

# **Environmental effects on colors and luminosity**

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# Outline

- 1) Study bimodal color distribution as a function of density
- 2) Does a “morphology-density” relation exist on large scales (5 Mpc) and at high redshift?
- 3) Fraction of luminous objects as a function of redshift

# 3D overdensity field

$$\delta_{\mathbf{g}}(r) = \frac{\rho_{\mathbf{g}}(r) - \bar{\rho}_{\mathbf{g}}}{\bar{\rho}_{\mathbf{g}}}$$

$$\delta_{\mathbf{g}}(r) \leq 0 \quad \rightarrow \quad \rho_{\mathbf{g}}(r) \leq \bar{\rho}_{\mathbf{g}}$$

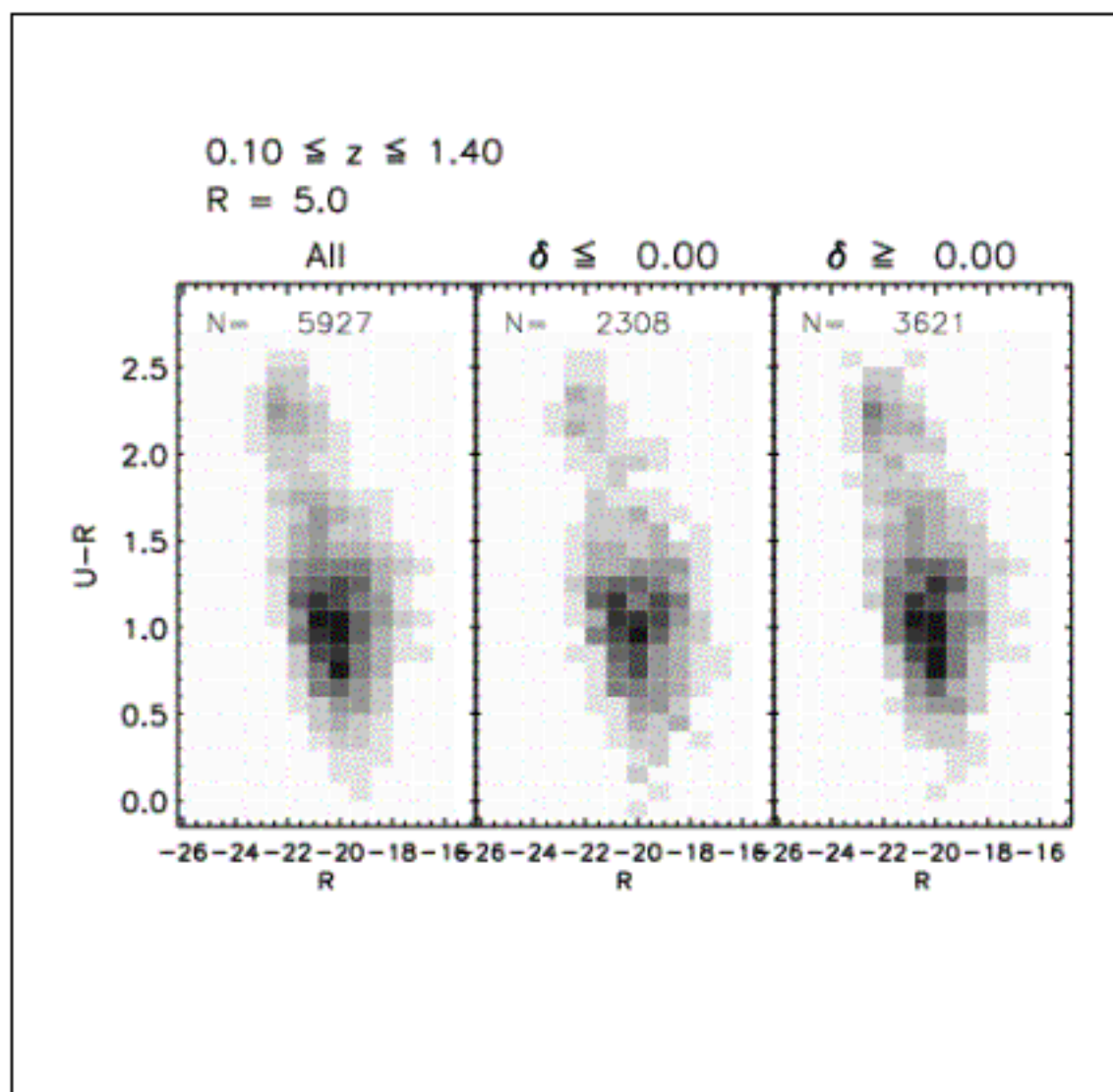
$$\delta_{\mathbf{g}}(r) = 0 \quad \rightarrow \quad \rho_{\mathbf{g}}(r) = \bar{\rho}_{\mathbf{g}}$$

$$\delta_{\mathbf{g}}(r) \geq 0 \quad \rightarrow \quad \rho_{\mathbf{g}}(r) \geq \bar{\rho}_{\mathbf{g}}$$

# Color distribution as a function of environment

(U-R) vs R

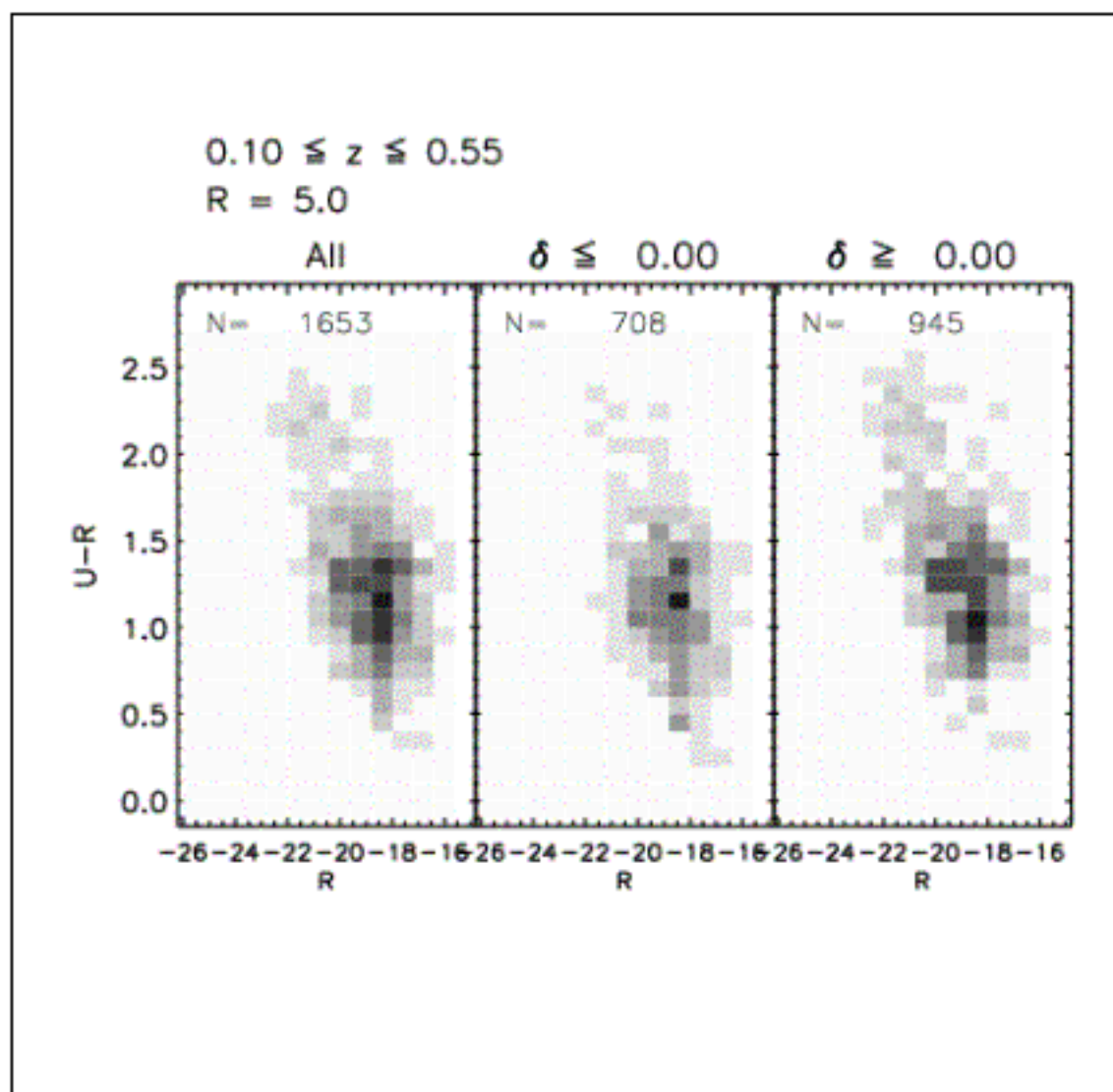
Redshift bin:  
 $0.10 \leq z \leq 1.40$



