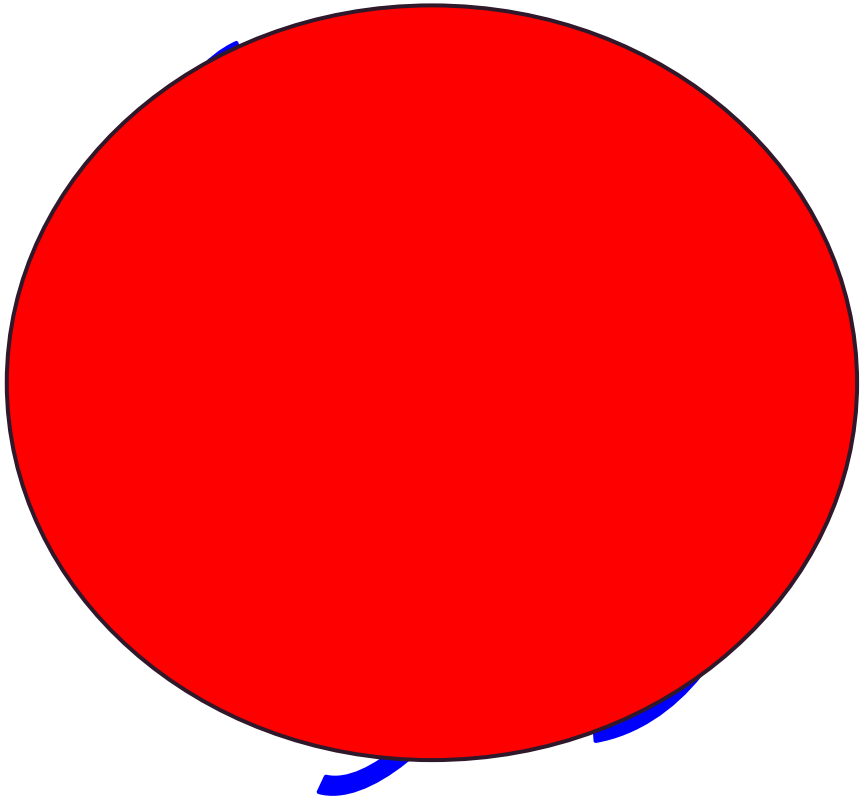
The Dependence of Quenching upon Inner Galactic Structure

