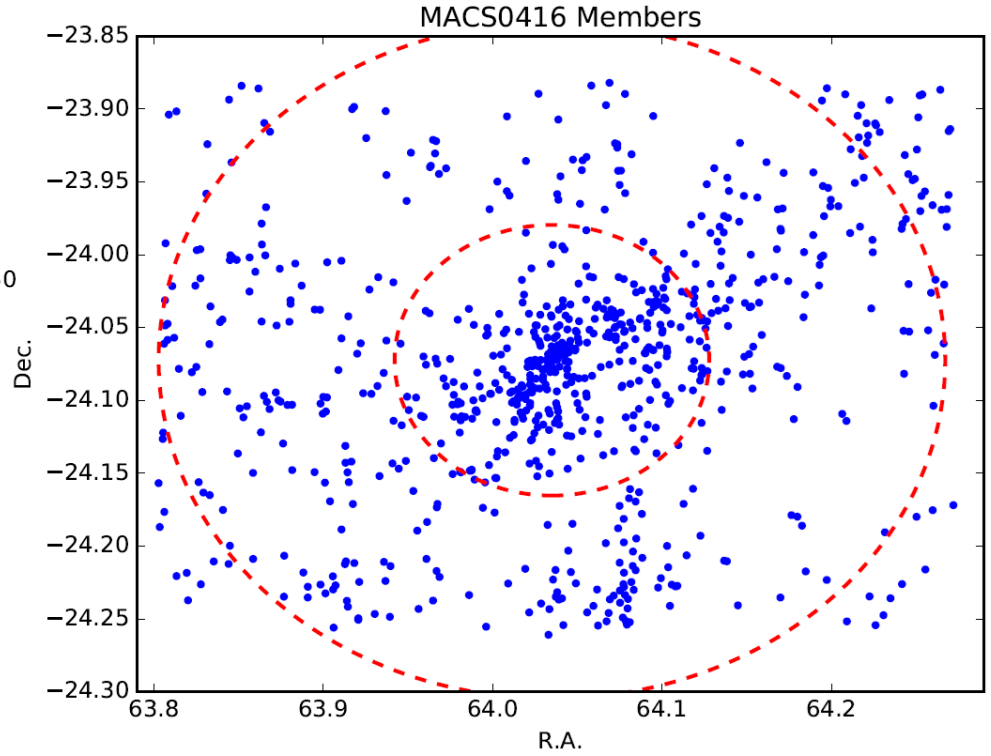
Galaxies in the Sky



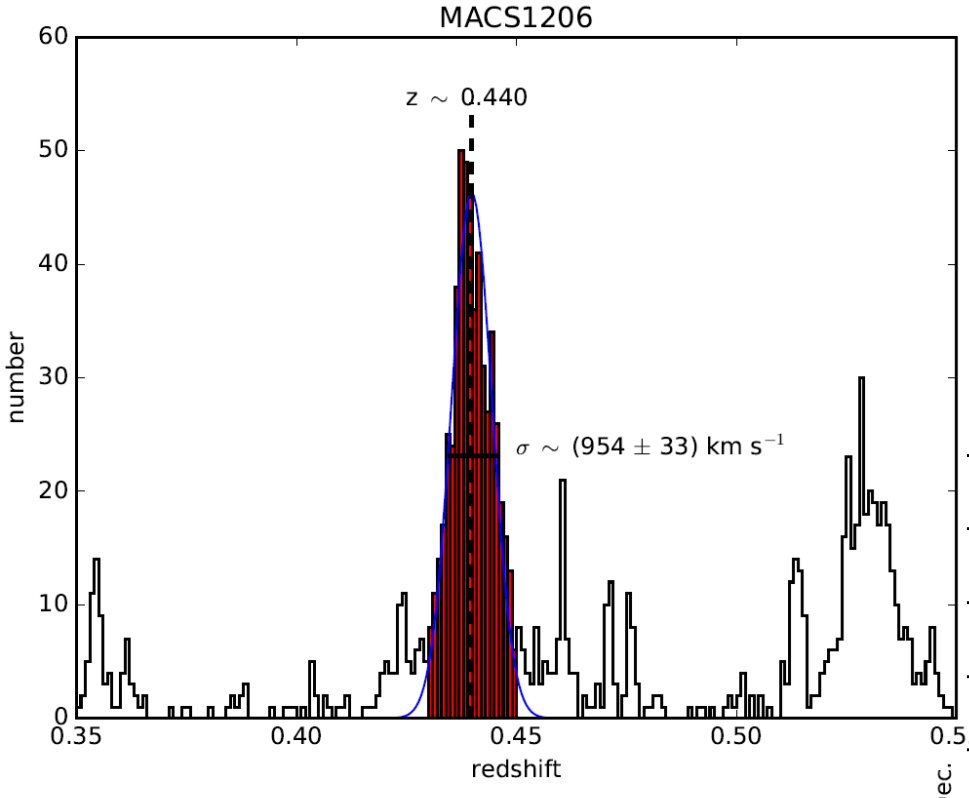