# Color distribution as a function of environment

(U-R) vs R

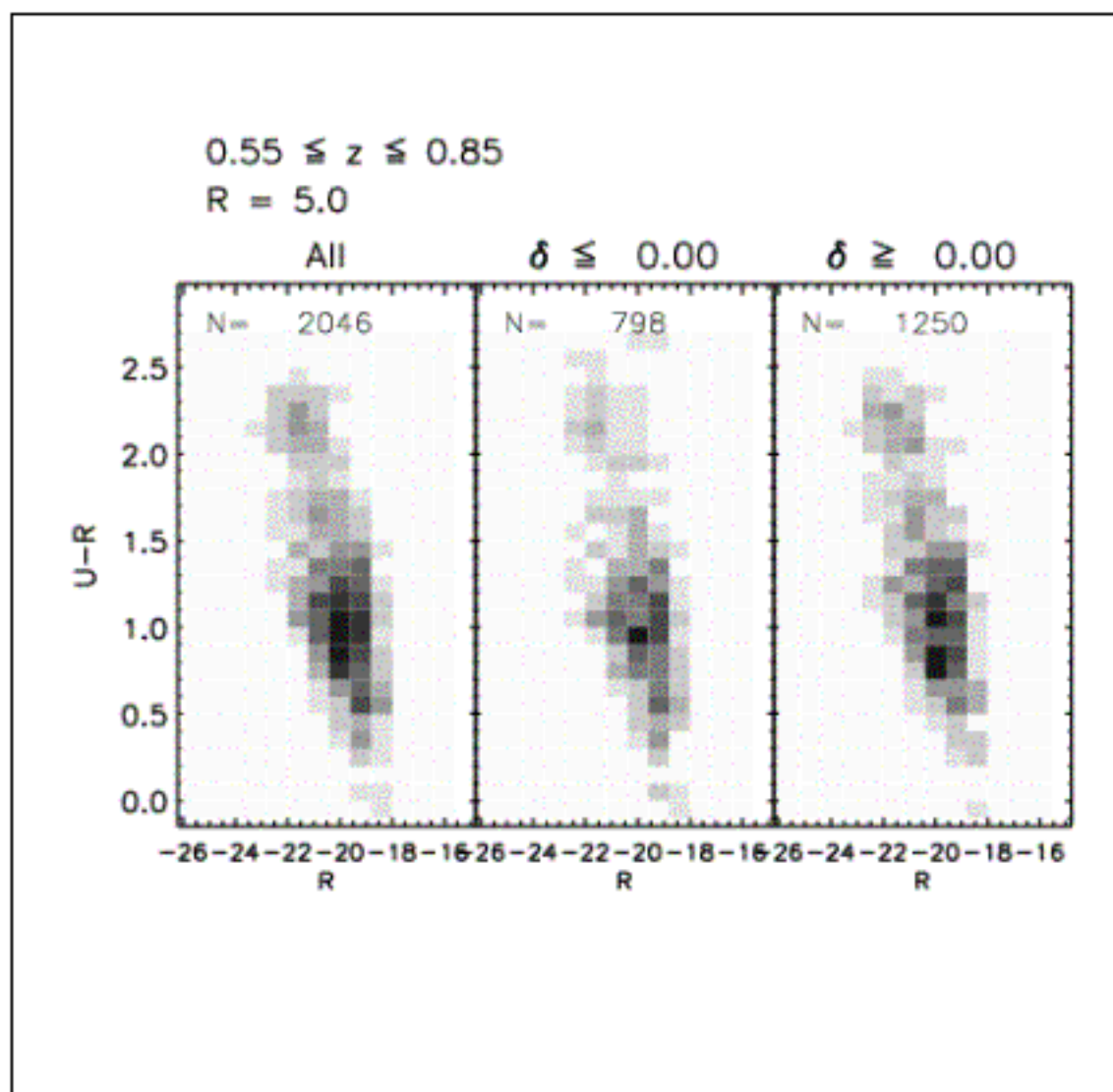
Redshift bin:  
 $0.10 \leq z \leq 0.55$



# Color distribution as a function of environment

(U-R) vs R

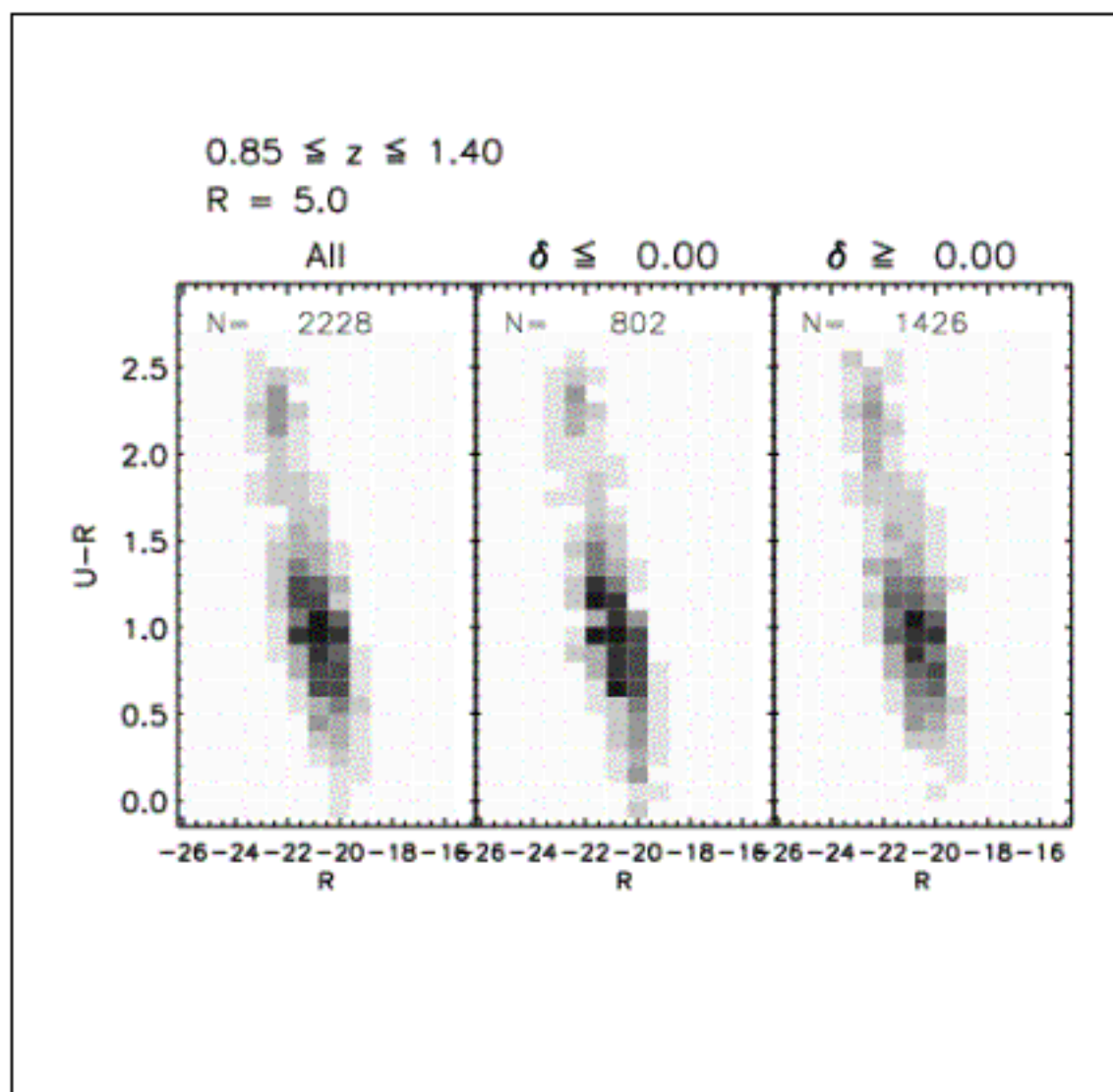
Redshift bin:  
 $0.55 \leq z \leq 0.85$



# Color distribution as a function of environment

(U-R) vs R

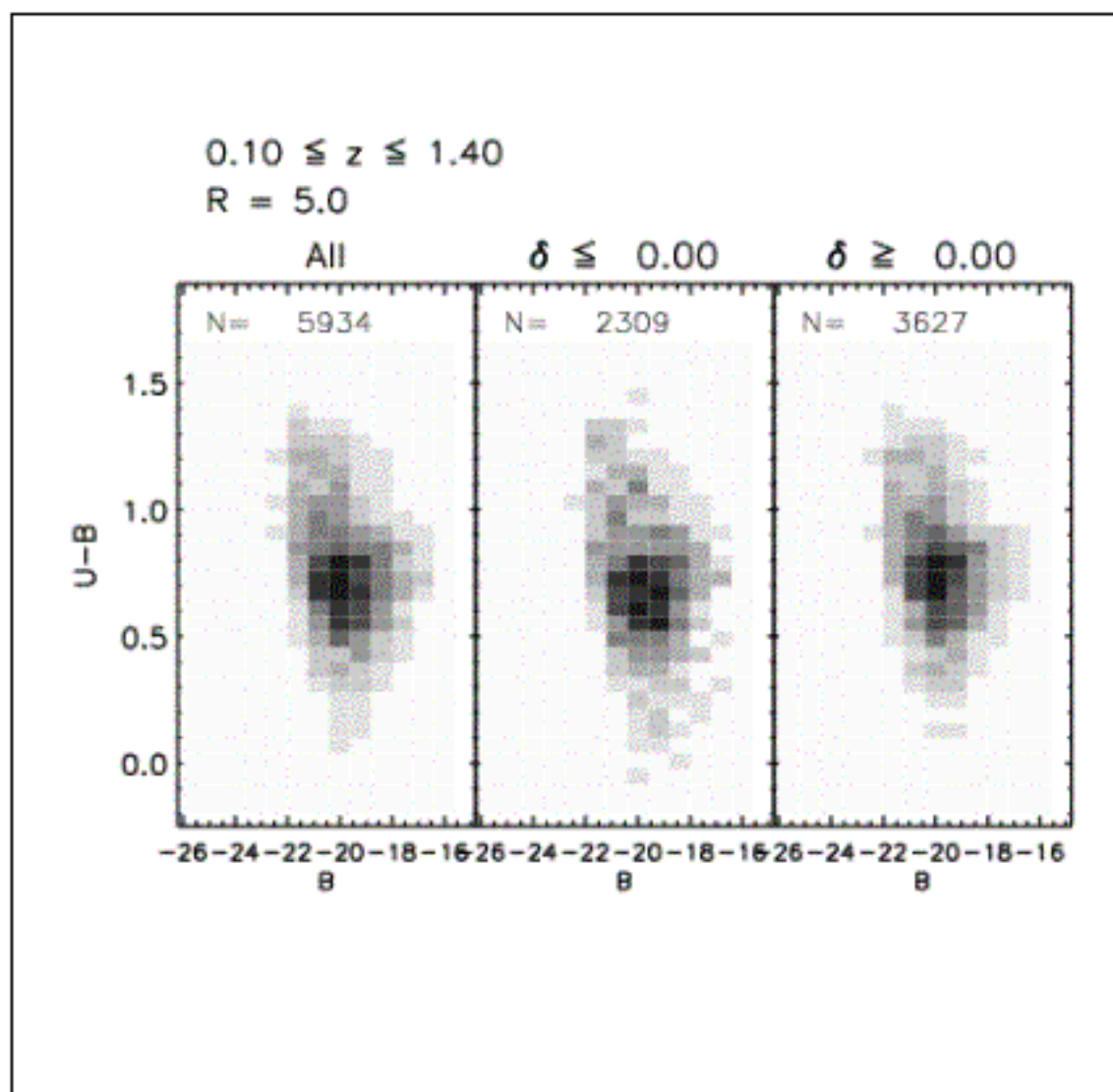
Redshift bin:  
 $0.85 \leq z \leq 1.40$



