The Mass-Luminosity Relation For Galaxies in the Deep Lens Survey

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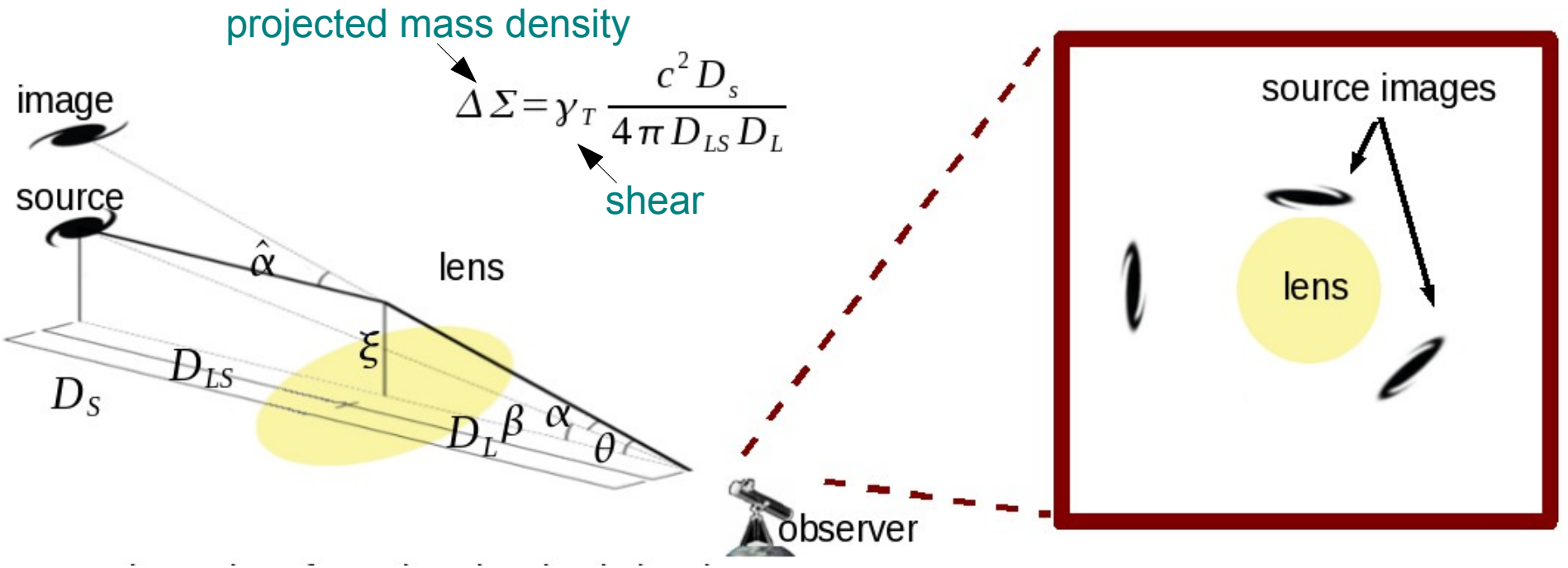
Characterize the galaxy-dark matter connection

by investigating, e.g., the M_{tot} - L relation using lensing to measure the total mass.