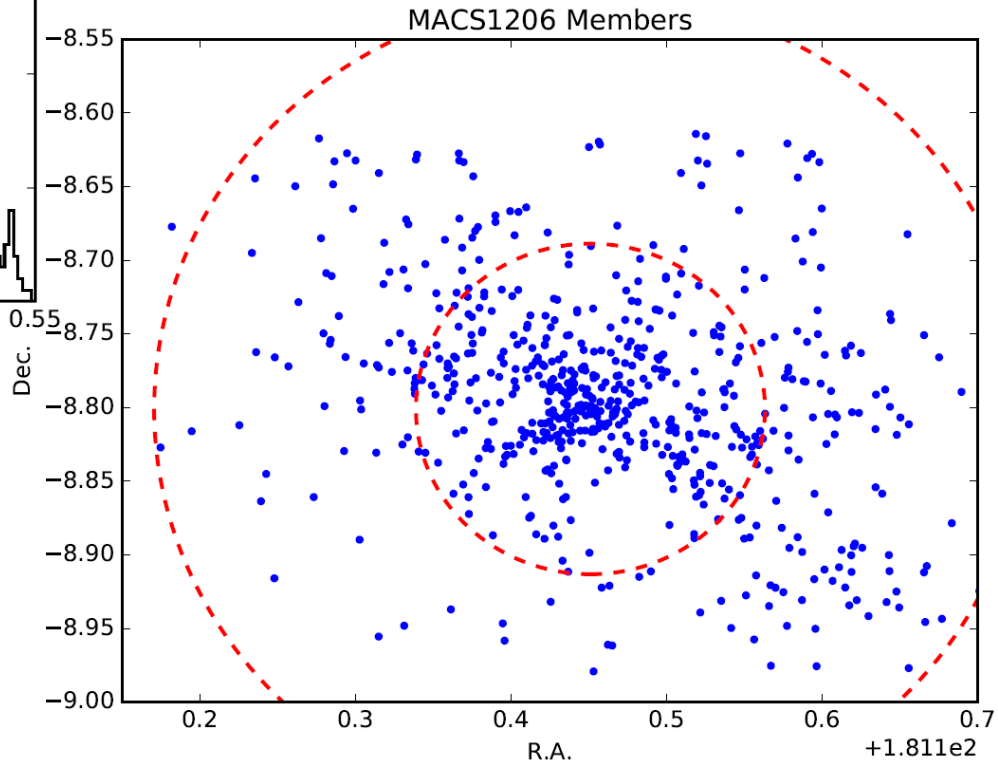
Cluster membership



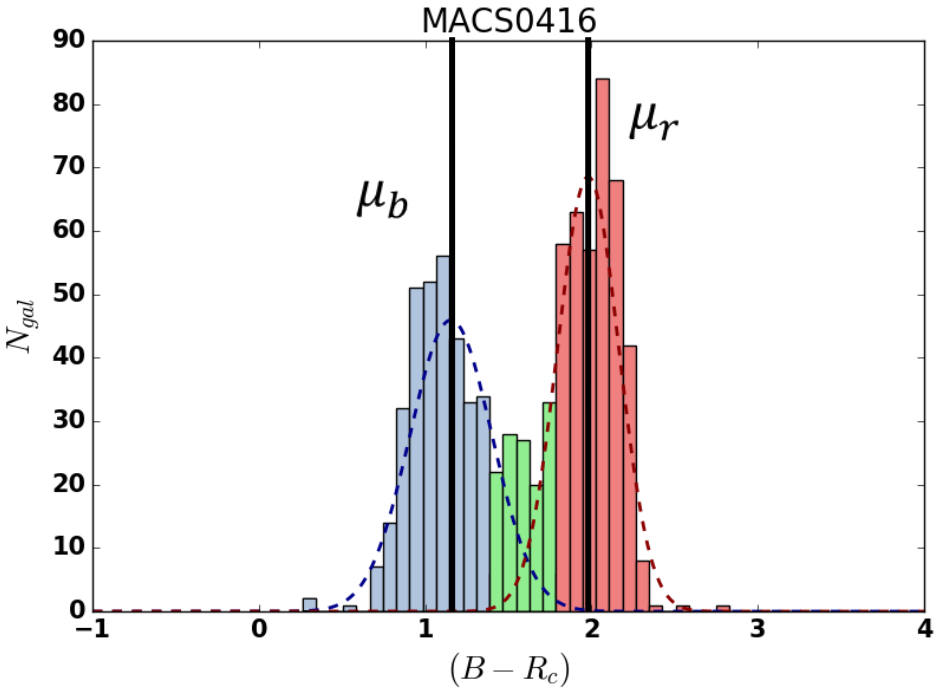


Cluster membership

