Star Formation and Quenching vs. Environment and Mass

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et al.

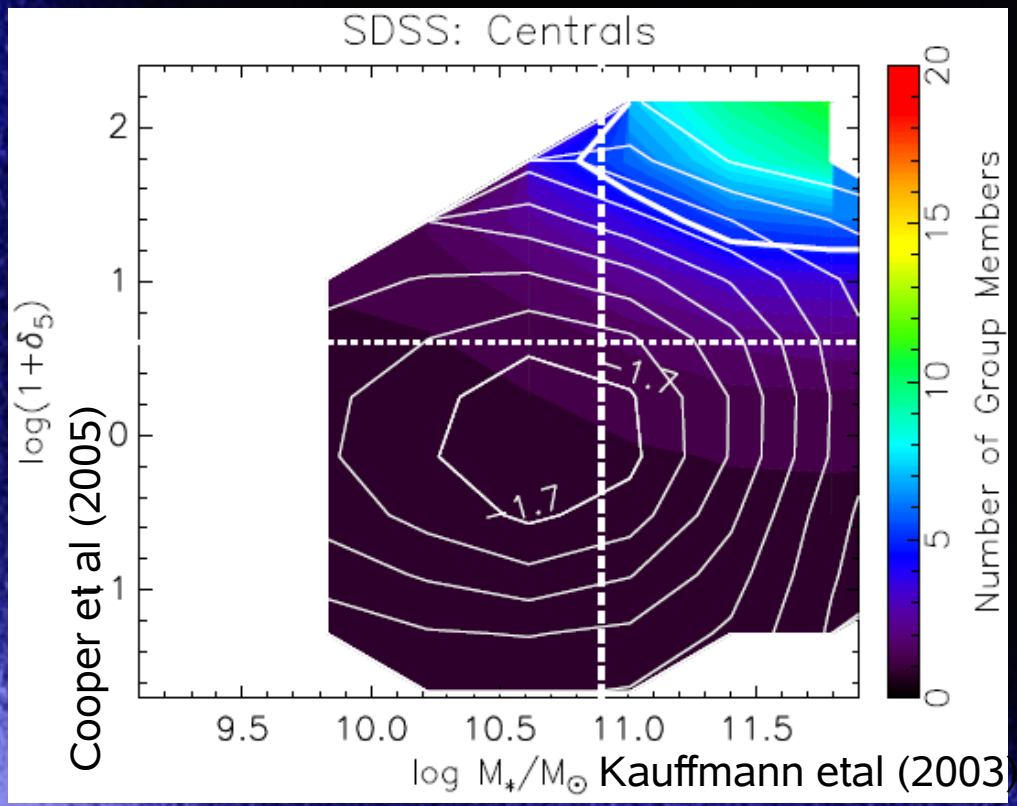
Goals

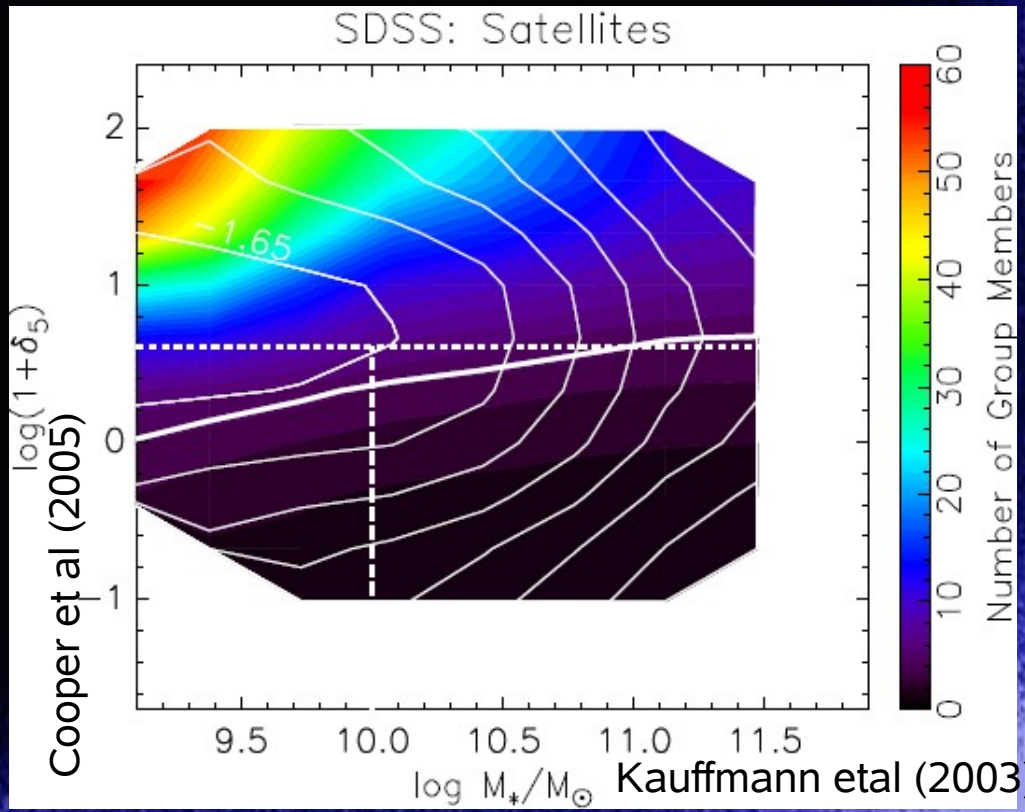
- Study relations between δ_N, M_*, M_h at z~0, z~1:
  - Splitting centrals and satellites
  - Using dual mode understanding of δ_N
    - Multi-halo mode, single-halo mode
- Study quenching vs. δ_N, M_*, M_h
  - Centrals vs. satellites, single halo/ multi halo mode
- Results:
  - M_h dominates quenching
  - Other kinds of quenching: small deviations

