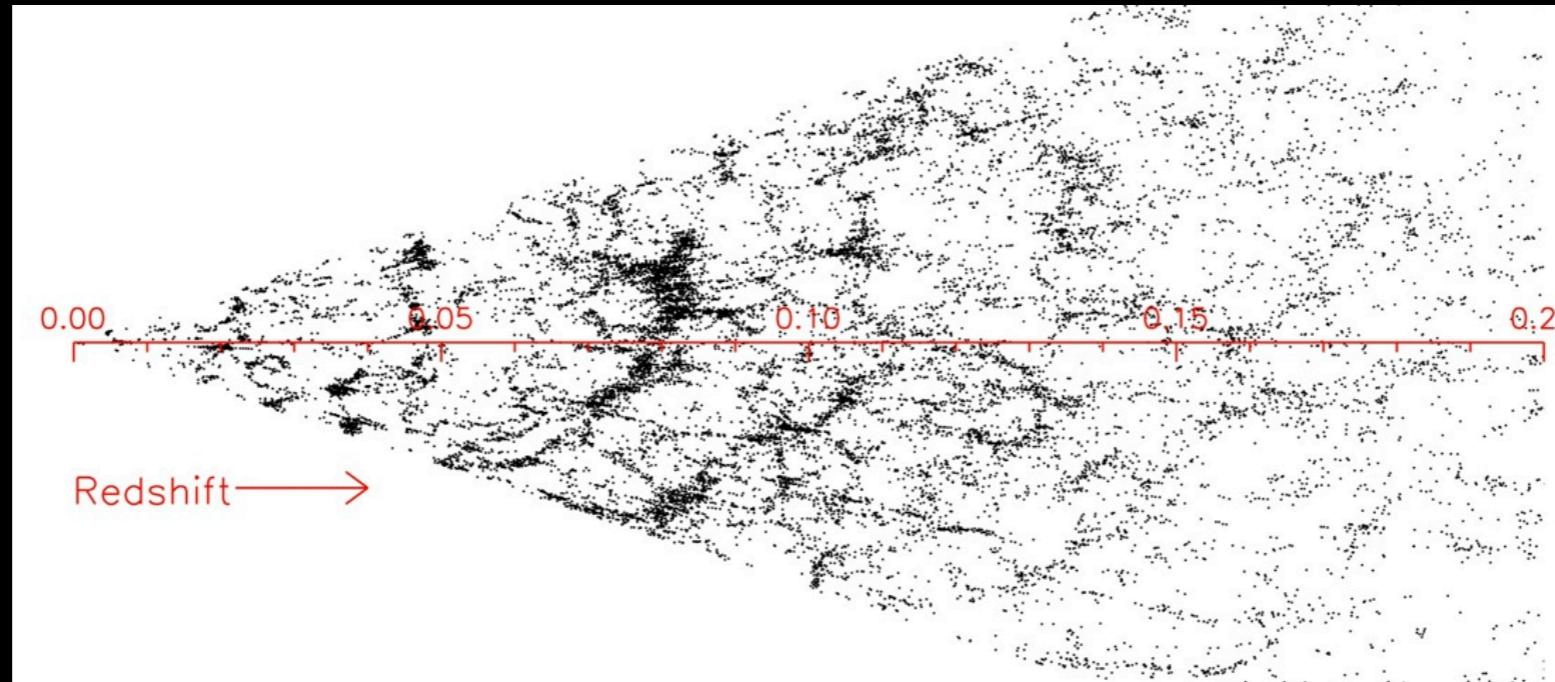


Evidence for a Large Local Underdensity and The Implications for Cosmology

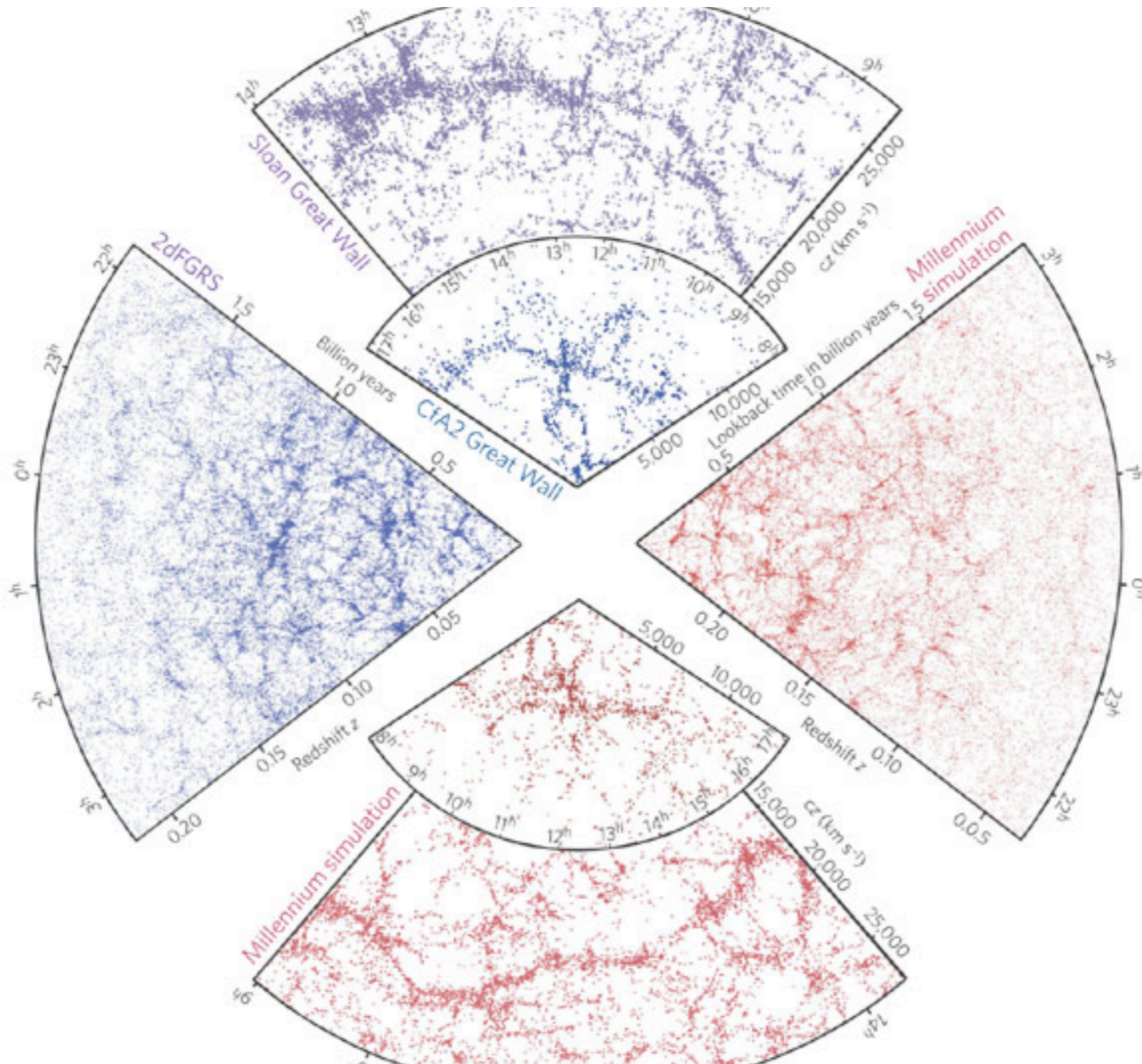


Ryan Keenan (ASIAA, Taiwan)

Collaborators: Amy Barger (U. Wisconsin), Lennox Cowie (IfA, Hawaii), Wei-Hao Wang (ASIAA, Taiwan), Isak Wold (U. Wisconsin), Laura Trouille (Northwestern, IL)

The Horizon Simulation: www.horizon-project.fr

Observations: CFA2, 2DFGRS, SDSS (blue and purple)