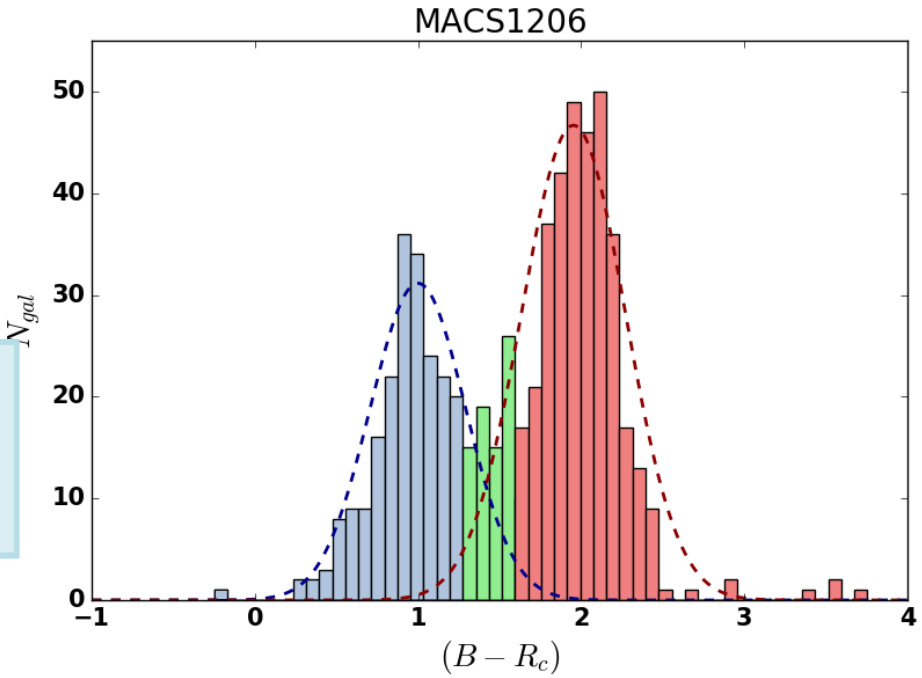




Colour Bimodality



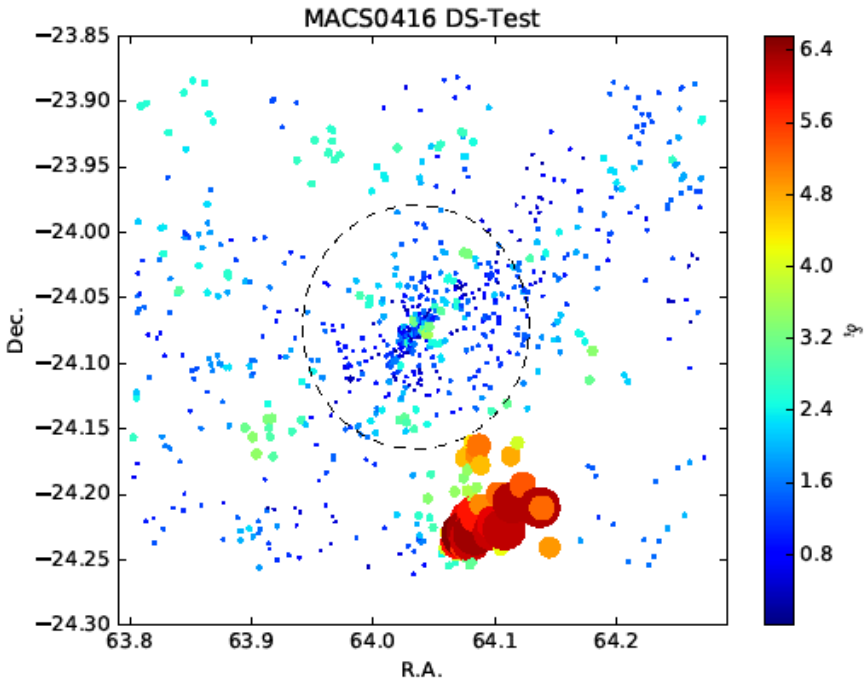
GMM (Muratov & Gnedin 2010)