Two modes of δ_N

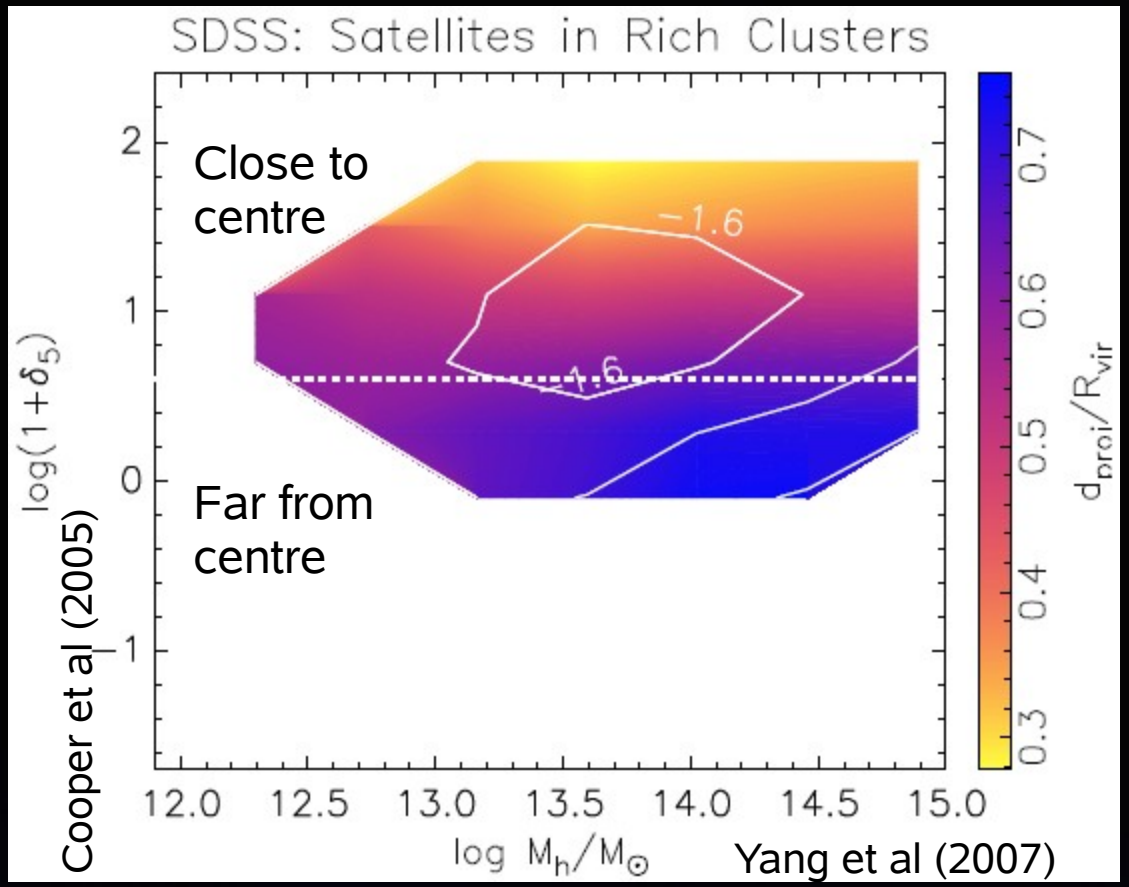
δ_N mode depends on:

- -N (SDSS: N=5)
- -mag limit
- -z





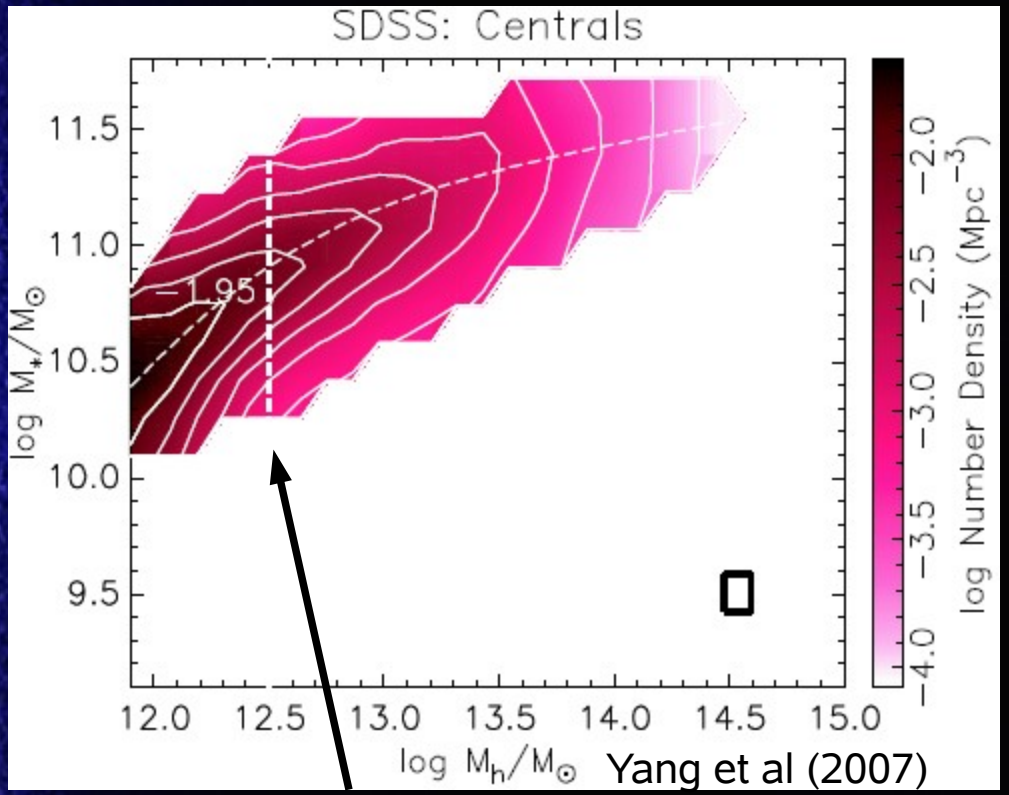
δ_N also measures proximity to halo centre