# Color distribution as a function of environment

(U-B) vs B

Redshift bin:  
 $0.10 \leq z \leq 1.40$

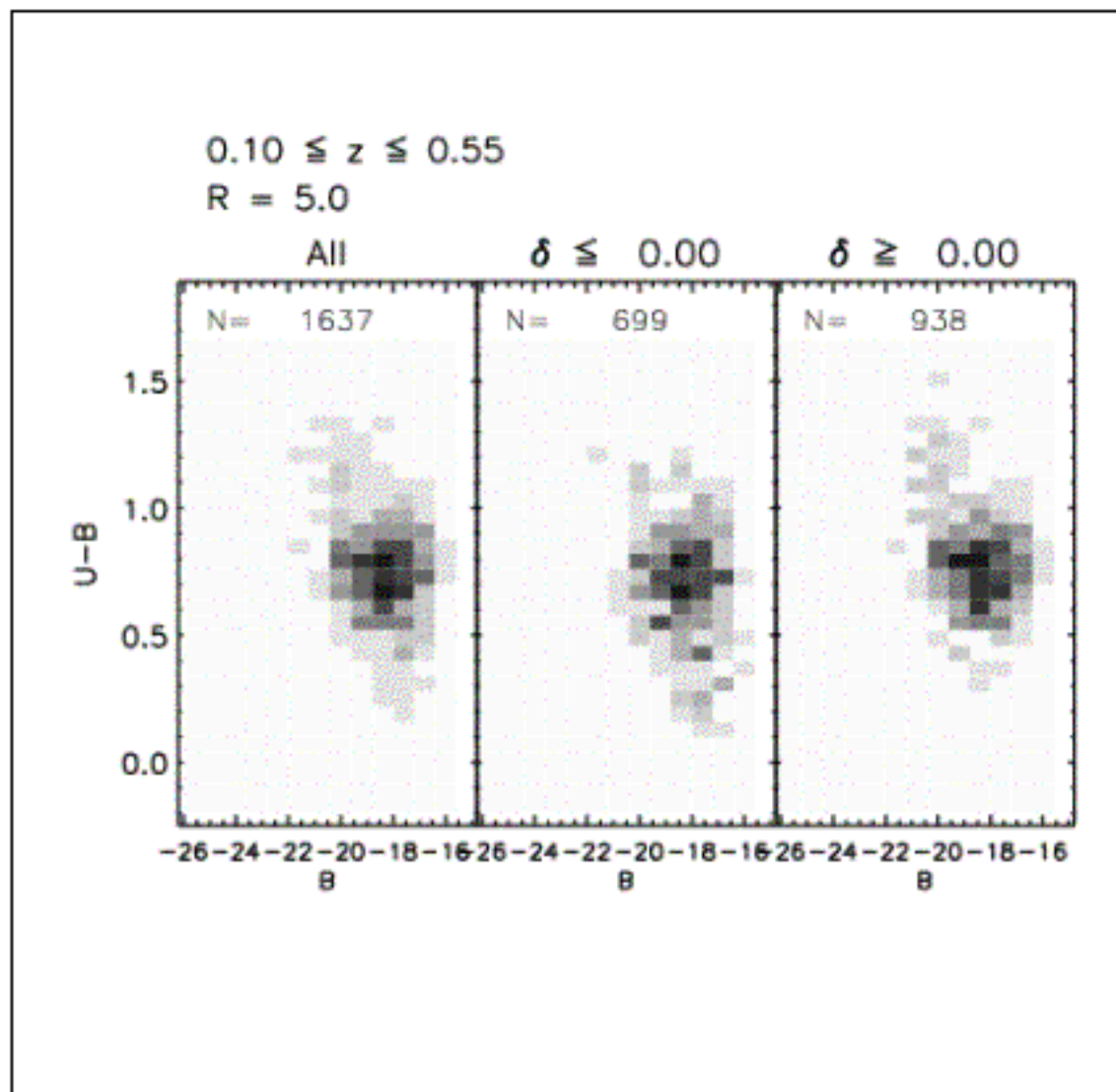




# Color distribution as a function of environment

(U-B) vs B

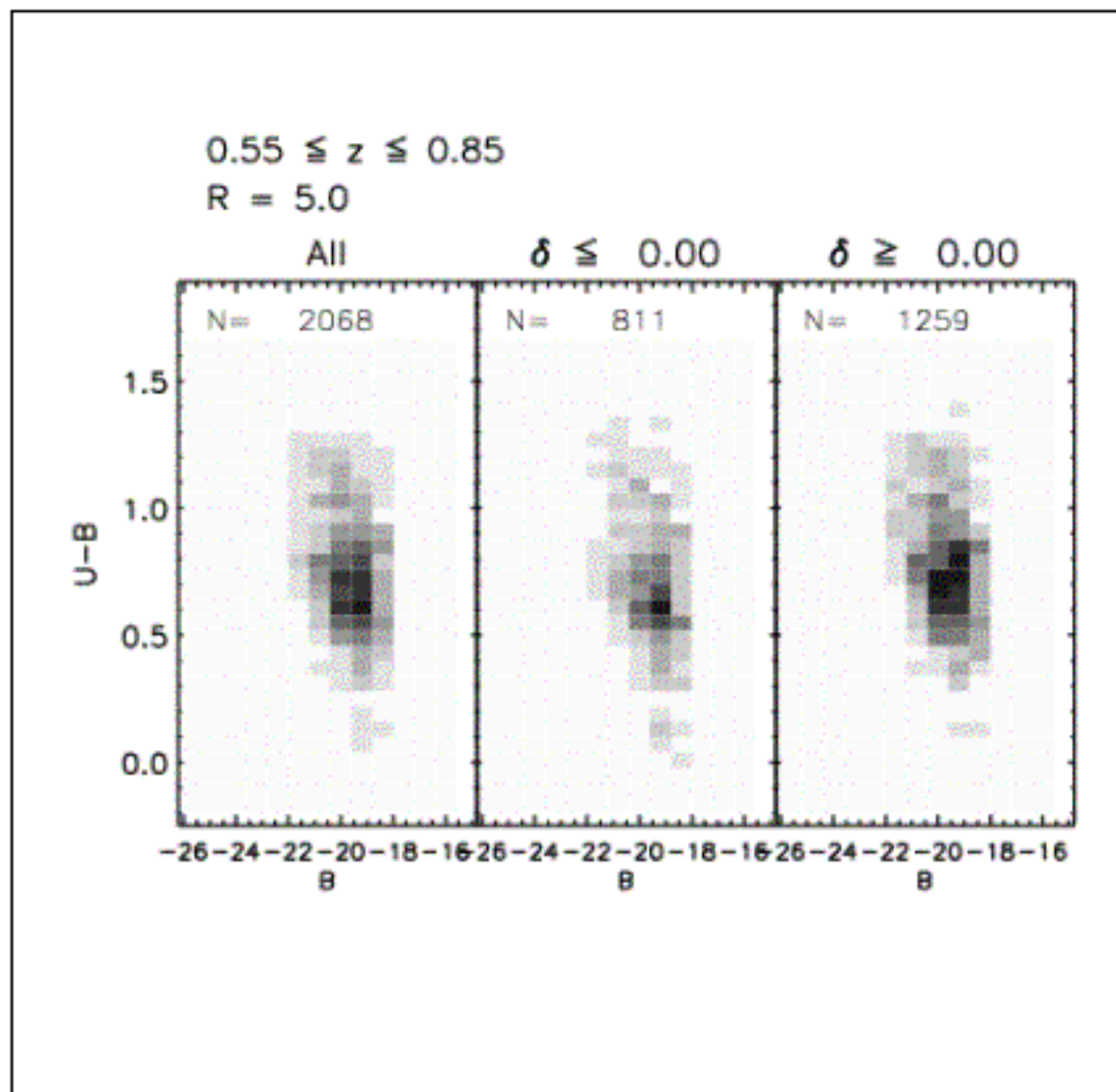
Redshift bin:  
 $0.10 \leq z \leq 0.55$