$$\text{Blue} : (B-R) \leq \mu_b + 1\sigma_b$$
$$\text{Red} : (B-R) \geq \mu_r - 1\sigma_r$$
$$\text{Green} : \mu_b + 1\sigma_b < (B-R) < \mu_r - 1\sigma_r$$

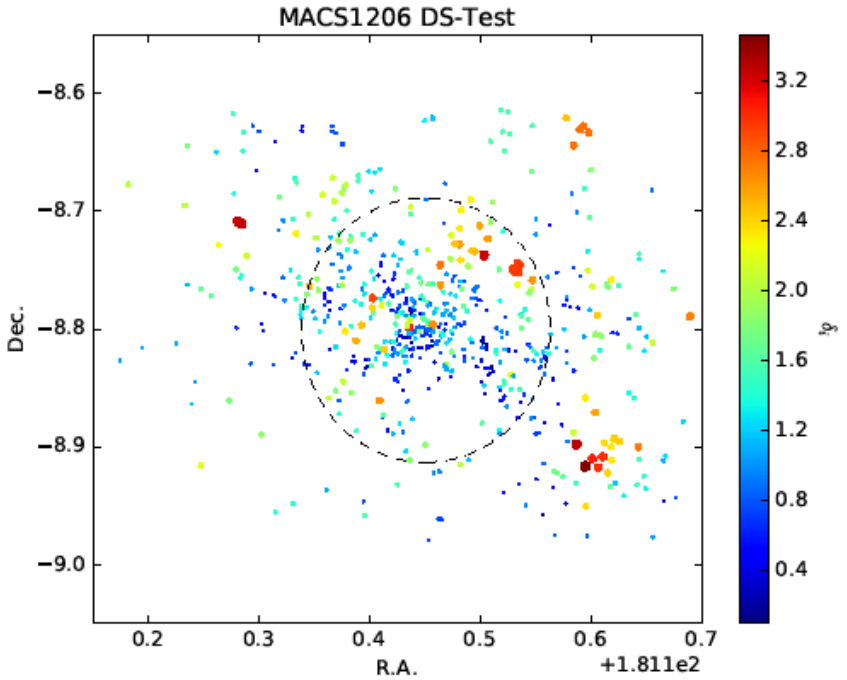
(Olave-Rojas et al. 2018)

Detection of Substructures



DS-Test (Dressler & Schectman 1988)

$$\delta_i^2 = \left(\frac{N_{nn}+1}{\sigma_{cl}^2}\right)\left[(\bar{v}_{local}^i - \bar{v}_{cl})^2 + (\sigma_{local}^i - \sigma_{cl})^2\right]$$