Edmond Cheung
Sandy Faber
David Koo
Aaron Dutton
AEGIS team

Santa Cruz Galaxy Workshop
August 15, 2012

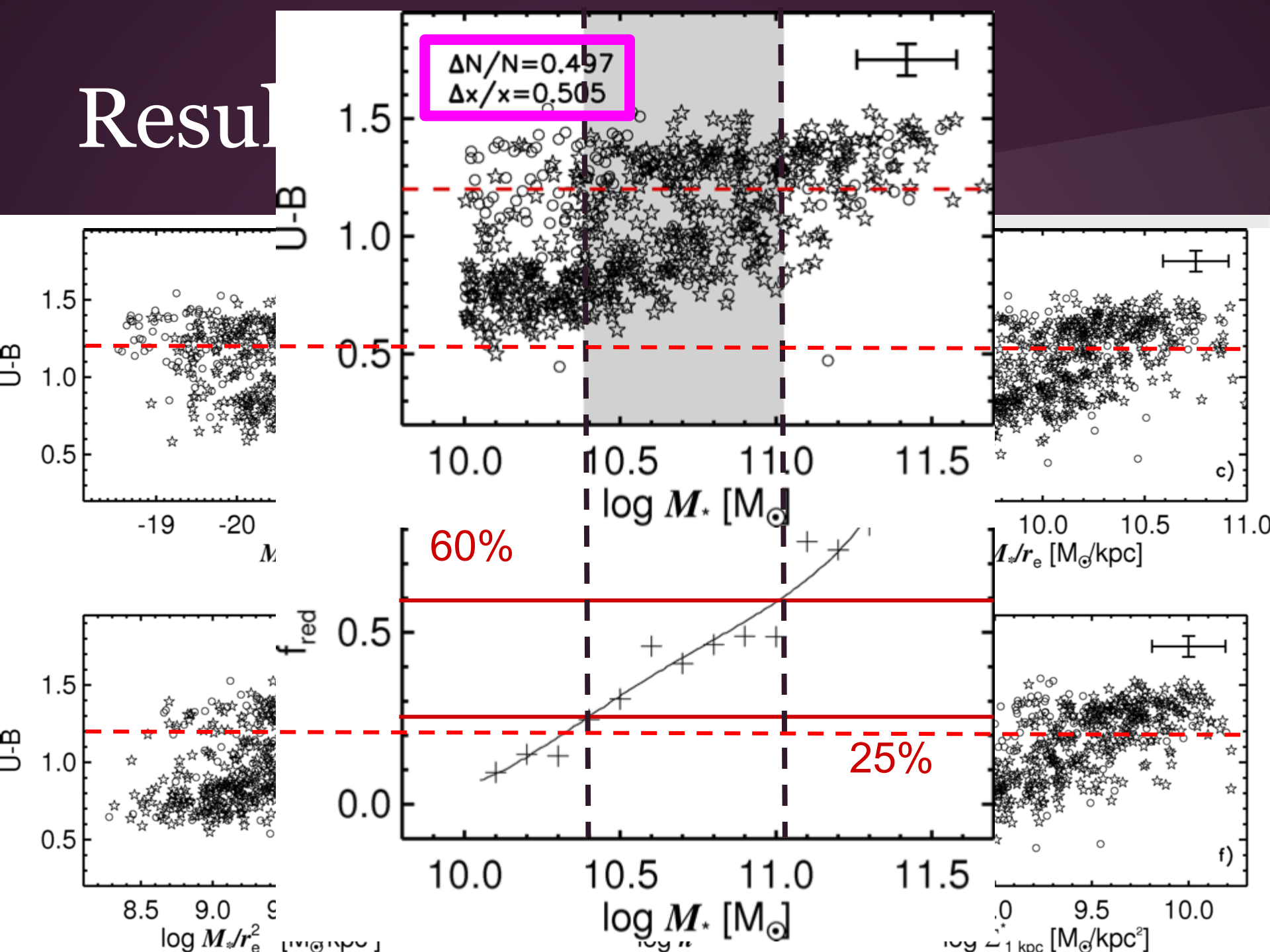
What is Quiescence?