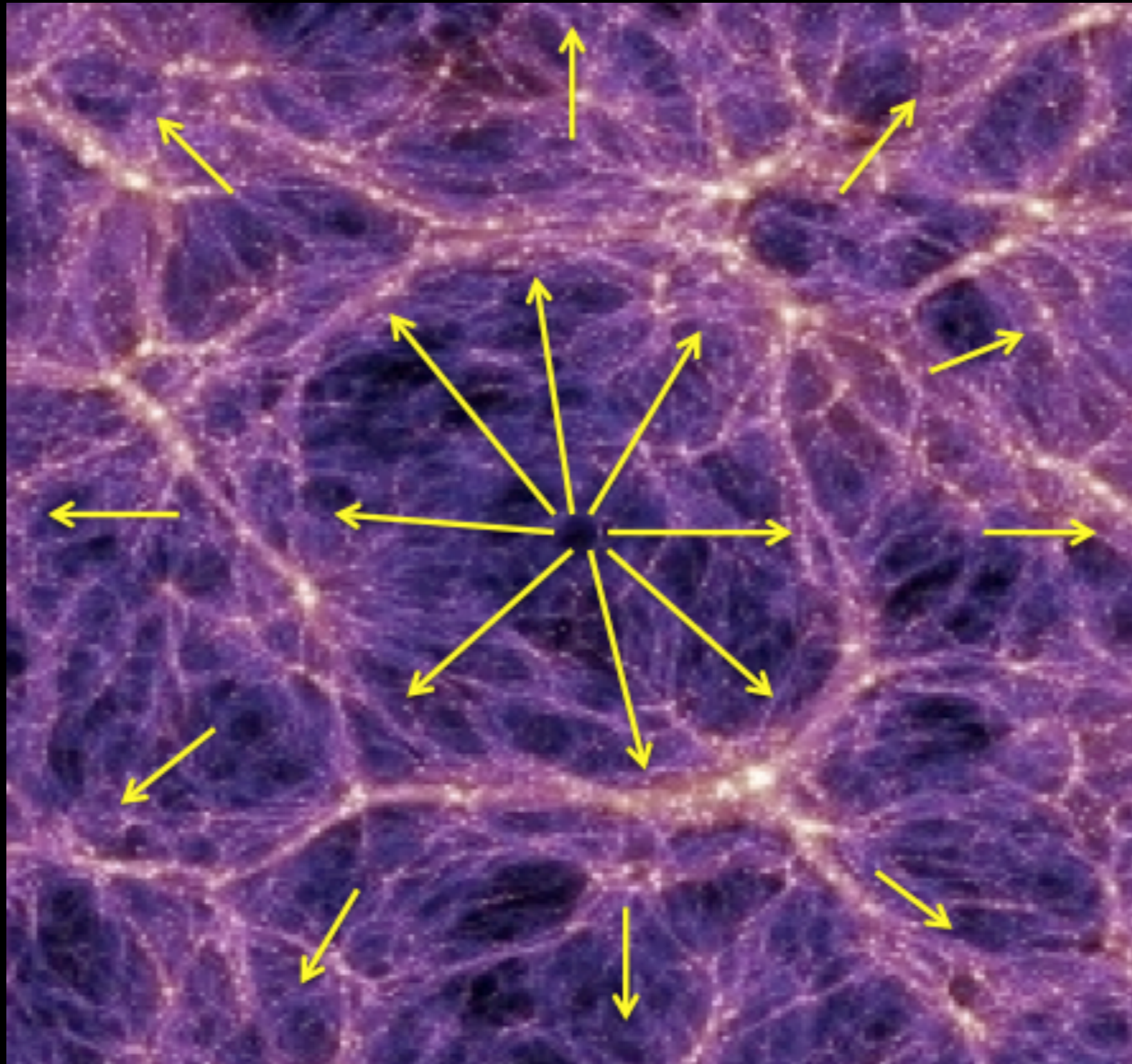


Millennium Simulation (red)

Springel et al. (2006)