# Color distribution as a function of environment

(U-B) vs B

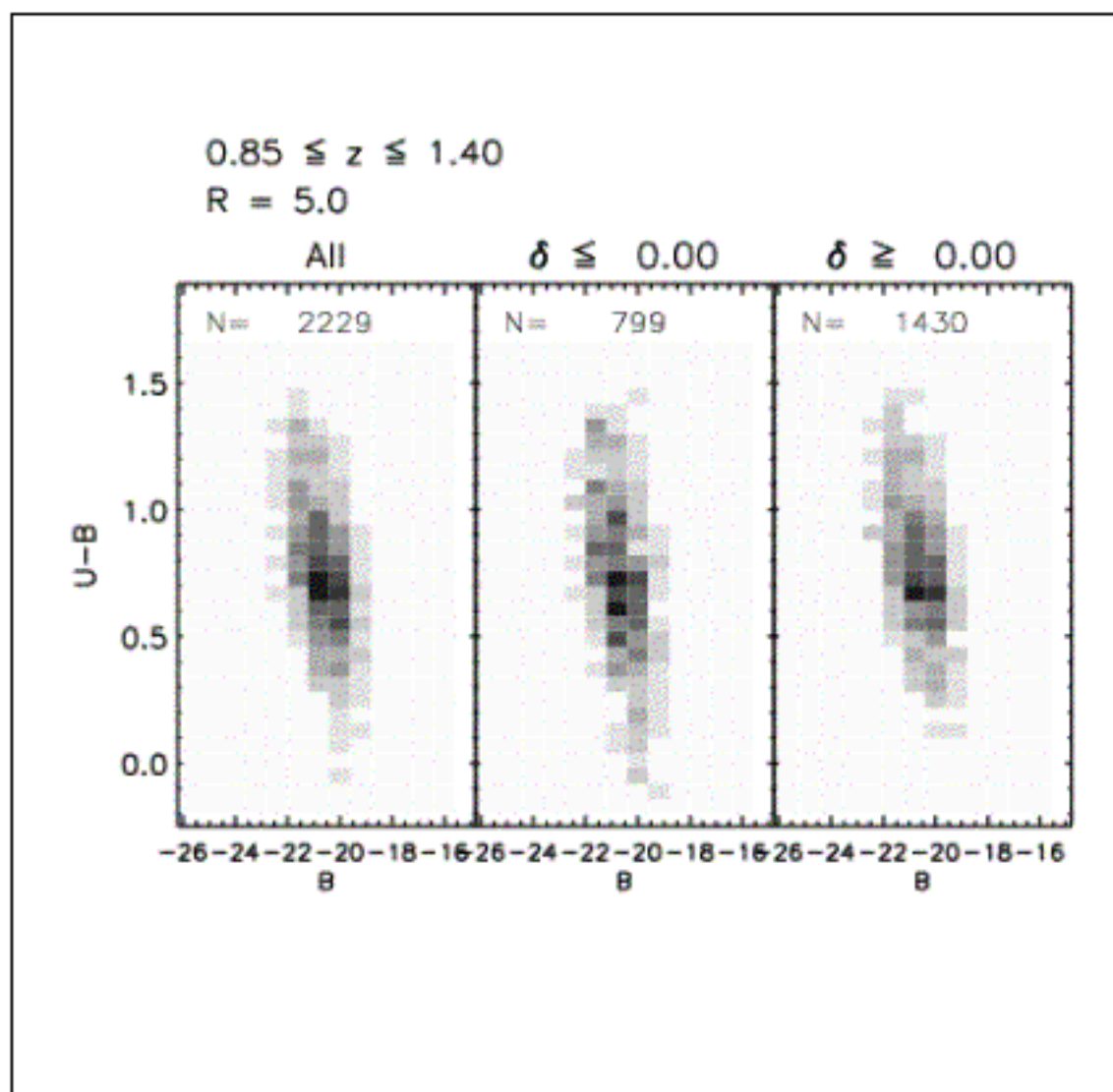
Redshift bin:  
 $0.55 \leq z \leq 0.85$



# Color distribution as a function of environment

(U-B) vs B

Redshift bin:  
 $0.85 \leq z \leq 1.40$

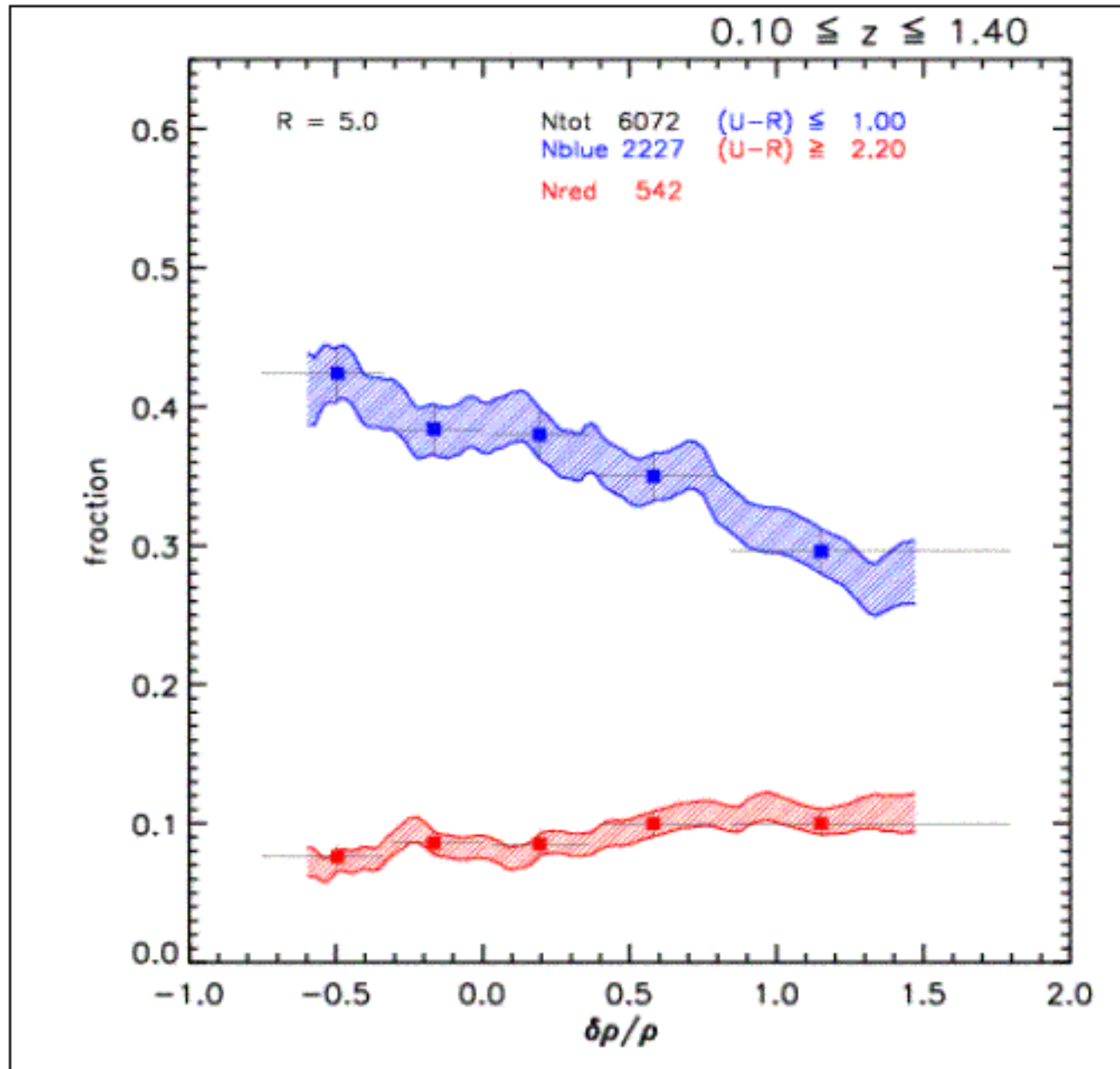


# Conclusion (1)

- **Bimodality holds up to  $z=1.4$** 
  - Less evident in (U-B) color
- **Bimodality still holds irrespective of environment up to  $z=1.4$** 
  - no remarkable difference between low and high density environments
- **Systematics: undersampling of red objects at lower redshift**

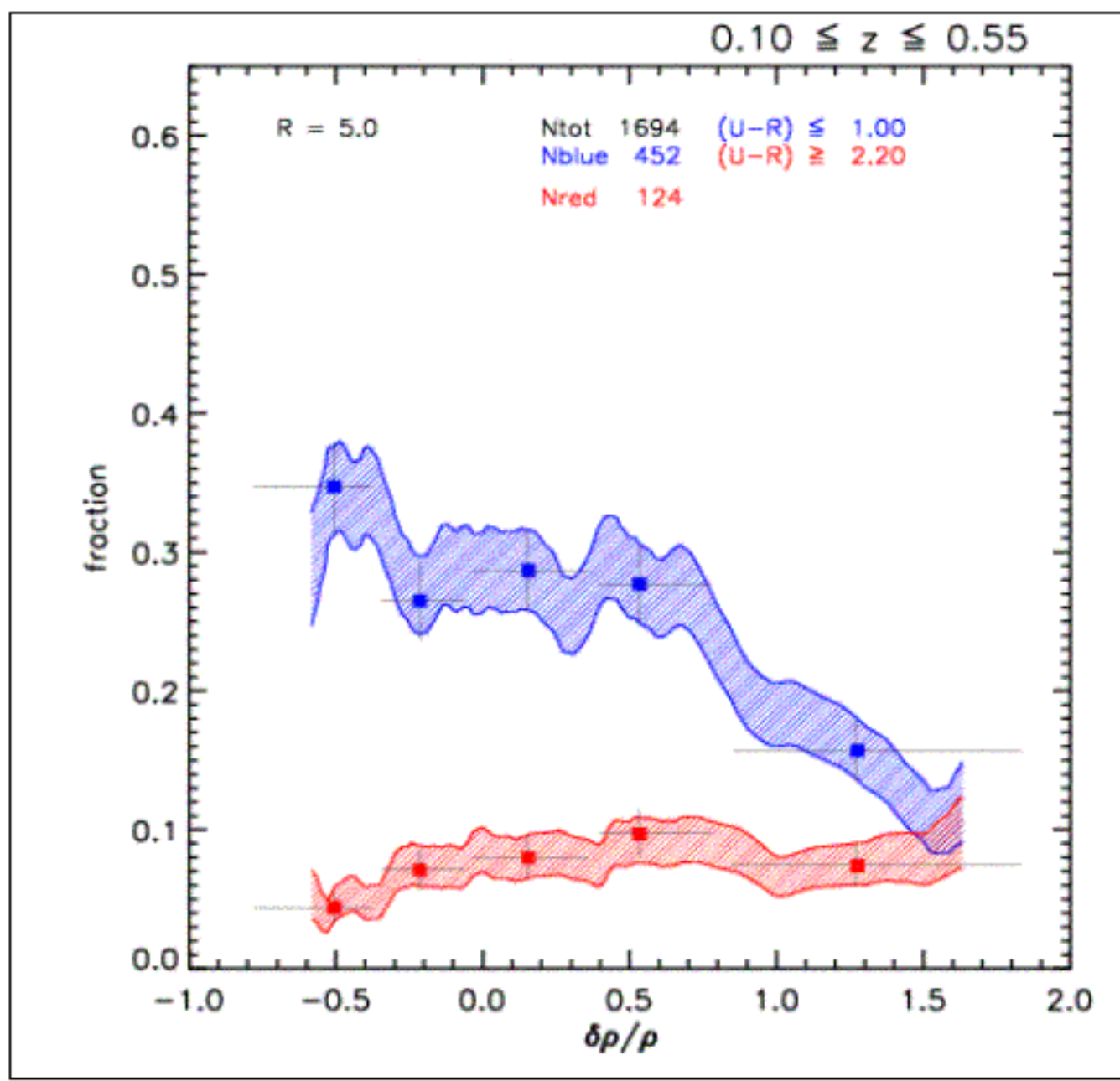
# "Morphology-density" relation (5 Mpc scale)