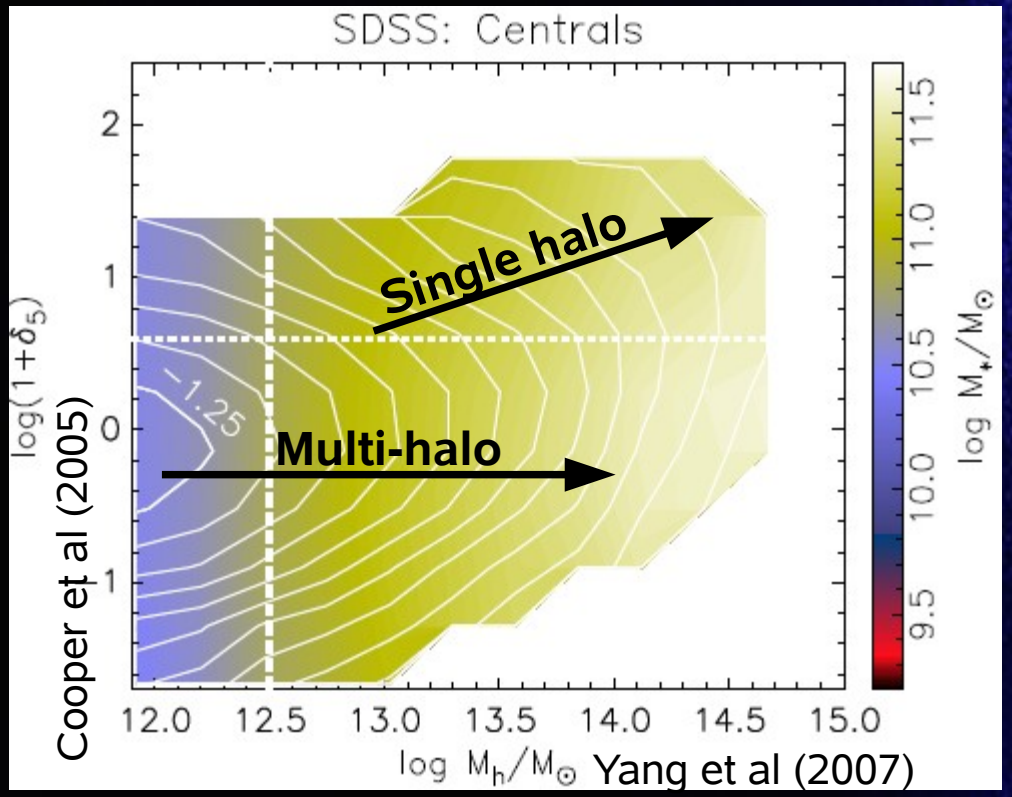
(references for data labelled beside all axes)

(Only for groups with more than 5 members)

Relations between δ_N, M_*, M_h: Centrals



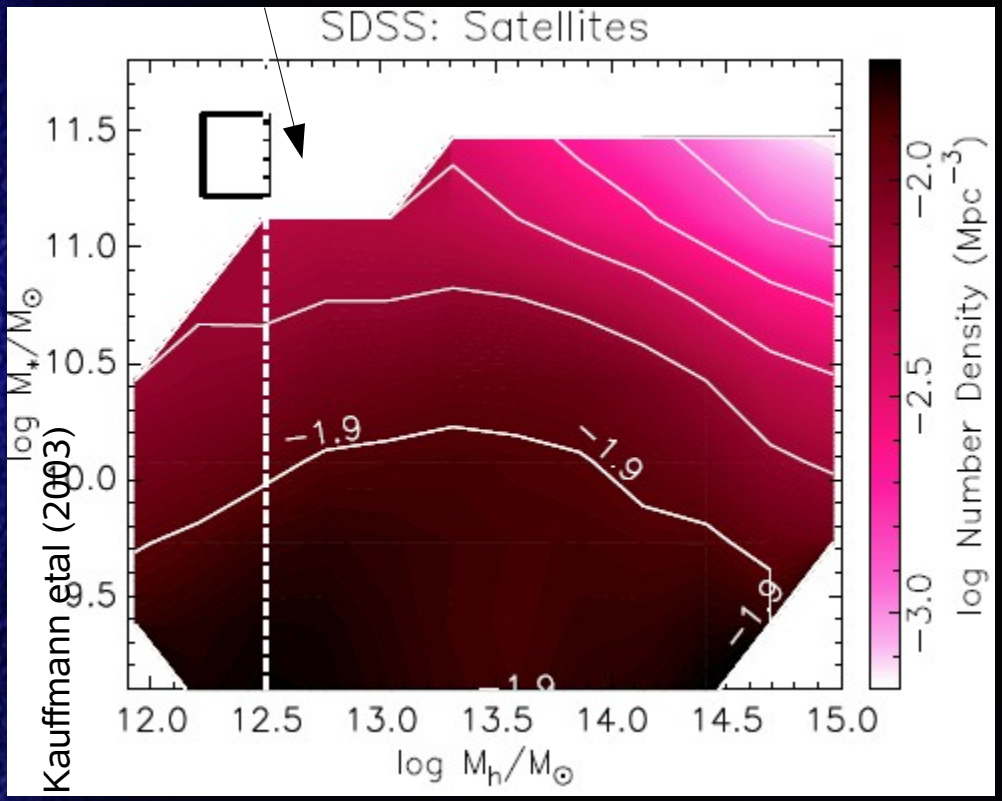
Shock scale ~ where relation begins to flatten



