Stellar and dark matter masses of sub-L* LBGs

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Summary of results

The importance of sub-L* UV-selected galaxies:

They...

(1) produce >½ of UV luminosity

(2) account for appreciable stellar mass

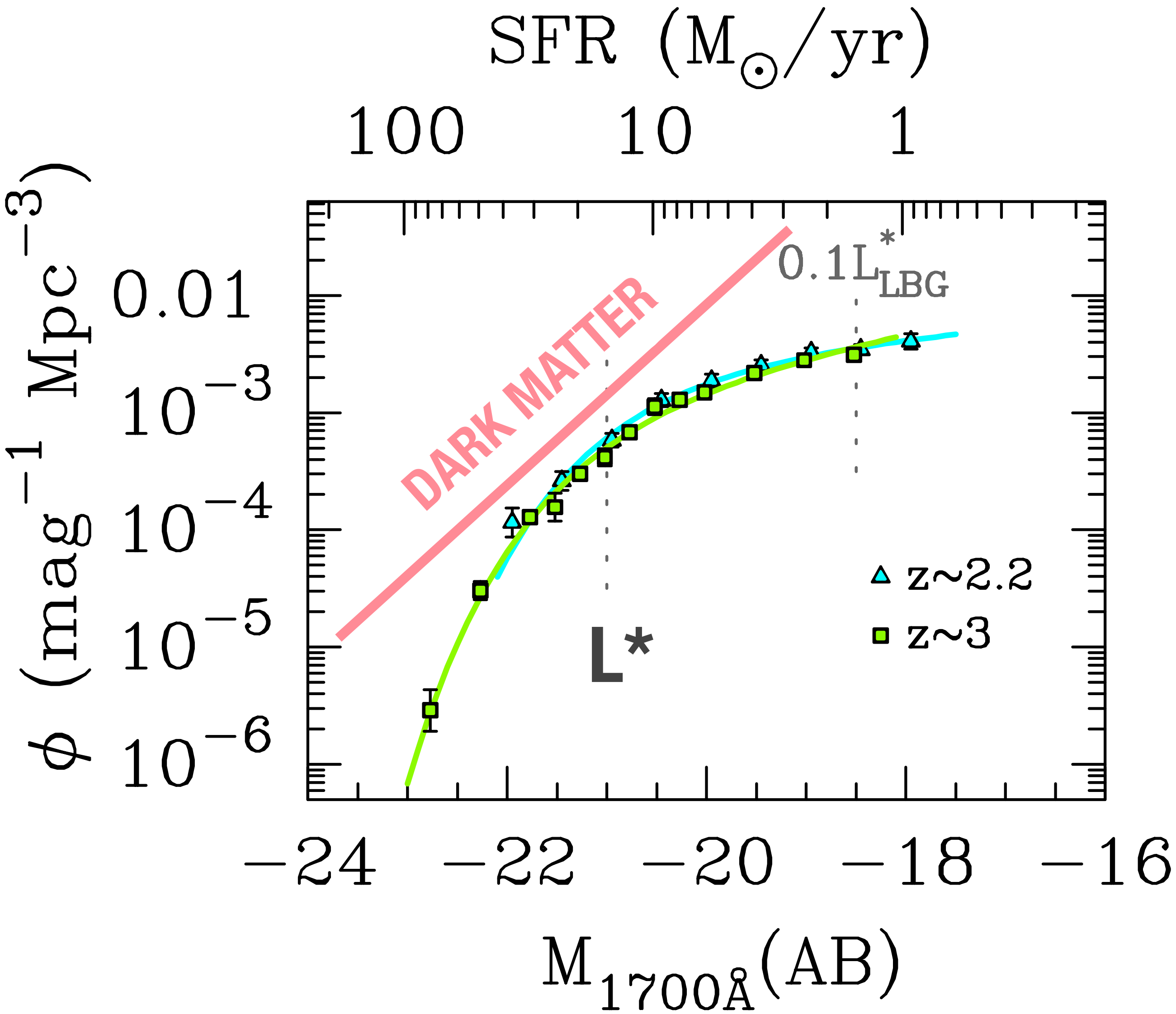
(3) have little dust

(4) have SFR-M_{stars} and L_{UV}-M_{stars} correlations

(5) at z=3 → 1.7, L_{UV}-M_{DM} correlation inverts: halo downsizing?

Going sub-L*

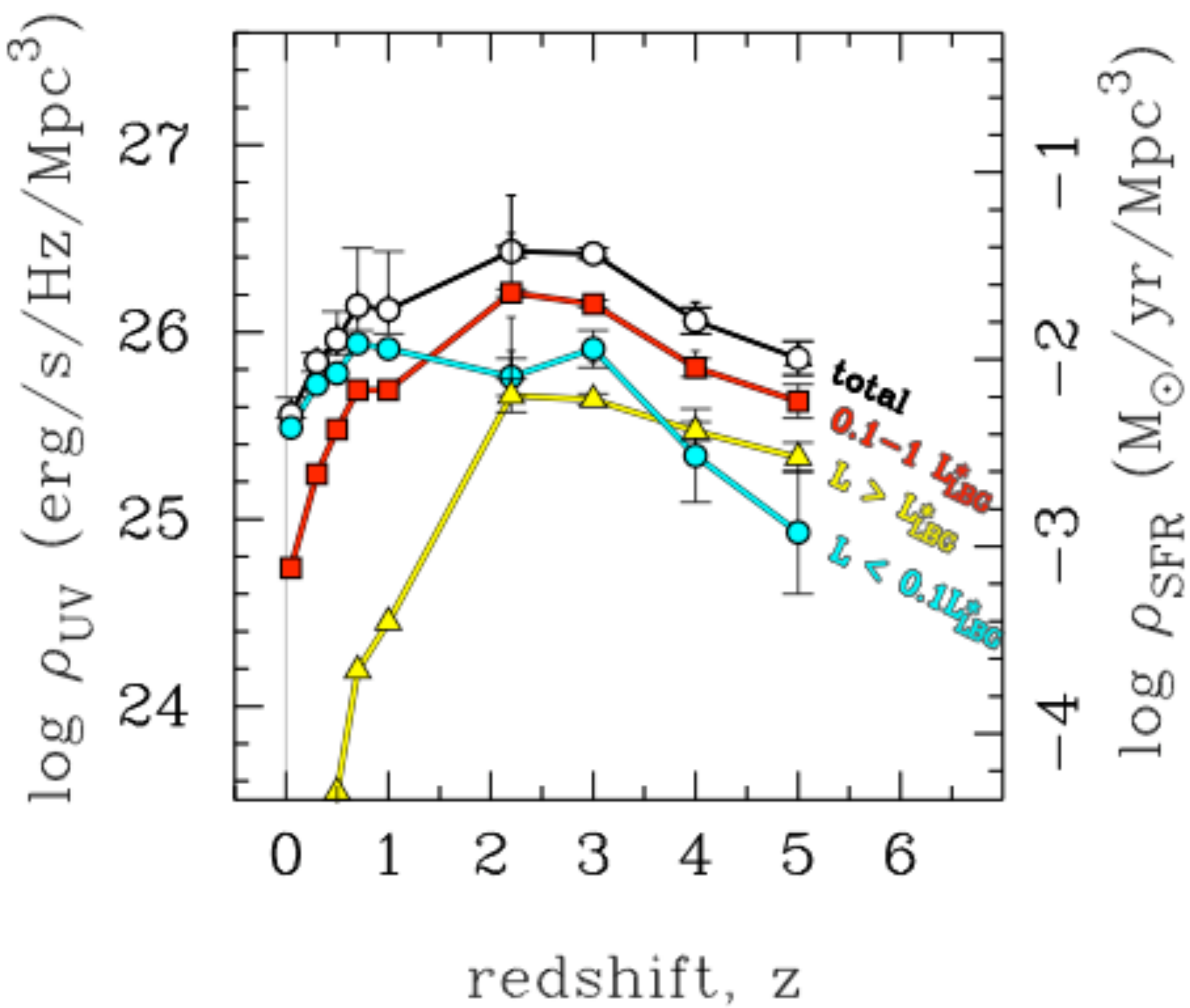
- they represent a different regime, so they can teach us much about galaxy formation physics