(U-R)



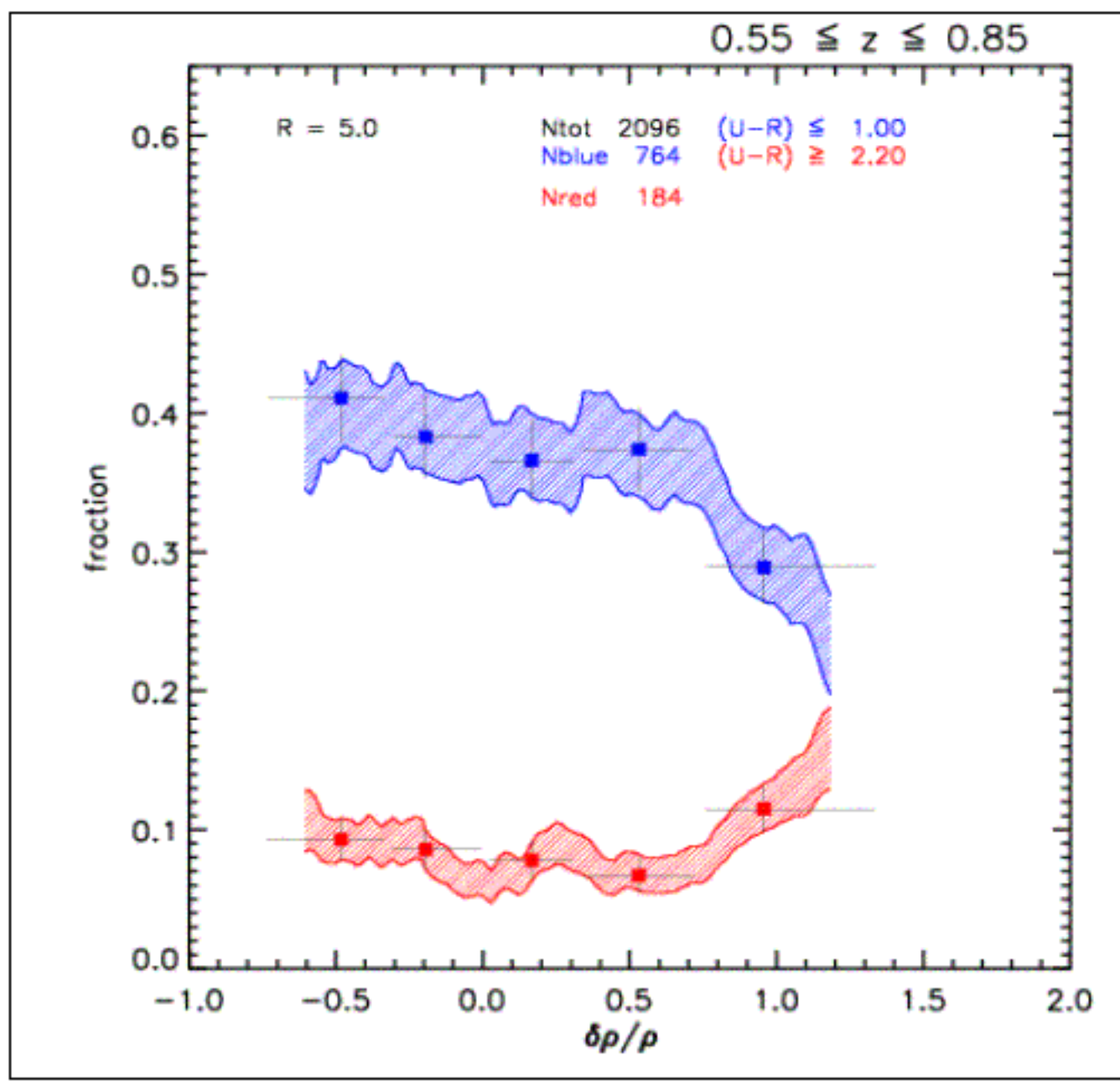
# "Morphology-density" relation (5 Mpc scale)

(U-R)



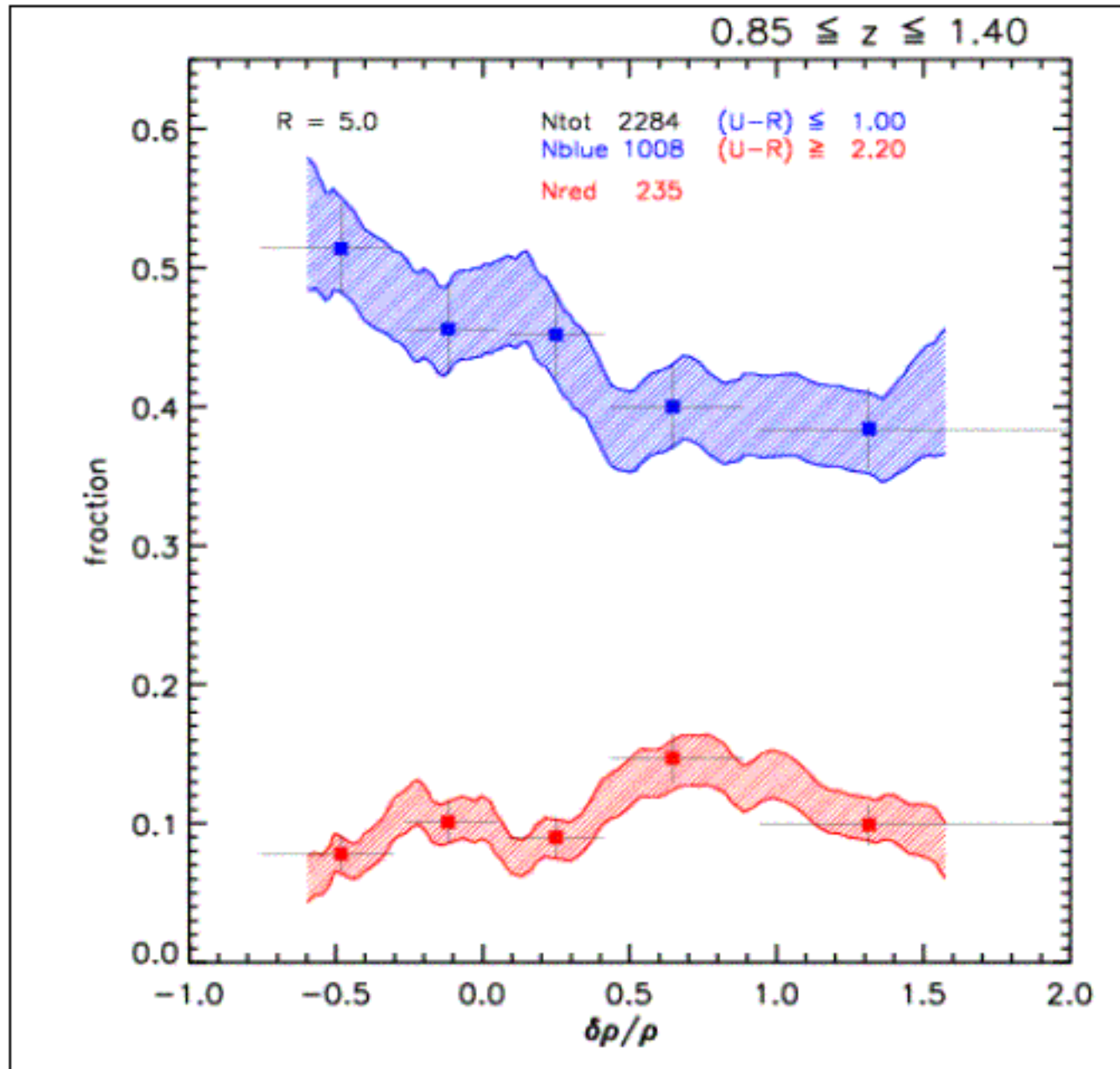
# "Morphology-density" relation (5 Mpc scale)

(U-R)



# "Morphology-density" relation (5 Mpc scale)

(U-R)





## Conclusion (2)

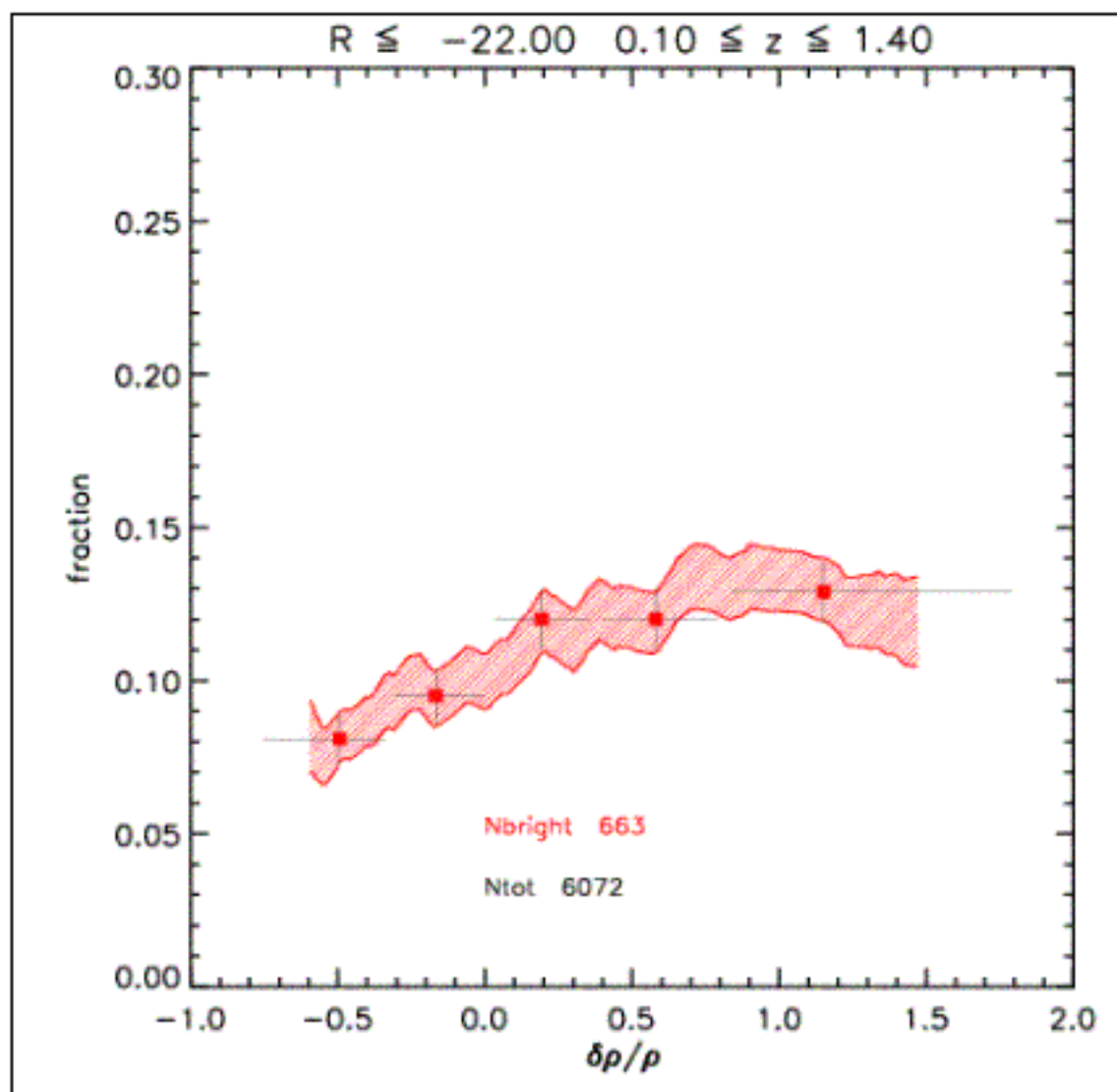
- “Morphology-density” relation on large scales holds up to  $z=1.4$
- Fraction of blue galaxies decreases as a function of environment ( $\sim 5\sigma$  effect)
- Fraction of red galaxies increases as a function of environment ( $\sim 1\sigma$  effect)
  - check luminosity effects

