

A Signature of Merger-Driven Star Formation in Spiral Galaxies

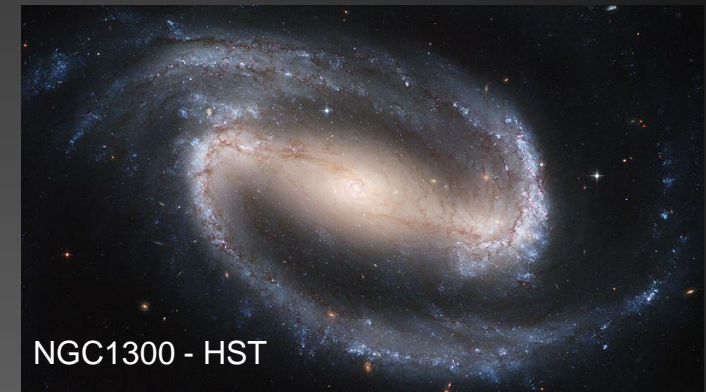
Tim Dolley

Supervisor : Michael Brown

Co-supervisor : Kevin Pimbblet

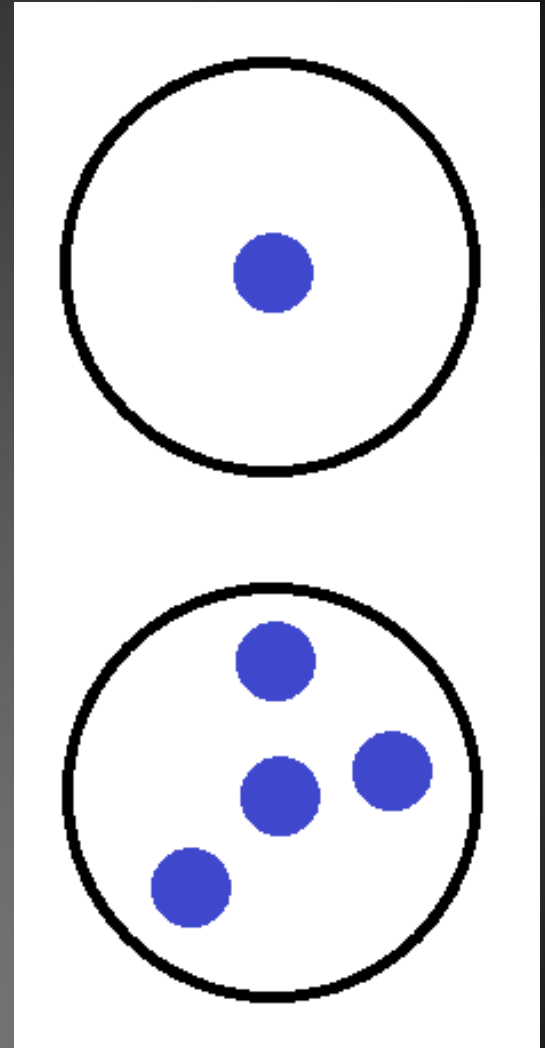
What Regulates Local Galaxy Star Formation?

- Secular evolution is thought to dominate local galaxy star formation
 - Kormandy+ 04, Friedl+ 93,95, Norman+ 96, MacArthur+ 03, Jogee+ 05, Regan+ 06, Sancisi+ 08, Keres 09, Xiang+ 96,98, Dodds+ 08
- Merger driven star formation must also contribute
 - Dressler+ 09, Menci+ 05, Scudder+ 12, Patton+ 13