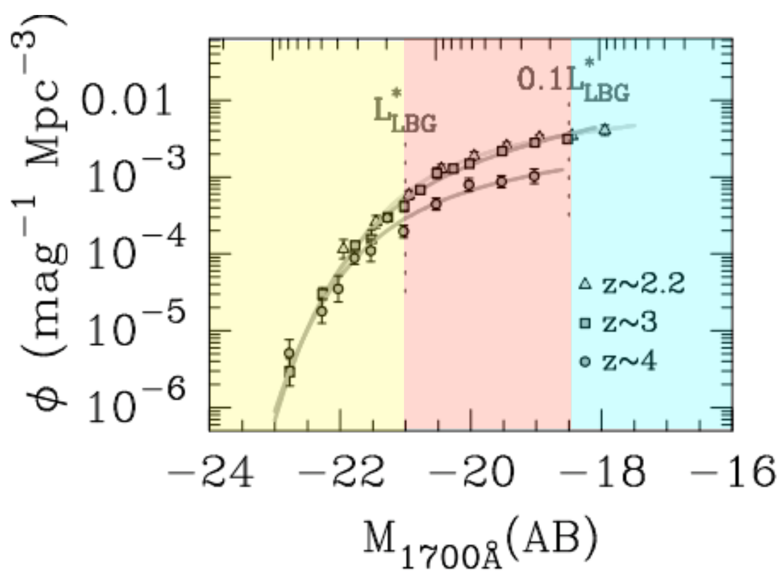


Sawicki & Thompson (2006)

Luminosity downsizing

- $L=(0.1\text{-}1)\times L^*_{z=3}$ galaxies dominate UV luminosity at high z
- Luminosity downsizing: luminous galaxies turn off earliest





Sawicki & Thompson (2006b)
Iwata et al (2007) @ z=5
GALEX at z<1

Sub-L* galaxies appear important...

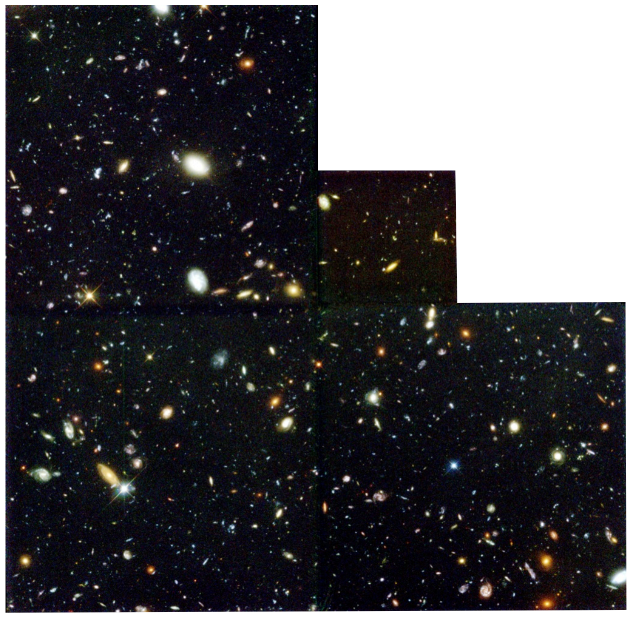
so let's study them in more detail

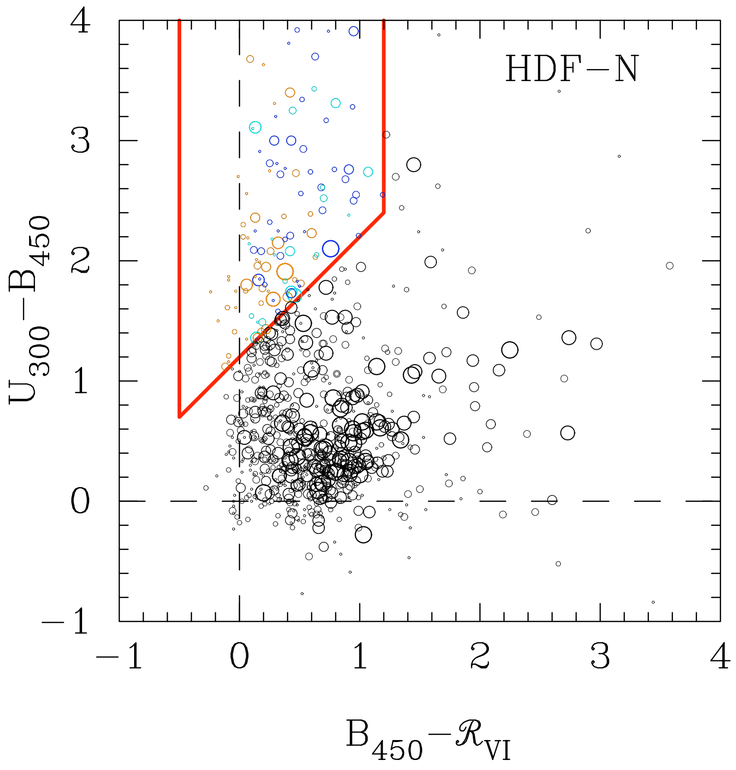
Stellar masses *etc* at $L<L^*$

- from SED fitting

SED fitting: sample

- Hubble Deep Field (since we need *depth*, not area)
- $U_{300}\ B_{450}\ V_{606}\ I_{814}\ J_{110}\ H_{160}$: ideal for SED-fitting at z~2
- color-color LBG/BX selection *a la* Steidel et al. (1996)
- + photo-z cut: $1.8<z<2.6$
- gives sample of 65 objects with *R*~25-27