# R-luminosity as a function of environment

R band

Redshift bin:  
 $0.10 \leq z \leq 1.40$

$R \leq -22.0$

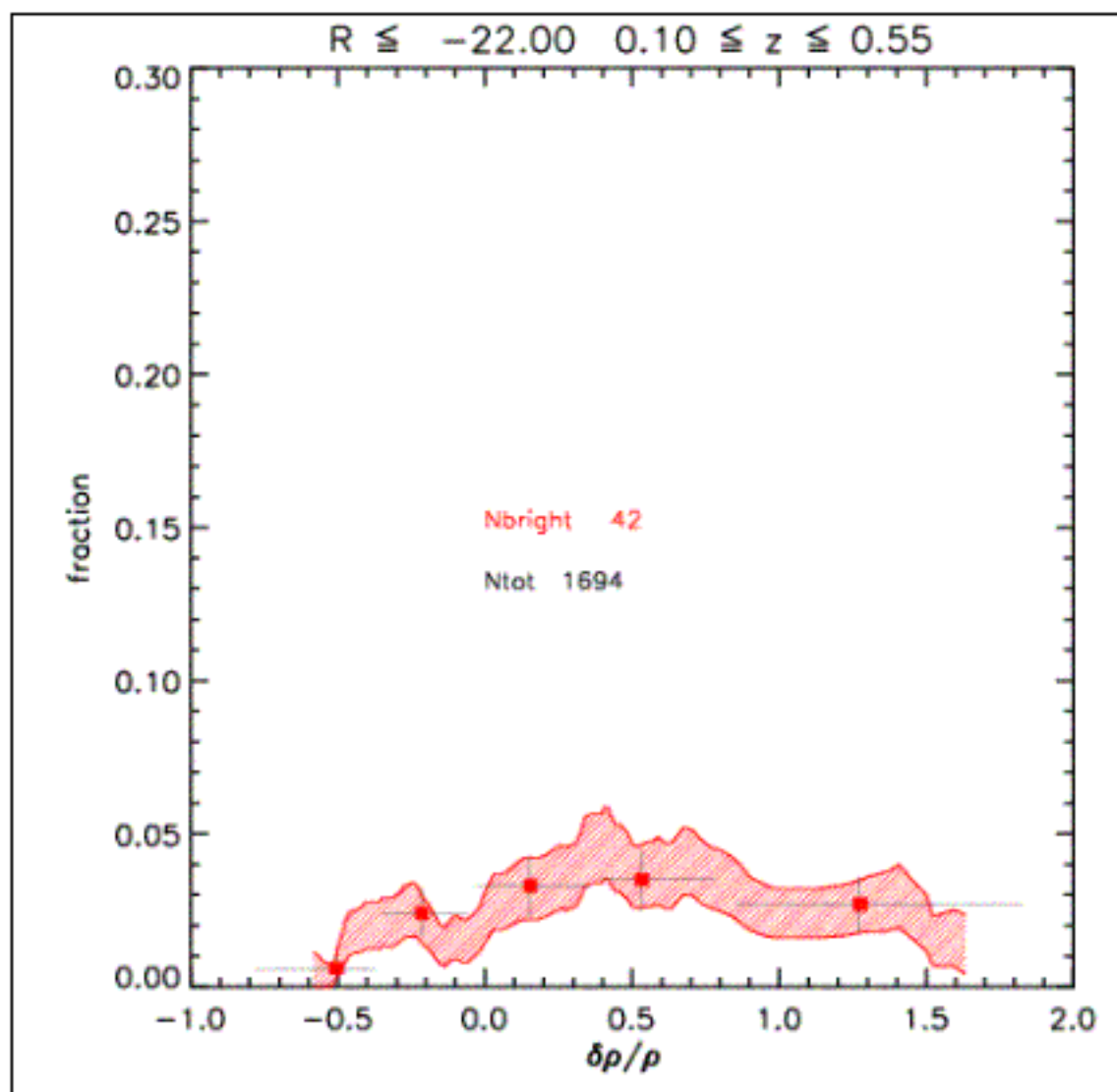


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R band

Redshift bin:  
 $0.10 \leq z \leq 0.55$

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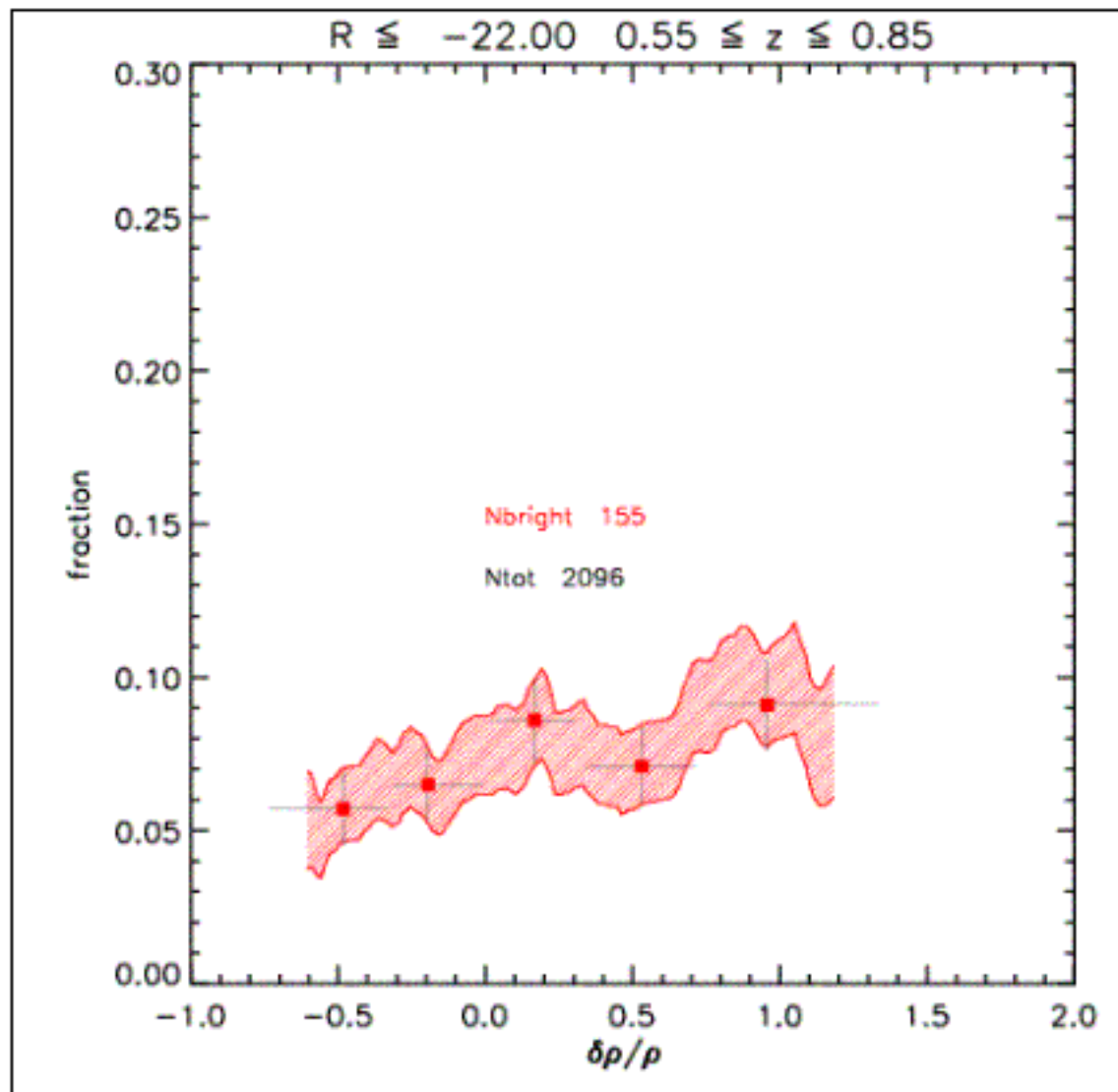