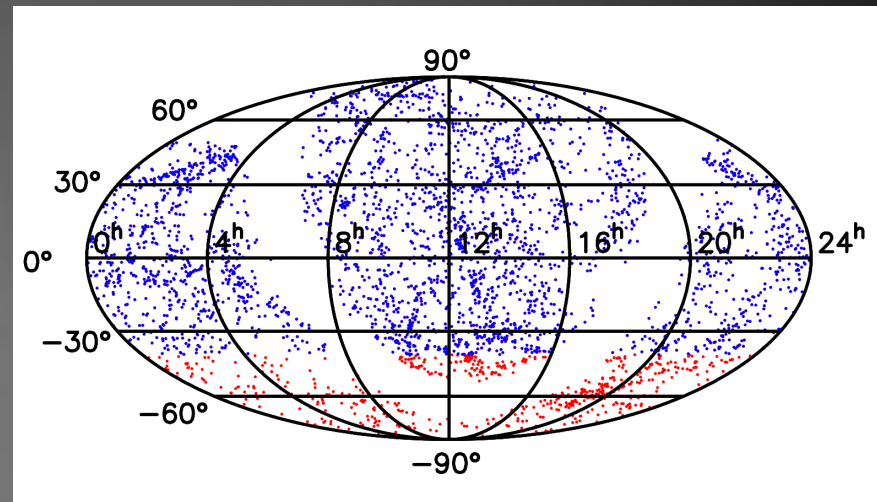
Galaxy Clustering

- Galaxies reside within dark matter halos
- Clustering of halos is a function of their mass
- Large scale clustering of galaxies gives halo mass
- Small scale clustering gives us distribution within halos