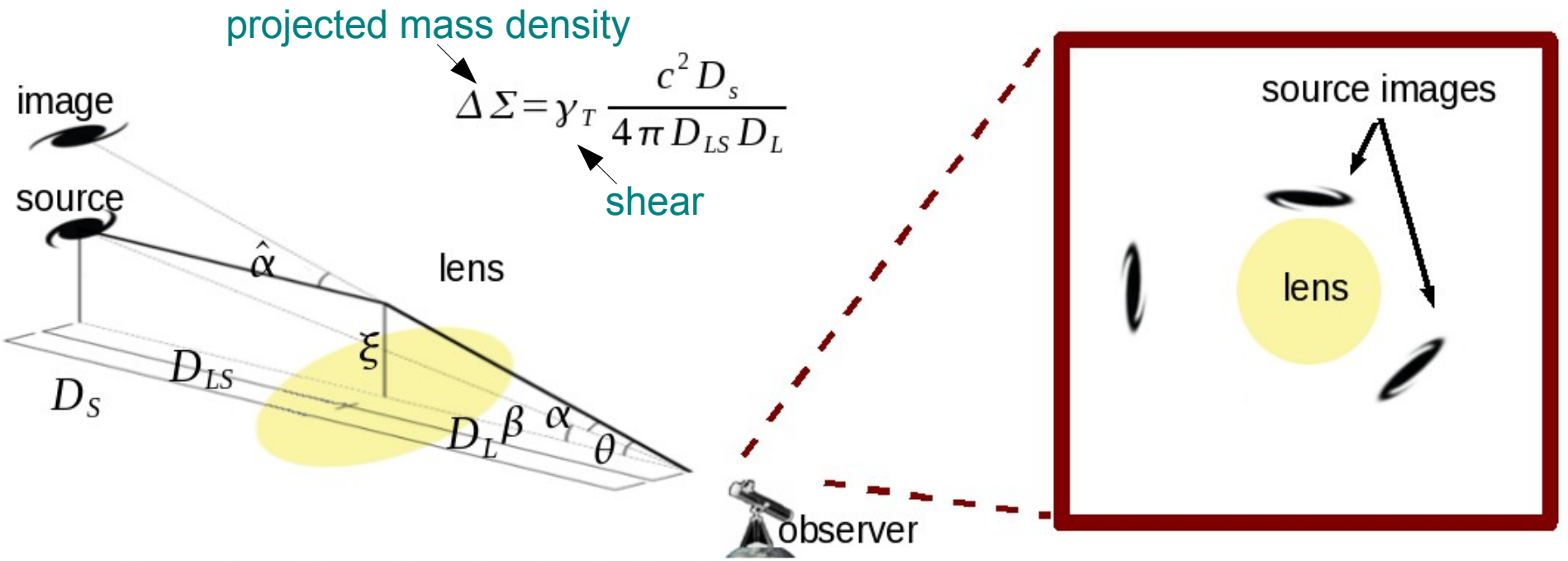
Observational results have studied low redshift galaxies or the most massive galaxies at higher redshifts, but we can now extend the mass and redshift ranges with current deep and wide surveys.

- Galaxy-galaxy weak lensing (GGWL) background
- Overview of the Deep Lens Survey (DLS)
- GGWL signal binned by color and luminosity
- M_{tot} - L relation
- Summary and future outlook

Galaxy-galaxy weak gravitational lensing



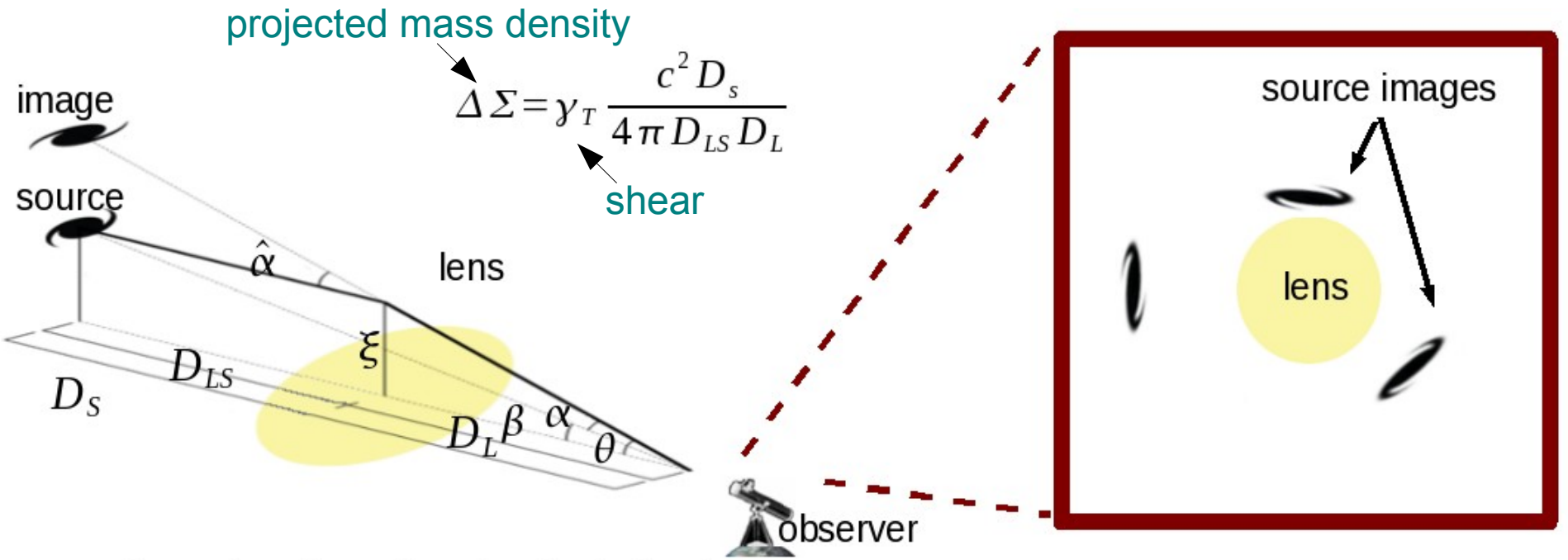
Galaxy-galaxy weak gravitational lensing

