Constraining satellites-quenching mechanisms in the HDFN

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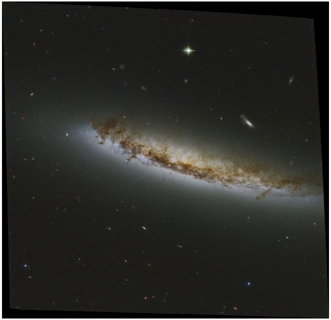
How satellite galaxies cease their star formation?

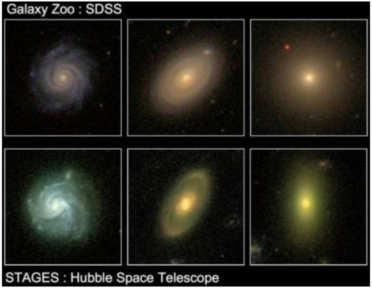
Quenching mechanisms on satellites

Ram-pressure stripping

- Strips the cold gas from the galaxies (Gunn & Got, 1972)
- Short time-scales ($\sim 10^8 yr$)
- Mild morphological change
- More efficient in low-mass sub-halos
- Increase of passive fraction at low masses

An example: NGC 4402





Strangulation

- Strips warm and hot gas. (Larson et al. 1980)
- Time-scales of few Gyr
- Mild morphological change
- In semi-analytical models (excess of passive galaxies)

Quenching mechanisms on satellites

Harassment

- Internal heating due to encounters (Moore, 1996)
- Strong morphological change
- More efficient in low-mass sub-halos
- More efficient when more subhalos
- May induce star-bursts

Quenching mechanisms on satellites

	Time scale	Modify Morphology?	Efficiency with M_{sat}	Efficiency with halocentric distance
Ram-pressure stripping	$\sim 10^8 yr$	Mild (S→ S0)	Low M_{sat}	Low distances
Strangulation	few Gyr	Mild (S→ S0)	–	–
Harassment	few Gyr	Strong (S→ E)	Low M_{sat}	Low distances (higher density)

But... Do these processes reproduce observations?

Data: Ferreras et al. 2014

SHARDS's deep medium band photometry

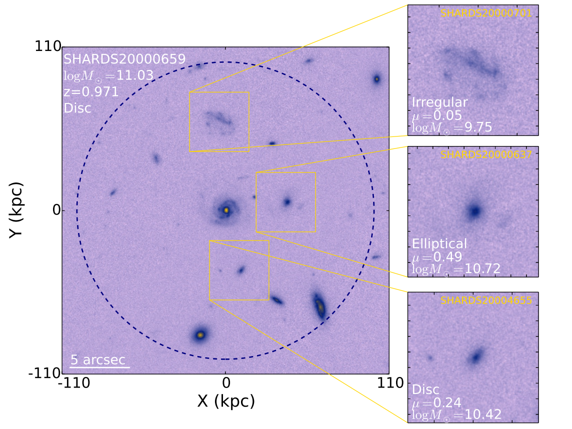
- Precise photometric redshifts:
  - $|\Delta z|/(1+z)$ is $0.55\,\%$
  - $1.6\,\%$ of catastrophic failures
- Stellar population properties
  - Age
  - Stellar masses

- $0.3 < z < 1.3$ Optimal to extract stellar ages
- $\mu > 0.01$ Mass completeness of the sample

Data: Visual morphology

Morphology

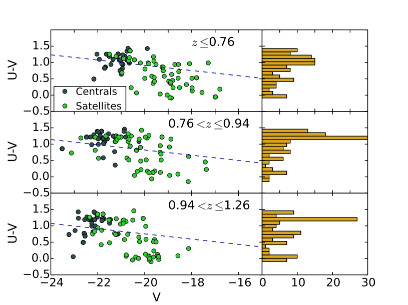
- HST/ACS images for morphological classification
- V-band (rest-frame)



Data: Colours

Colours

- Matched photometry from IRAC (P-G 2008)
- Synthetic photometry (P-G 2013) for rest-frame colours
- Red and blue objects following Bell et al. 2004



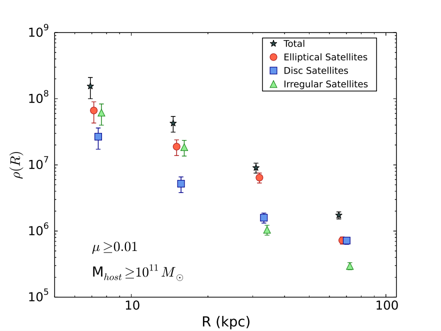
$$\langle U - V \rangle = 1.15 - 0.31z - 0.08(M_V - 5\log h + 20)$$