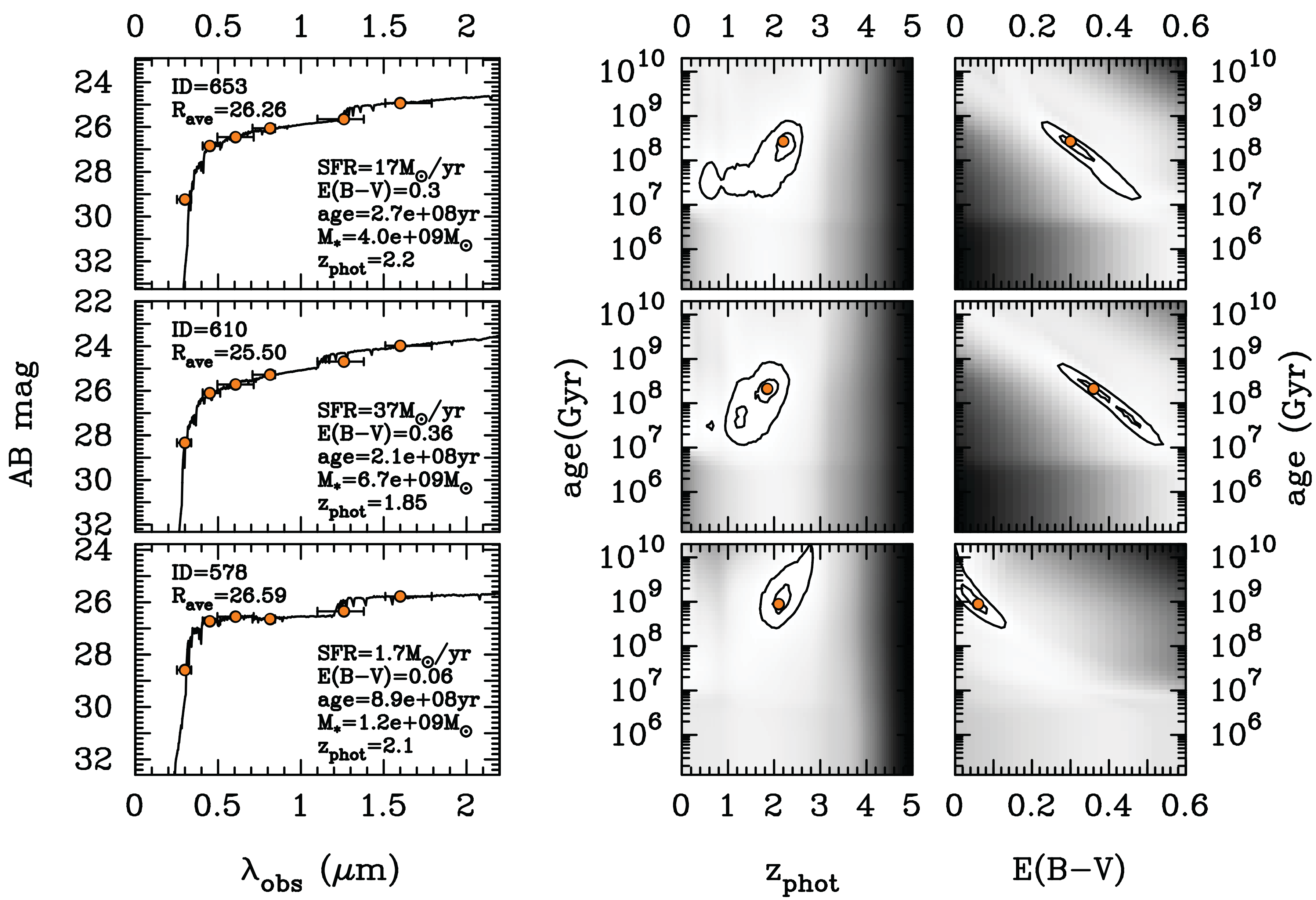




Sawicki et al. (2007)

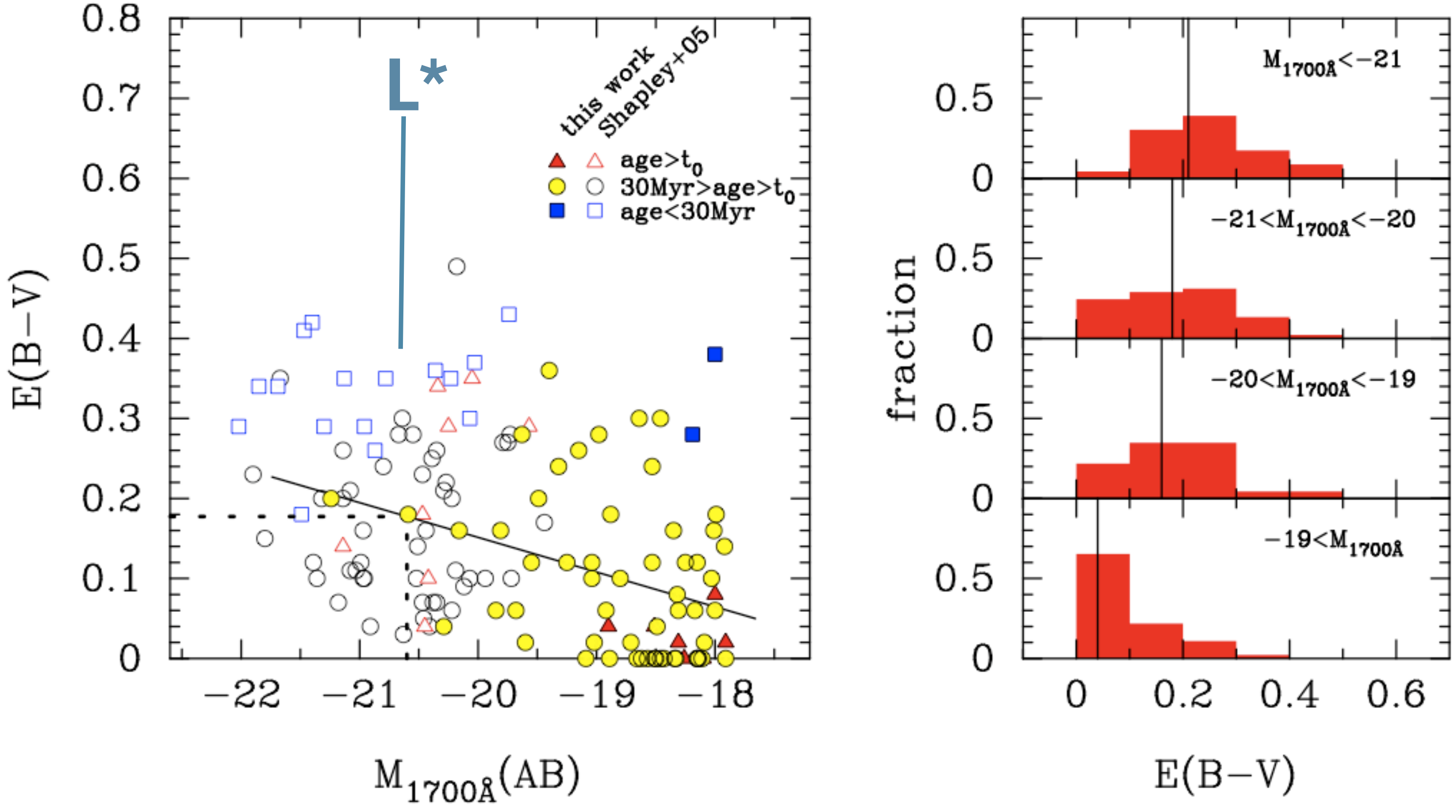
SED fitting: technique

- models: constant SFR Bruzual & Charlot (2003) + Calzetti et al. (2000) dust   (for consistency with Shapley et al 2005 at L*)