# R-luminosity as a function of environment

R band

Redshift bin:  
 $0.55 \leq z \leq 0.85$

$R \leq -22.0$

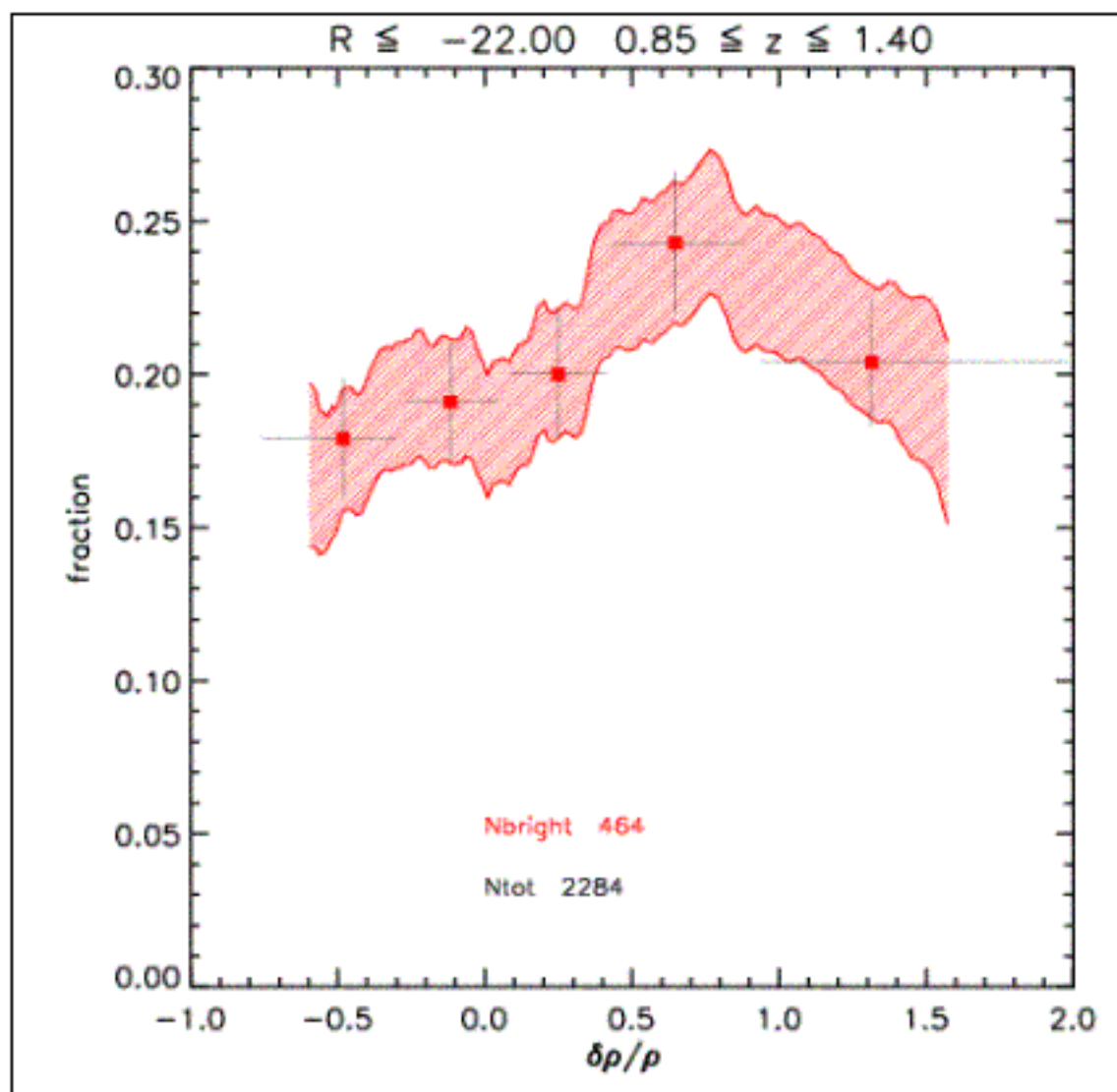


# R-luminosity as a function of environment

R band

Redshift bin:  
 $0.85 \leq z \leq 1.40$

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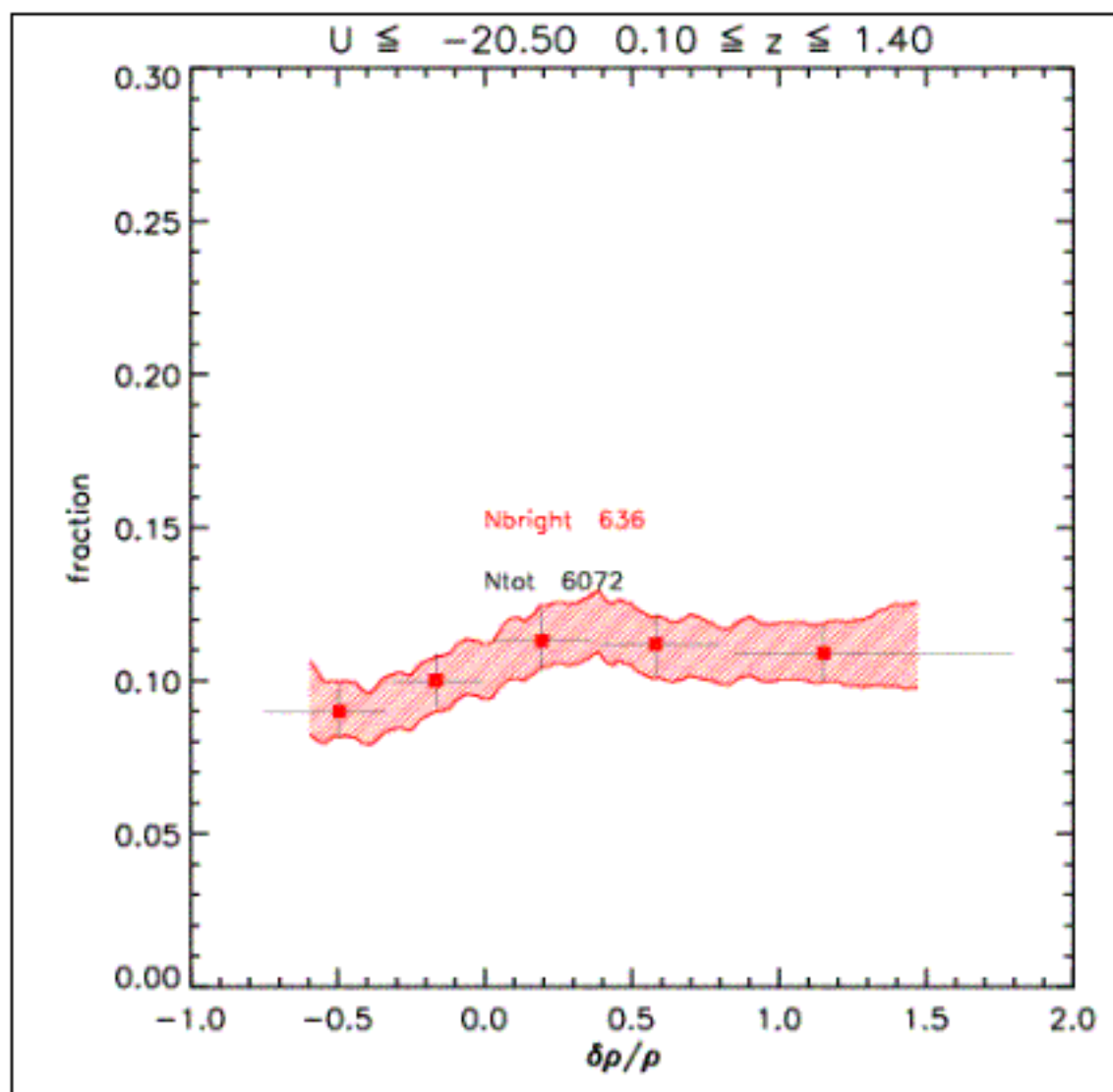