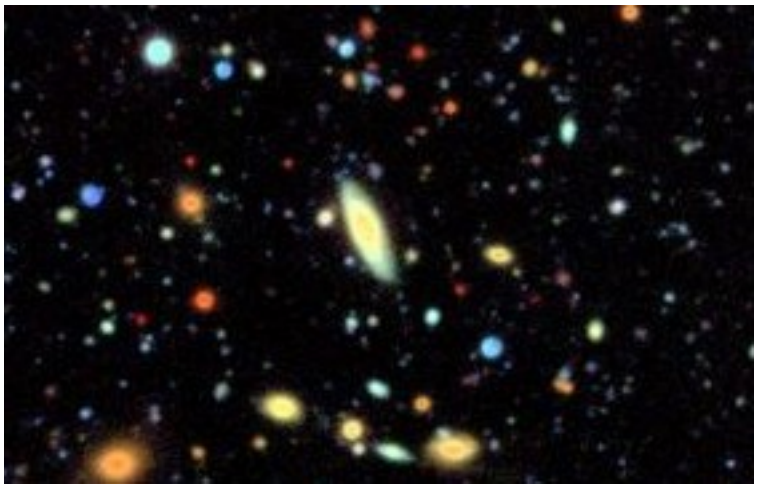


How do I measure the shear for a given source galaxy?

$$e^{observed} = e^{intrinsic} + \gamma_T$$

Galaxy-galaxy weak gravitational lensing





Lensing assumes the distribution of intrinsic ellipticities is zero on average.

$$\langle e^{observed} \rangle = \langle e^{intrinsic} \rangle + \langle \gamma_T \rangle$$