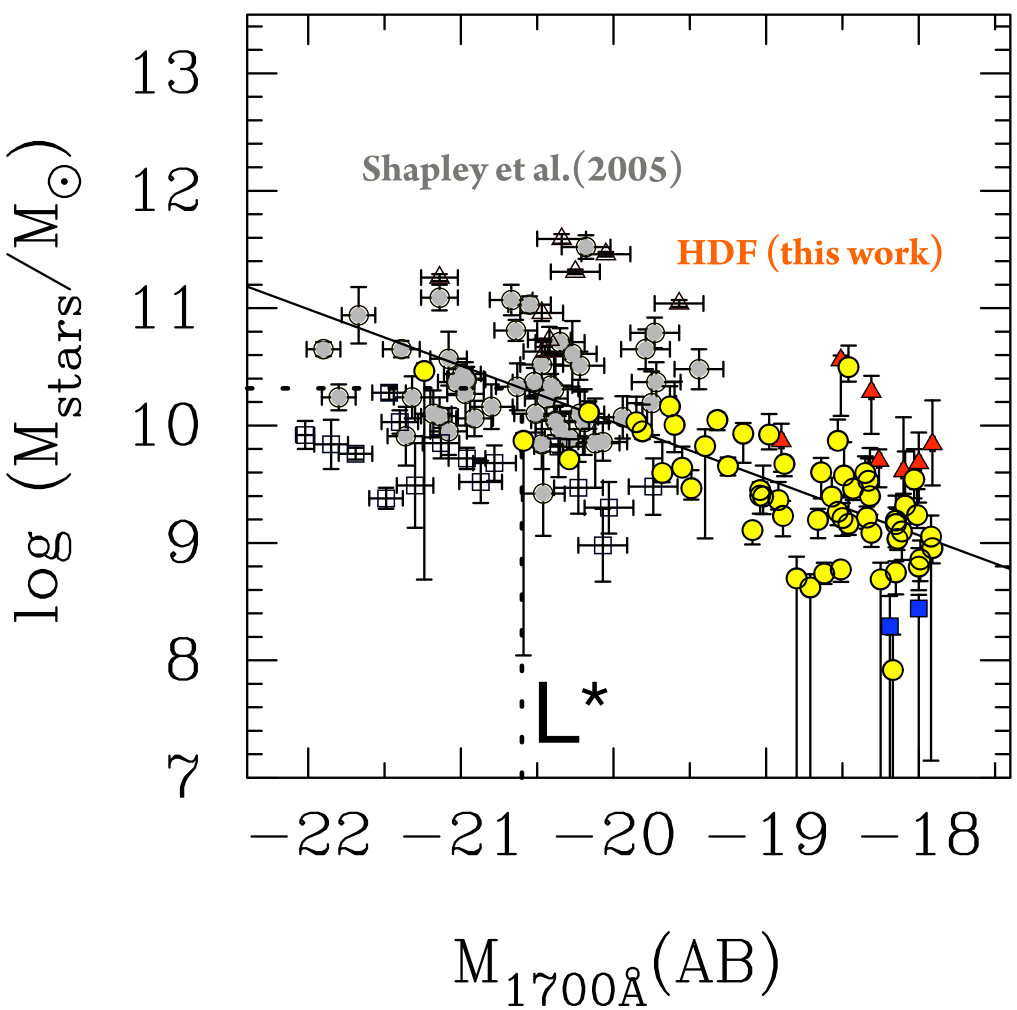
Results: dust

- Extinction lower in fainter galaxies:
  faint UV-selected galaxies are close to naked



Stellar Mass - L_{UV} relation

- perhaps natural consequence of low dust

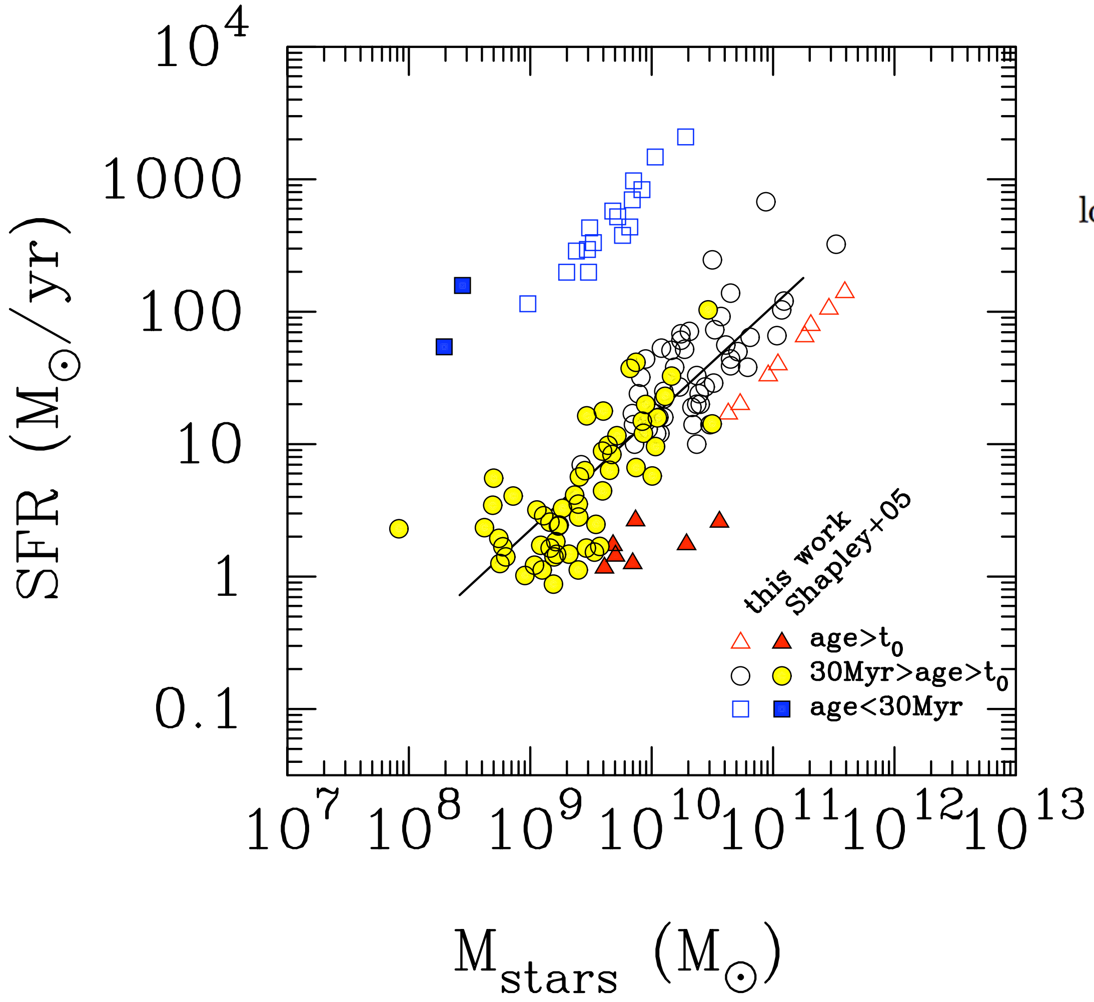


$$\log\left(\frac{M_{stars}}{M_\odot}\right) = 0.40 - 0.48 M_{1700}$$

Sawicki et al. (2007)