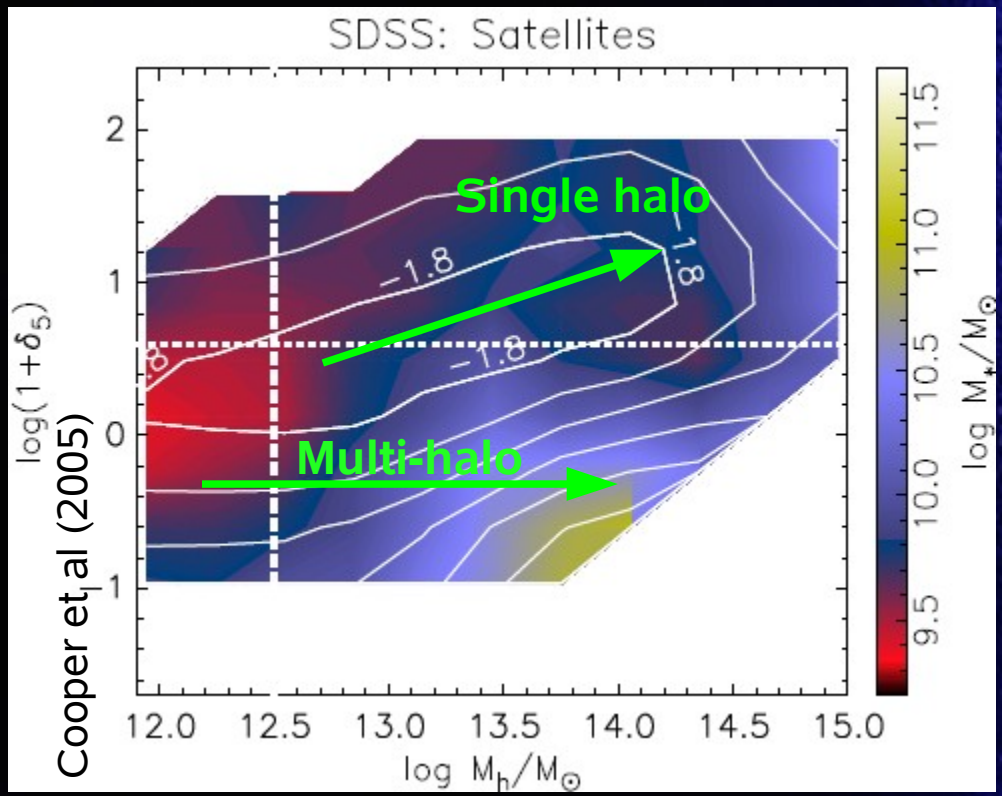
Expect δ_N to correlate with M_h within halo due to density profile

Relations between δ_N, M_*, M_h: Satellites

No big satellites
in small halos



Kauffmann et al (2003)



Cooper et al (2005)

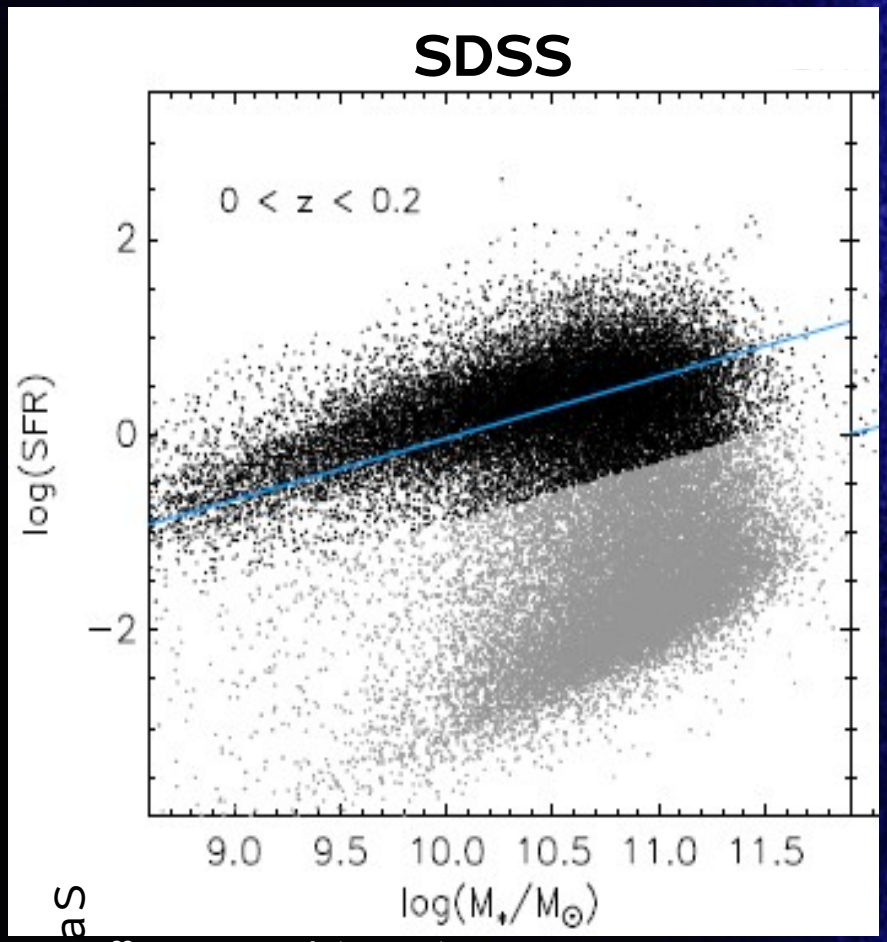
δ_N correlates with M_h also because of density profile

SFR Sequence

What's a "star-forming" galaxy?
-on the SFR sequence

What's a "quenched" galaxy?
- >2σ below SFR sequence

The "quenched fraction" =
quenched / total
(weighted by volume and spectroscopic completeness)



