Boris Deshev

TARTU OBSERVATOORIUM
eesti kosmosekeskus

Galaxy populations in the merging cluster Abell 520

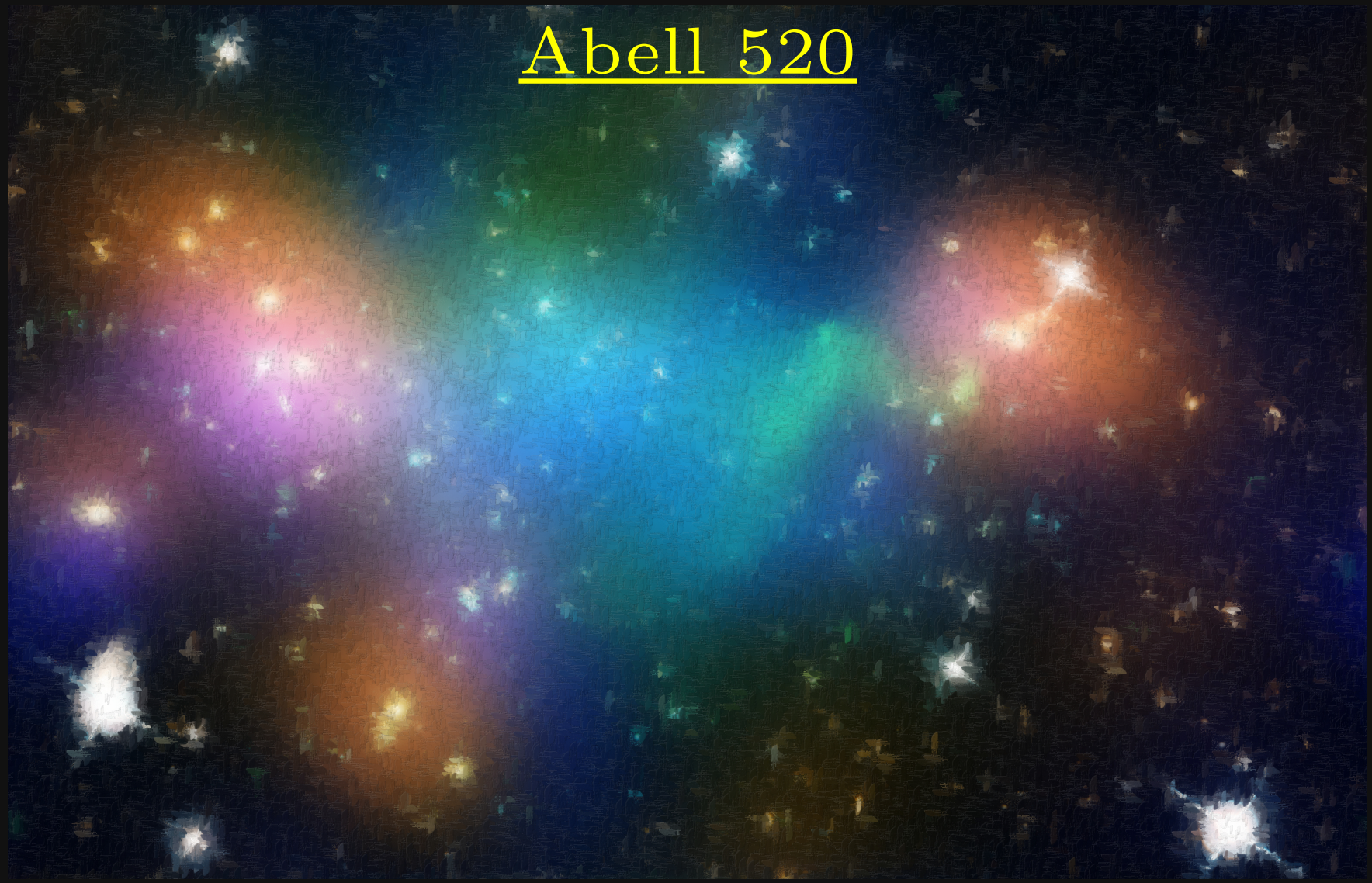


Image credit: Jee and Mahdavi + Van Gogh

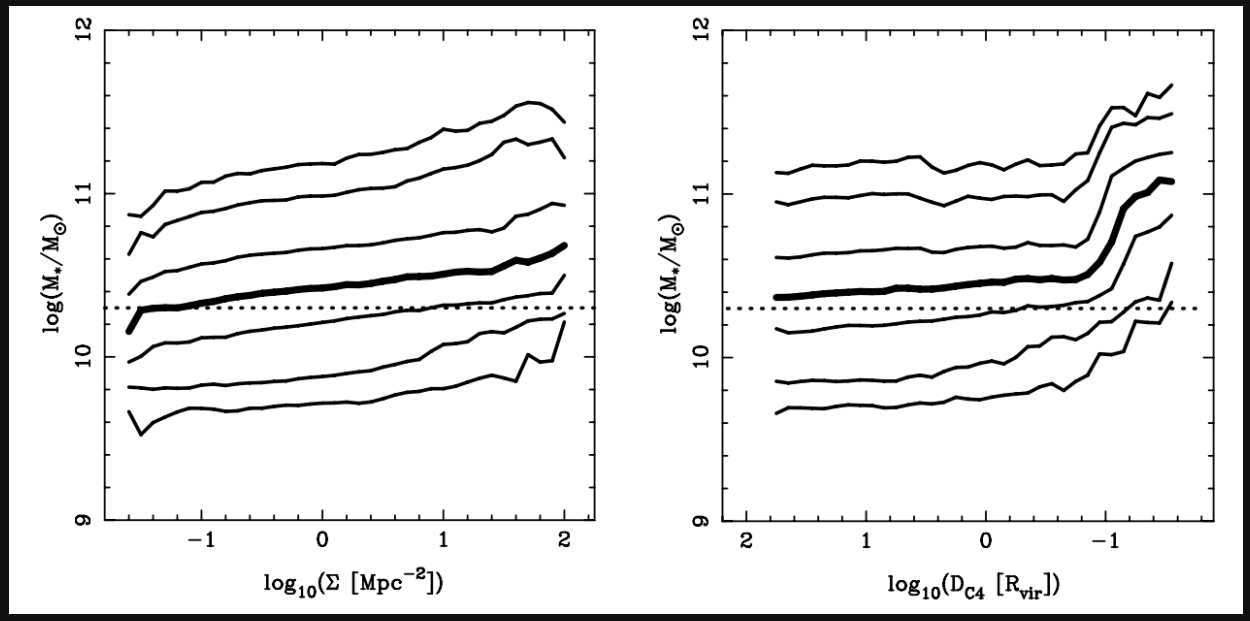
Tõravere, 16.Dec.2015

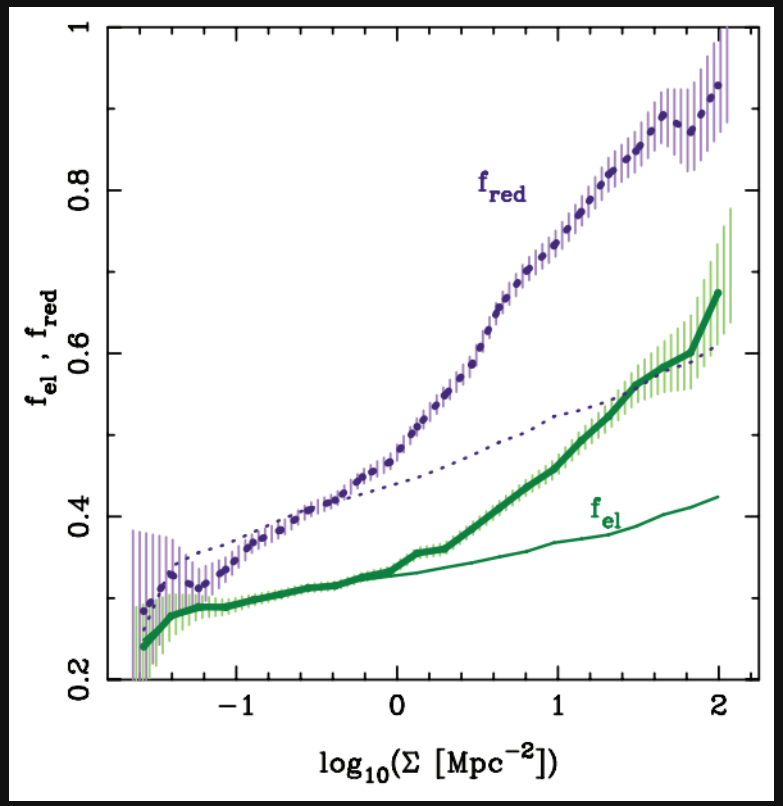
Collaboration

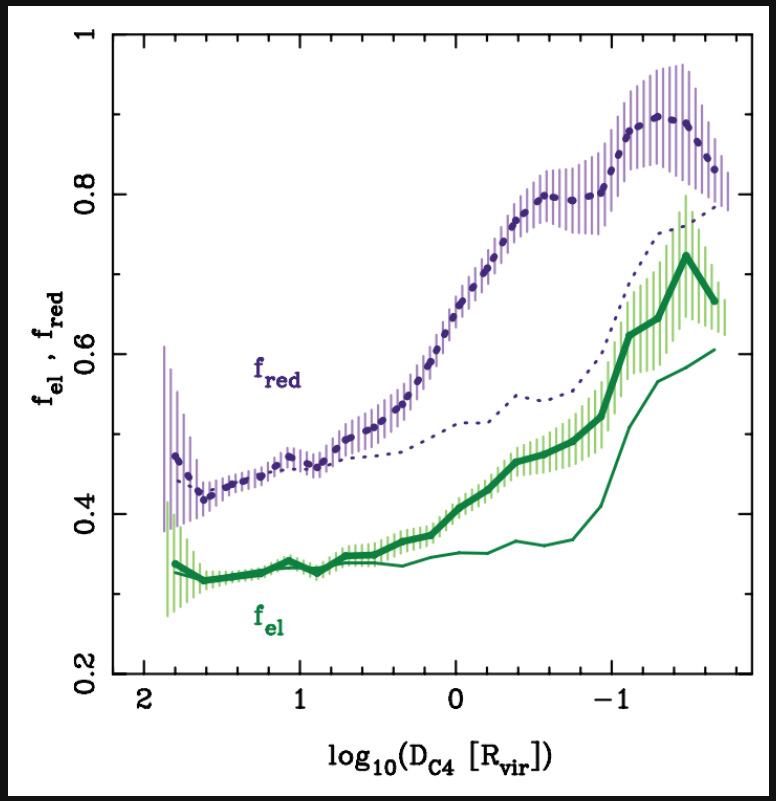
Miguel Verdugo	-	Vienna Observatory, Austria
Bodo Ziegler	-	Vienna Observatory, Austria
Ho Seong Hwang	-	KIAS, Korea
Changbom Park	-	KIAS, Korea
Peter Kamphuis	-	CSIRO, Australia
Alexis Finoguenov	-	Helsinki University, Finland
Peeter Tenjes	-	Tartu Observatory, Estonia
Antti Tamm	-	Tartu Observatory, Estonia