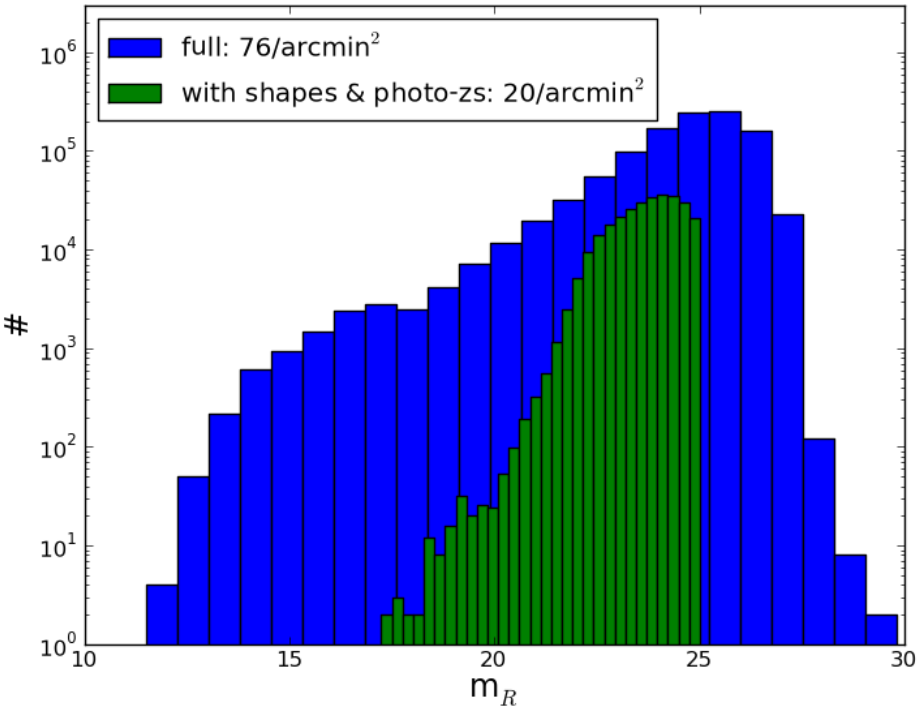
($\langle e^{intrinsic} \rangle \to 0$)

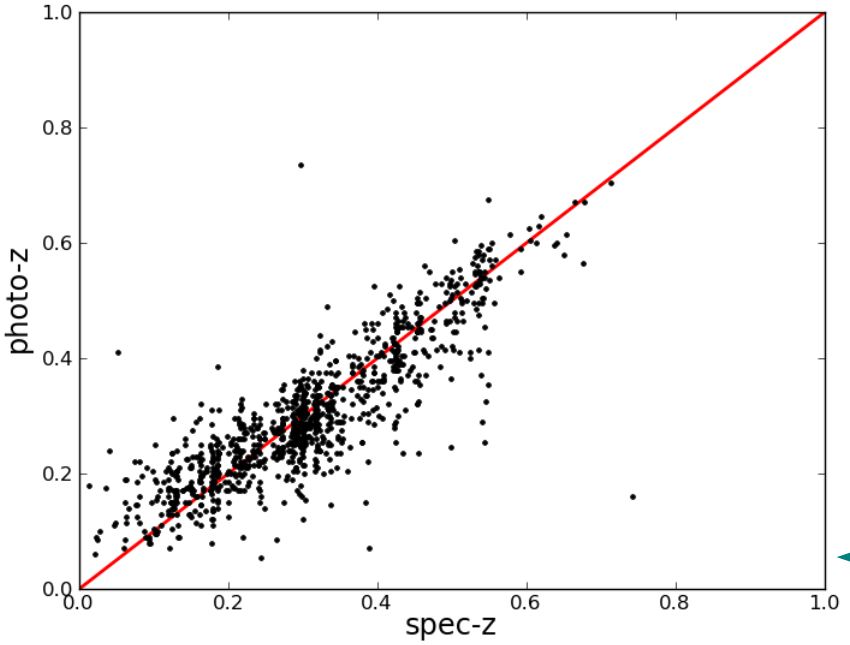
$$\langle e^{observed} \rangle = \langle \gamma_T \rangle$$

Deep Lens Survey (DLS)