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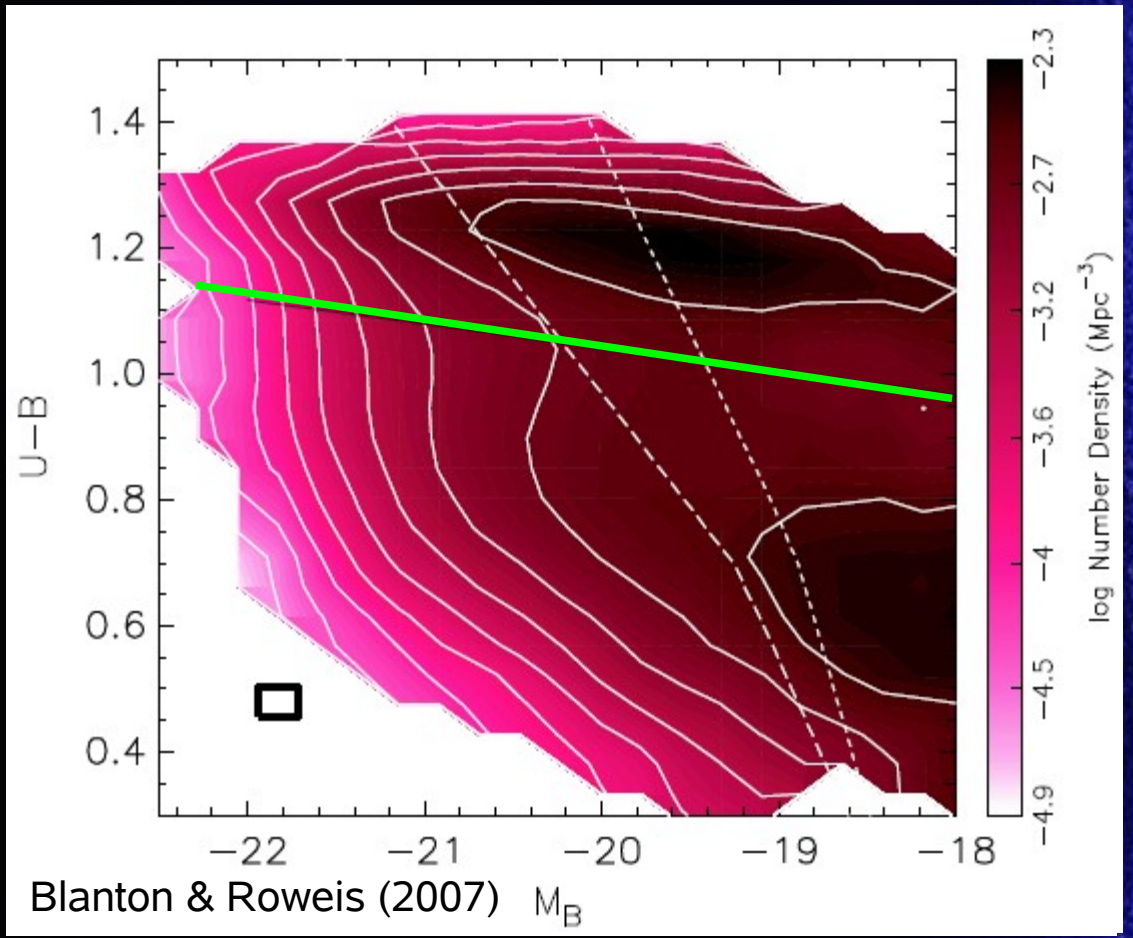
SFR Sequence vs. Blue Cloud

- How do the BC and RS compare to being on the SFR sequence or below it?
- 31% of the RS lie on the SFR sequence → dusty!
- Only 7% of BC lie below SFR sequence (post-starburst)



Blanton & Roweis (2007)

The RS is not all quenched! Better to use SFR-M_* diagram to distinguish between "star-forming" and "quenched" galaxies.

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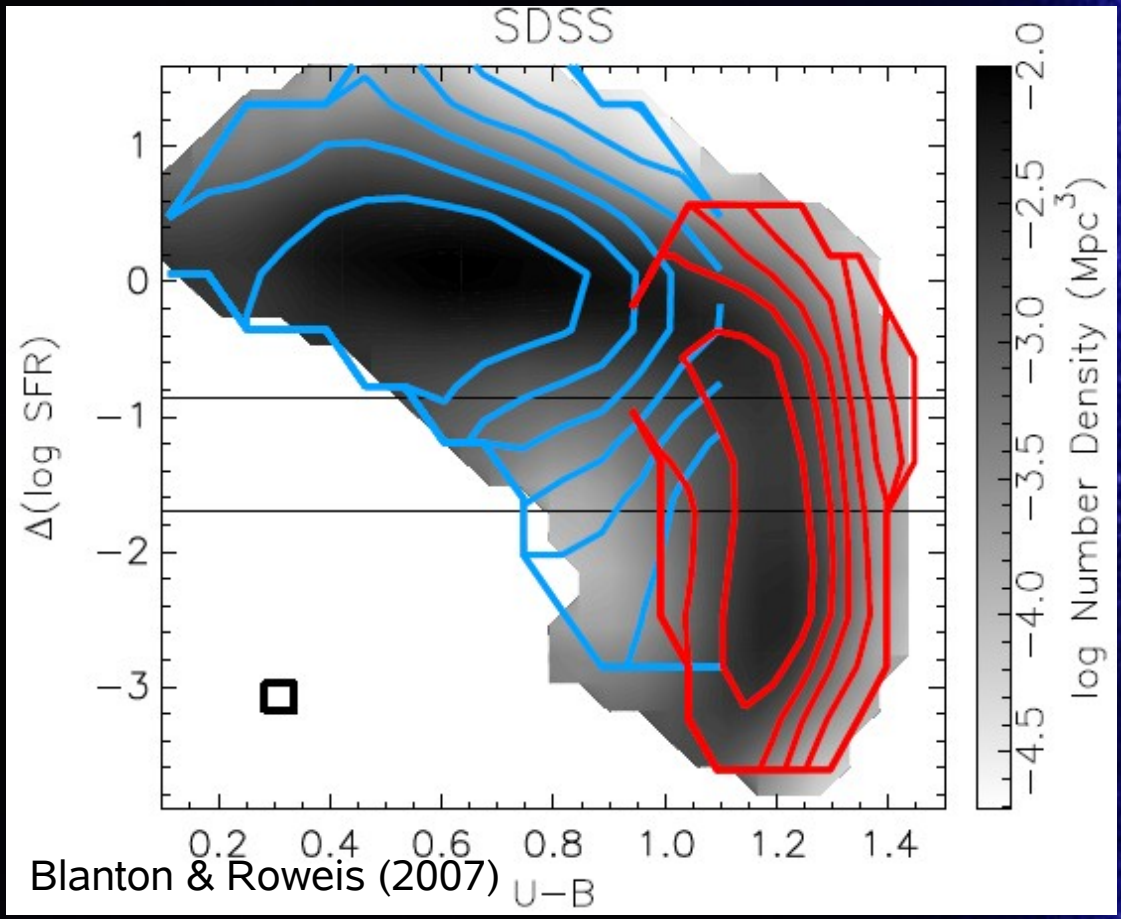