Radial mass density profiles I

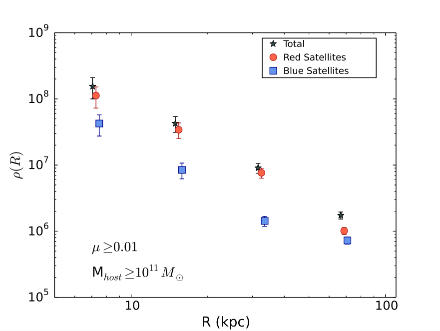
Density profiles probing trends with the halocentric distance

$$\rho(R) = \frac{1}{N_{cent}} \sum \frac{M_{*,sat}}{\pi(r_1^2 - r_2^2)}$$

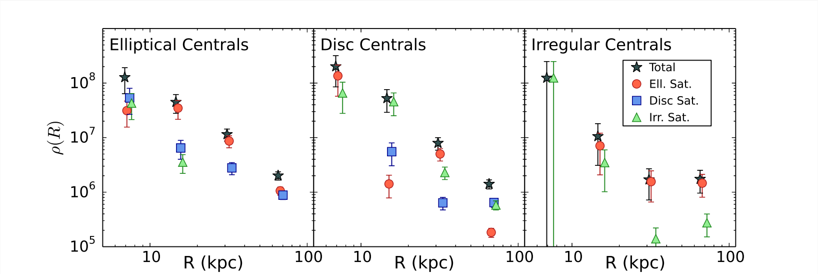
Morphology

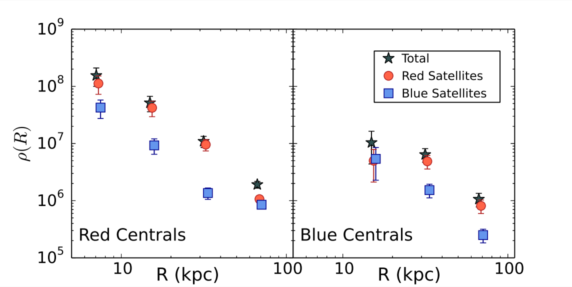


Colours

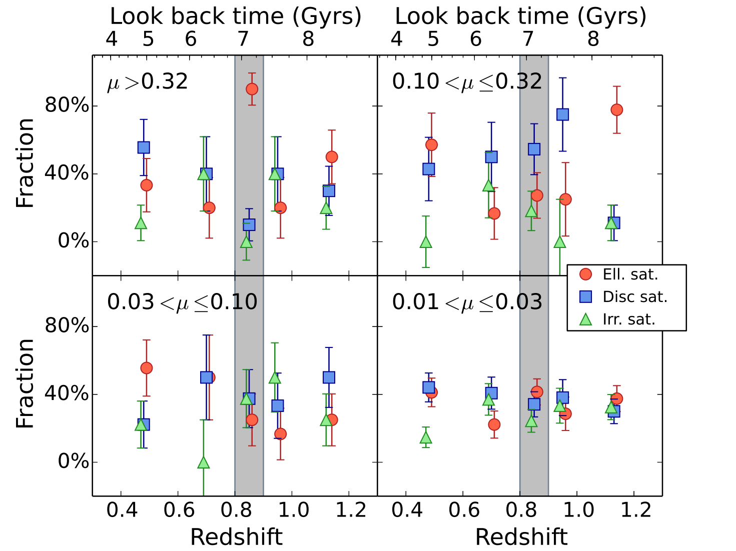


Radial mass density profiles II

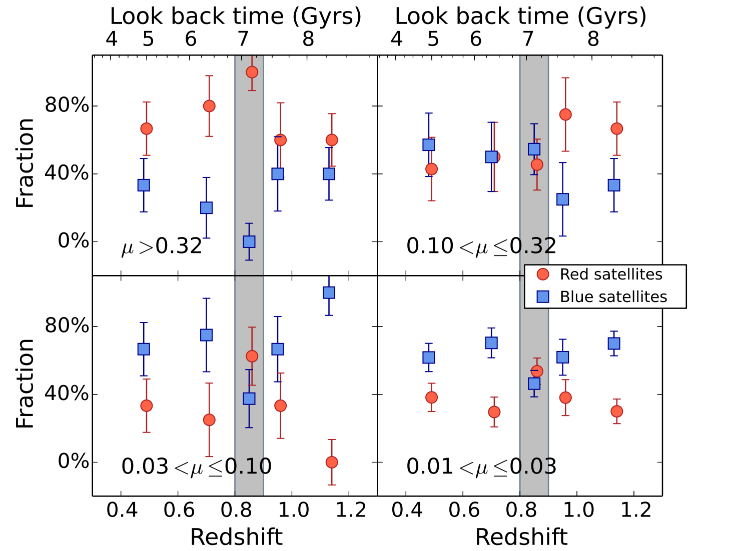




Satellite Properties Evolution: Morphology

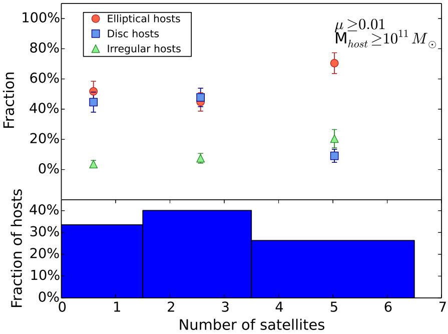


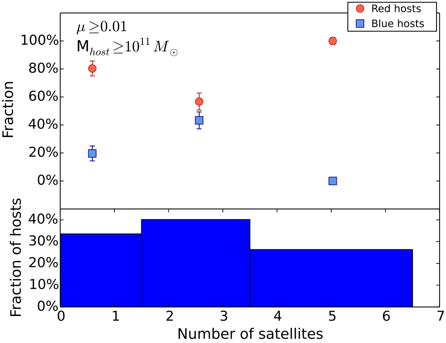
Satellite Properties Evolution: Colours



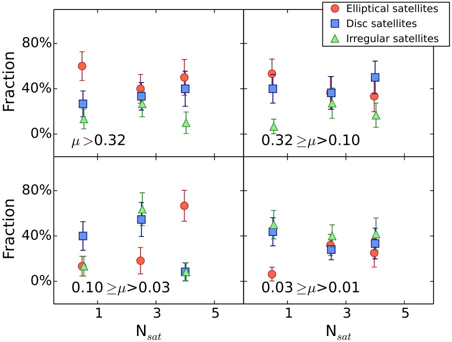
Satellite Multiplicity I

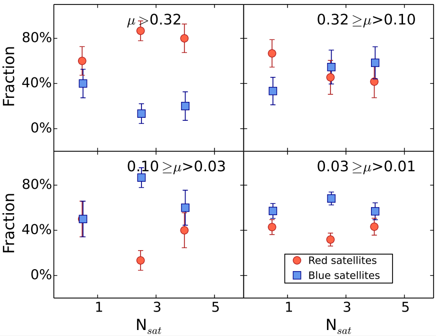
Number of satellites as a proxy to the halo mass





Satellite Multiplicity II





Some conclusions

- Red/Elliptical galaxies dominate inner regions