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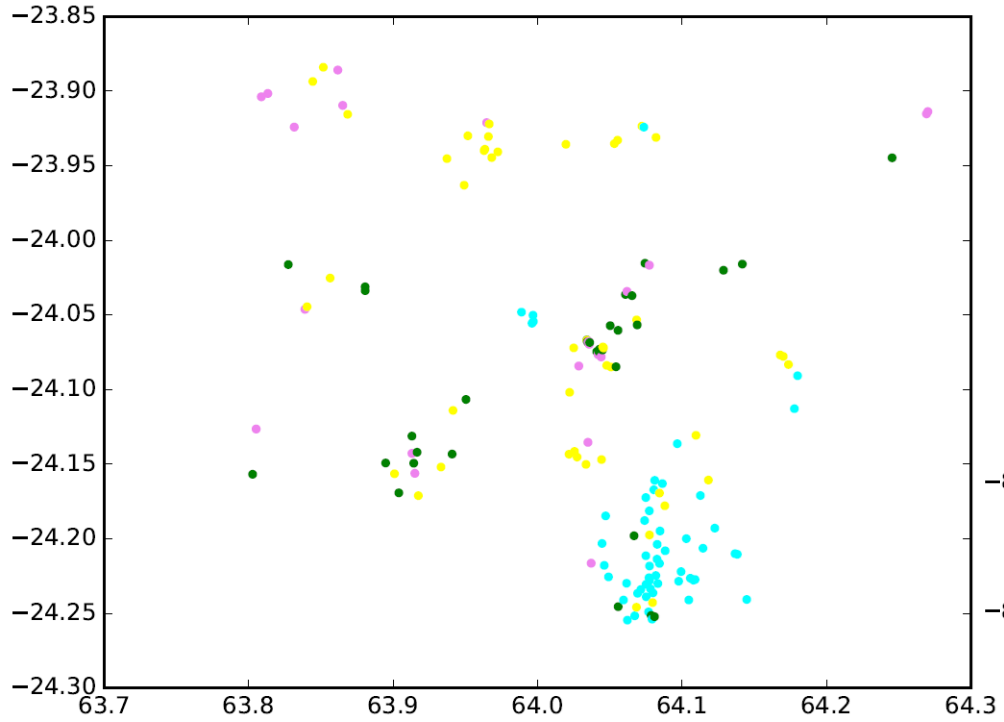