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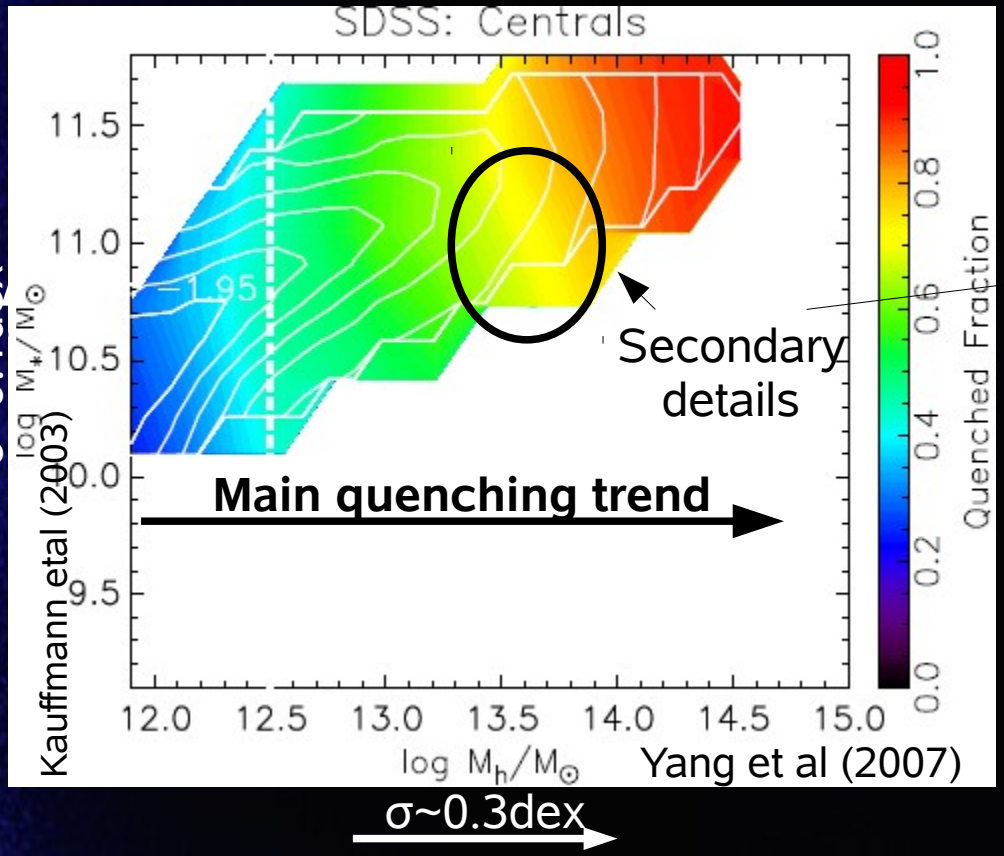
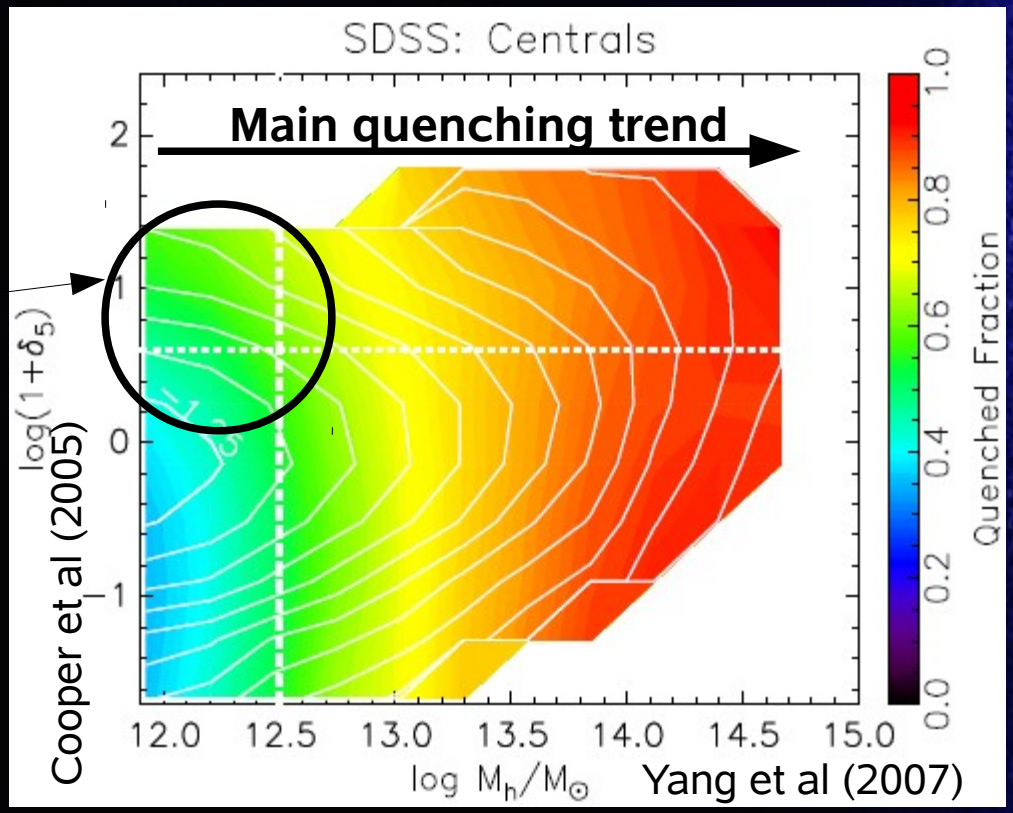
Quenching vs. δ_N, M_*, M_h: Centrals