Bamford+ 2009

Environmental effects

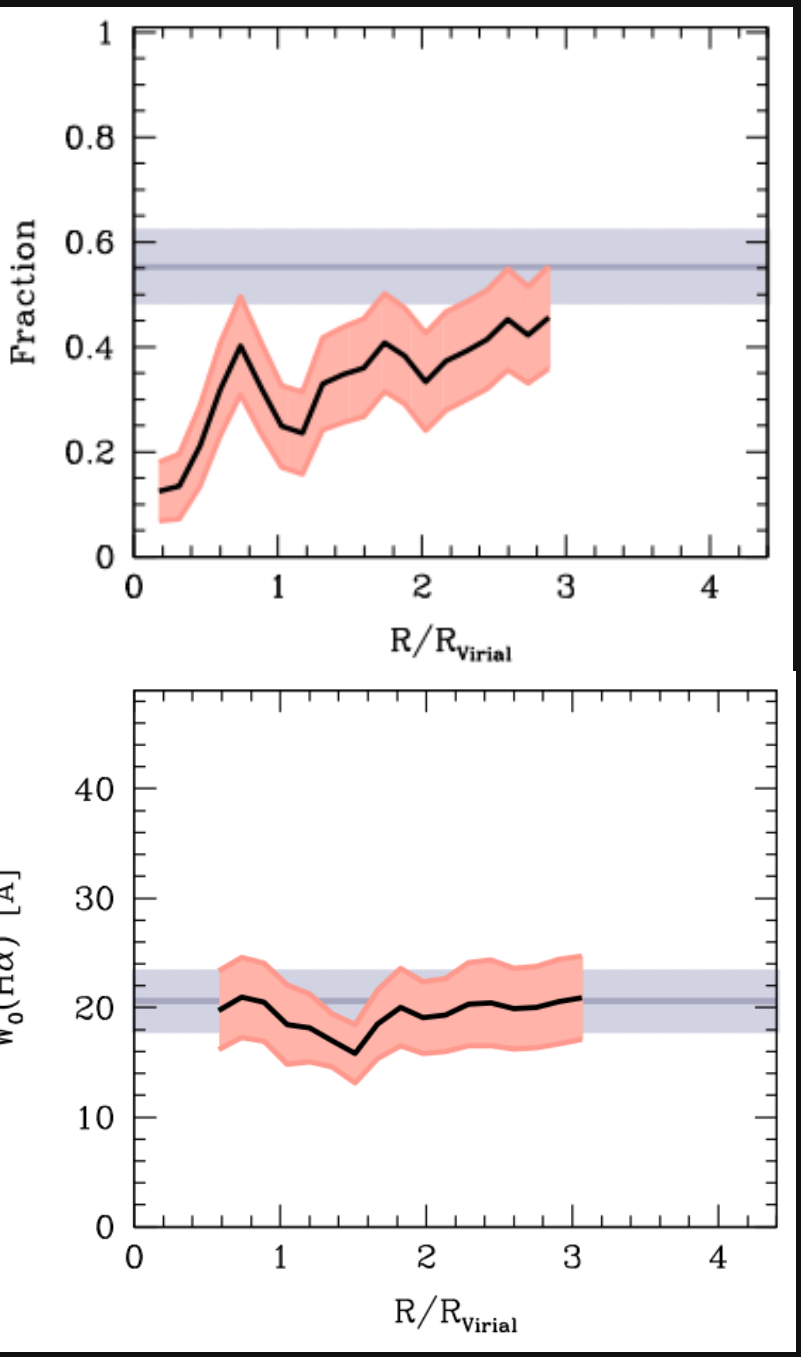




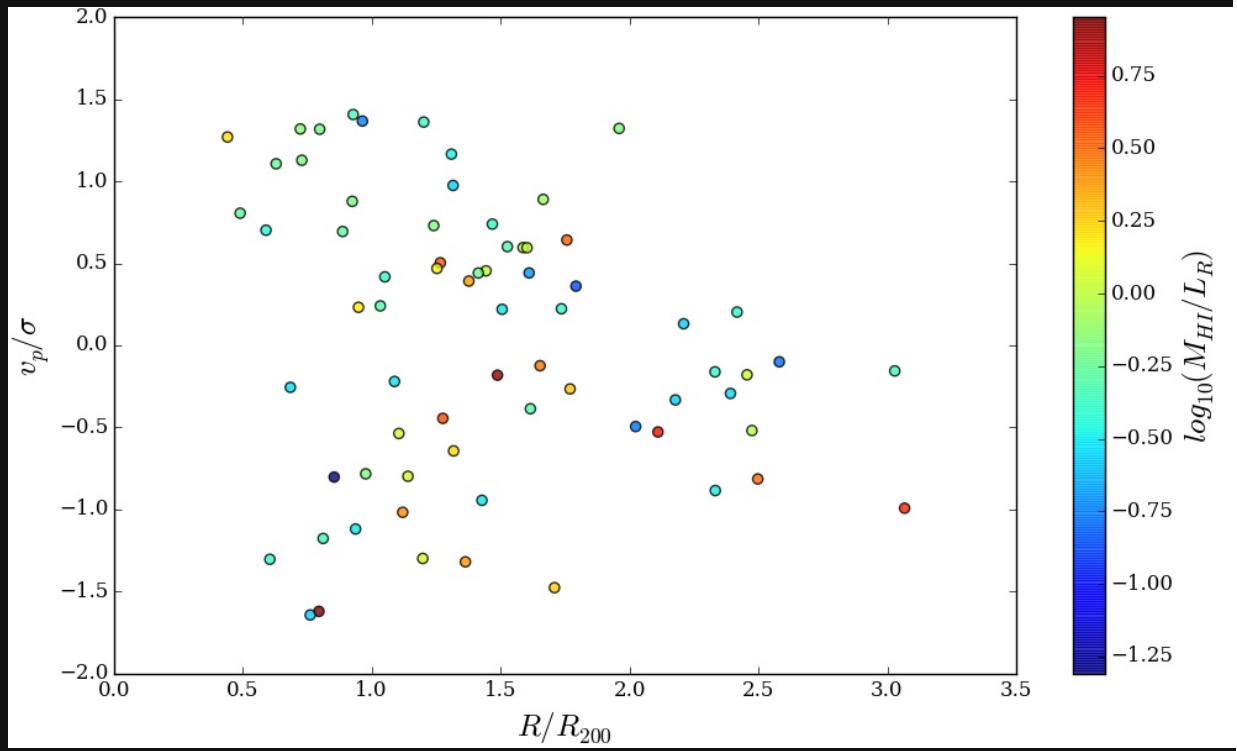


Environmental effects

Verdugo, Ziegler and Gerken 2008

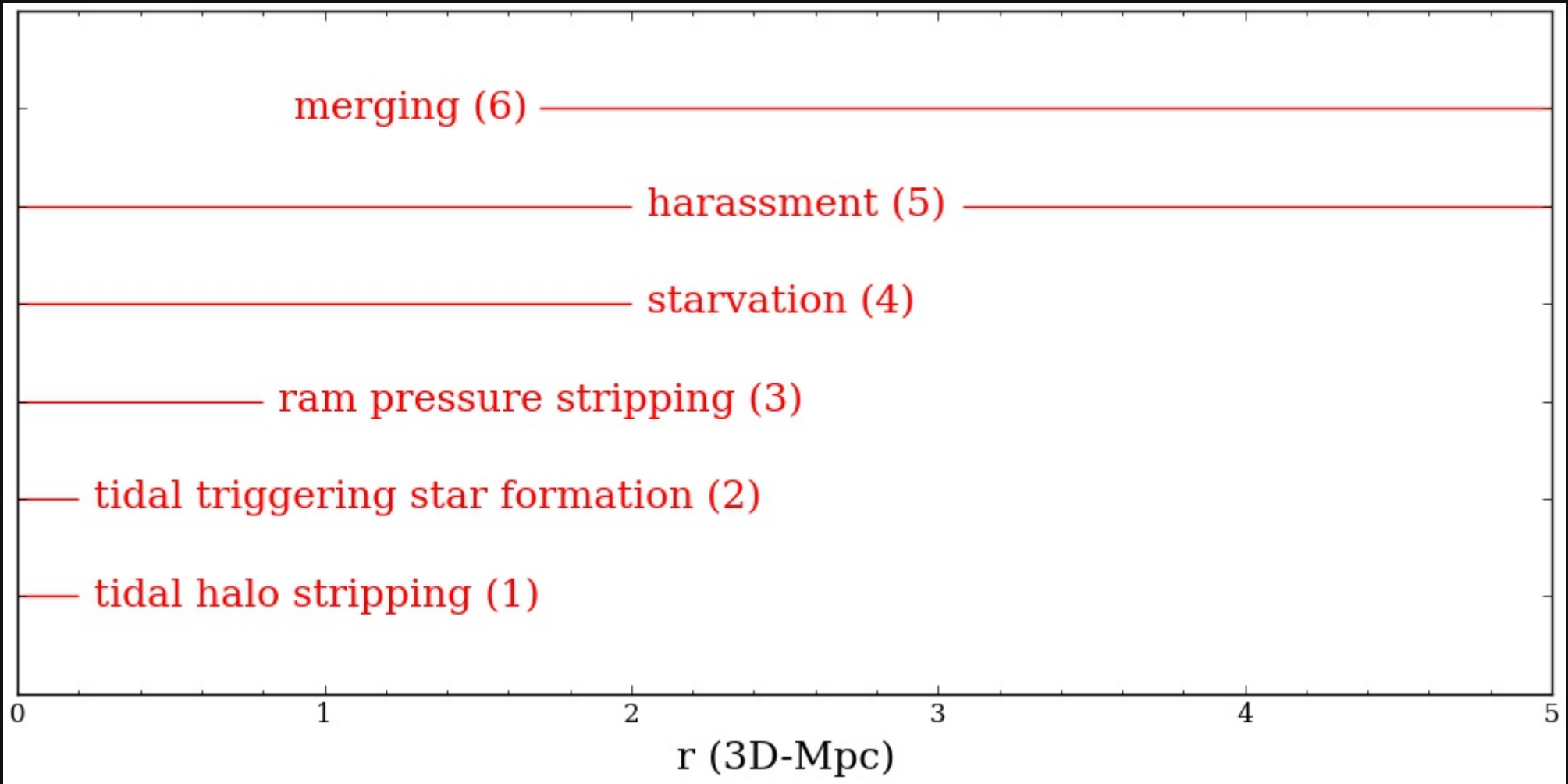


A963, Deshev+ 2009



Environmental effects

Treu+2003



Merging clusters do:

Triger star formation

Ferrari et al. 2005

Miller & Owen 2003

Owen et al. 2005

Hwang & Lee 2009

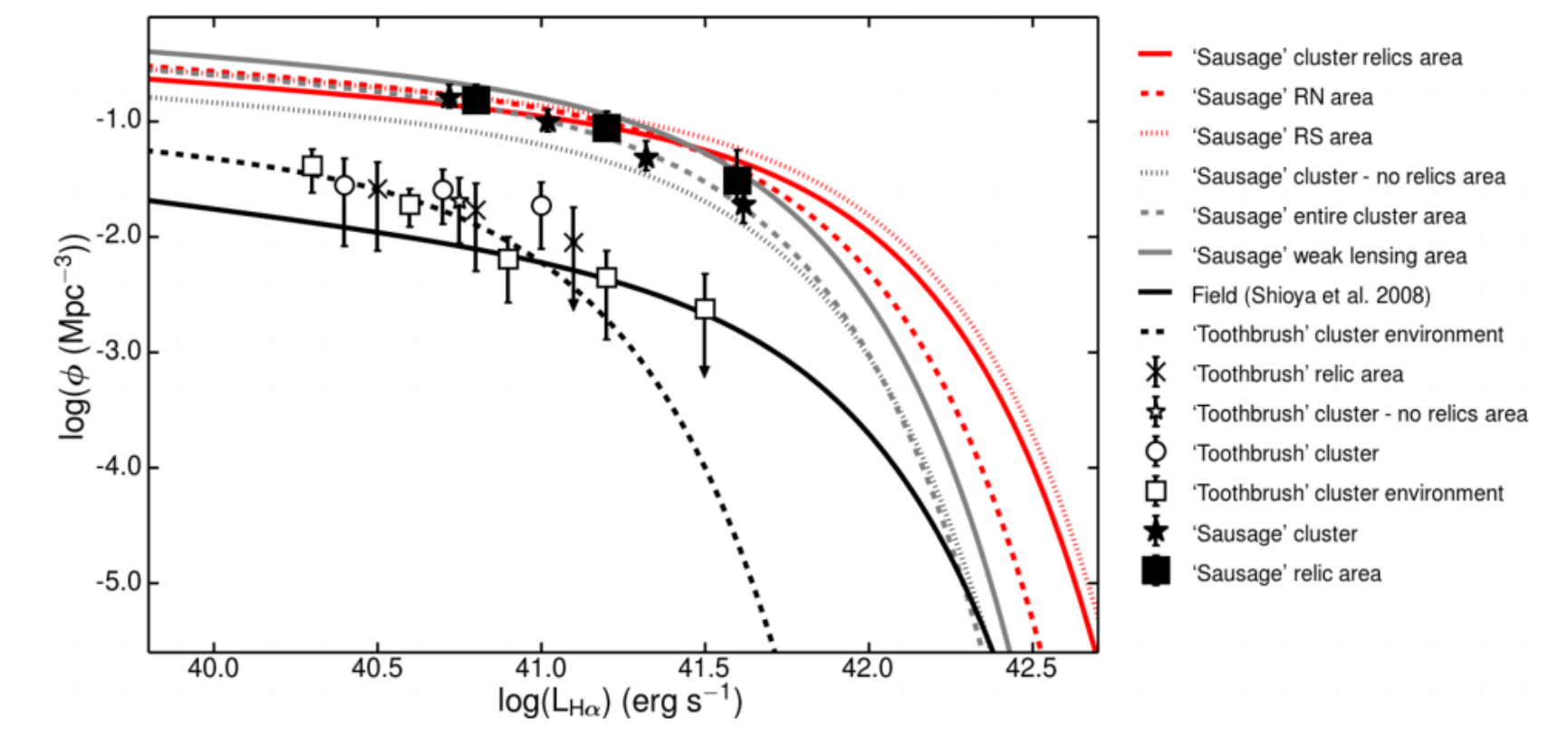
Stroe et al. 2015

Quench star formation

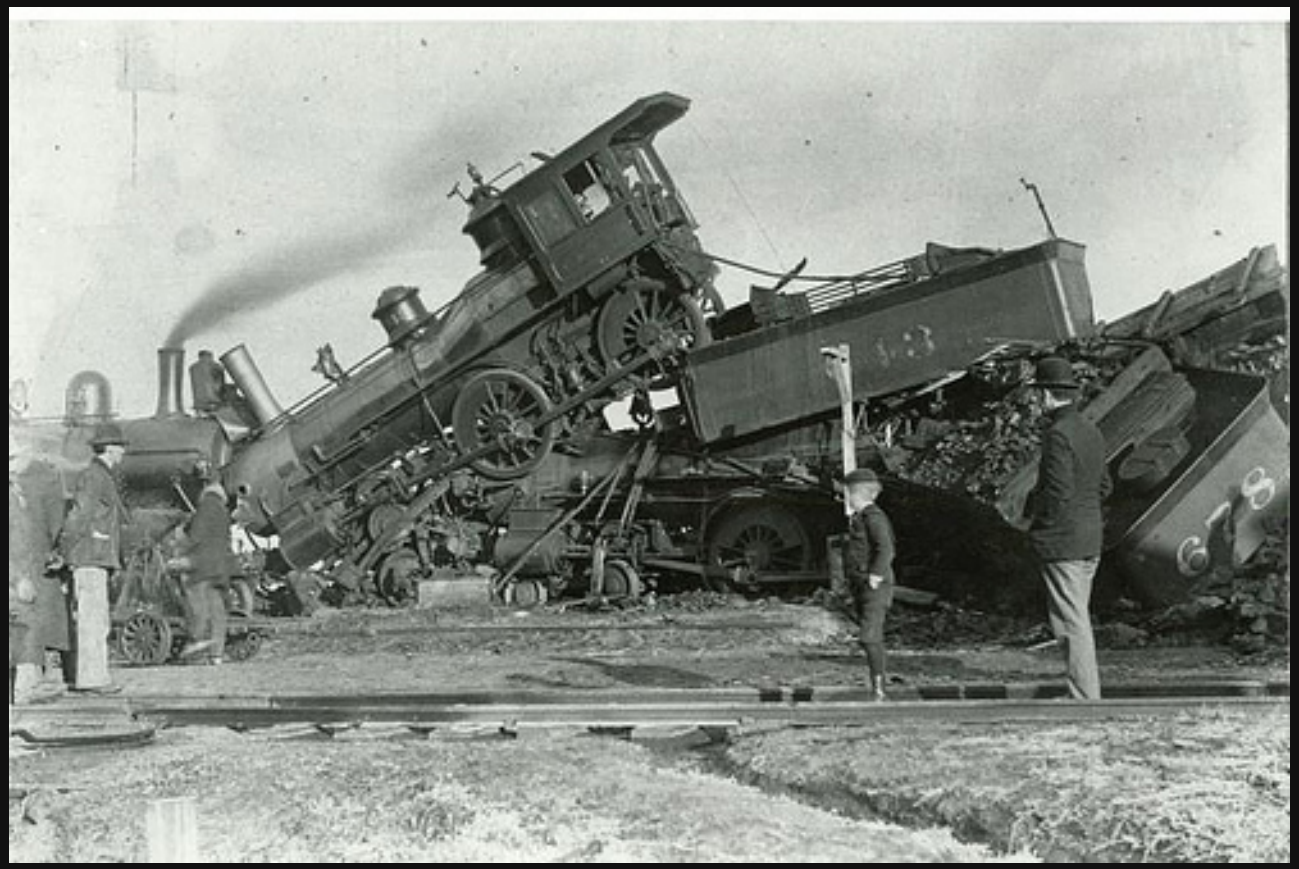
Poggianti et al. 2004

Do nothing

Chung et al. 2010



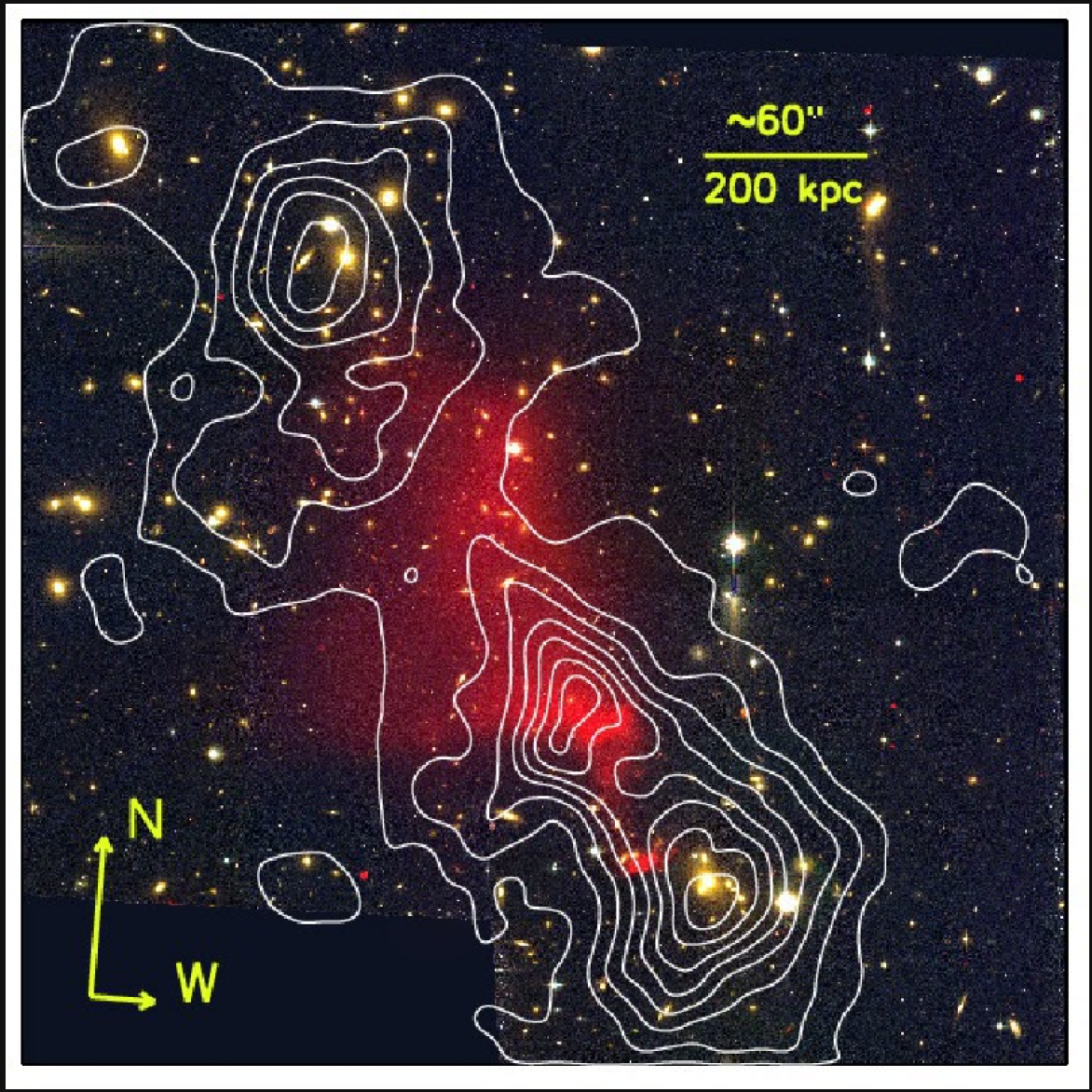
Abell 520 a.k.a. Trainwreck



Bullet
Sausage
Toothbrush
CIZA J2242.8+5301
Musket ball

Abell 520 a.k.a. Trainwreck

Jee et al. 2014



- z = 0.201
- σ_v = 1068 km/s
- R_{200} = 2.43 Mpc
- M_{200} = 1.29 x 10^{15} Mo

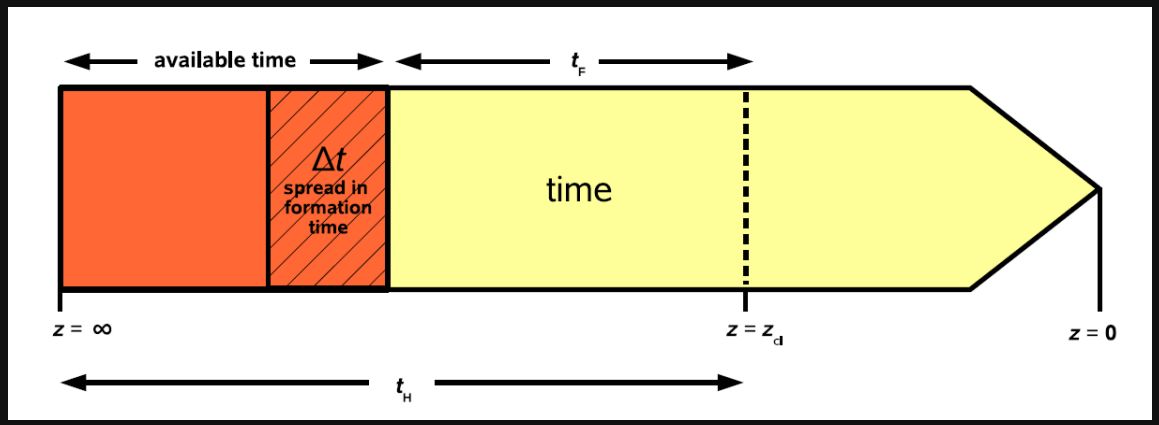
- Abell richness class = 1 (Abell et al. 1989)
- L_X(0.1–2.4 keV) = 14.20×10^{44} erg s^{-1} (Ebeling et al. 1996)
- T_X = 7.1 ± 0.7 keV (Govoni et al. 2004)

Post merger, observed ~1Gyr after core passage (Markevitch et al. 2005)

The Scatter-Age test

(Bower, Lucey and Ellis 1992)