Results: *SFR* - M_{stars} relation

- suggests star formation is likely steady (i.e., not too variable) in z~2 sub-L* galaxies

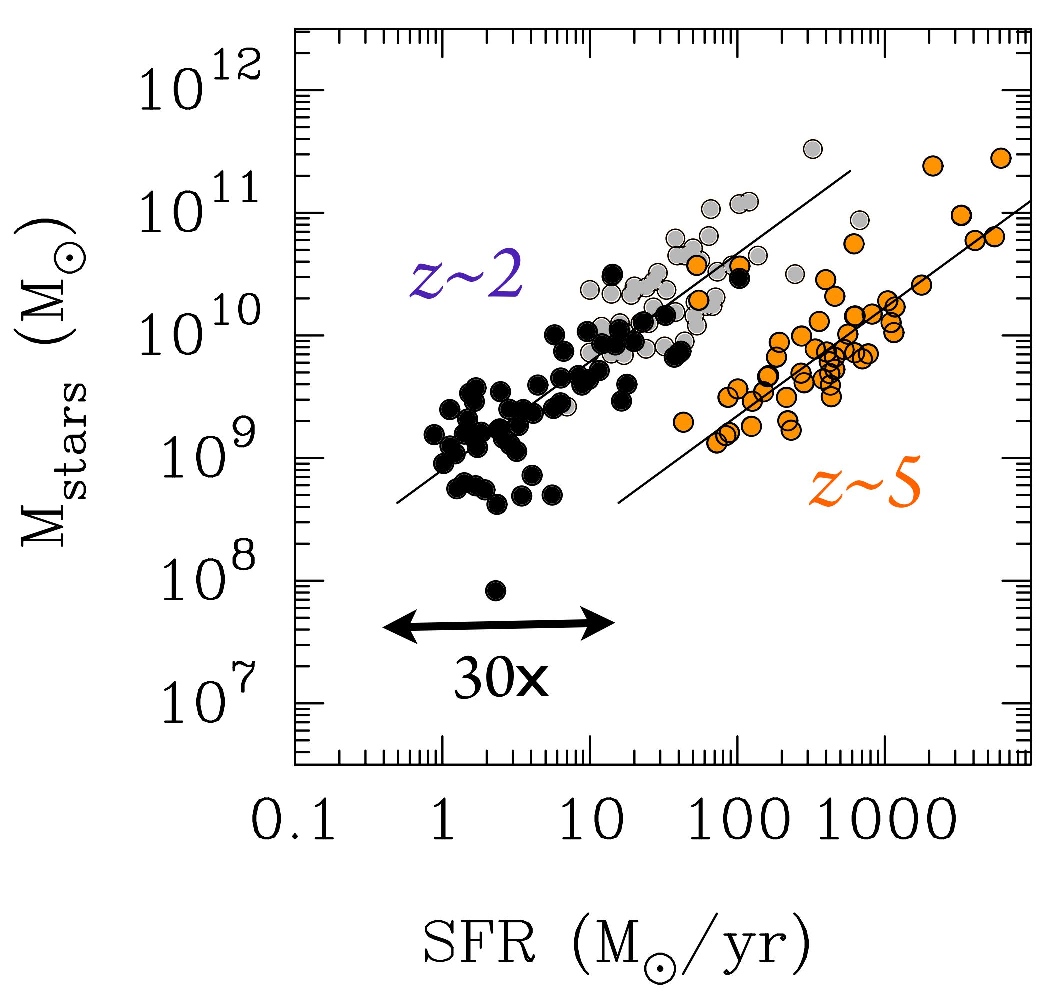


$$\log\left(\frac{SFR}{M_\odot/yr}\right) = 0.85\log\left(\frac{M_{stars}}{M_\odot}\right) - 7.26$$

Sawicki et al. (2007)

High-z interlude: z~2 *vs* z~5

- SSFR ~30x higher at z~5 than at z~2
- constant SFR in z~5 galaxies would overproduce mass in the z~2 galaxies



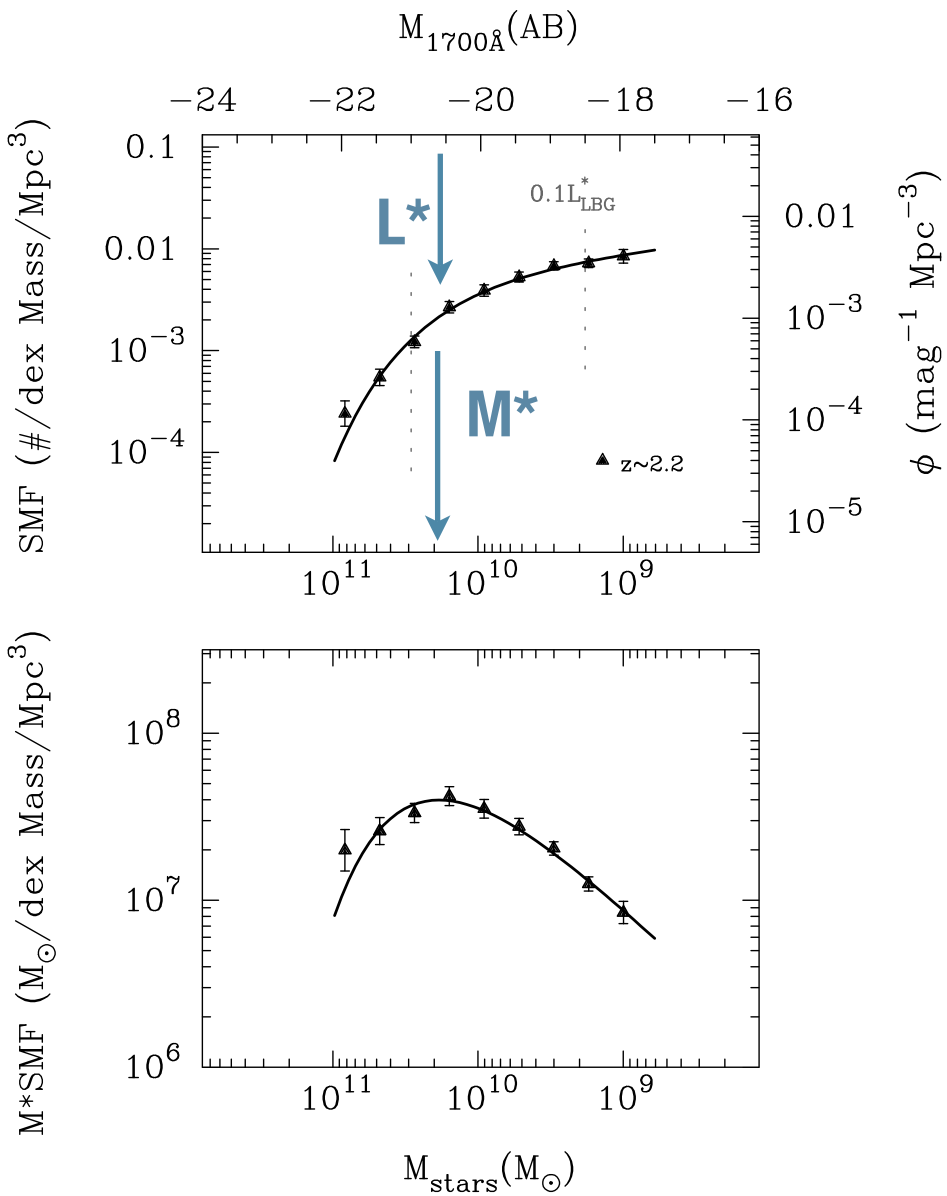
z~2: HDF+Shapley et al (2005)