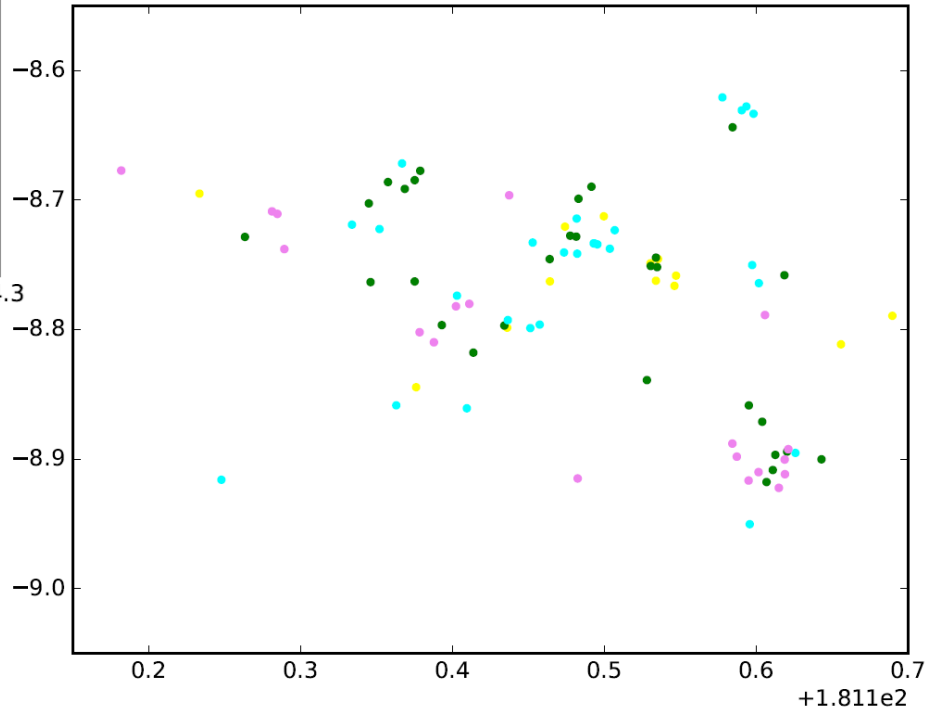

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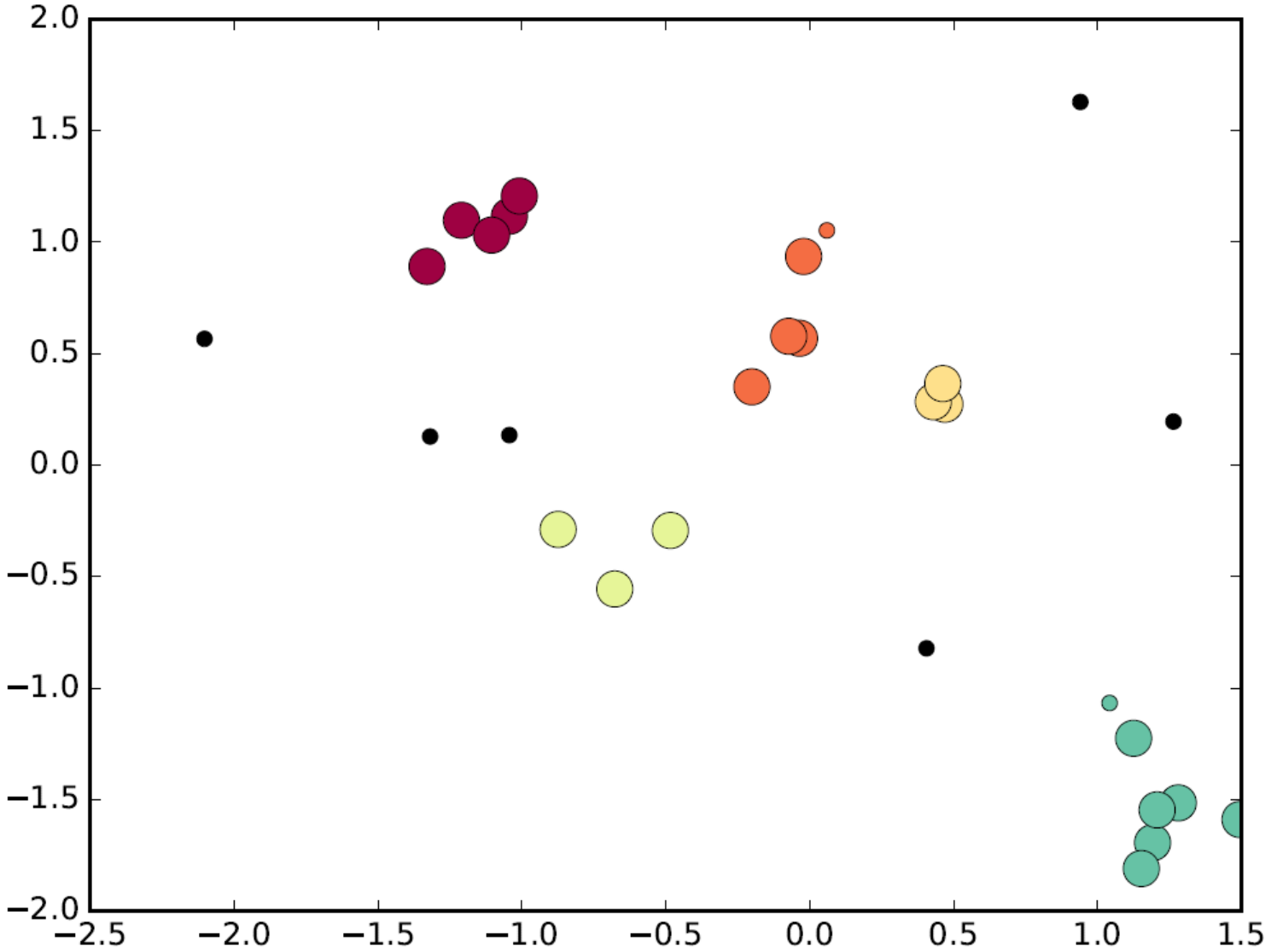