# U-luminosity as a function of environment

U band

Redshift bin:  
 $0.10 \leq z \leq 1.40$

$U \leq -20.50$

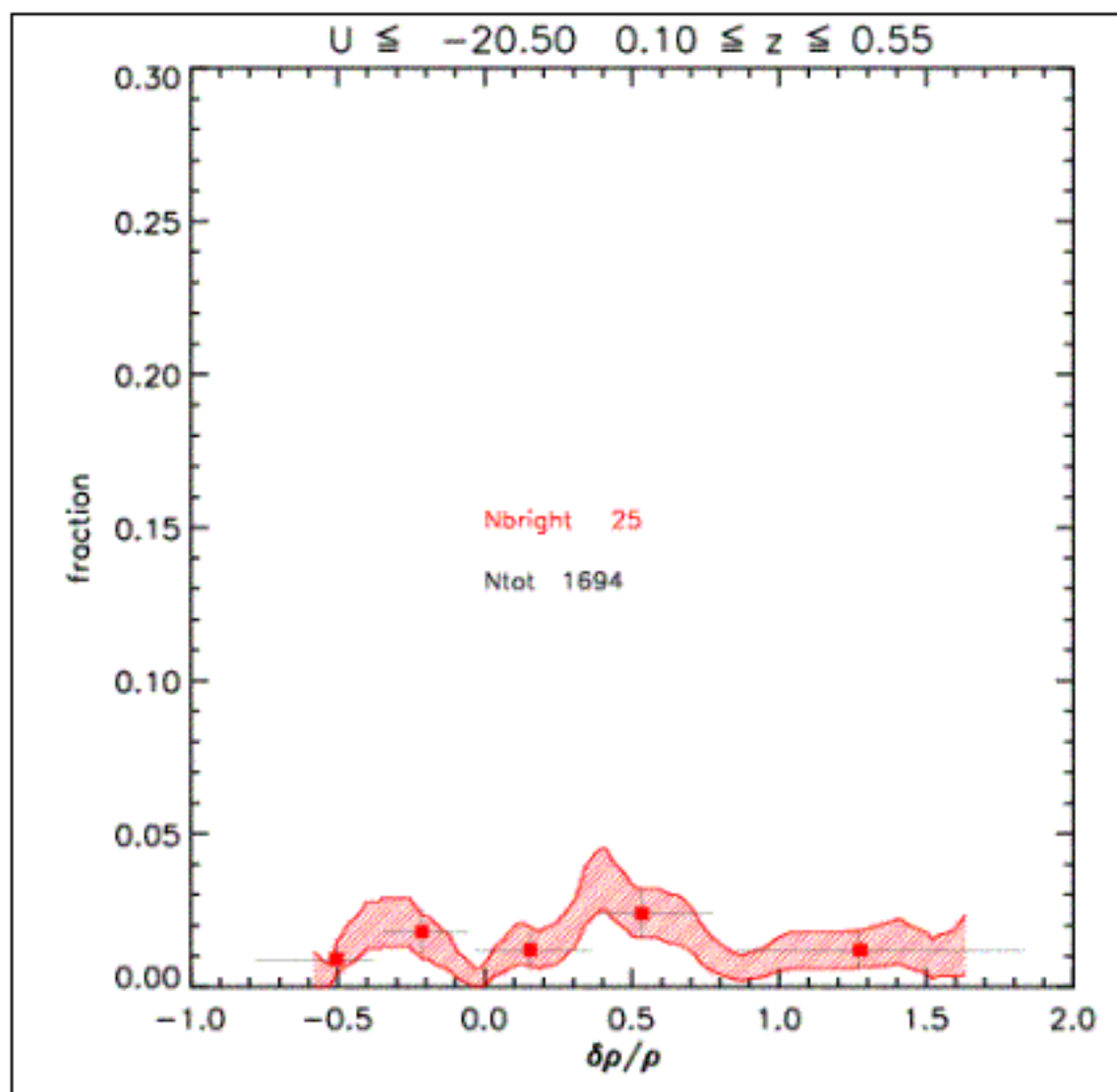


# U-luminosity as a function of environment

U band

Redshift bin:  
 $0.10 \leq z \leq 0.50$

$U \leq -20.50$

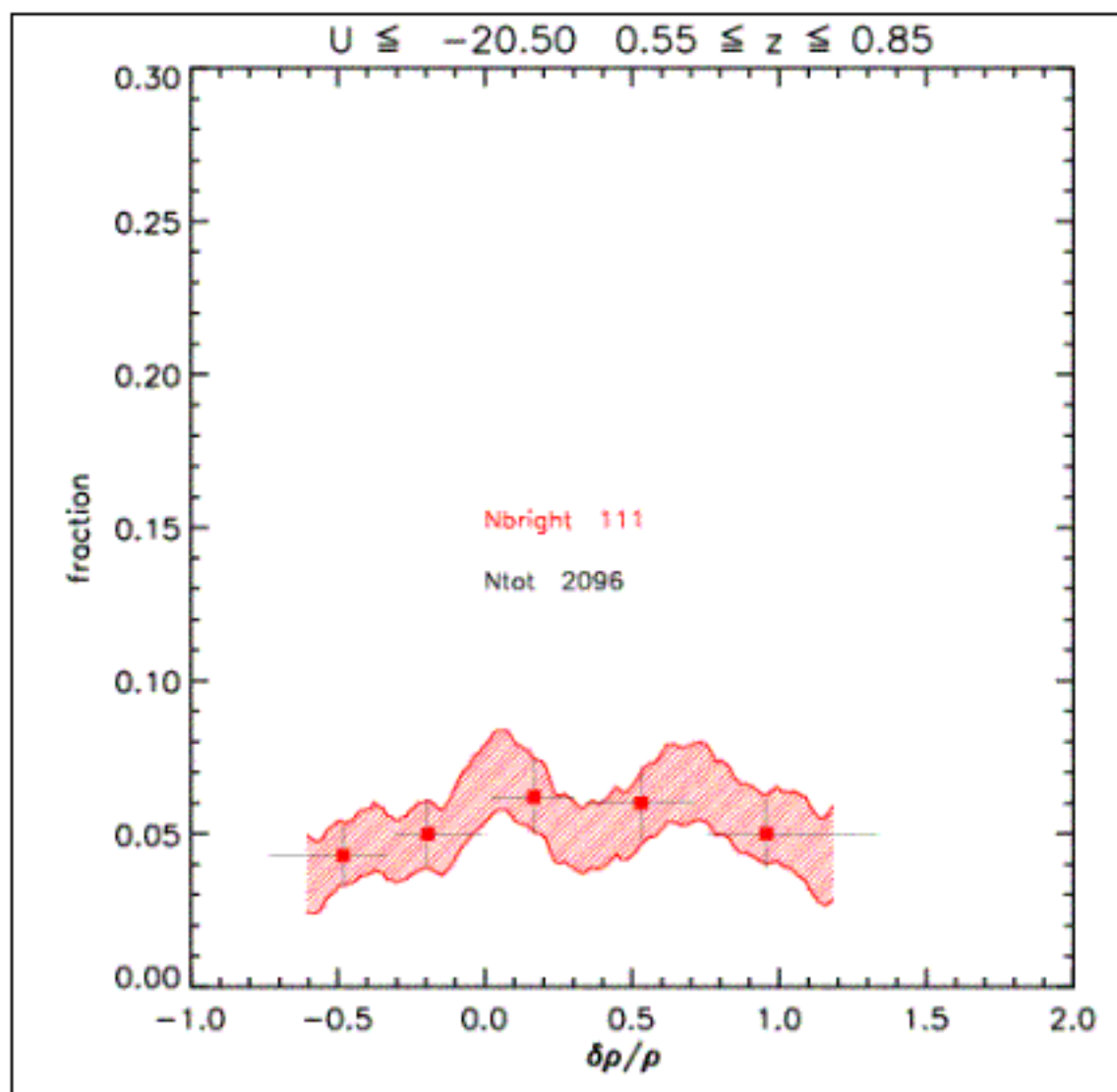


# U-Luminosity as a function of environment

U band

Redshift bin:  
 $0.50 \leq z \leq 0.85$

$U \leq -20.50$



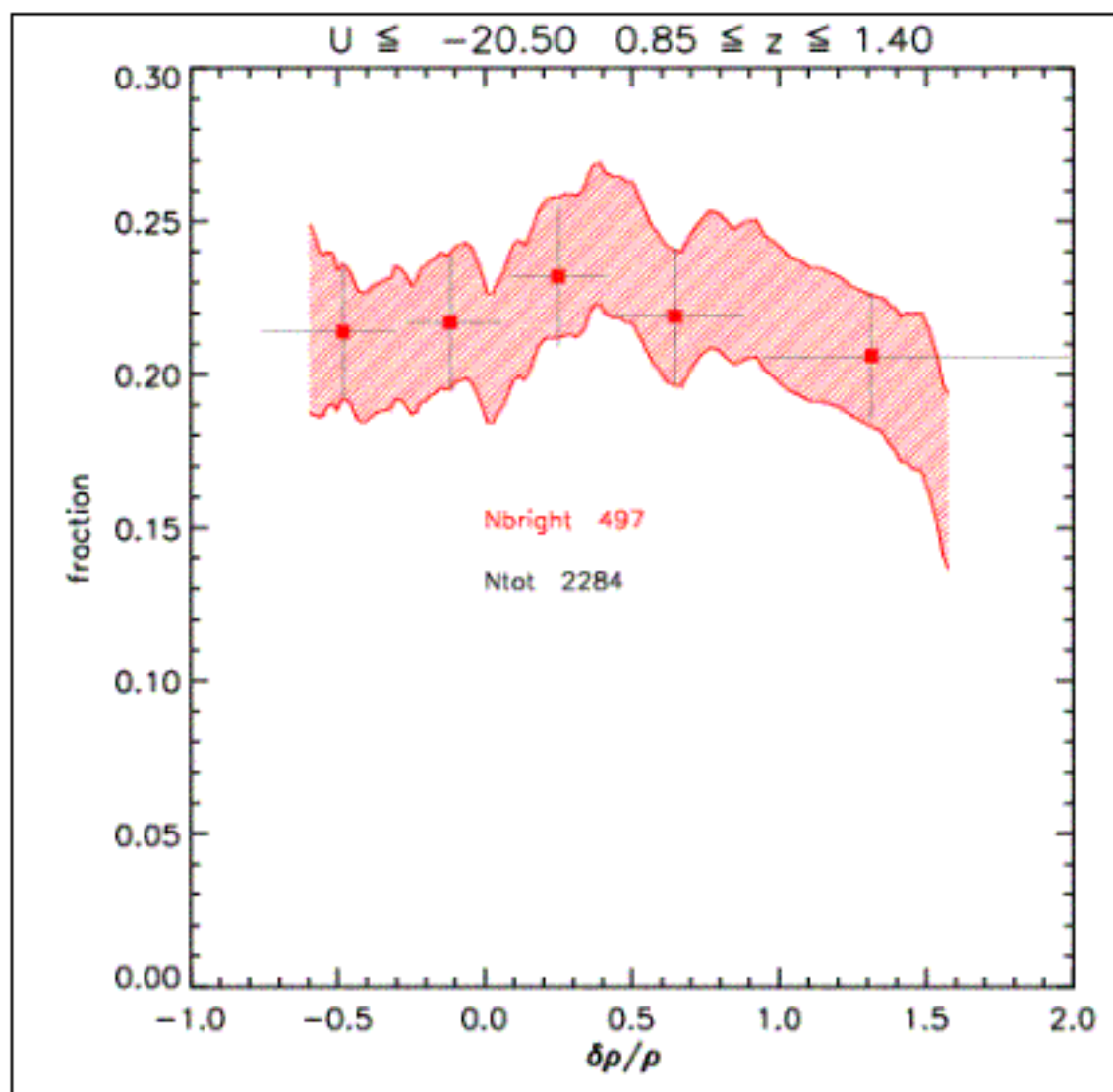


# U-luminosity as a function of environment

U band

Redshift bin:  
 $0.85 \leq z \leq 1.40$

$U \leq -20.50$



## Conclusion (3)

- **R band:** the fraction of (red) bright galaxies becomes larger in denser environments, at every redshift ( $\sim 2\sigma$  effect)
- **U band:** no variation is detected in the fraction of (blue) bright galaxies as a function of environment

# Still to do

- Check for differences between “Franzetti’s” and “Ilbert’s” magnitudes
- Select “morphological types” according to bimodality
- Fraction of red and blue galaxies as a function of redshift, for a fixed absolute magnitude bin in low and high density environments
- Completing the paper!