z~5: Yabe et al (2009) LBGs: VRI +IRAC fits: *see Yabe poster (#17)*

(see also Yuma poster (#18) for comparison between z~5 LBGs and LAEs)

Where is the mass?

- Empirical conversion from UV LF → SMF: $\log\left(\frac{M_{stars}}{M_\odot}\right) = 0.40 - 0.48 M_{1700}$
- about half the mass is below L^*_{UV}
- $L^* \rightarrow M_{stars}^*$ $\sim 2 \times 10^{10} M_\odot$.



z~2.2 UV LF: Keck Deep Fields (Sawicki & Thompson 2006)

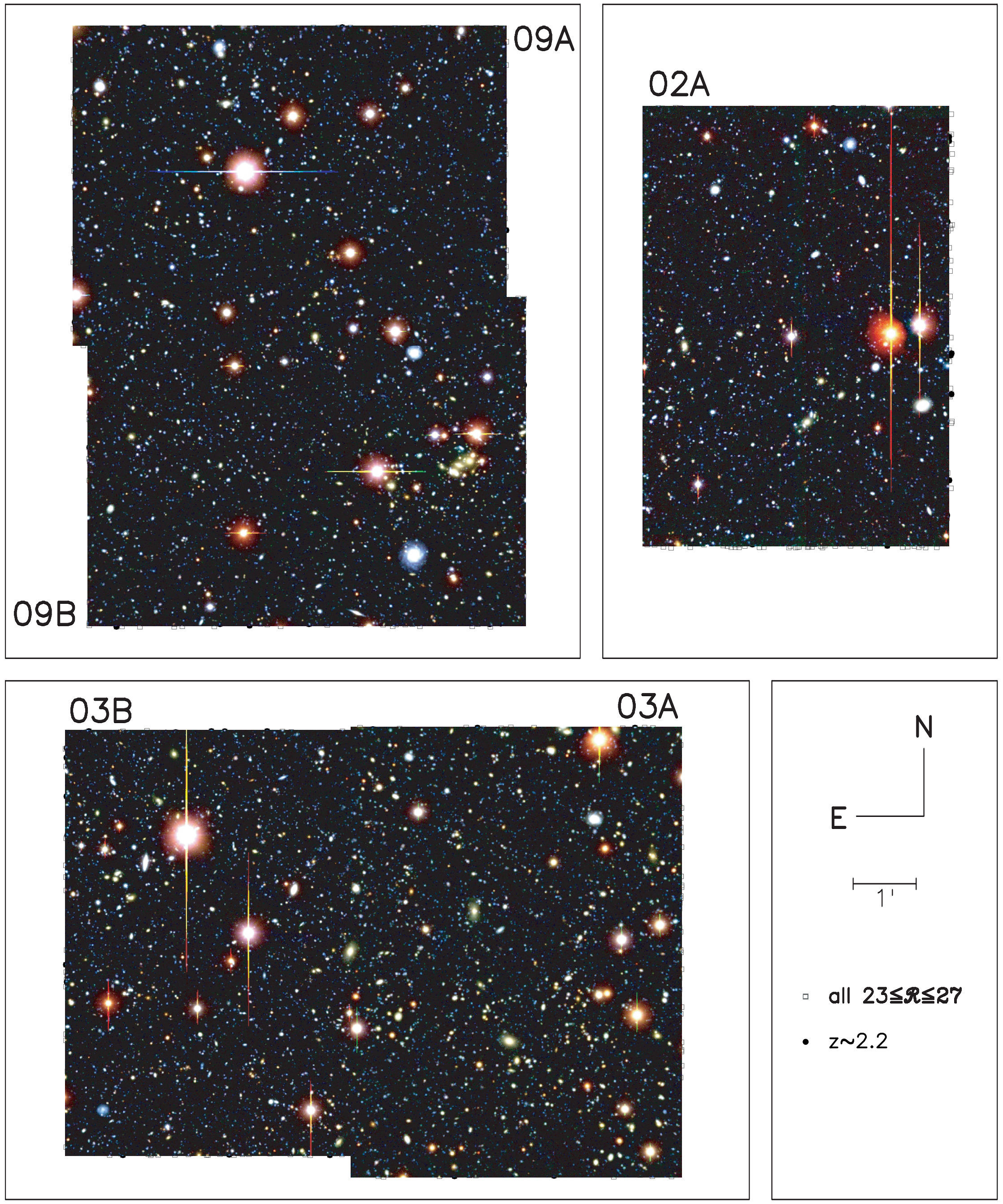
Halo masses of faint LBGs

- from clustering

with Jonathan Savoy (Saint Mary's)

Clustering: method / sample

- LBG/BX/BM-selected galaxies in the Keck Deep Fields ($R_{\rm lim}$=27.0; Sawicki & Thompson 2005, 2006)