Data

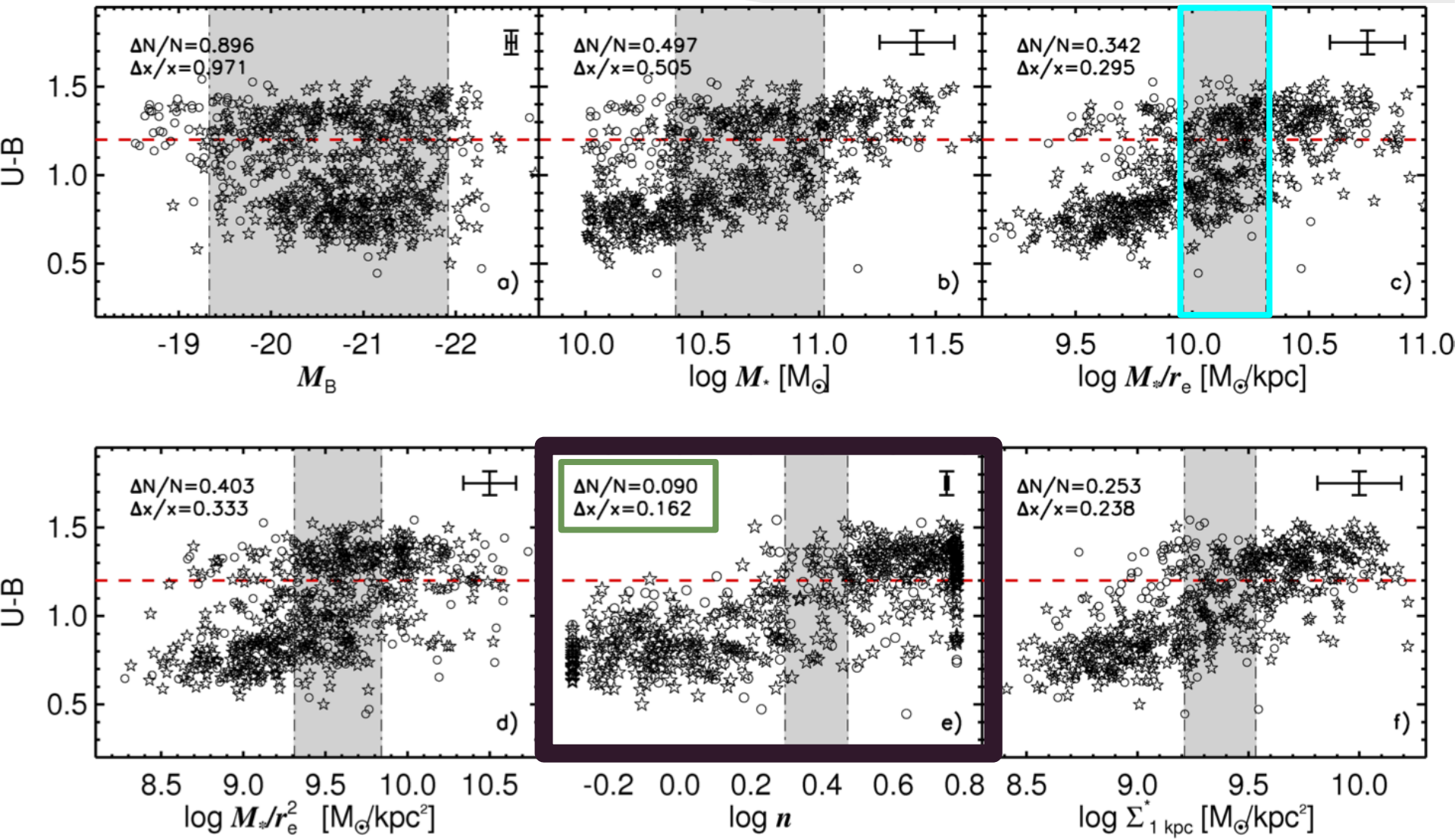
- Photometry
  - CFHT *BRI*
  - *HST*/ACS *V*+*I* imaging from AEGIS
- Redshifts
  - spectroscopic redshifts from DEEP2 survey; photometric redshifts from Jiasheng
  - restrict to 0.5<z<0.8 to minimize *k*-corrections
- Rest-frame Magnitudes
  - *k*-correct v4.2 (Blanton et al. 2007)
- GIM2D
  - bulge+disk decompositions by Luc Simard
  - V, I, r_e for bulge and disk component
- Stellar Masses
  - stellar masses of spectroscopic sample from Bundy et al. 2006
  - fit a relationship between M_*/L and V, I, z

Resul


ΔN/N=0.497
Δx/x=0.505
U-B
log M_* [$M_\odot$]
60%
25%
f_{red}
c)
f)
M_*/r_e [$M_\odot$/kpc]
log M_*/r_e^2
[$M_\odot$/kpc^2]