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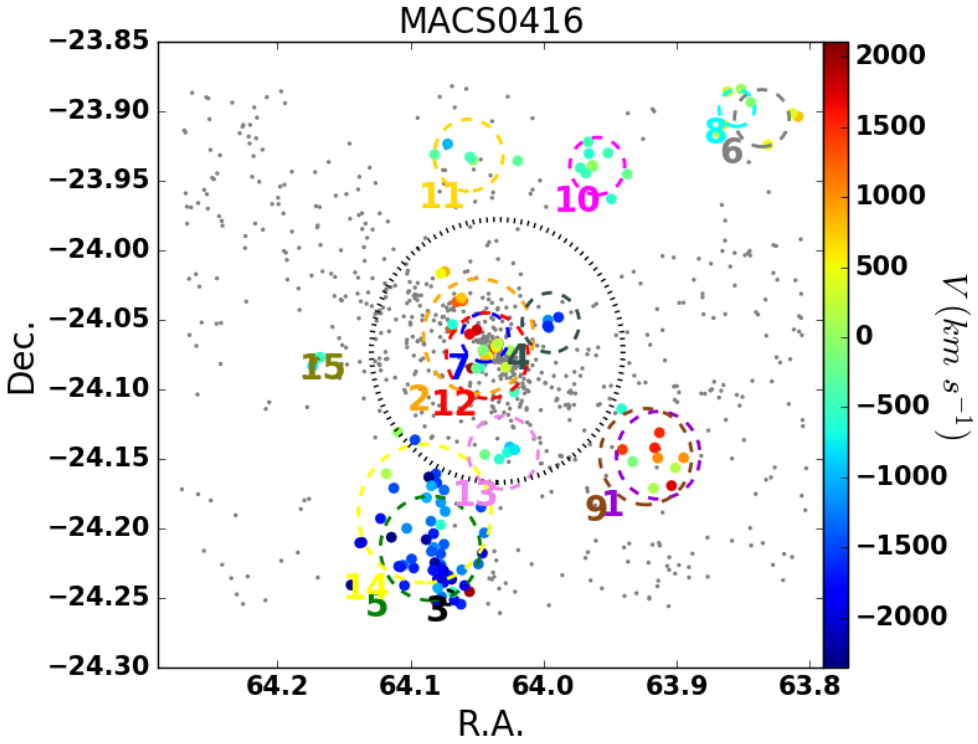
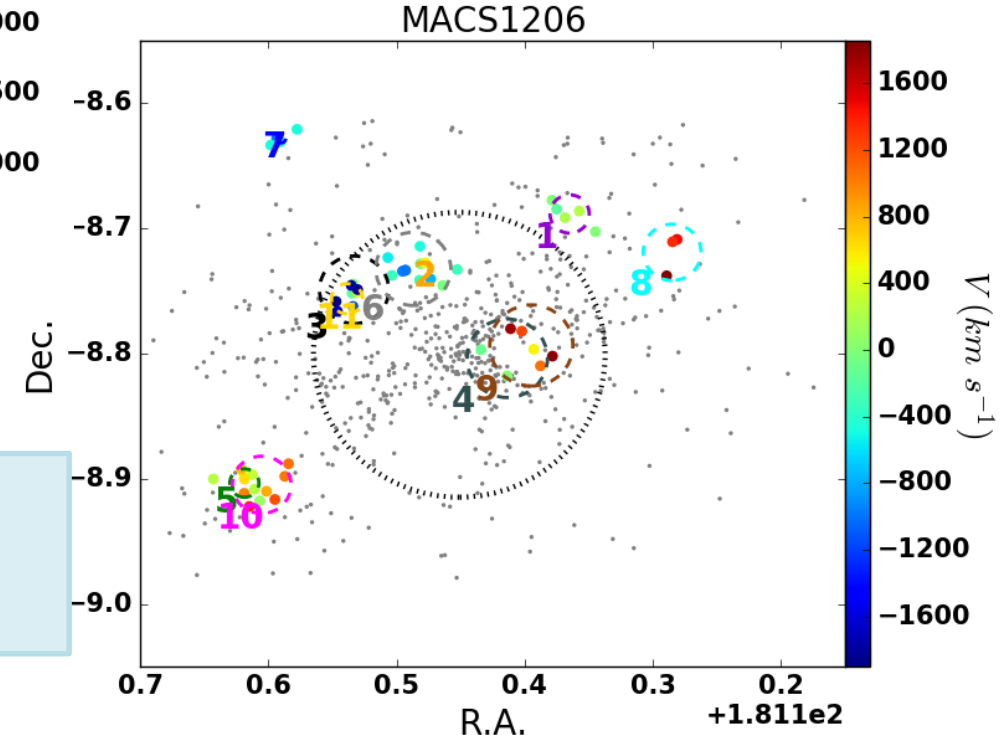


Dressler-Shectman (DS) Test
(Dressler & Shectman 1988)

✚

DBSCAN (Ester et al. 1996)