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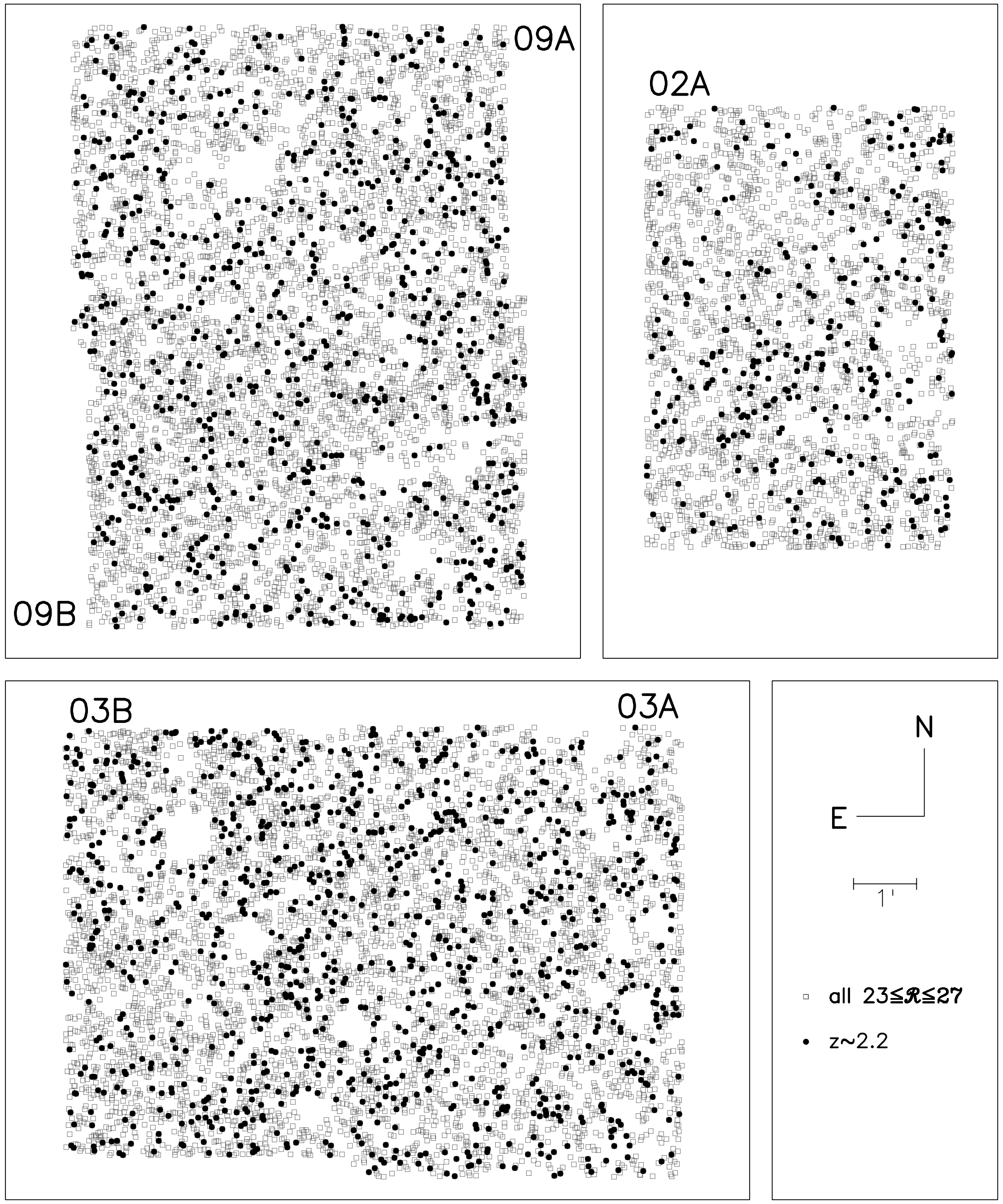

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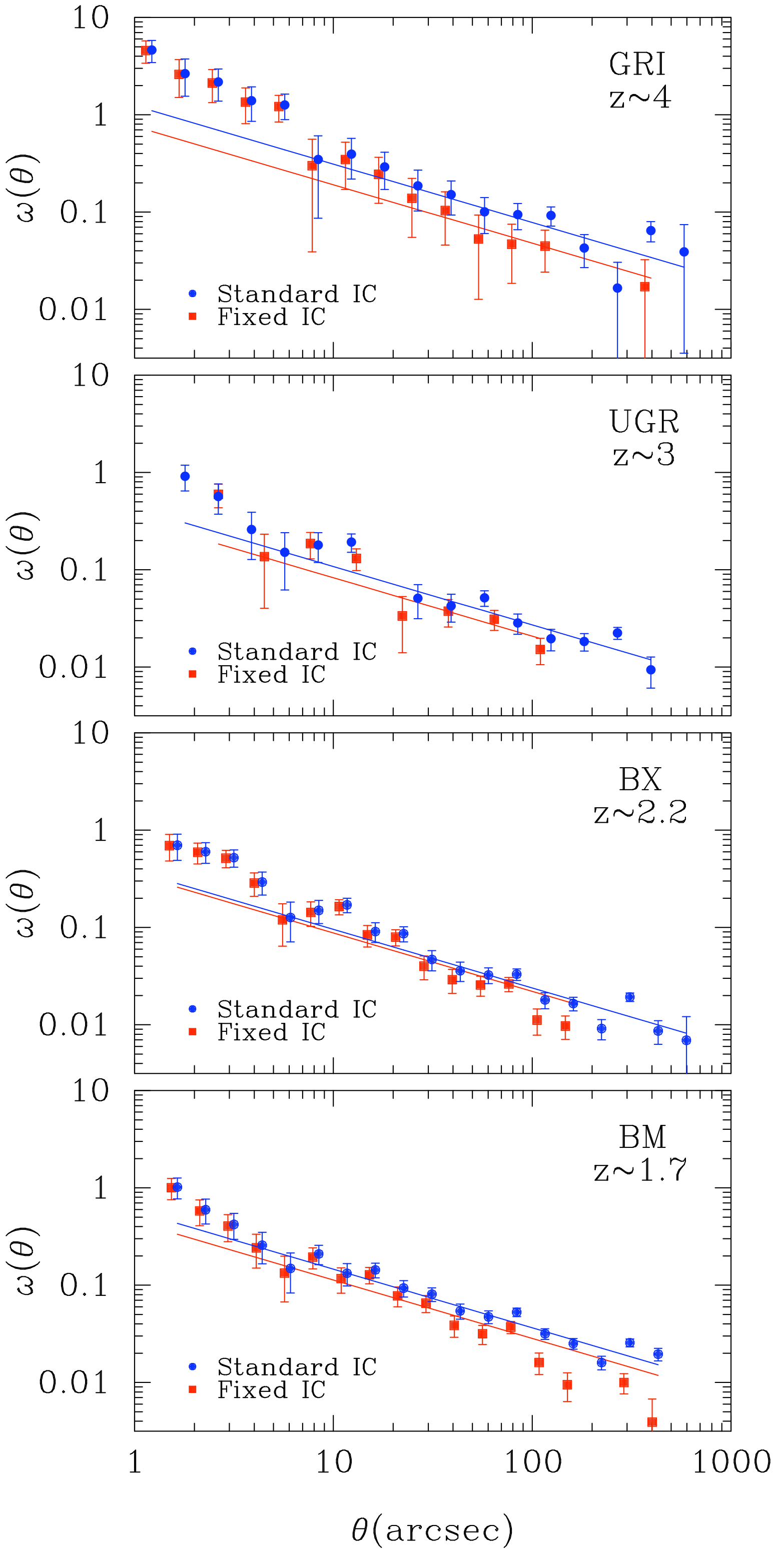
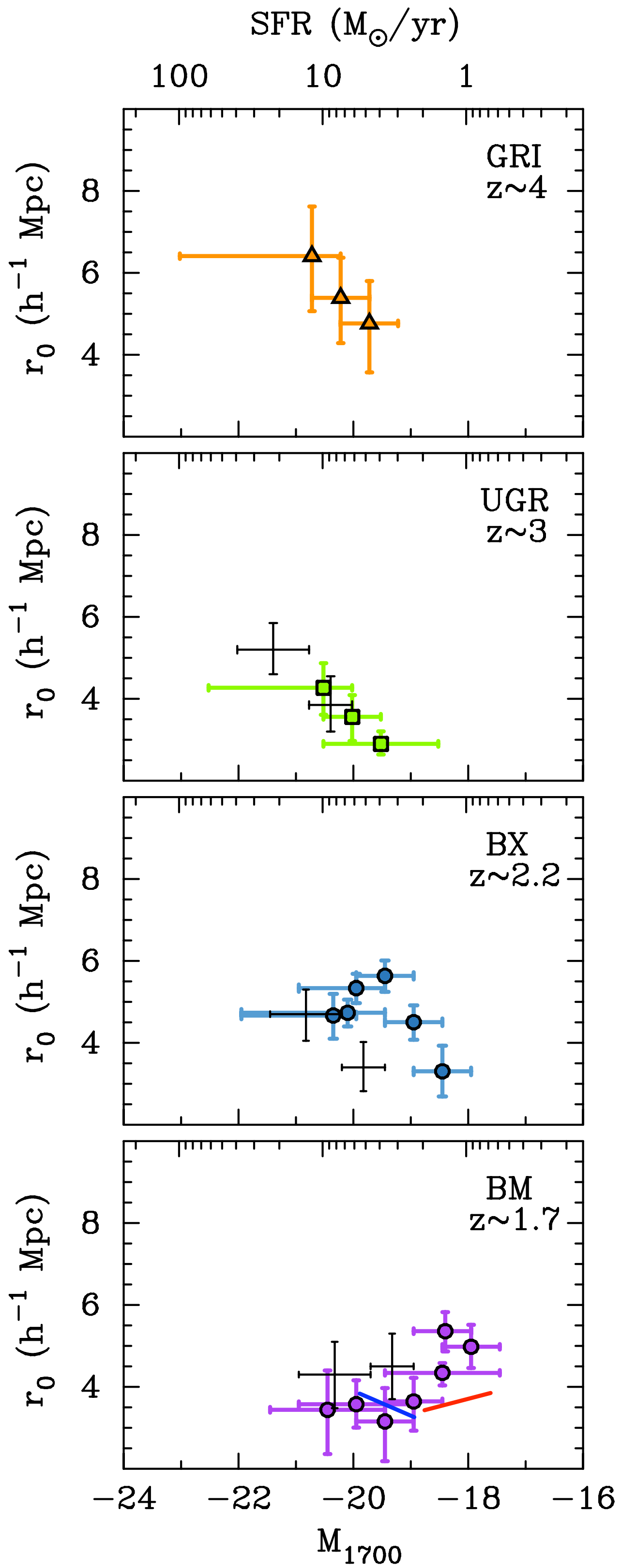