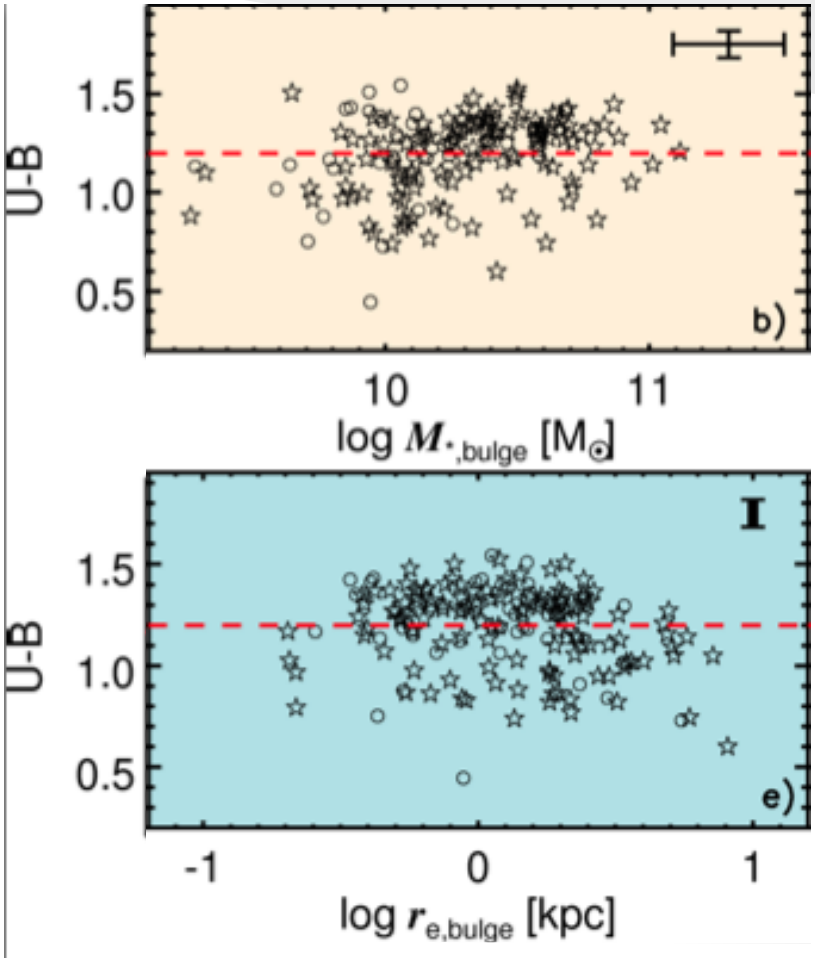
Results