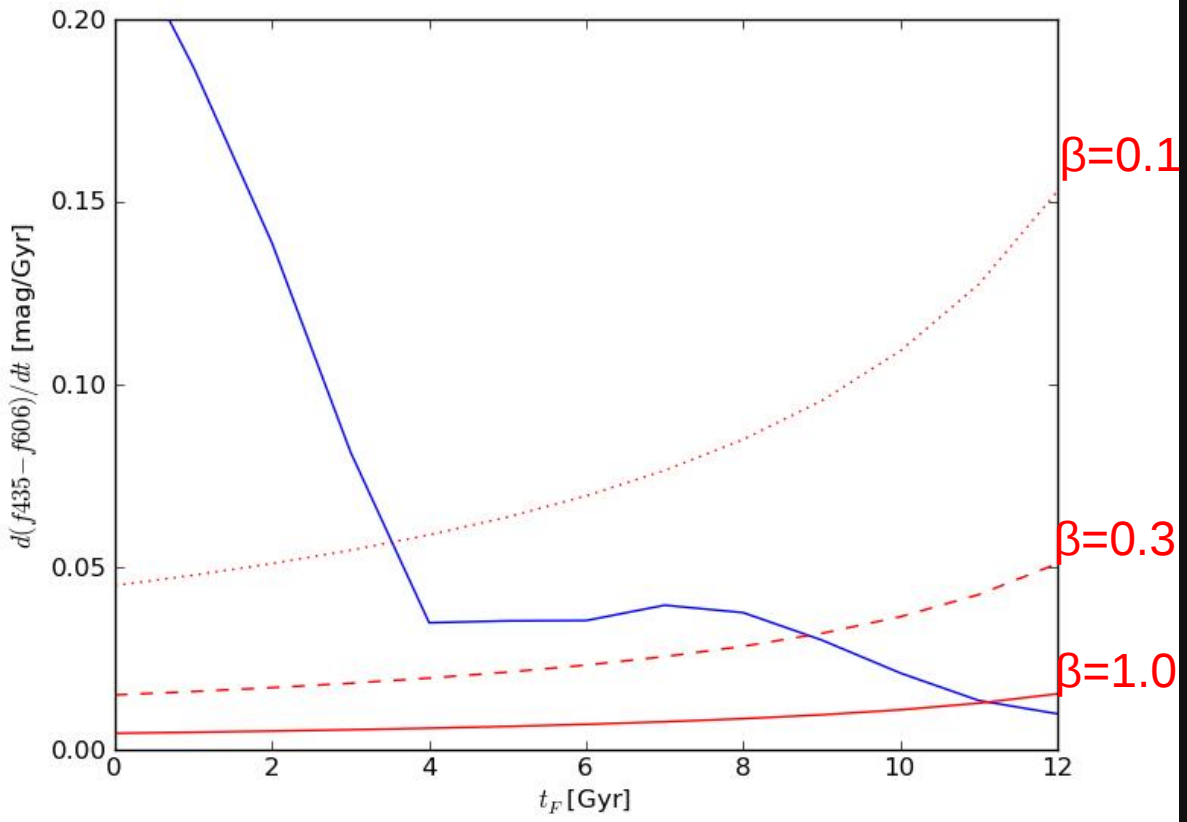
Jaffé+2011



$$\delta(U-V)_0 = \frac{d(U-V)_0}{dt}(t_H - t_F)\beta \leq \sigma_{int}$$

$$\beta = \frac{\Delta t}{(t_H - t_F)}$$

$$\frac{d(m_{435} - m_{606})}{dt} = \frac{\sigma_{int}}{(t_H - t_F)\beta}$$



Bruzual and Charlot 2003

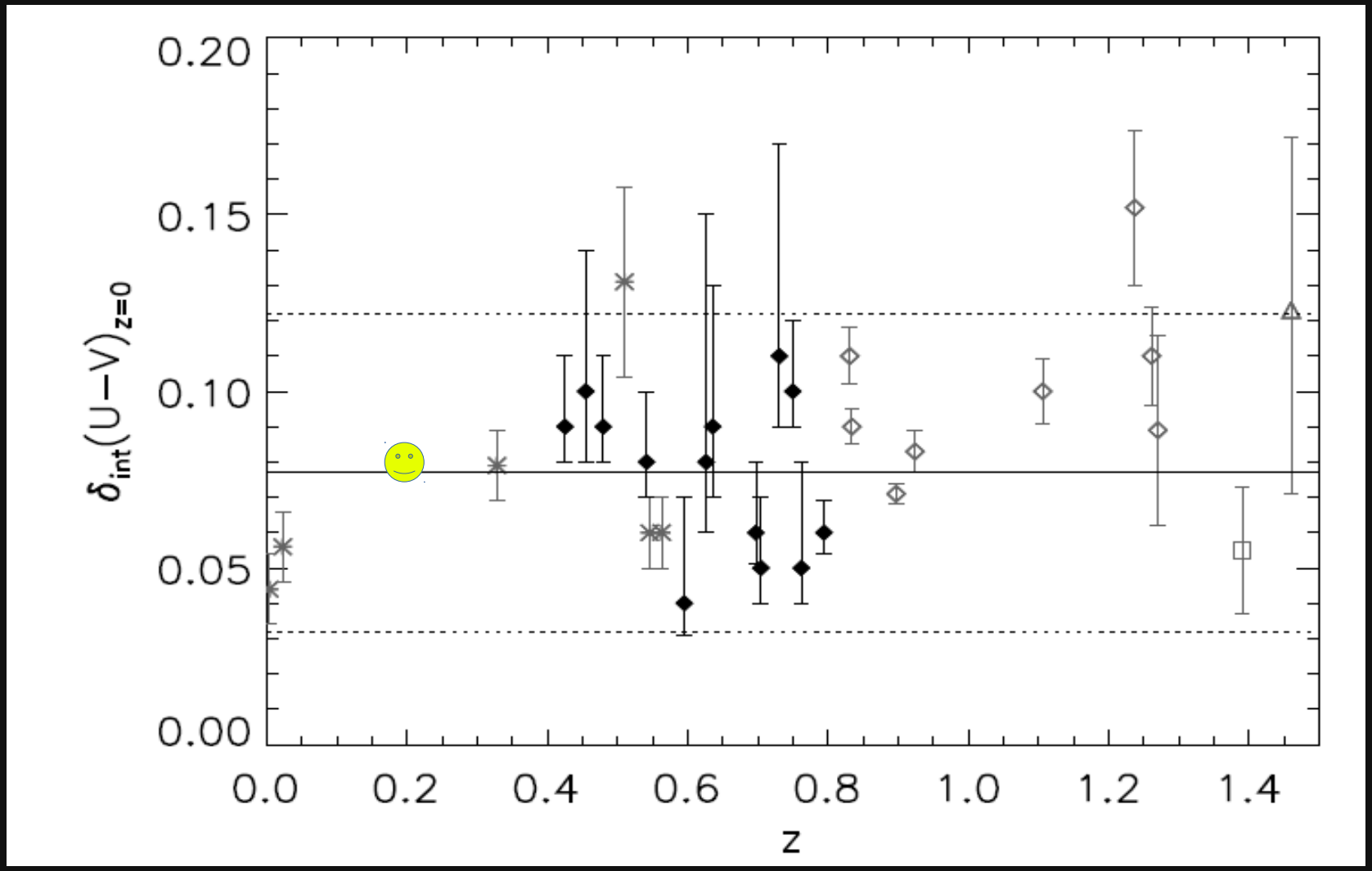
1Gyr SF burst

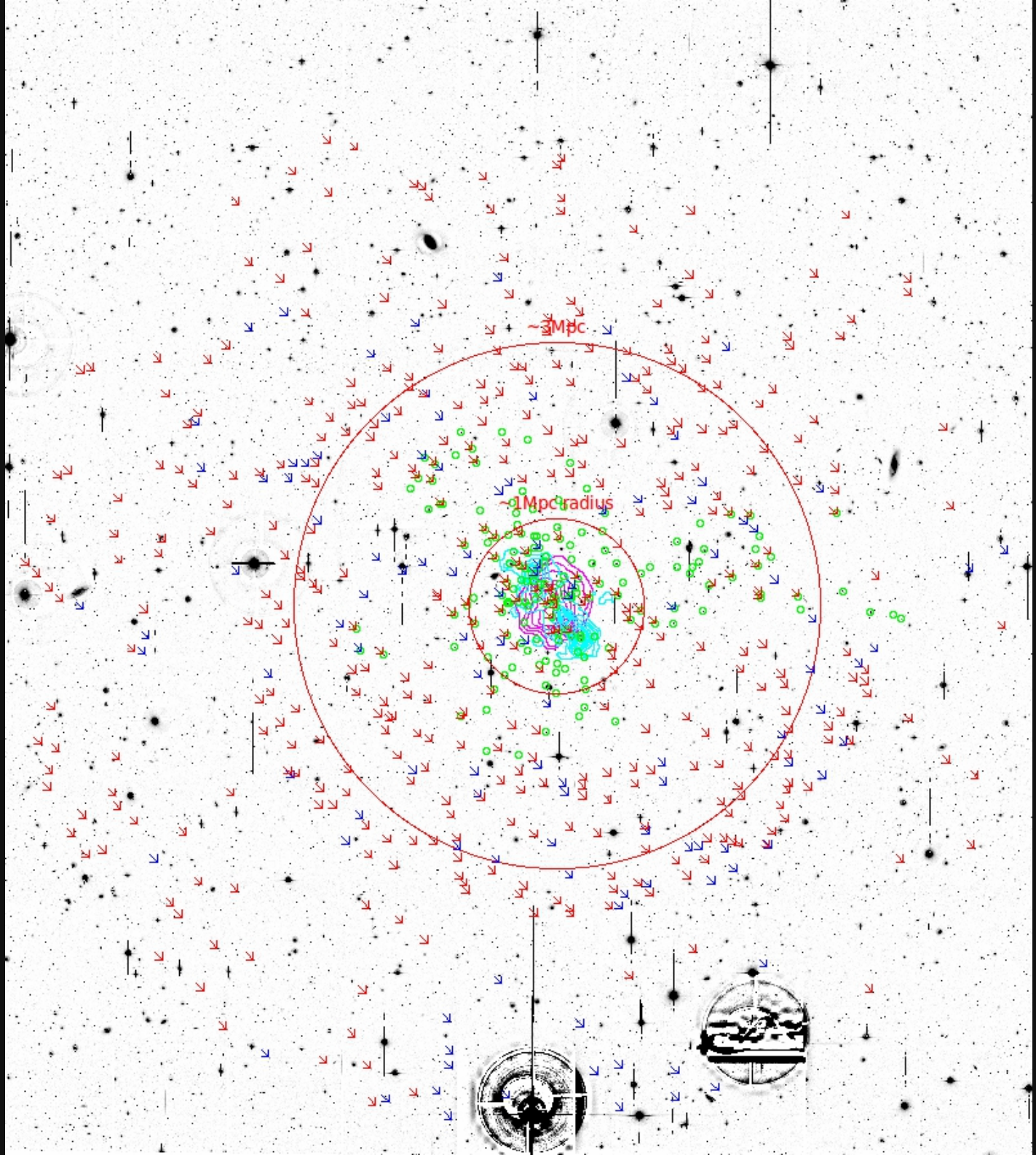
Z=0.02

Chabrier, 2003 IMF

Redshift evolution of the color scatter

EDisCS clusters from Jaffe+2011

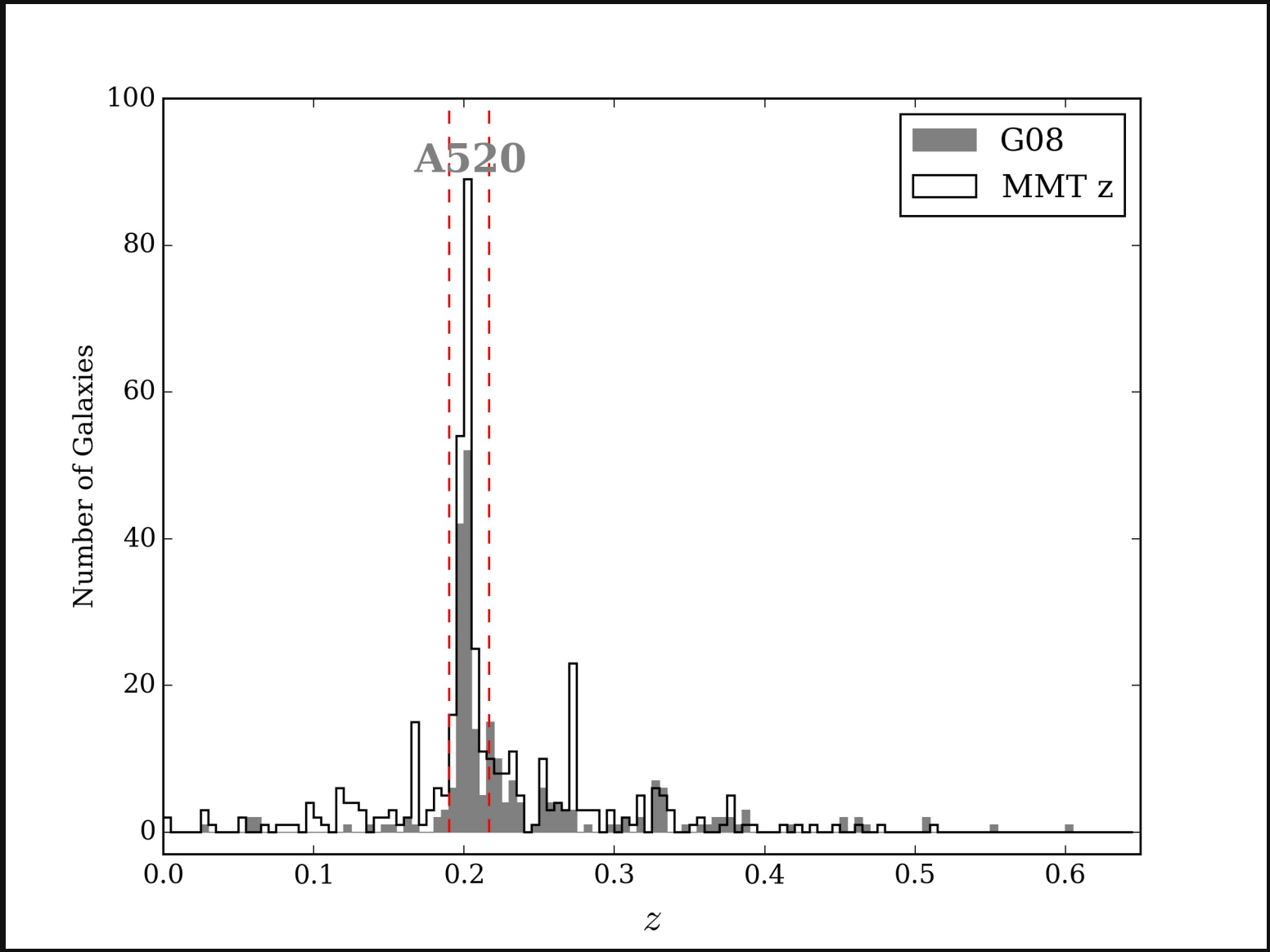




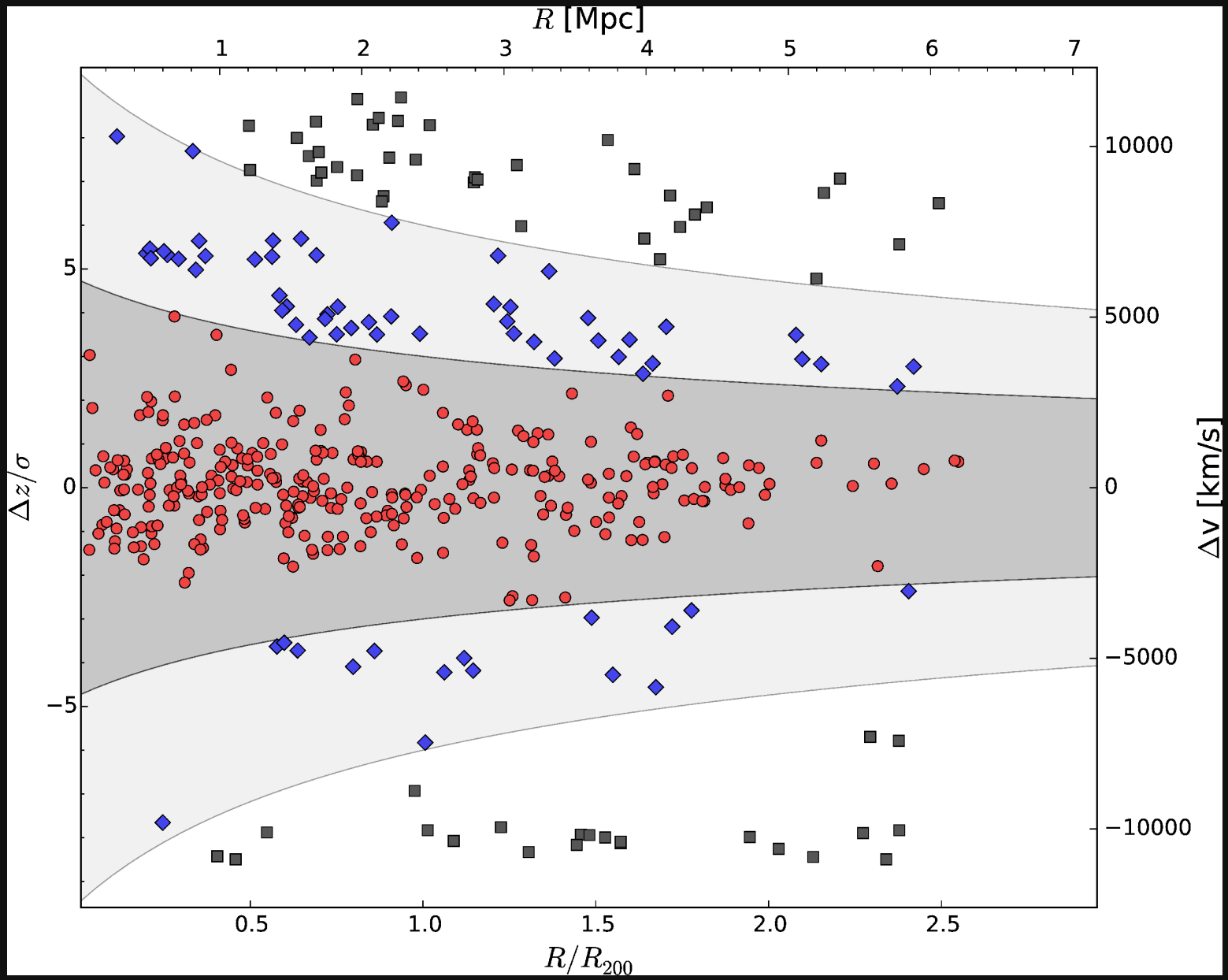
MMT survey

- 167 known cluster members Girardi+ 2008
- 523 targets
- 409 redshifts
- Mass concentration Jee+ 2014
- X-ray Markevitch+ 2005