- Galactic conformity appears in the data
- Blue/Disc galaxies dominate low mass ratios
- Number of satellites (halo mass) does not affect
- No trend with redshift (time-scales?)

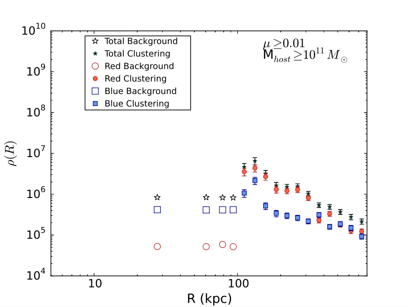
	Time scale	Modify Morphology?	Efficiency with M_{sat}	Efficiency with halocentric distance
Ram-pressure stripping	$\sim 10^8 yr$ (?)	Mild (S→ S0)	Low M_{sat} ×	Low distances✓
Strangulation	few Gyr (?)	Mild (S→ S0)	–	–
Harassment	few Gyr (?)	Strong (S→ E)	Low M_{sat} ×	Low distances (higher density)✓

What is driving the quenching?

- Combination of processes
- Other kind of process
- Galactic conformity?

Ongoing/Future work

Background and clustering simulations



- More statistics - New samples
- Lower mass ratios ⟶ Nearby galaxies and LSB structures
- Exquisite image cleaning (Stripe82, GTC, LCGOT)