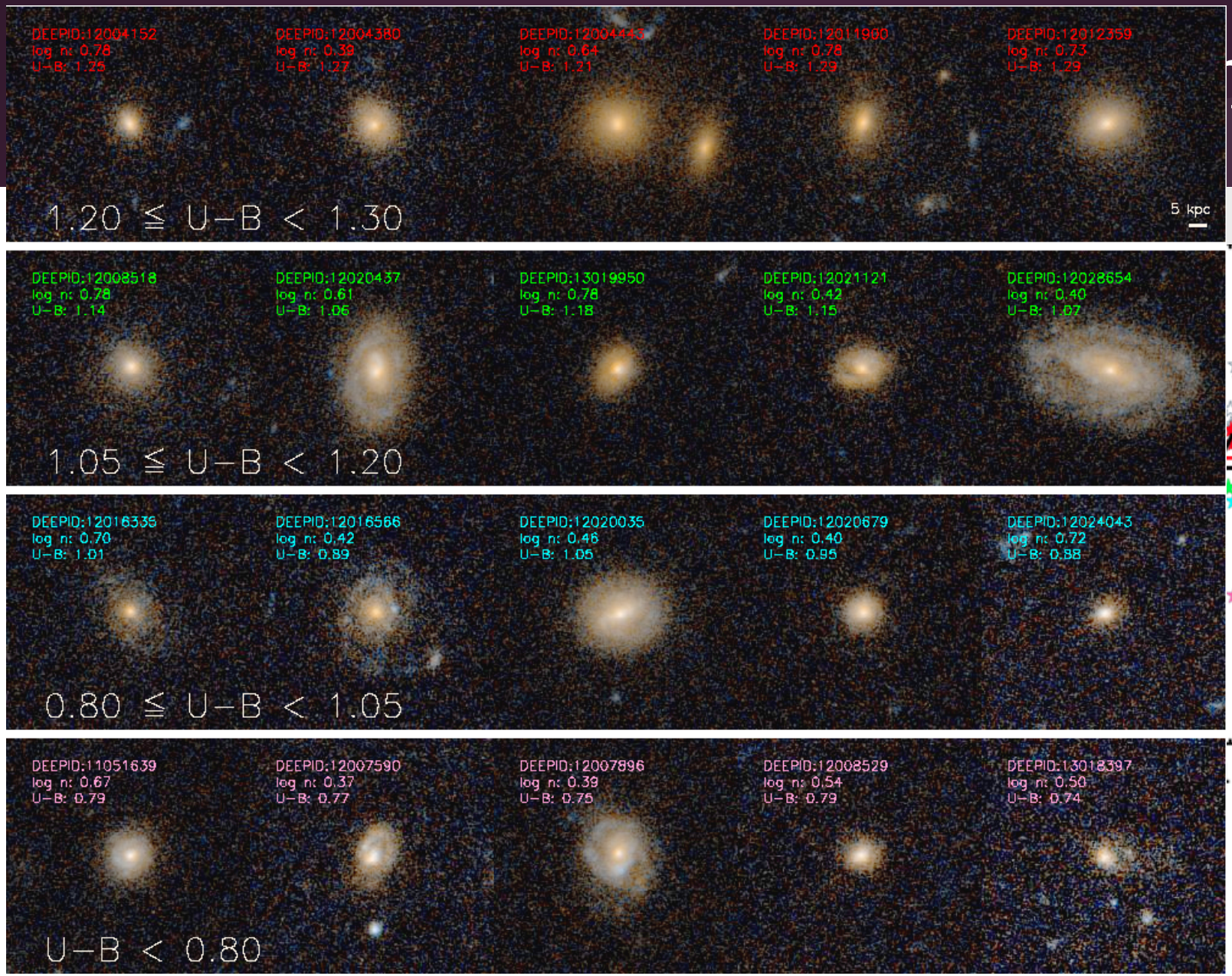
Cheung et al. (submitted)