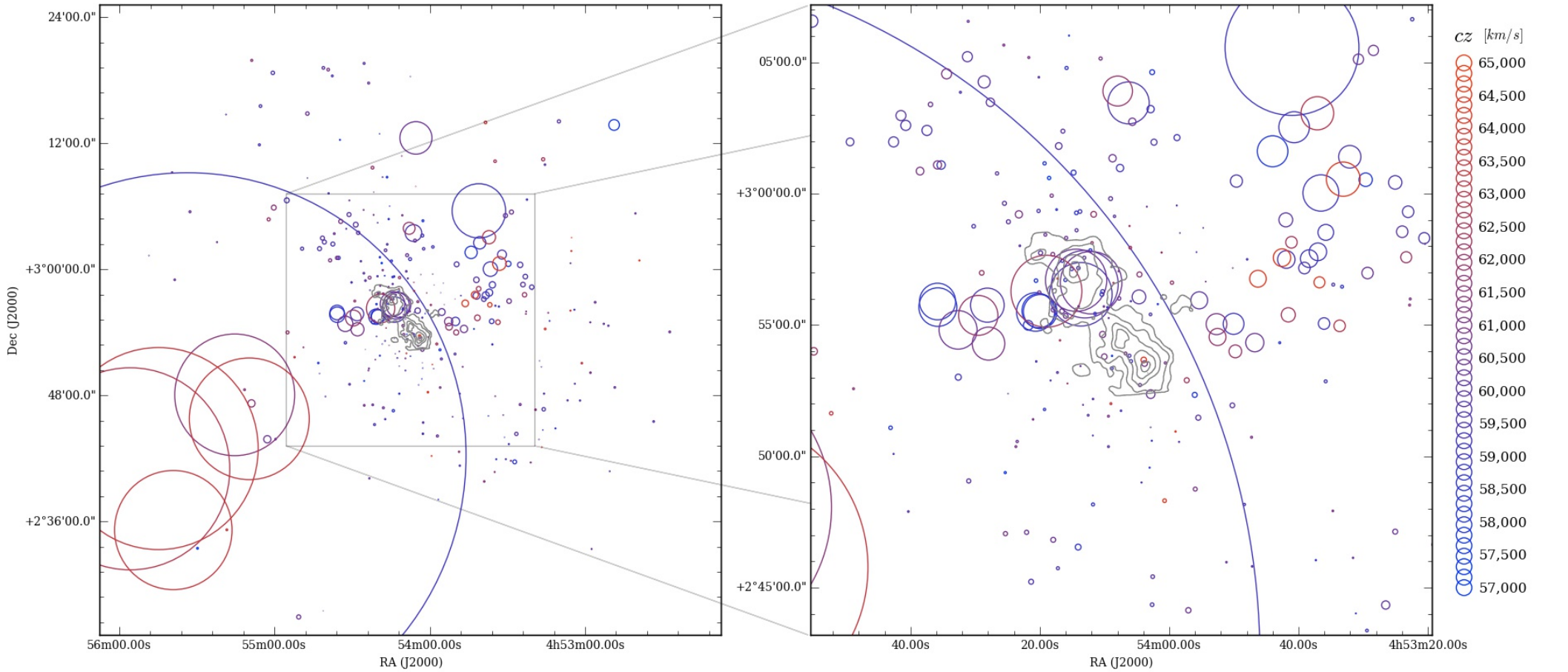
MMT survey


A520
G08
MMT z
Number of Galaxies
z
0
20
40
60
80
100
0.0
0.1
0.2
0.3
0.4
0.5
0.6

MMT survey

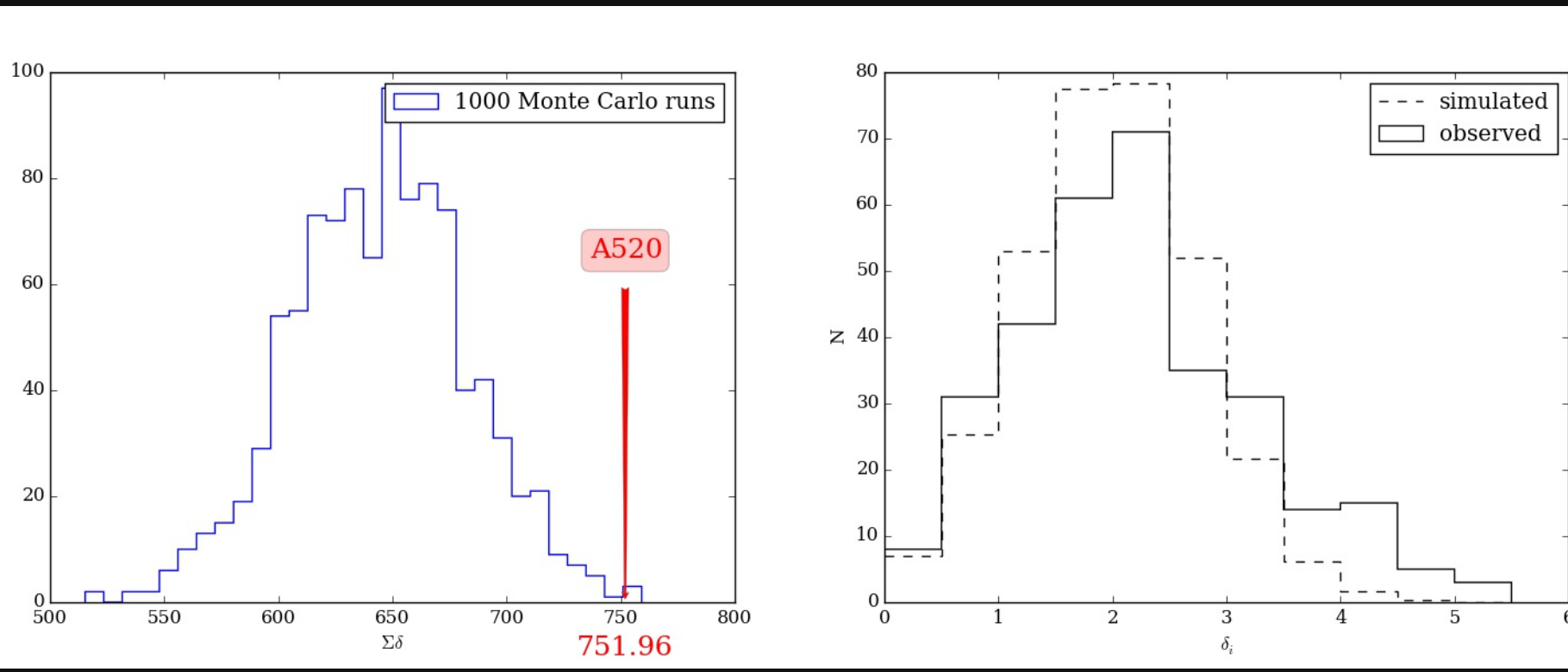

R [Mpc]
1
2
3
4
5
6
7
10000
5000
0
−5000
−10000
Δv [km/s]
5
0
−5
$\Delta z/\sigma$
0.5
1.0
1.5
2.0
2.5
R/R_{200}

Dressler-Shectman test

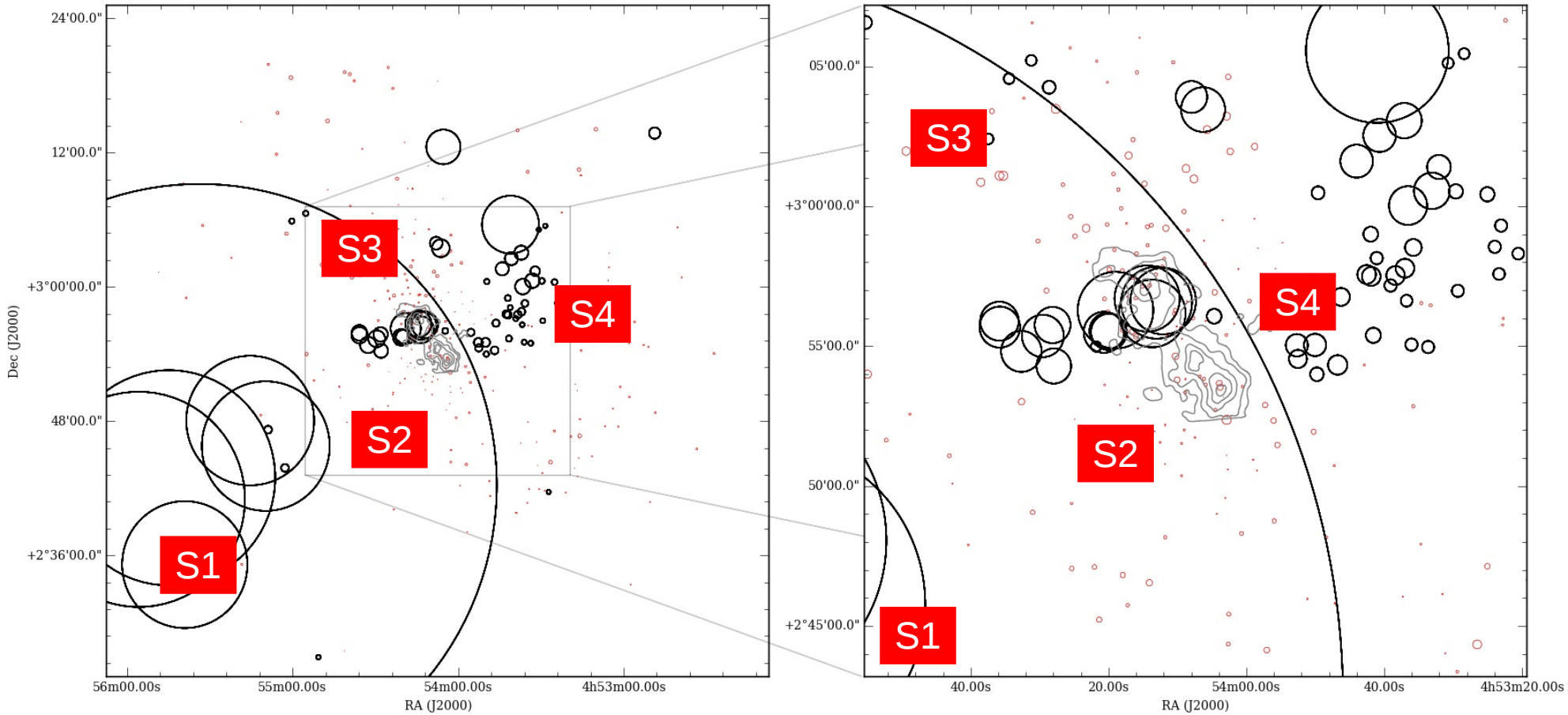


- Circle size is proportional to δ - the probability of the given galaxy to belong to a substructure
- Circle color represents recession velocity (cz)
- Mass concentration from weak lensing (Jee+2014) shown with gray contours