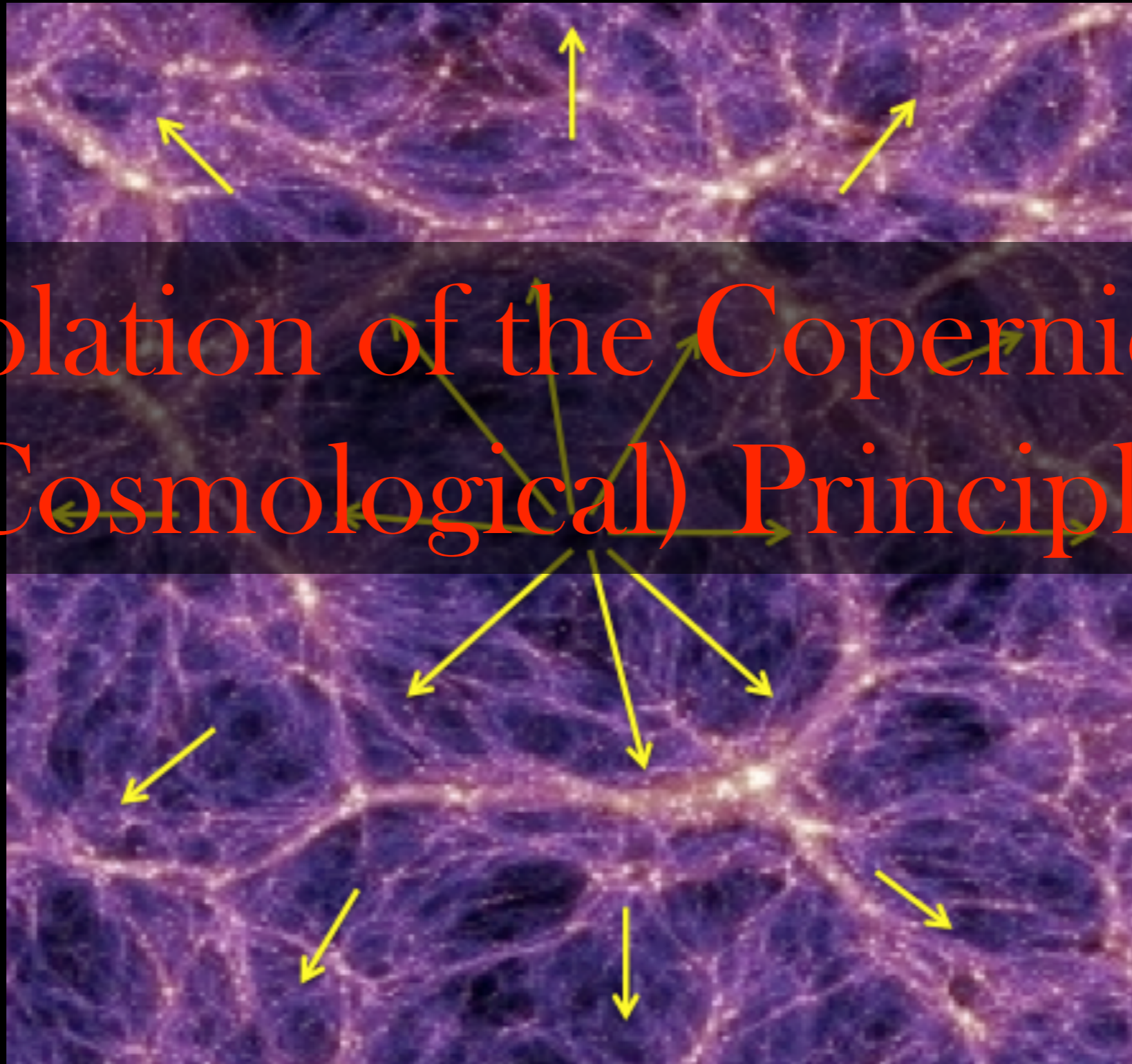
The Horizon Simulation: www.horizon-project.fr