- measure 2D clustering
- invert using Limber equation → 3D
- compare to clustering of halos in the Millennium simulation → gives halo masses

Clustering: results



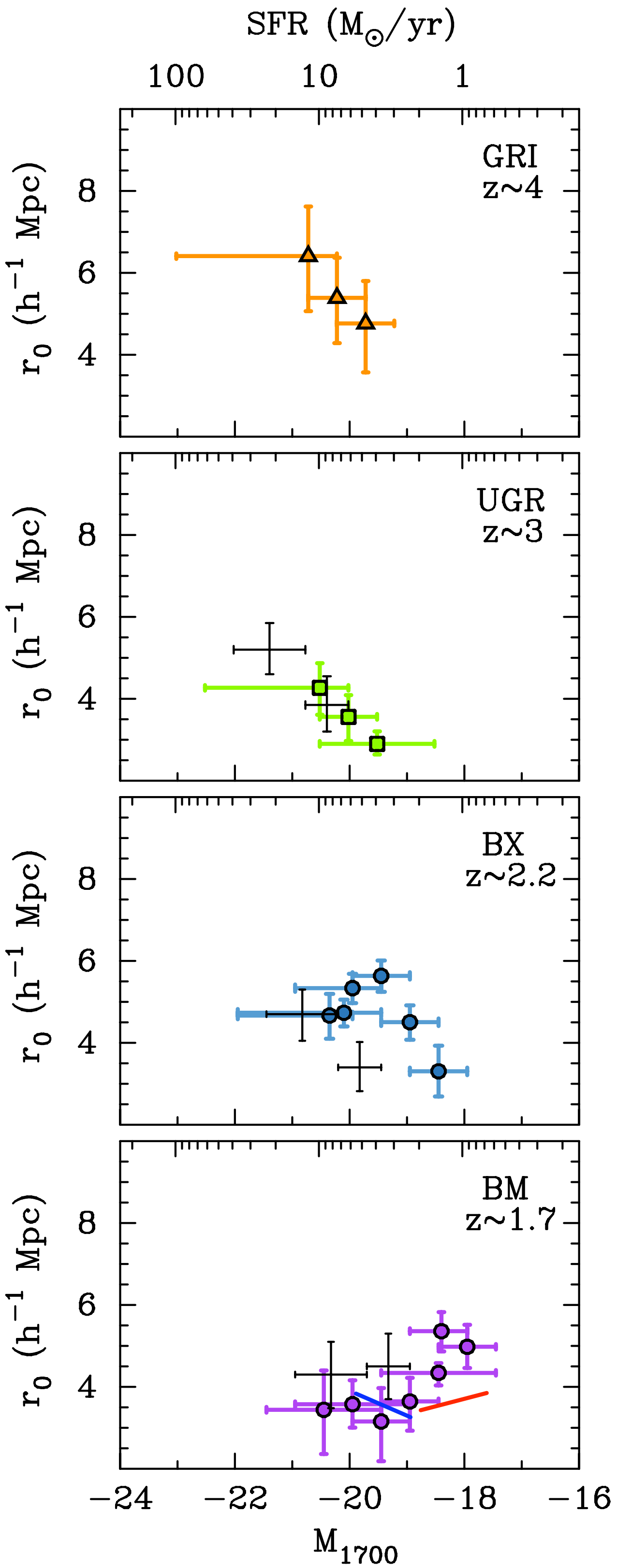
- as expected at z~4, 3
- inverts from z=3 → 1.7
- the most clustered galaxies are not the brightest ones at z=2.2 and 1.7
- (see also Quadri et al. 2007 z~2 K-selected sample)

colored points: Keck Deep Fields

black crosses: Adelberger et al. (2005)

blue & red lines: UV-selected clustering at z~1, 0.3 (Heinis et al. 2007) with GALEX+SDSS/CFHTLS

Downsizing in halo mass?



- most massive halos shut down star formation?
- as they fade, their central galaxies dominate the clustering signal
- halo mass ~10^{12} - $10^{13} M_\odot$

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The End

Symbols

- M_{stars}
- $M_{\odot}$
- →
- ½ ⅓ ⅔ ¼ ¾