Dressler-Shectman test

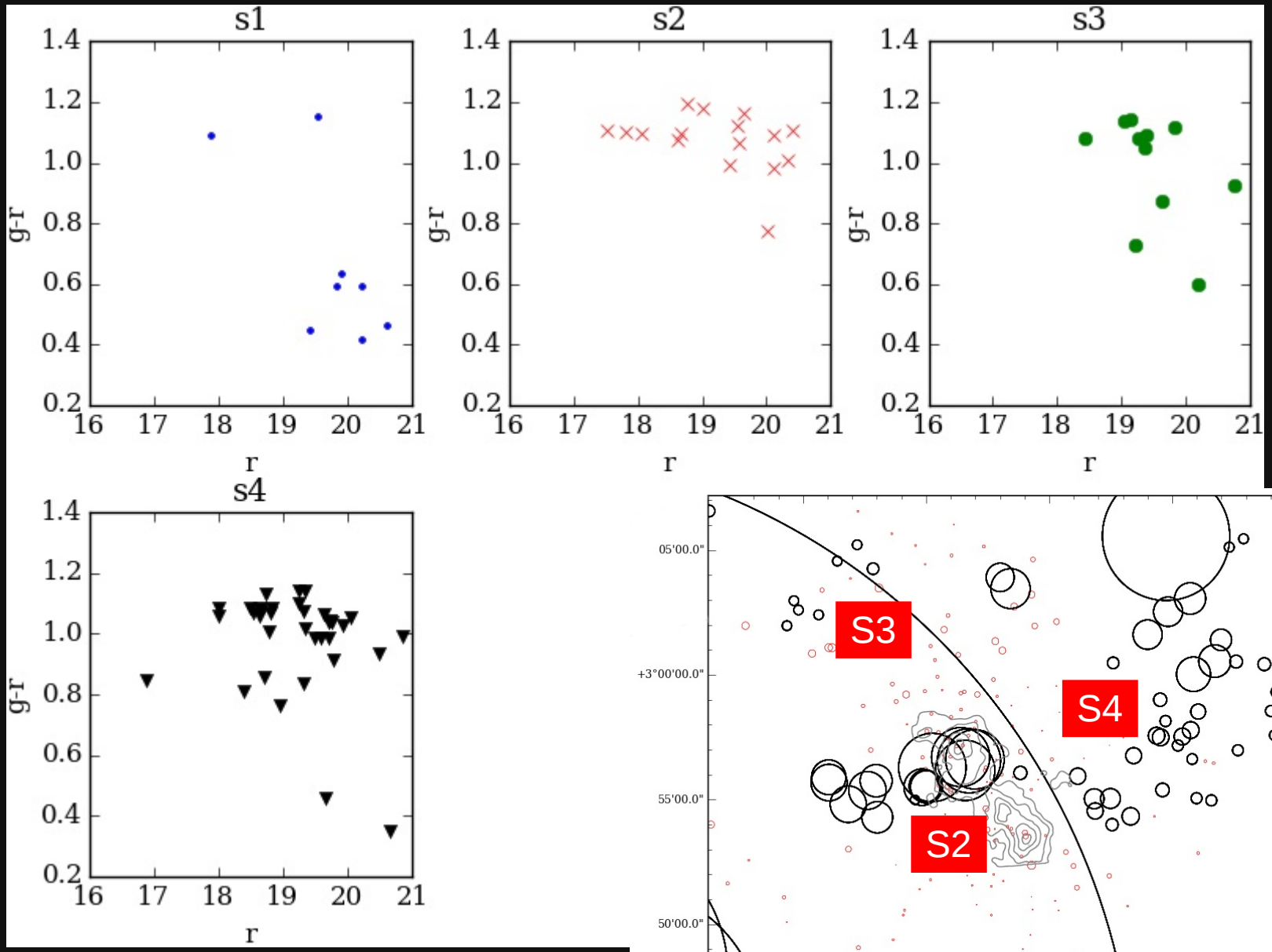


Dressler-Shectman test

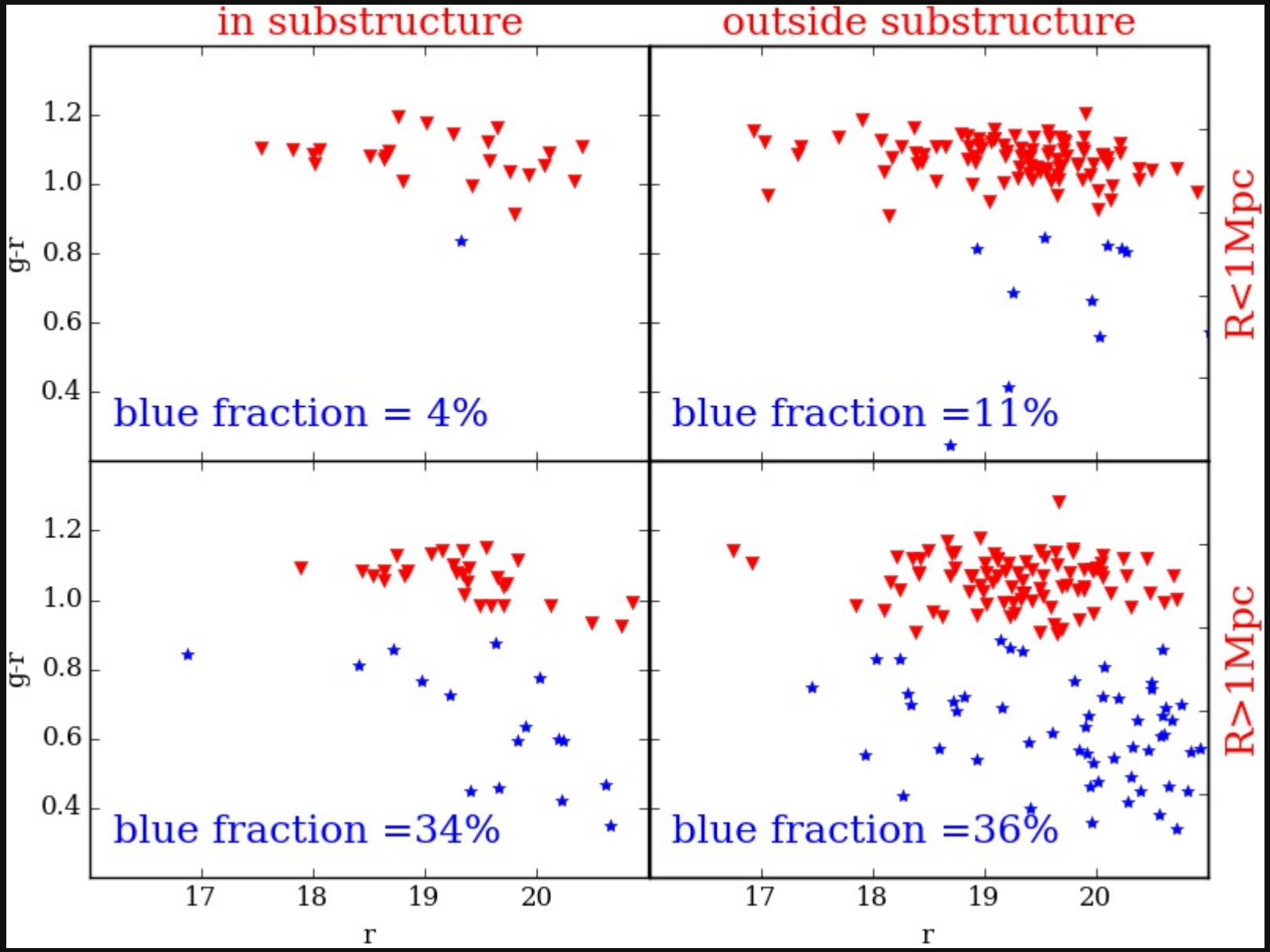


- Substructure threshold determined with Monte Carlo simulations
- Separate substructures numbered S1 through S4