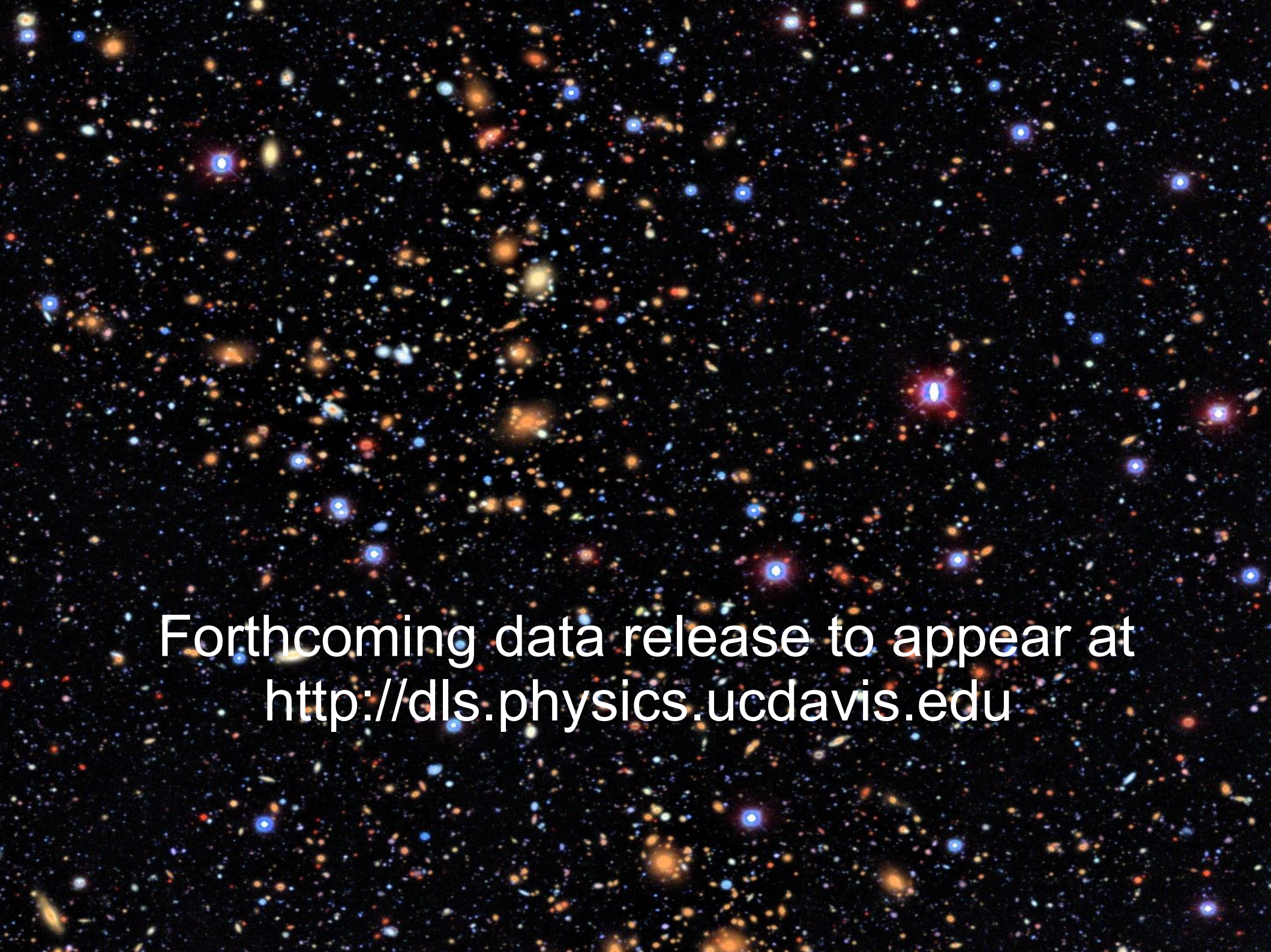
BVRz' imaging of 20 sq. deg. over five fields at Kitt Peak and Cerro Tololo 4m + Mosaic (Wittman et al. 2002)

- seeing $\leq$0.9 in R
- 18000s in R, 12000s in Bvz'
- calibration using Übercal method (Padmanabhan et al. 2008)