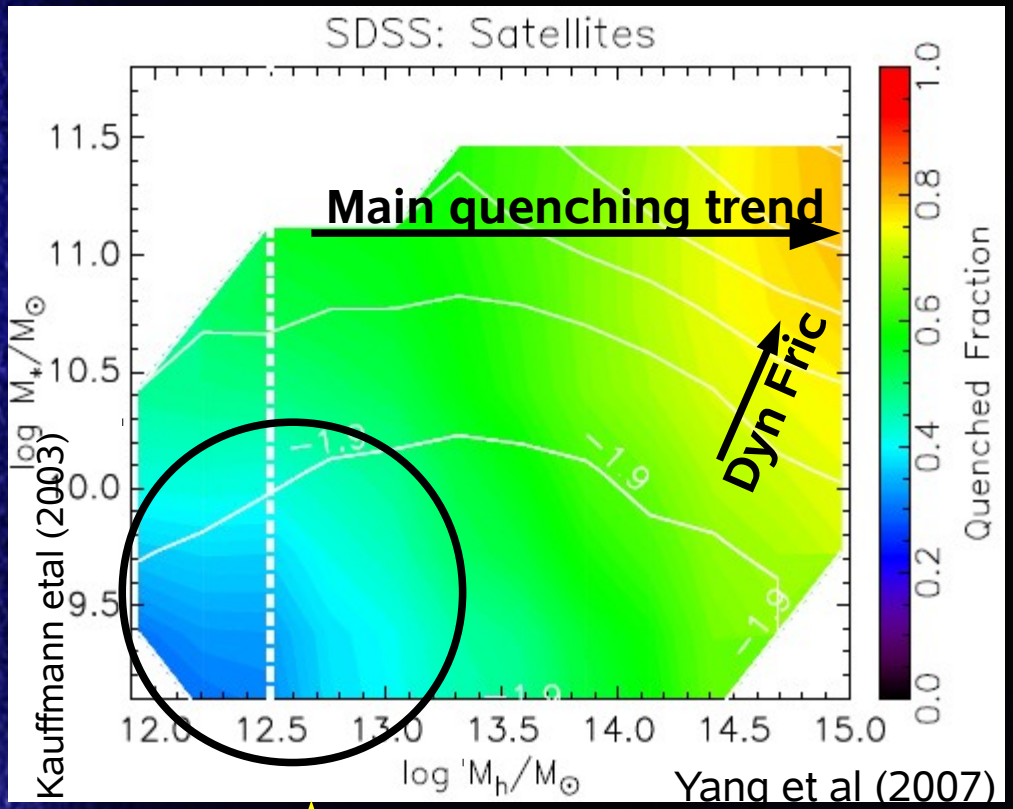




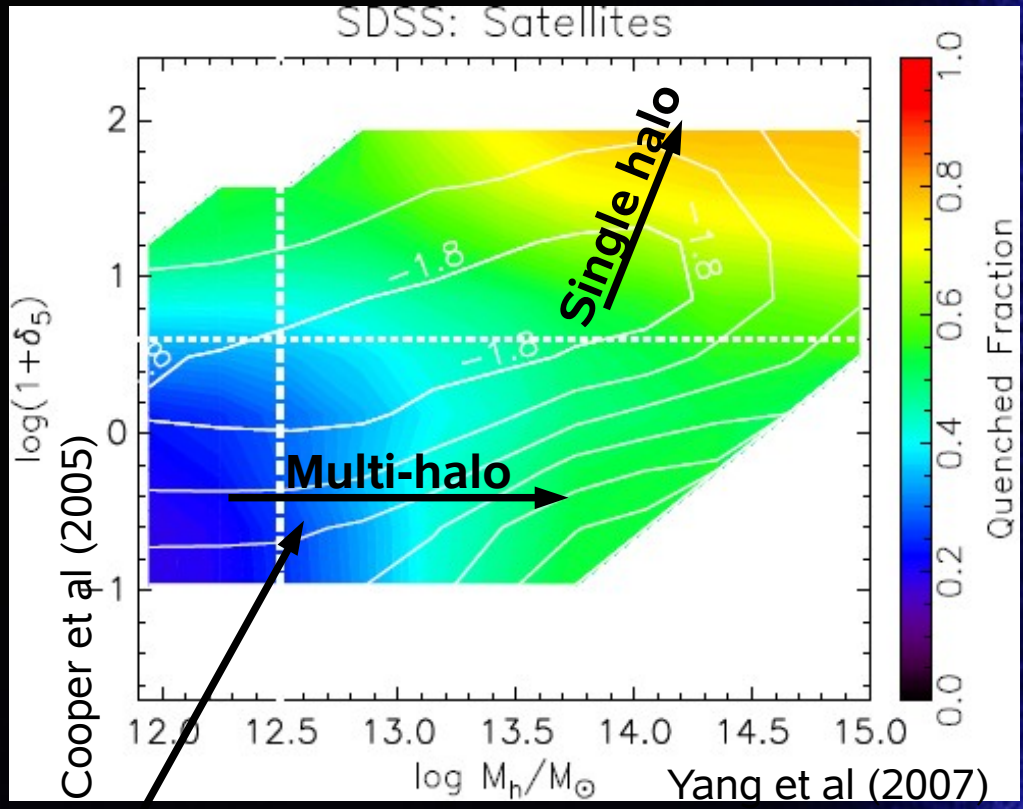
The dominant trend of quenching is with ***halo mass,*** not stellar mass or environment density.

Quenching vs. δ_N, M_*, M_h: Satellites

Proximity to centre:
-shock heating more efficient
-stripping, harrassment, strangulation



Incompleteness?