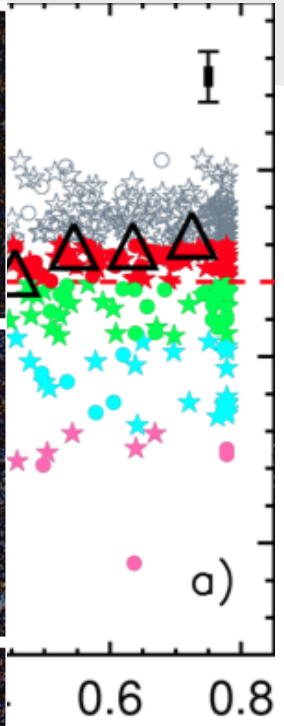


M_*/r_e Overlap Region

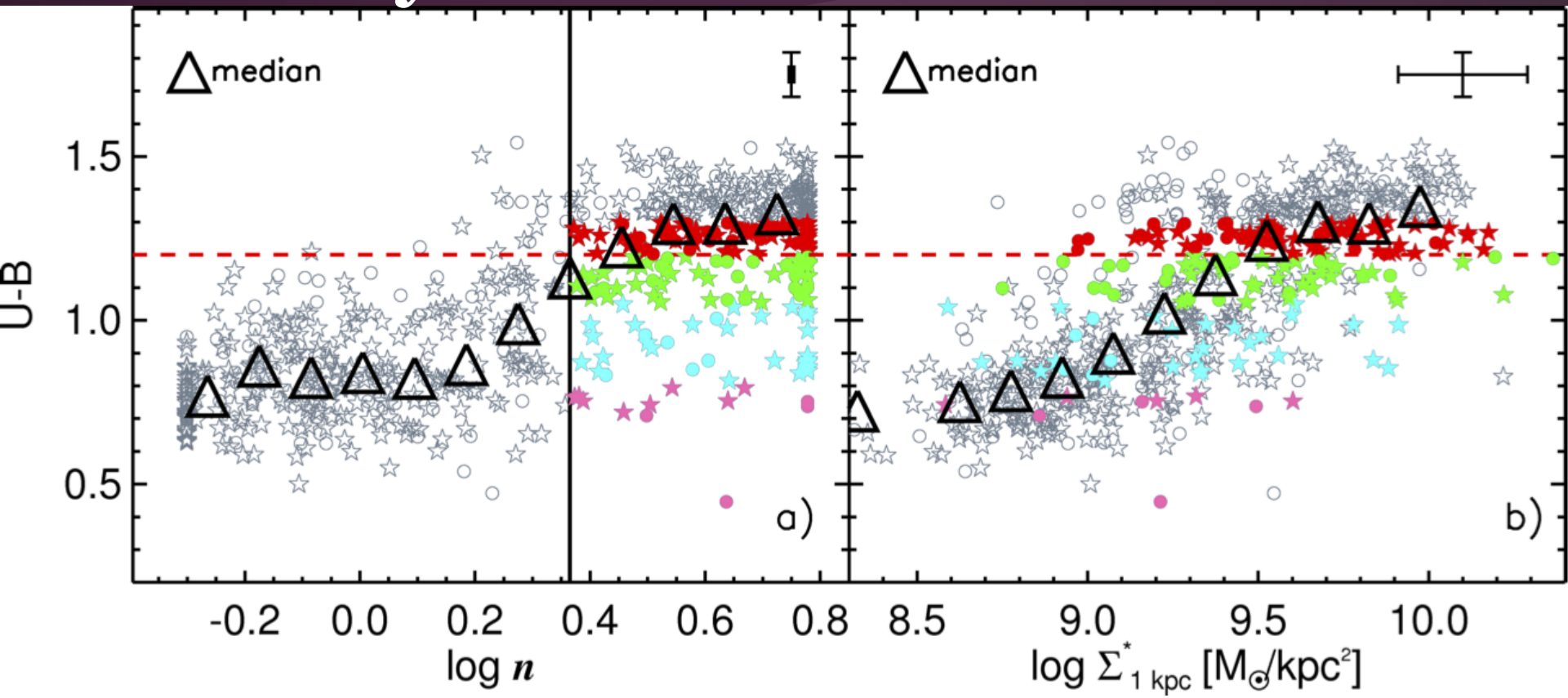
- Genuine inner structural difference between quenched and star-forming galaxies
  - blue cloud galaxies cannot simply *fade* on to the red sequence
  - migration to red sequence requires a significant rearrangement of the *inner stellar mass*




DEEPID:12004152
log n: 0.78
U−B: 1.25
DEEPID:12004380
log n: 0.39
U−B: 1.27
DEEPID:12004443
log n: 0.64
U−B: 1.21
DEEPID:12011960
log n: 0.78
U−B: 1.29
DEEPID:12012359
log n: 0.73
U−B: 1.29
1.20 ≦ U−B < 1.30
5 kpc
DEEPID:12008518
log n: 0.78
U−B: 1.14
DEEPID:12020437
log n: 0.61
U−B: 1.06
DEEPID:13019950
log n: 0.78
U−B: 1.18
DEEPID:12021121
log n: 0.42
U−B: 1.15
DEEPID:12028654
log n: 0.40
U−B: 1.07
1.05 ≦ U−B < 1.20
DEEPID:12016336
log n: 0.70
U−B: 1.01
DEEPID:12016566
log n: 0.42
U−B: 0.89
DEEPID:12020035
log n: 0.46
U−B: 1.05
DEEPID:12020679
log n: 0.40
U−B: 0.95
DEEPID:12024043
log n: 0.72
U−B: 0.88
0.80 ≦ U−B < 1.05
DEEPID:11051639
log n: 0.67
U−B: 0.79
DEEPID:12007590
log n: 0.37
U−B: 0.77
DEEPID:12007896
log n: 0.39
U−B: 0.75
DEEPID:12008529
log n: 0.54
U−B: 0.79
DEEPID:13018397
log n: 0.50
U−B: 0.74
U−B < 0.80