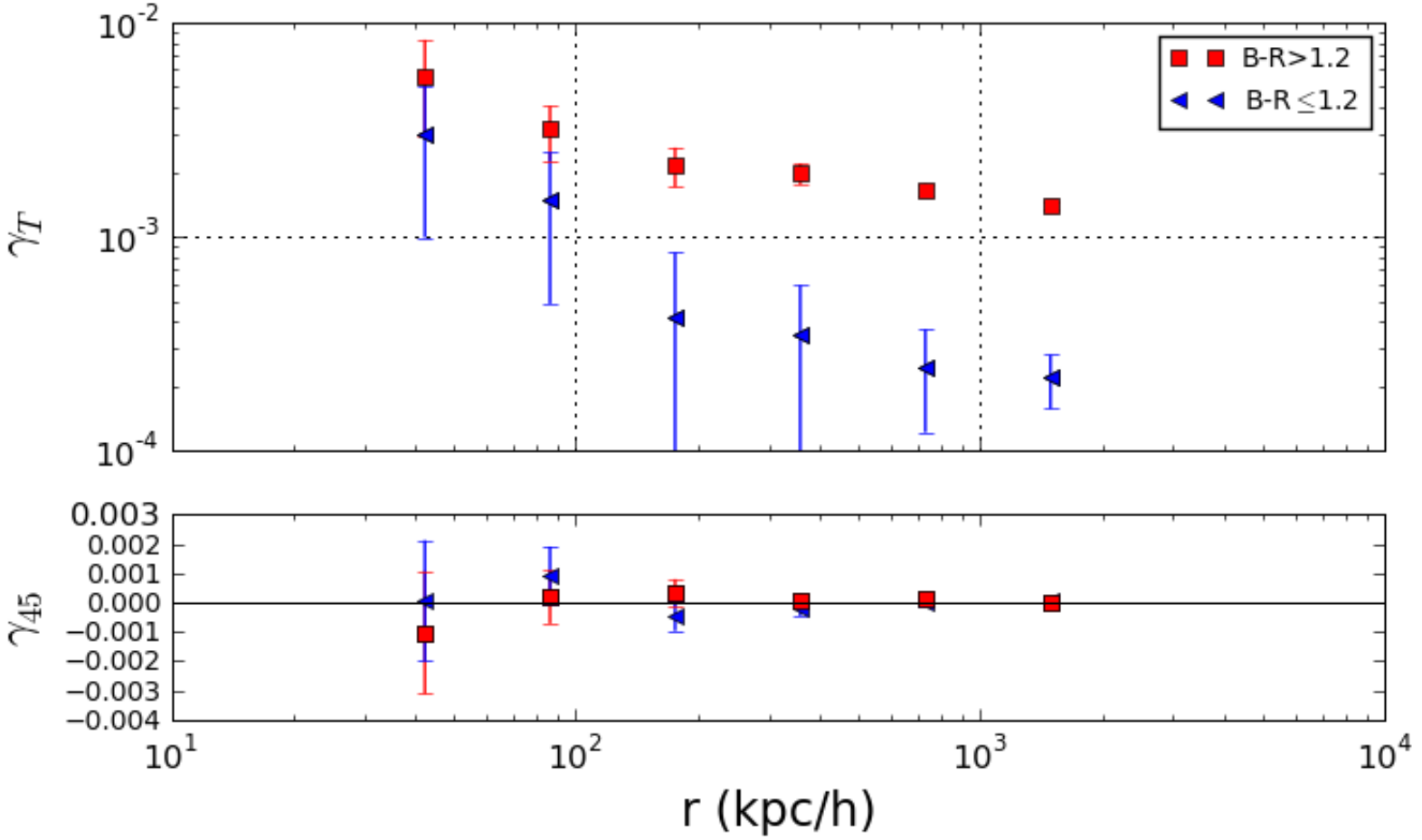




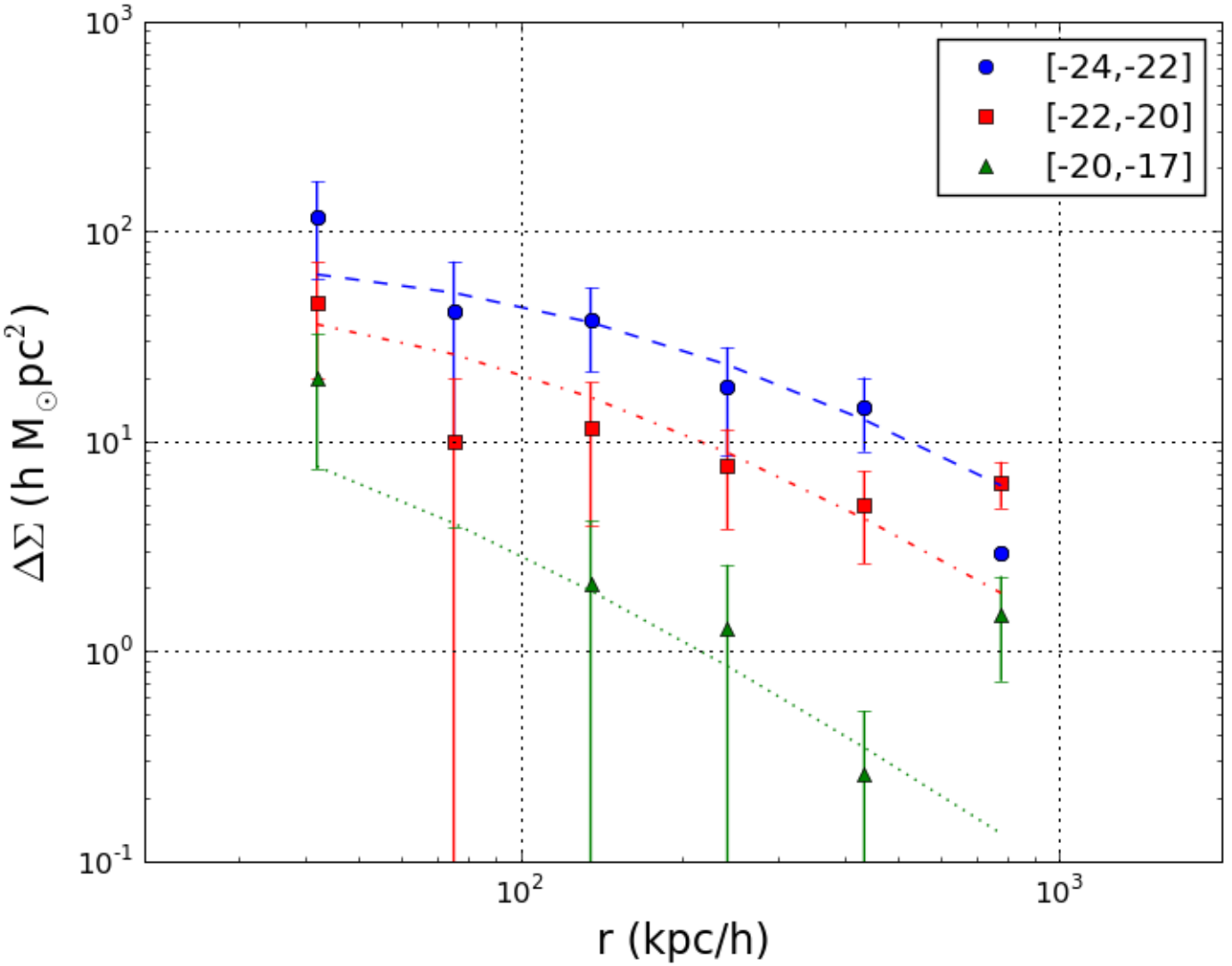
- shapes:
  PSF-convolved elliptical Gaussians using PCA to describe the PSF (Bernstein & Jarvis 2002; Jee et al. 2007)
- photometric redshifts (photo-zs):
  measured using BPZ (Benitez 2000)
  - Comparison of 1000 spec-zs from SHELS (Geller et al. 2005) gives σ ~ 0.036