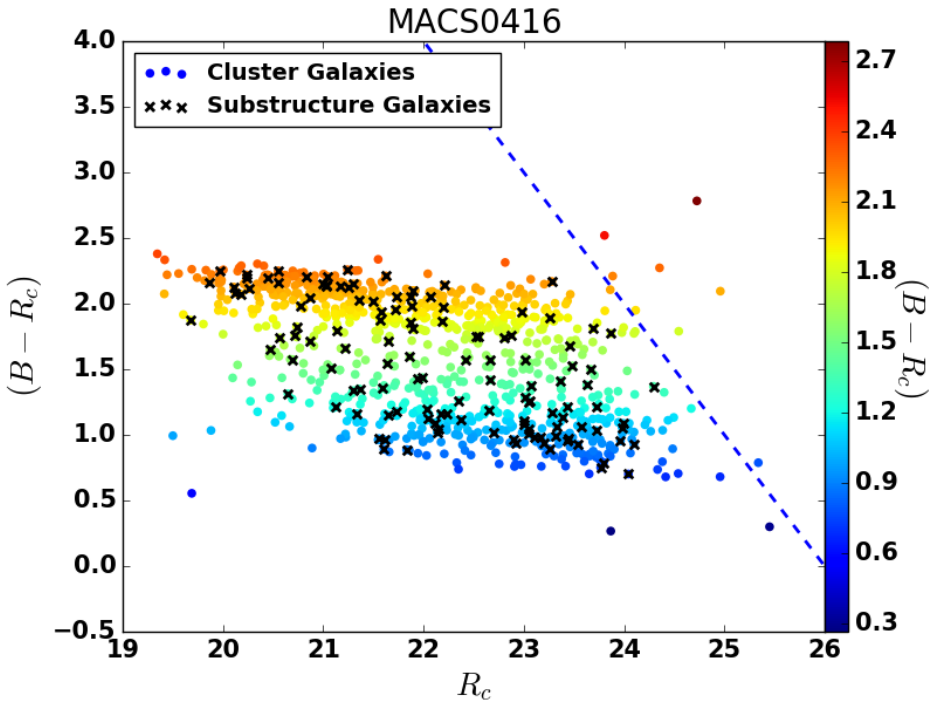


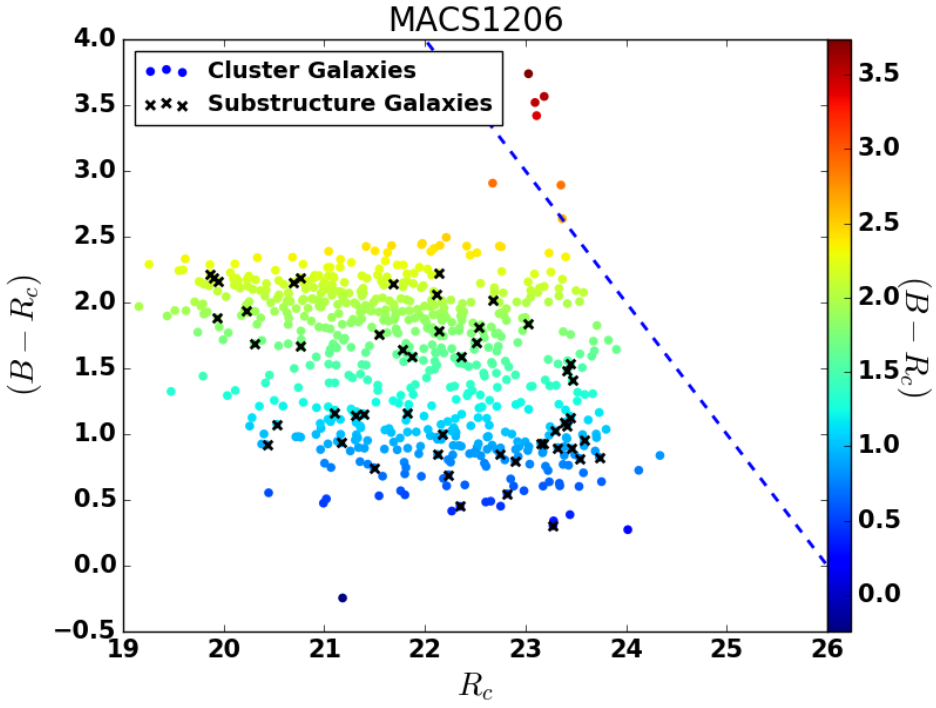
$r_{200_{sb}} \sim (0.2 - 1.0)\ Mpc$

40% are in inner regions ($r \leq r_{200}$)
60% are in the outer regions ($r > r_{200}$)

Olave-Rojas et al. 2018

Colour-Magnitude Diagram





Absence of significant differences between the CMDs in clusters and substructures.

Olave-Rojas et al. 2018

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