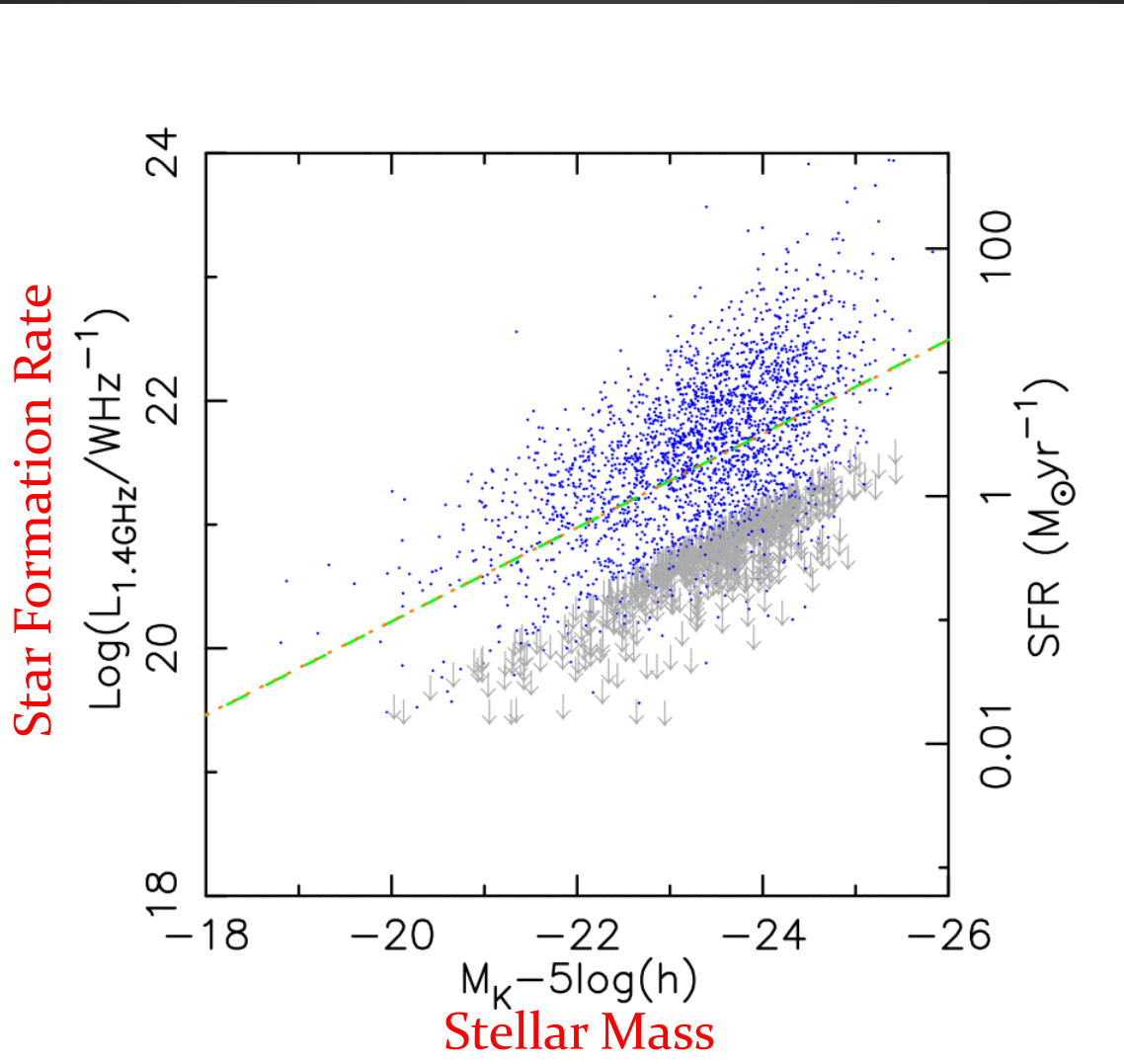


Spiral Galaxy Sample

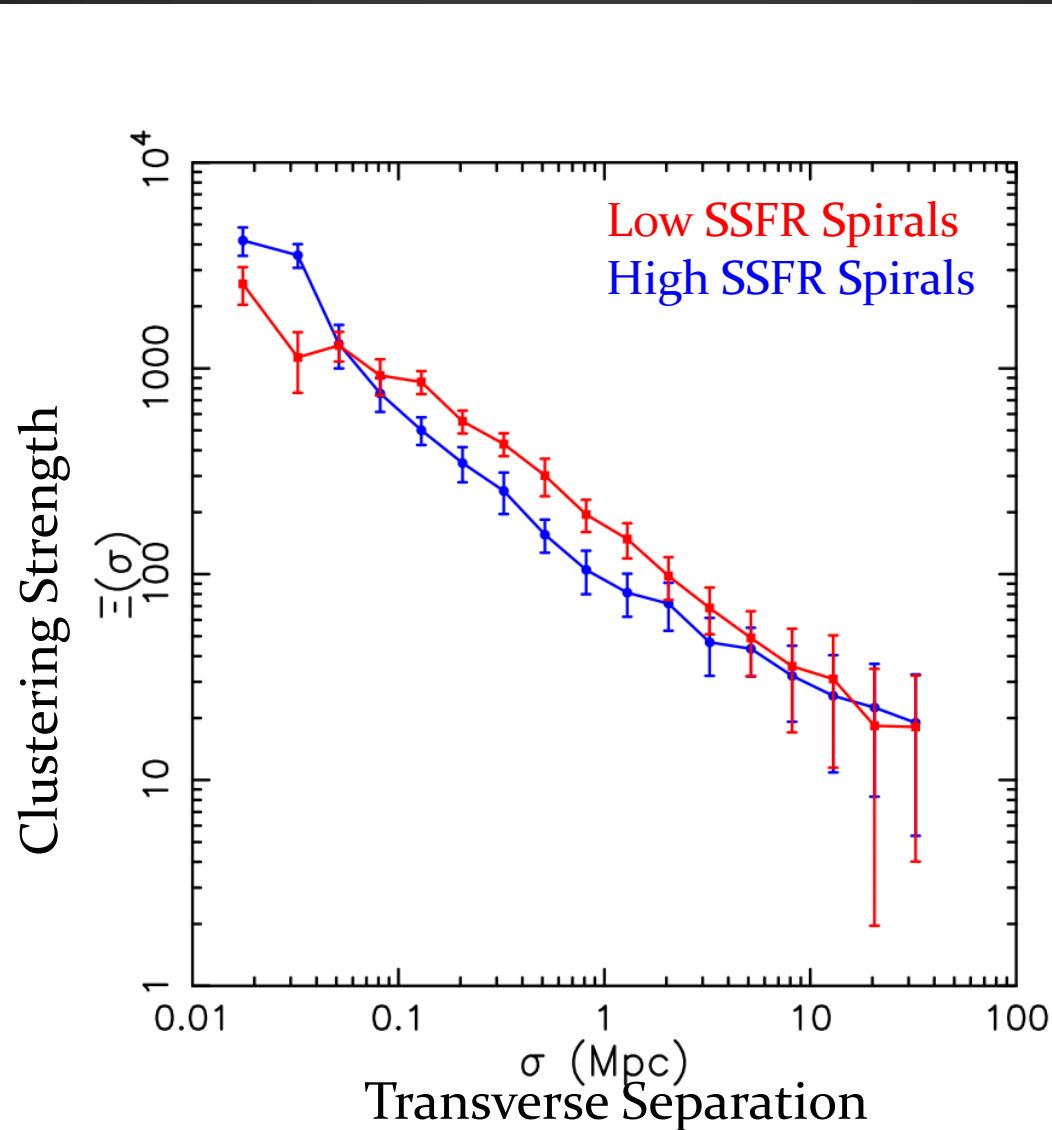
- Morphology selected sample
 - Bonne et al., in prep.
- $K < 10.75$, all sky
- $z < 0.1$
- 98% complete
- Measured SFRs from NVSS 1.4GHz radio continuum
- 5423 galaxies