Forthcoming data release to appear at
http://dls.physics.ucdavis.edu

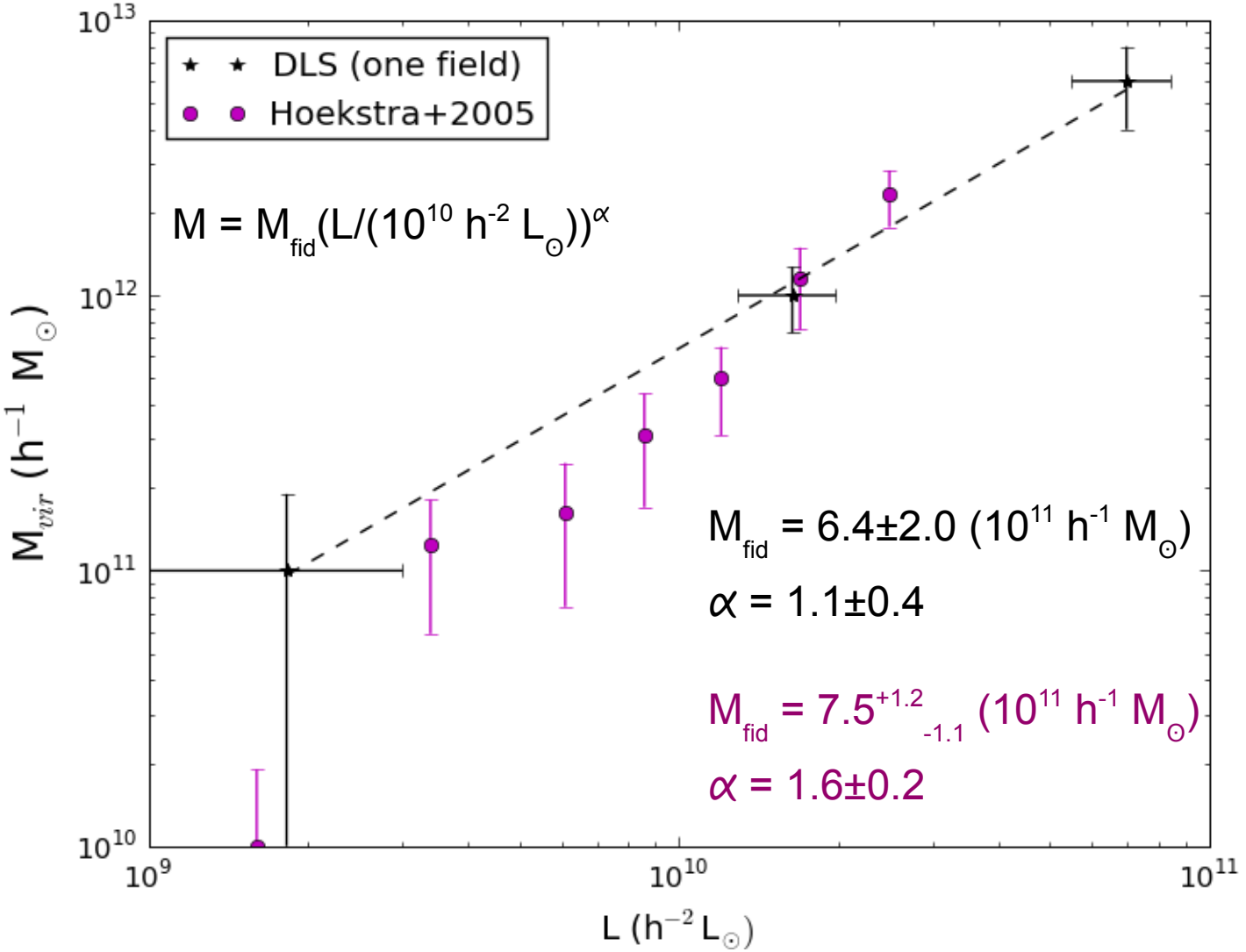
GGL Signal: Scaling with Color



GGL Signal: Scaling with Luminosity



Mass-Luminosity



Summary

- GGL signal scales with luminosity and color
- Mass scales with luminosity in agreement with previous studies

Ongoing/Future Work

- Calibrated GGL signal for 20 sq. deg. (Choi et al., in prep)
- Explore GGL with type, stellar mass, and redshift with the end goal of M_*-M_{tot} as a function of cosmological time
- Halo model-fitting – what's happening at large radii?
- Halo shapes