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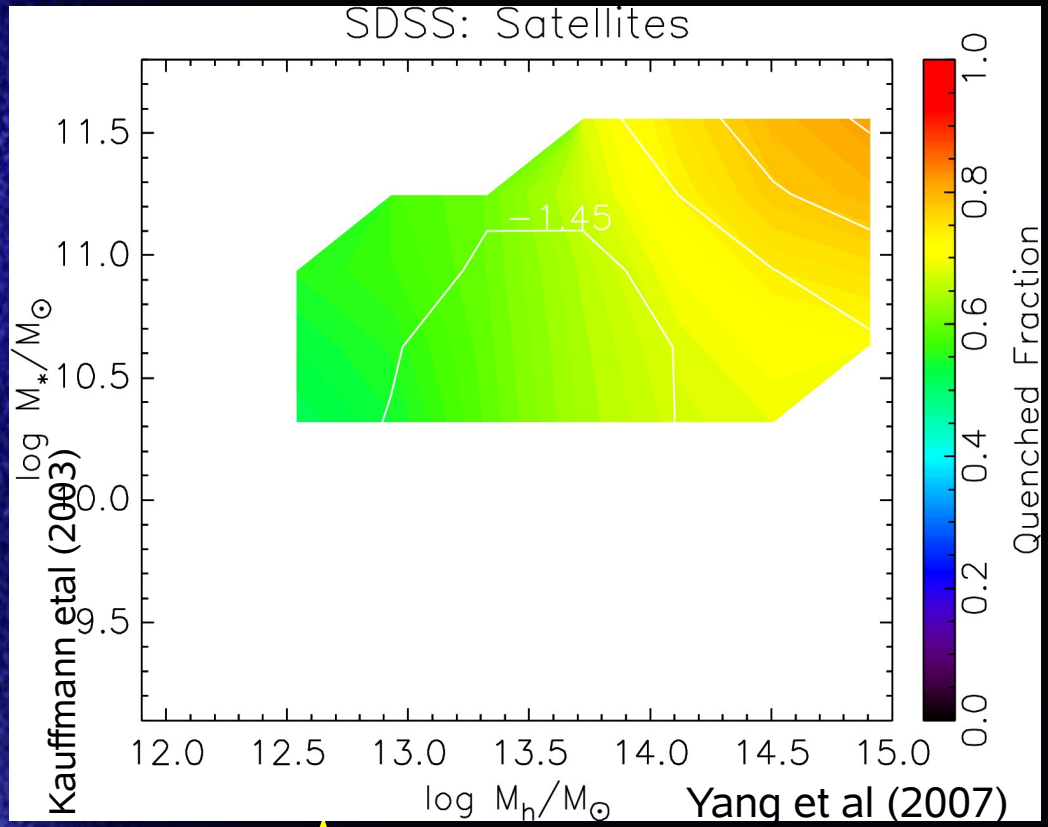

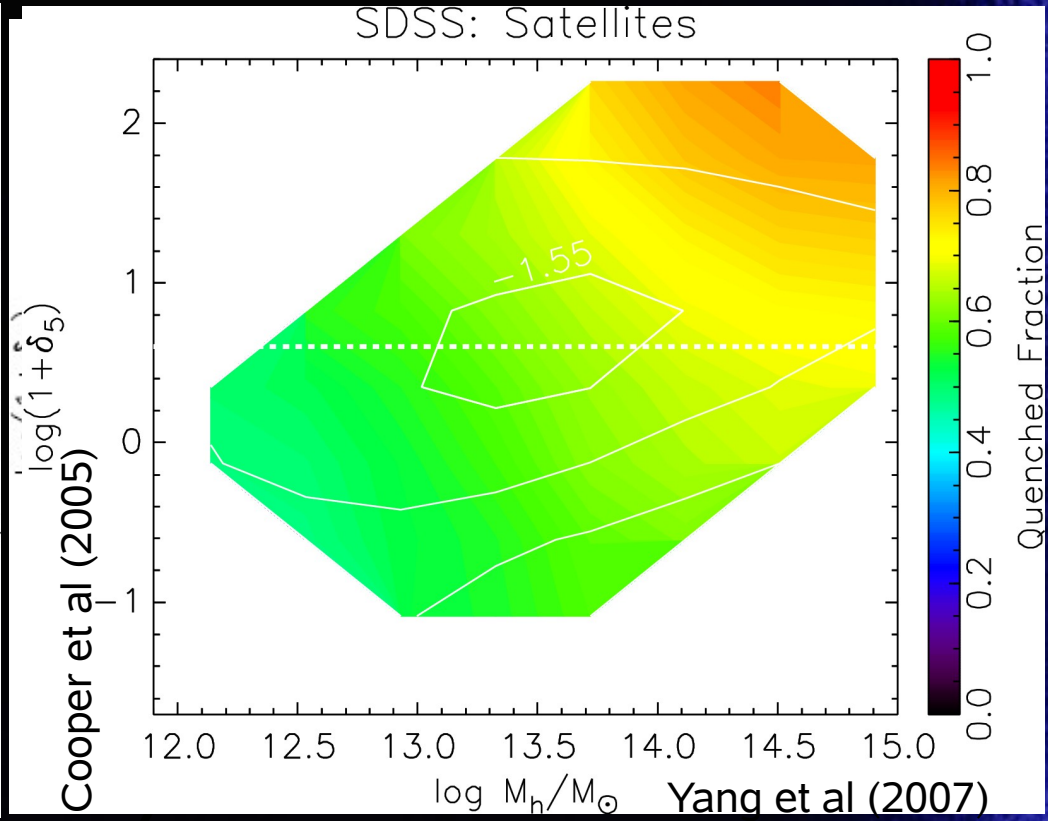

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Summary of Results

- The dominant quenching trend for centrals is with ***halo mass*** not M_* or δ_5
  - External quenching
  - Small dependence on M_* and δ_5 : deviation
- The quenching trend for satellites is with ***both M_h and δ_5*** in the single halo mode and with ***M_h*** in the multi-halo mode
  - External quenching
  - Small M_* trend: consistent with dynamical friction
- Note: these quenching trends with M_h show up when measured by the *quenched fraction* instead of the *red fraction*;
  - Since large SF galaxies are dusty, the red fraction will correlate more with M_* than M_h causing quenching appear to be internal