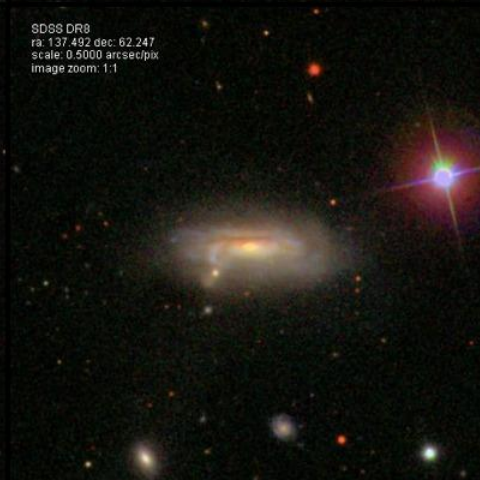
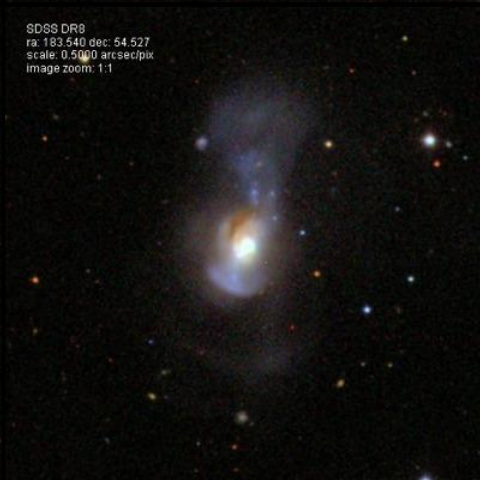
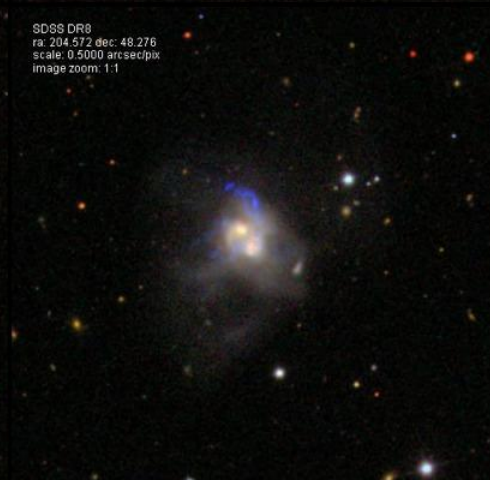
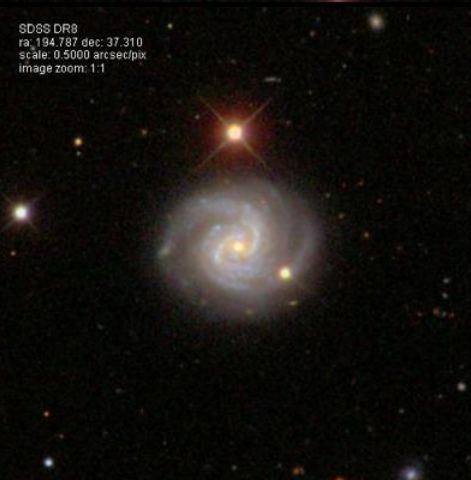
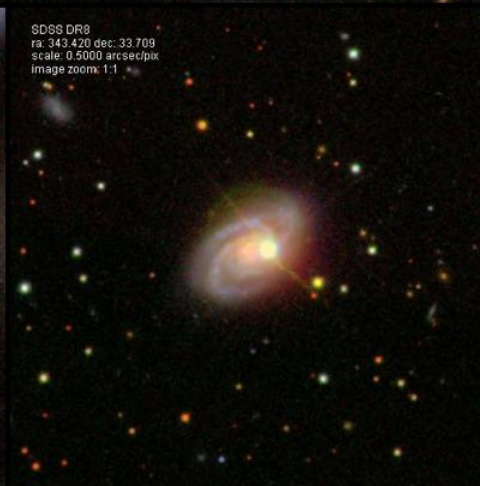
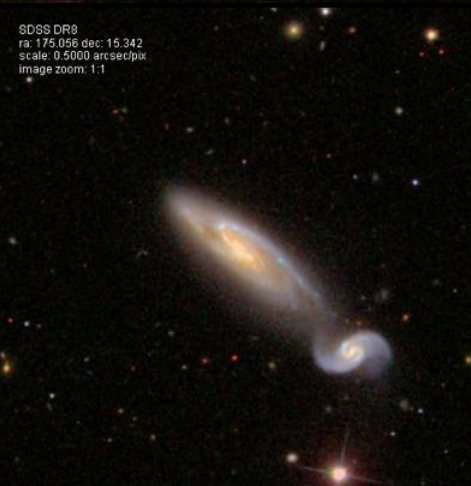
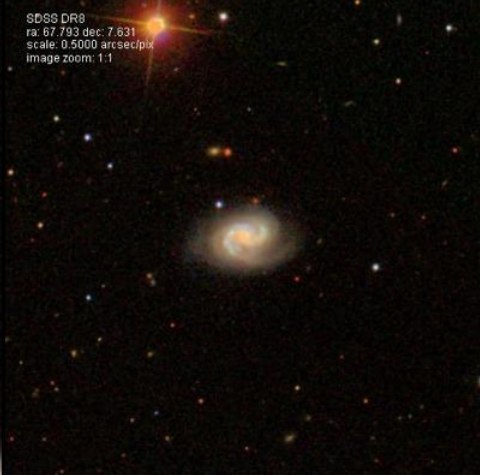