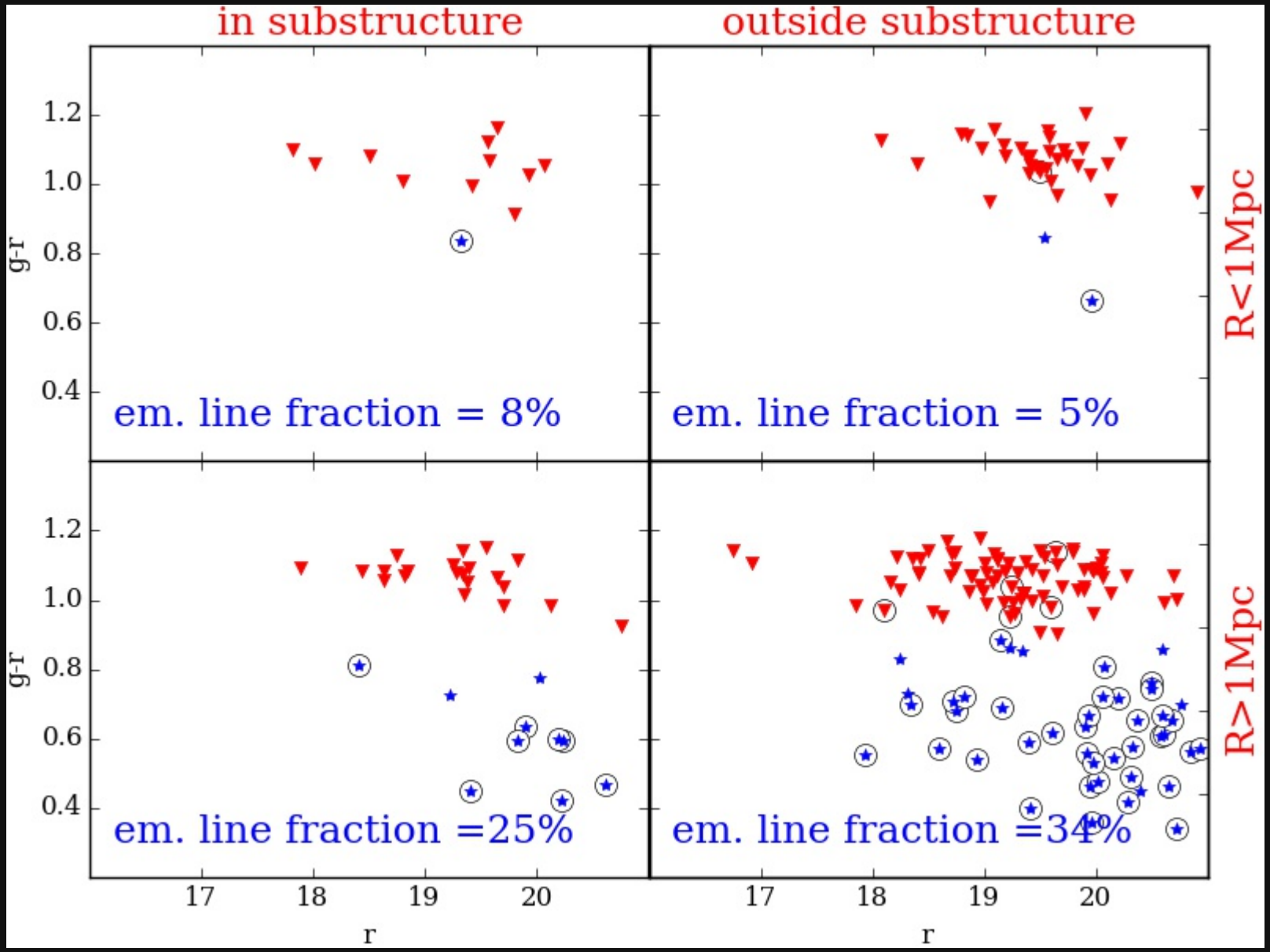
Dressler-Shectman test



Blue fraction in substructures

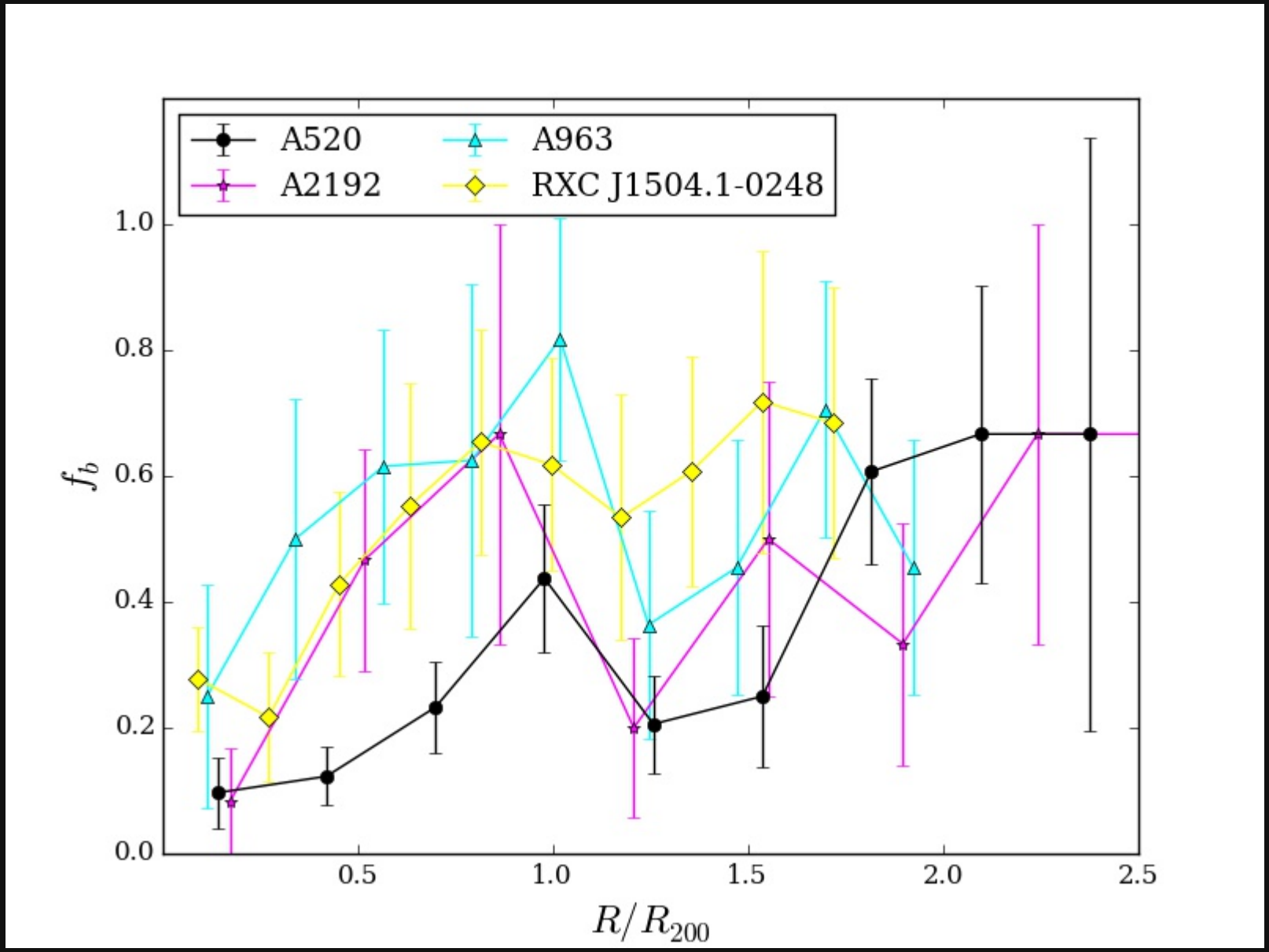


Emission line fraction



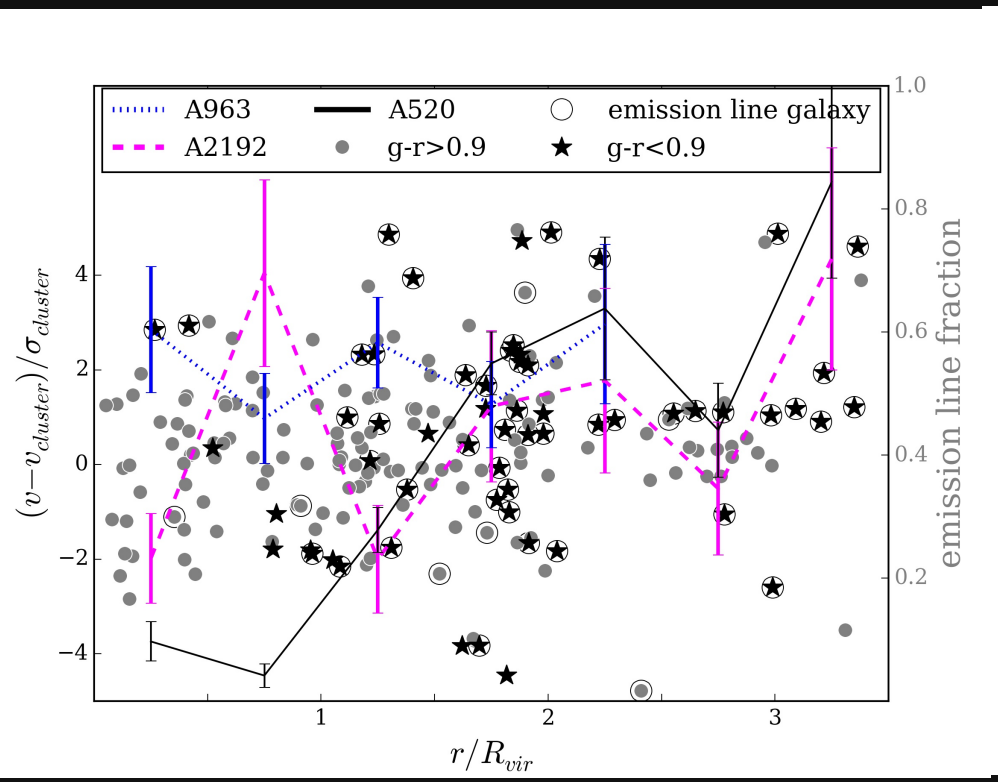
Blue fraction. Comparison with other clusters

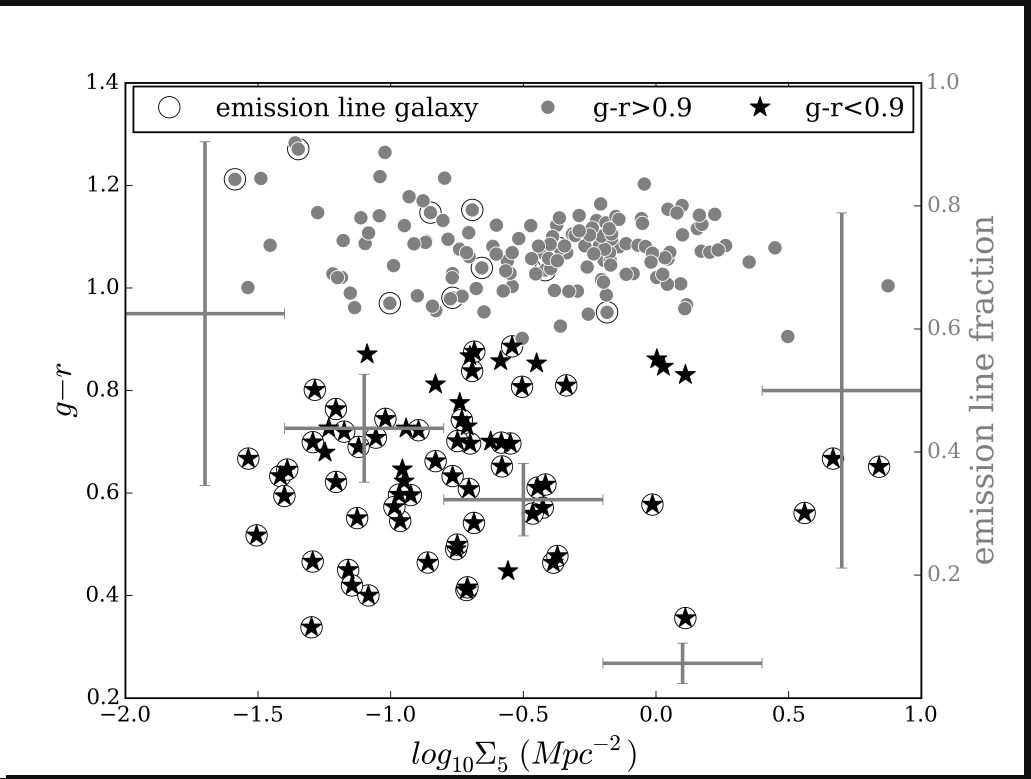
A2192 and A963 data from Jaffe+2012; RXJ1504 from Verdugo+2008



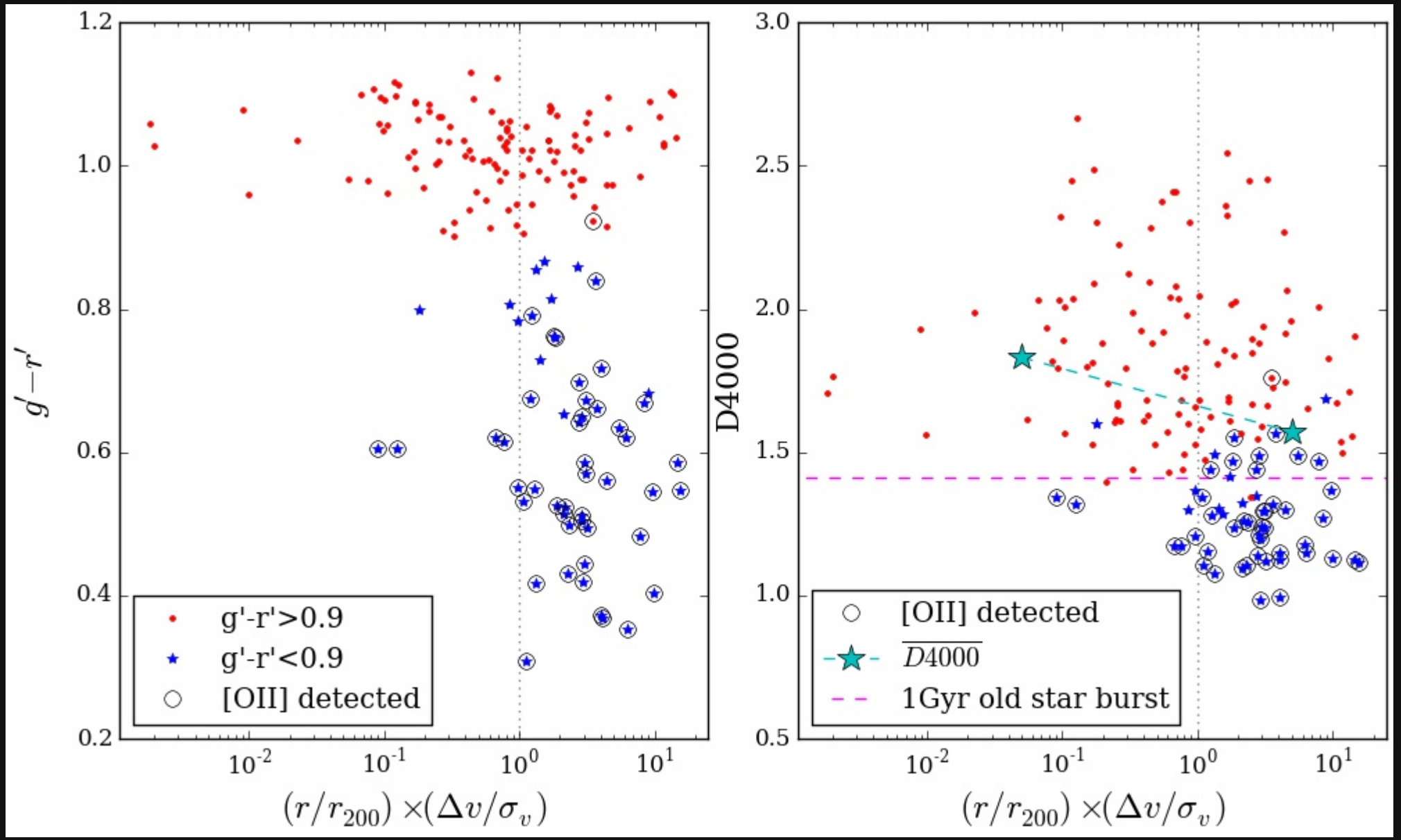
Emission line fraction. Comparison with other clusters