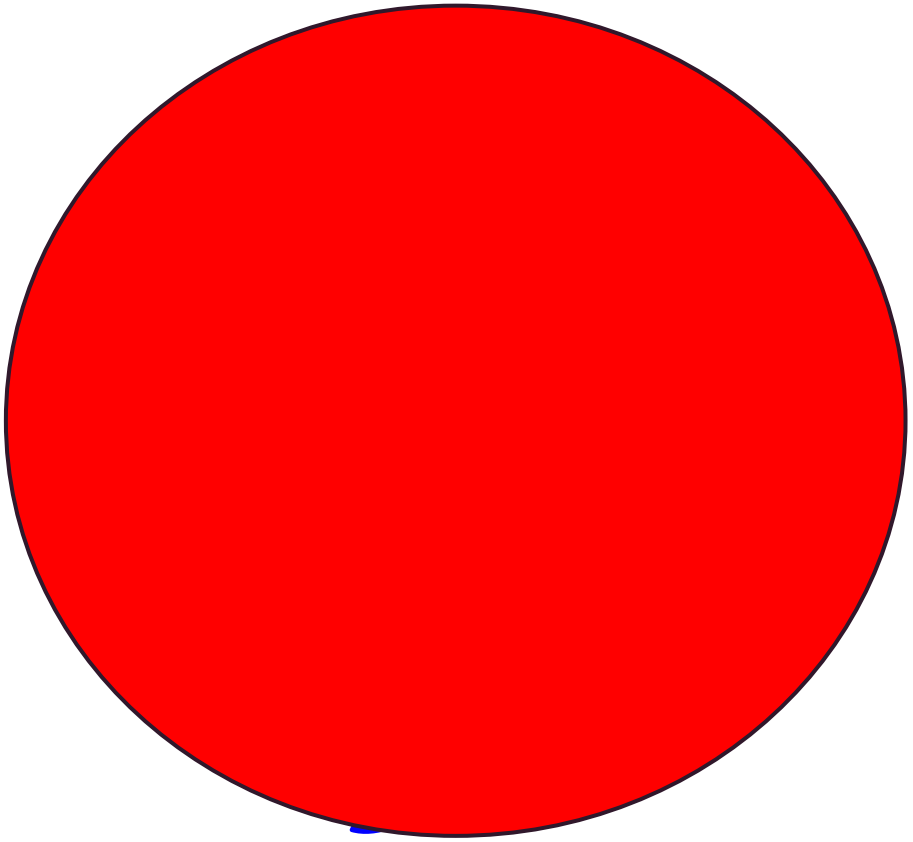

a)
0.6
0.8

Color Central Surface Mass Density



- Σ^*_{1kpc} corrects the outliers
- Suggests that inner structure of galaxies is most related to quiescence

A Visual Approximation of our Conclusions



- Sérsic index most sharply discriminates star-forming galaxies from quiescent galaxies
  - however, ~30% of high *n* galaxies are still star-forming
- Central surface mass density corrects these outliers, suggesting that it is the *inner* structure of galaxies that is most related to quiescence
- Red sequence bulges are ~2x as massive as blue cloud bulges, while also ~2x as small, thus corroborating our conclusion that stellar mass density must absolutely increase at the centers of galaxies as they quench