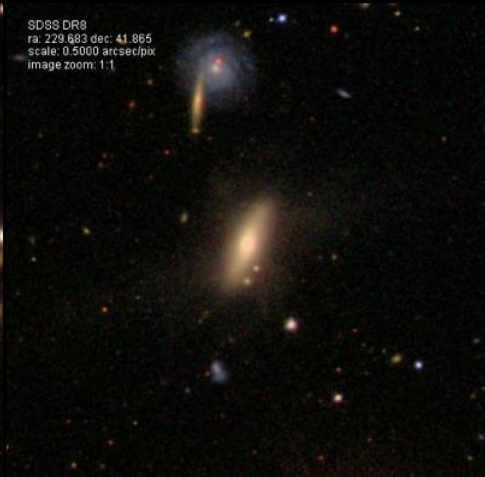
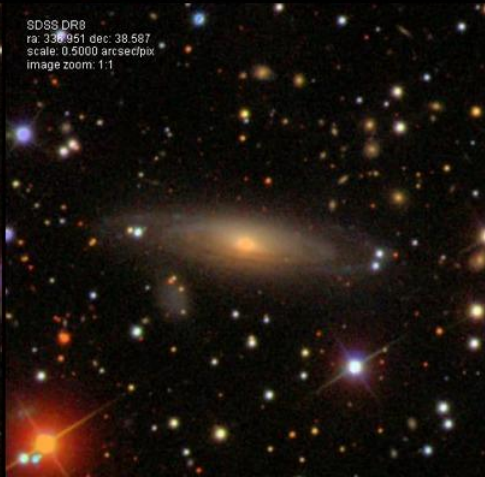
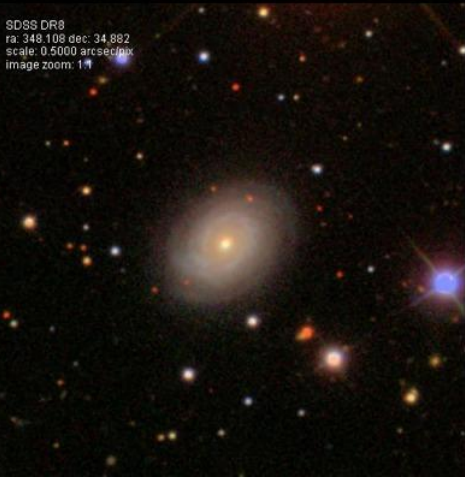
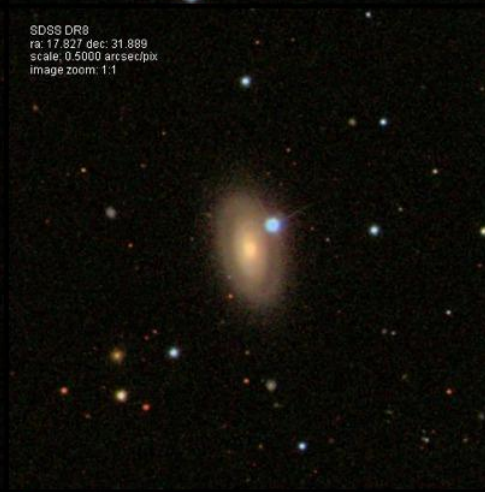
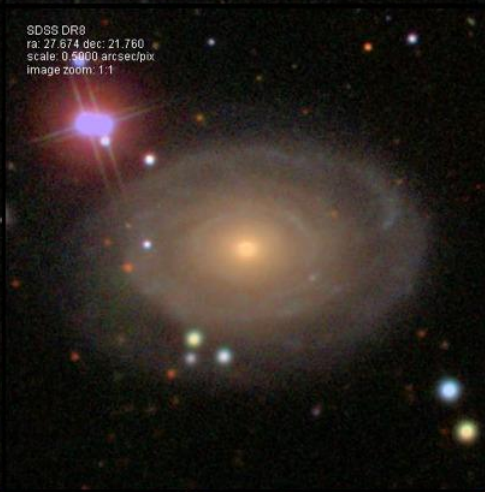
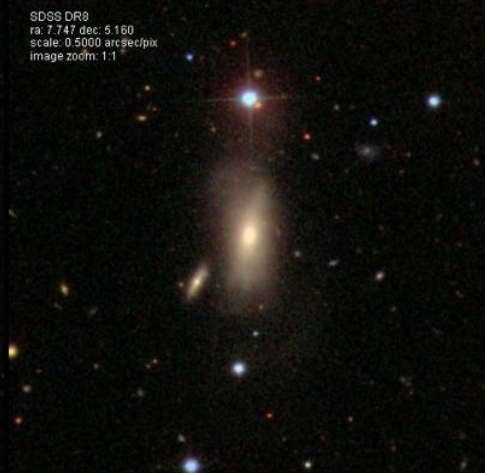
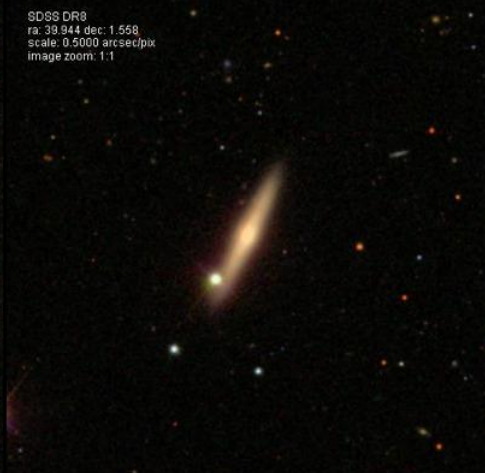
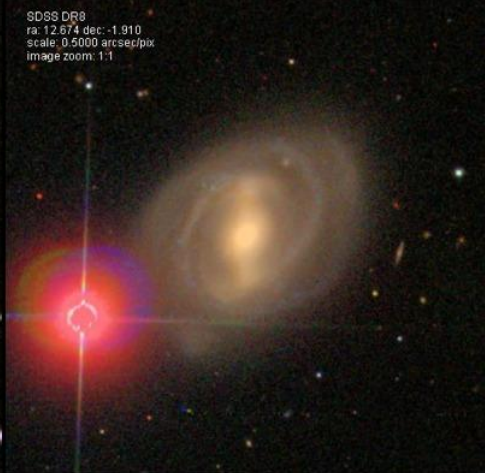
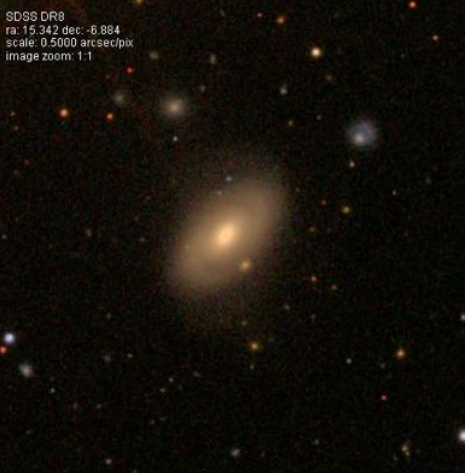
Galaxy Main Sequence