A2192 and A963 data from Jaffe+2012

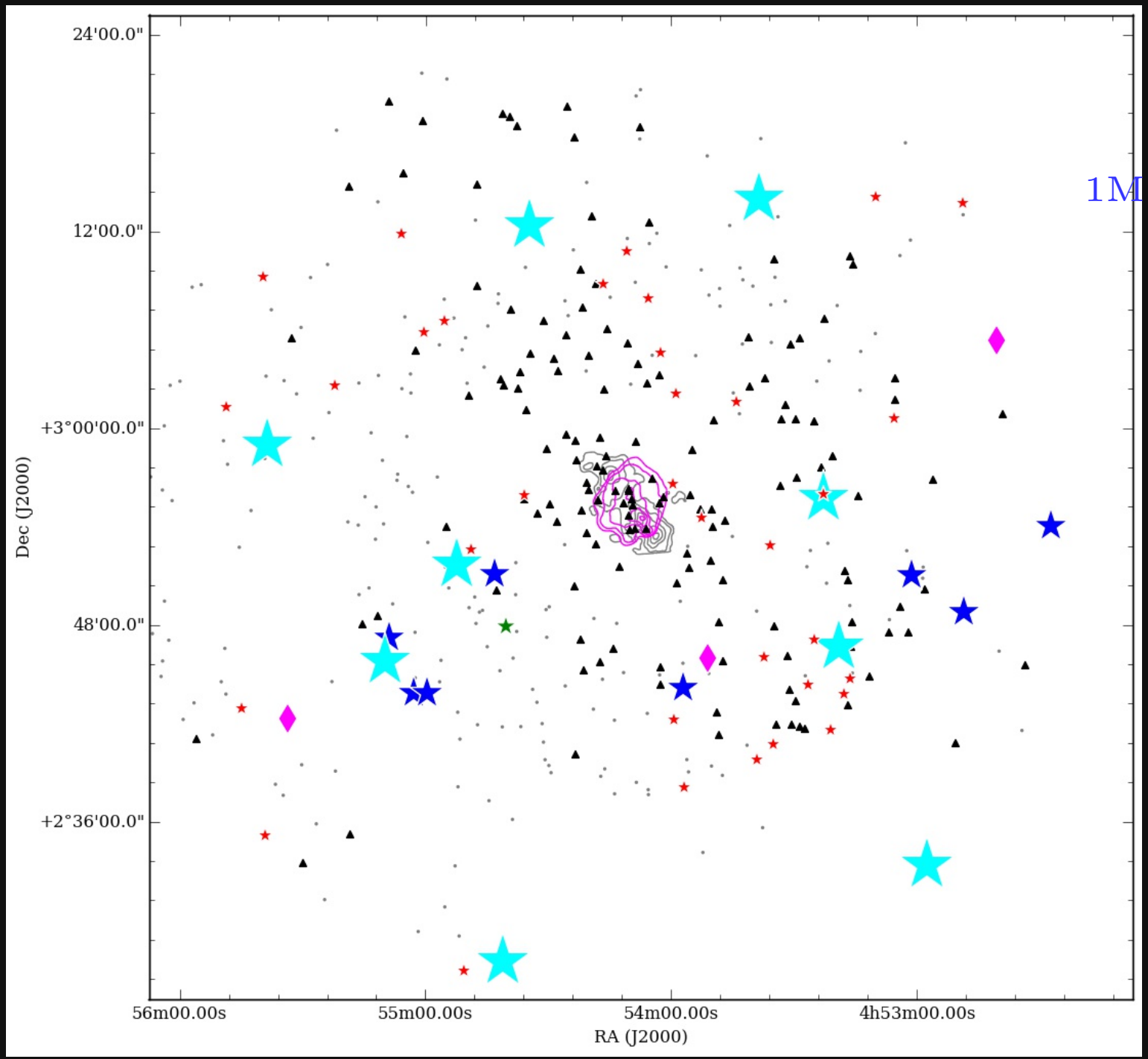




Effects of global environment on stellar populations



Current activity around A520



Hα detected

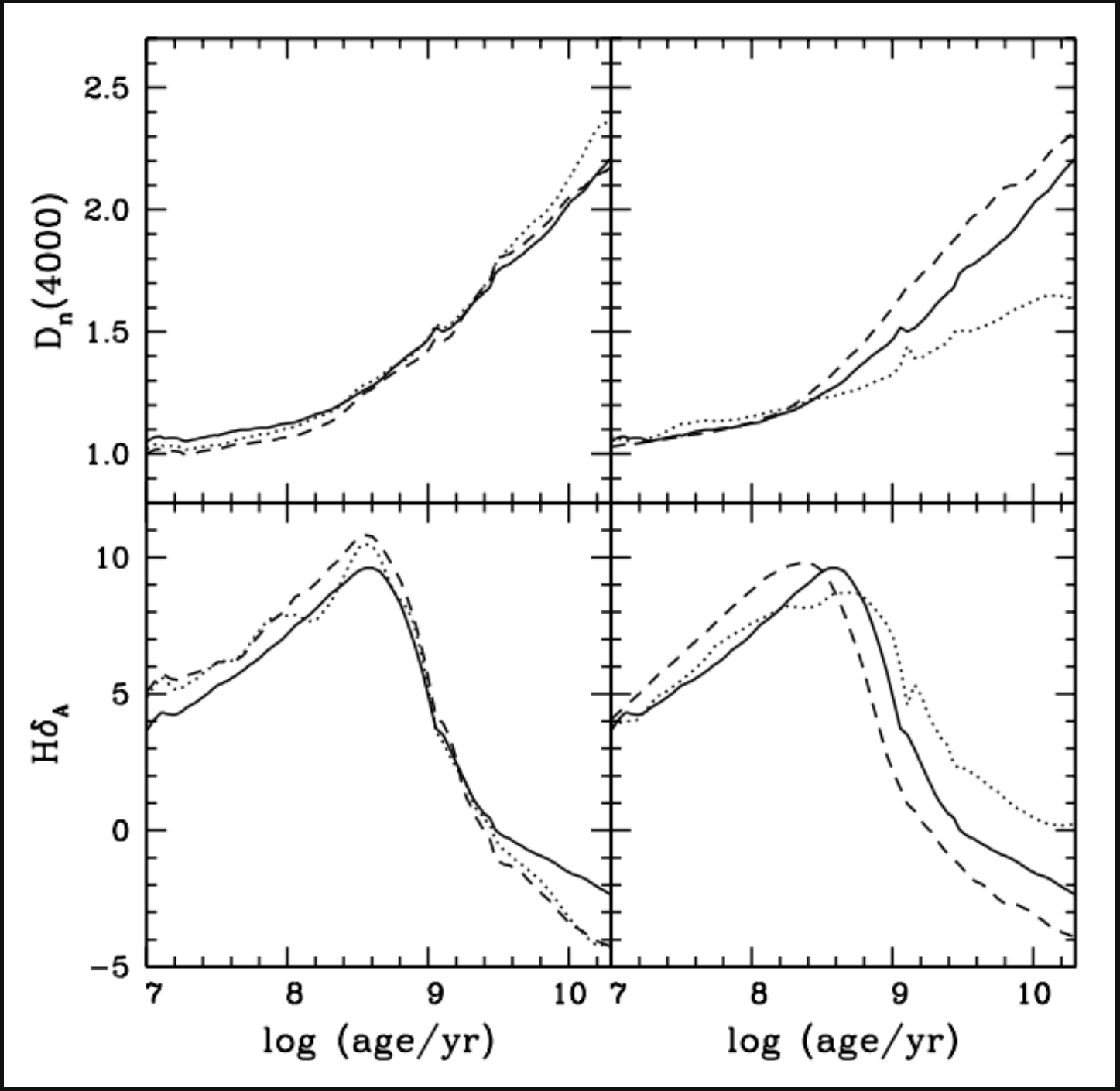
AGN

SFR<1M yr^{-1}

1M yr^{-1}<SFR<10M yr^{-1}

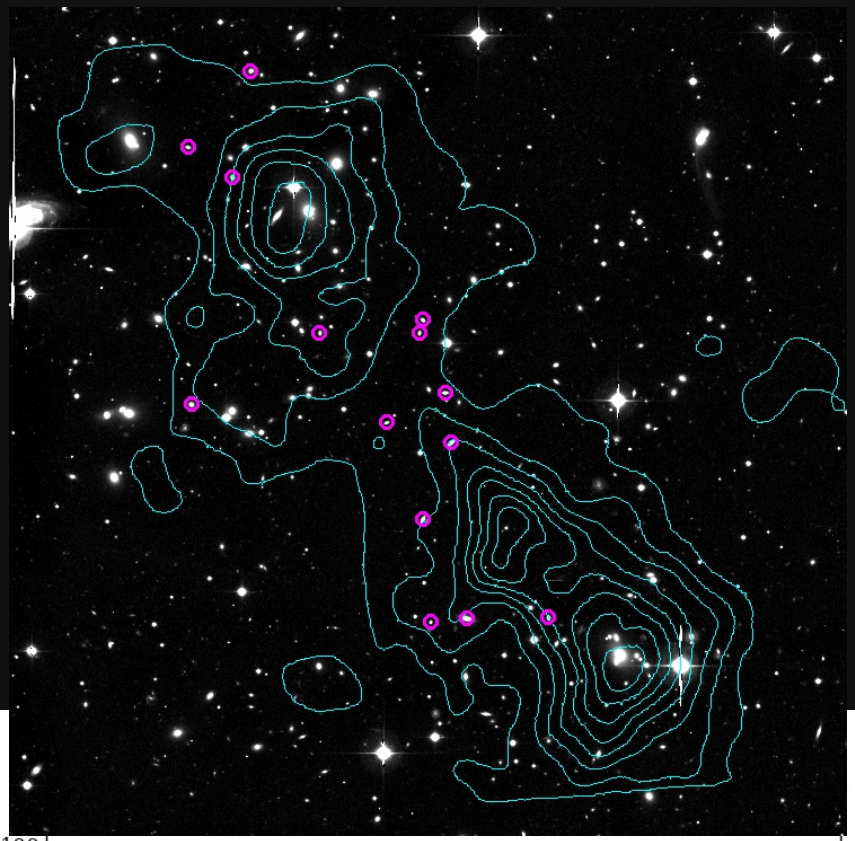
SFR>10M yr^{-1}

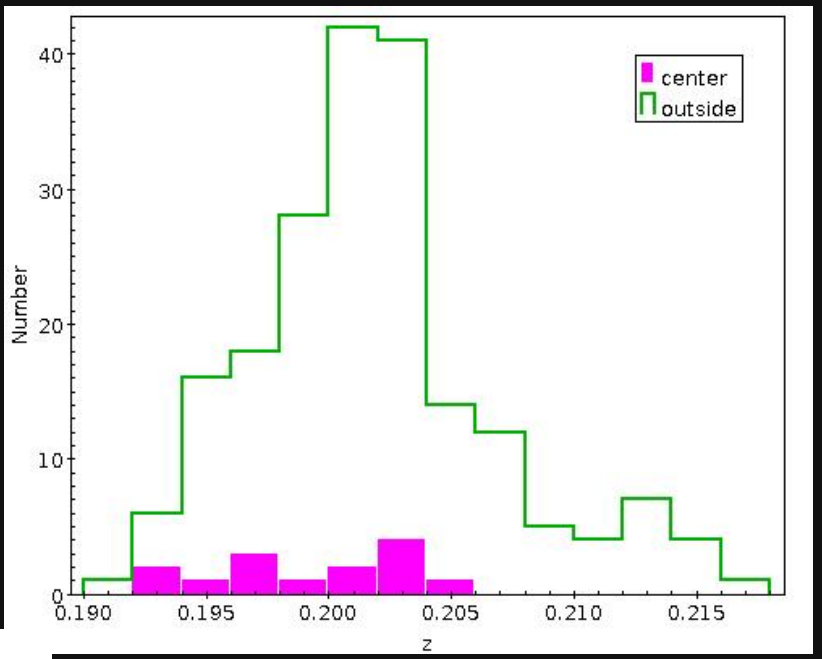
Past activity in A520

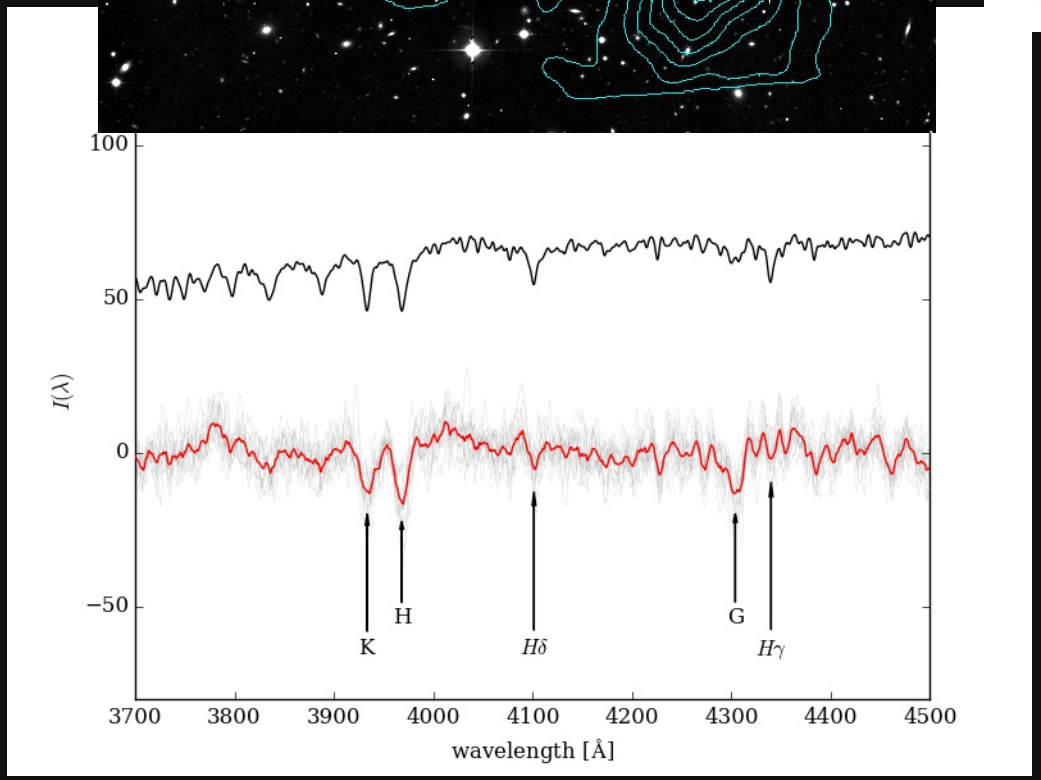


Kauffmann et al. 2003

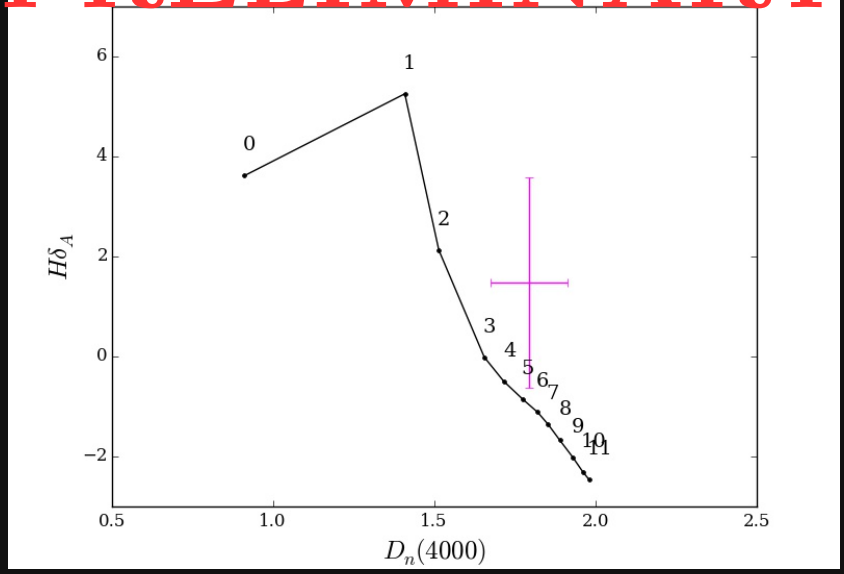
Past activity in A520







PRELIMINARY



Outlook

- Structural parameters analysis based on multi-band wide field ground based imaging and multi-band HST imaging
- Intra-cluster light analysis based on HST imaging
- IFU spectroscopy of the central part of the merger to derive 2D velocity fields

Thank You!