Clustering of Spiral Galaxies

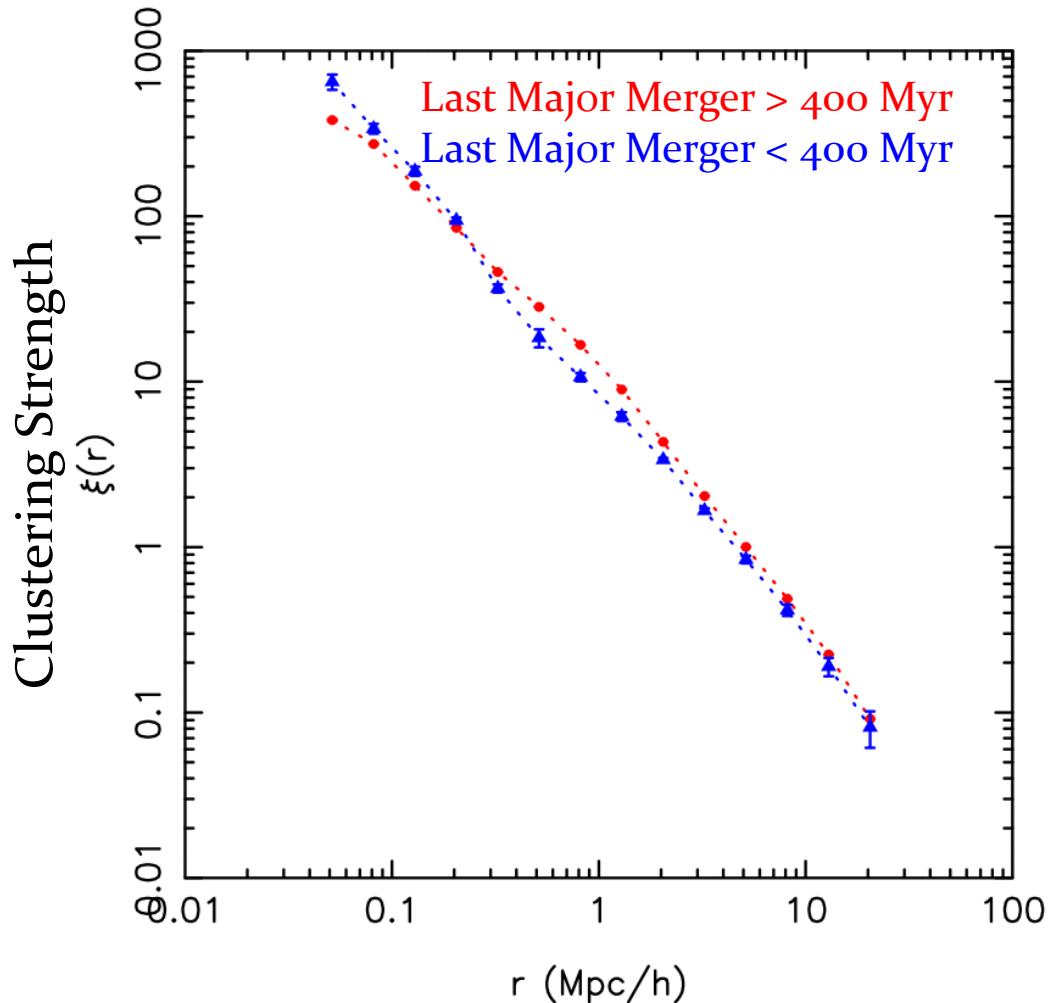






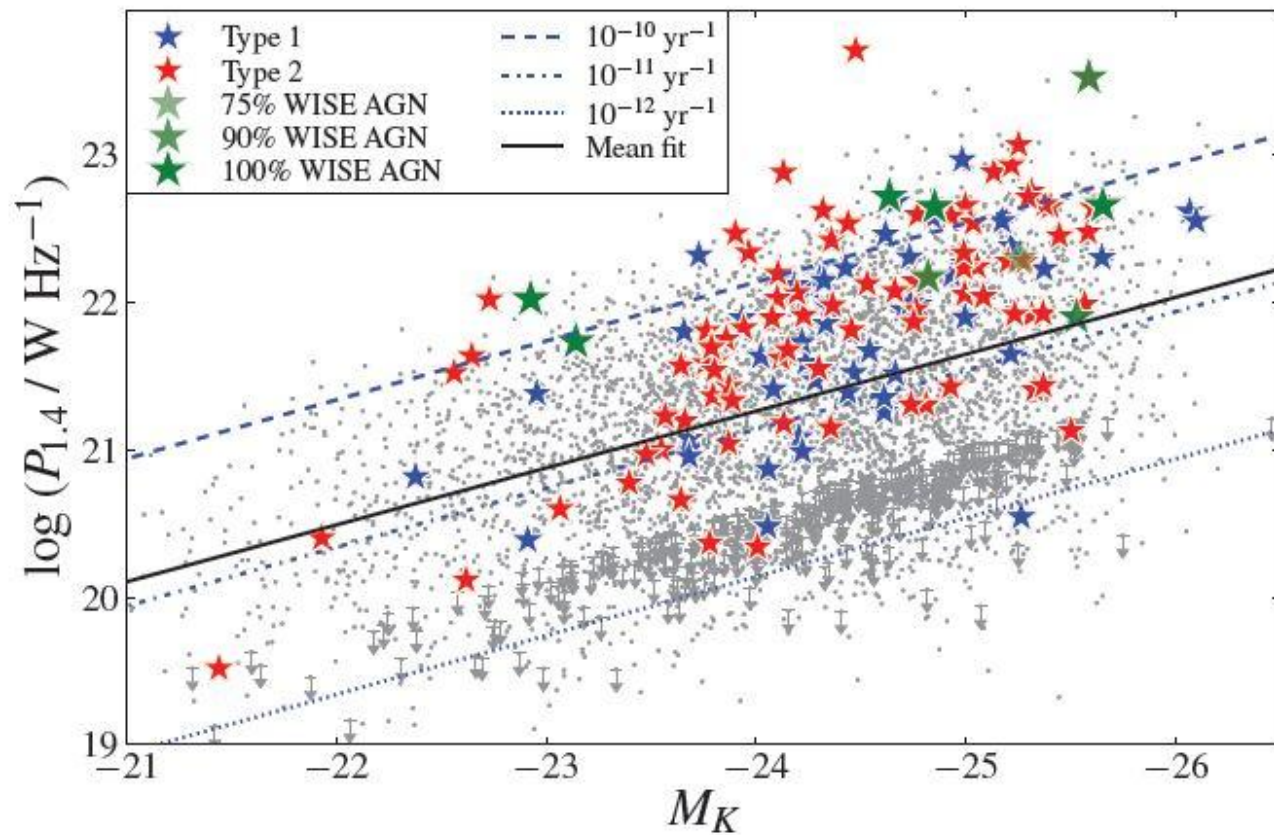
Simulations

- Millenium simulations, Croton et al. 2006
- 500 Mpc cube
- Disk galaxies
- $M_{\text{stellar}} > 10^{10} M_{\text{Sun}}$
- ~1.1 million galaxies
- Major mergers (3:1) within last 400 Myr



Summary

- Measured clustering of spiral galaxies as a function of SSFR
- Signature of mergers found in correlation function of enhanced SSFR galaxies
- Mergers perhaps play a bigger role in driving star formation than expected.
- This relies on counting pairs of galaxies, not seeing tidal tails or morphologies, so can be applied to higher redshift galaxies.



Floyd et al. (submitted)

Halo Masses

- IR luminosity is a proxy for star formation rate (SFR)
- Highest SFR galaxies are in highest mass halos
- Upper halo mass of $10^{12.8} M_{\odot}$
 - Transition region in halo mass where star formation is truncated
- SFR in constant mass halos increases with z