A Large Underdensity Can Produce an Apparent Acceleration of Expansion

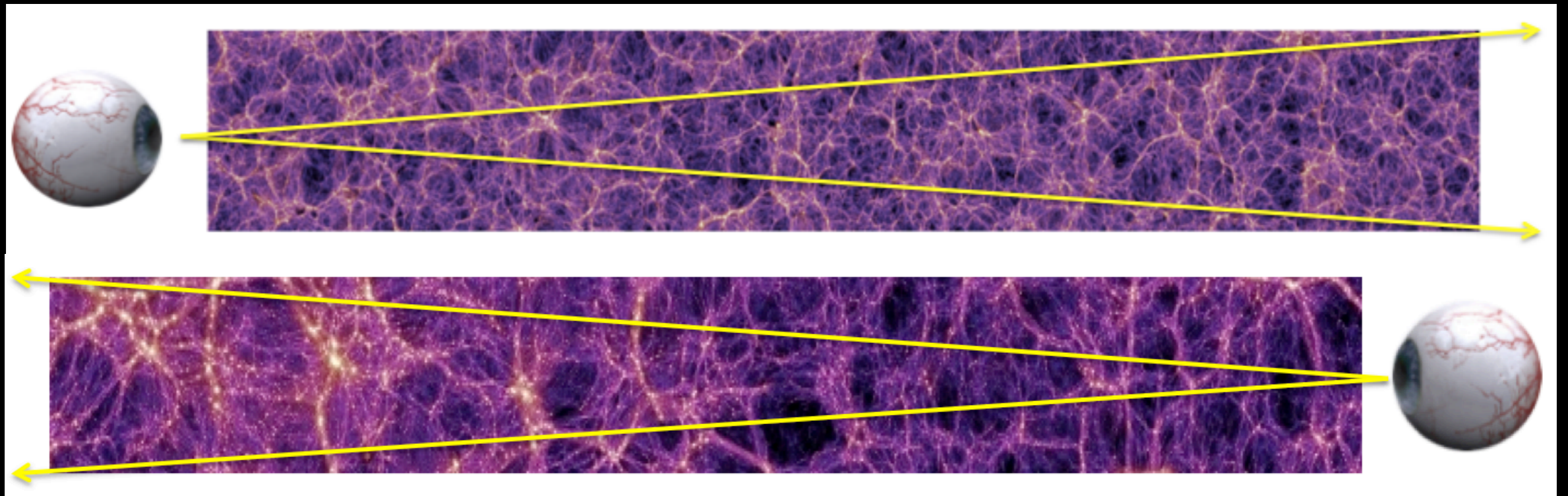


A Large Underdensity Can Produce an Apparent Acceleration of Expansion

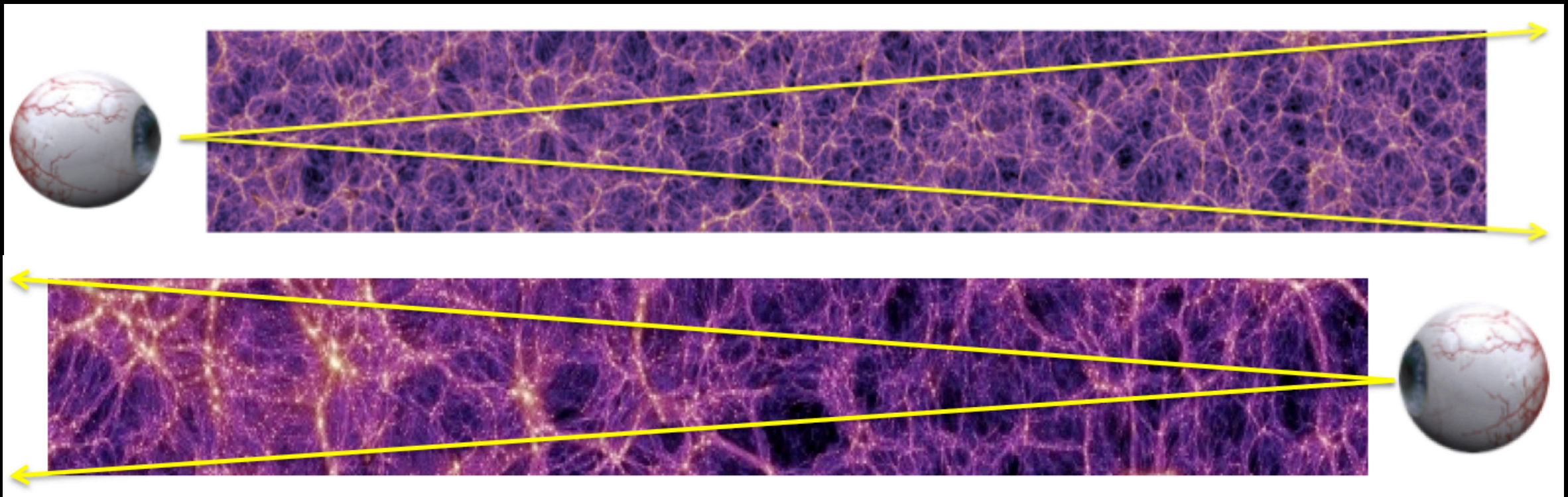
Violation of the Copernican
(Cosmological) Principle!



(NIR) Galaxy Counts to Probe Structure



(NIR) Galaxy Counts to Probe Structure



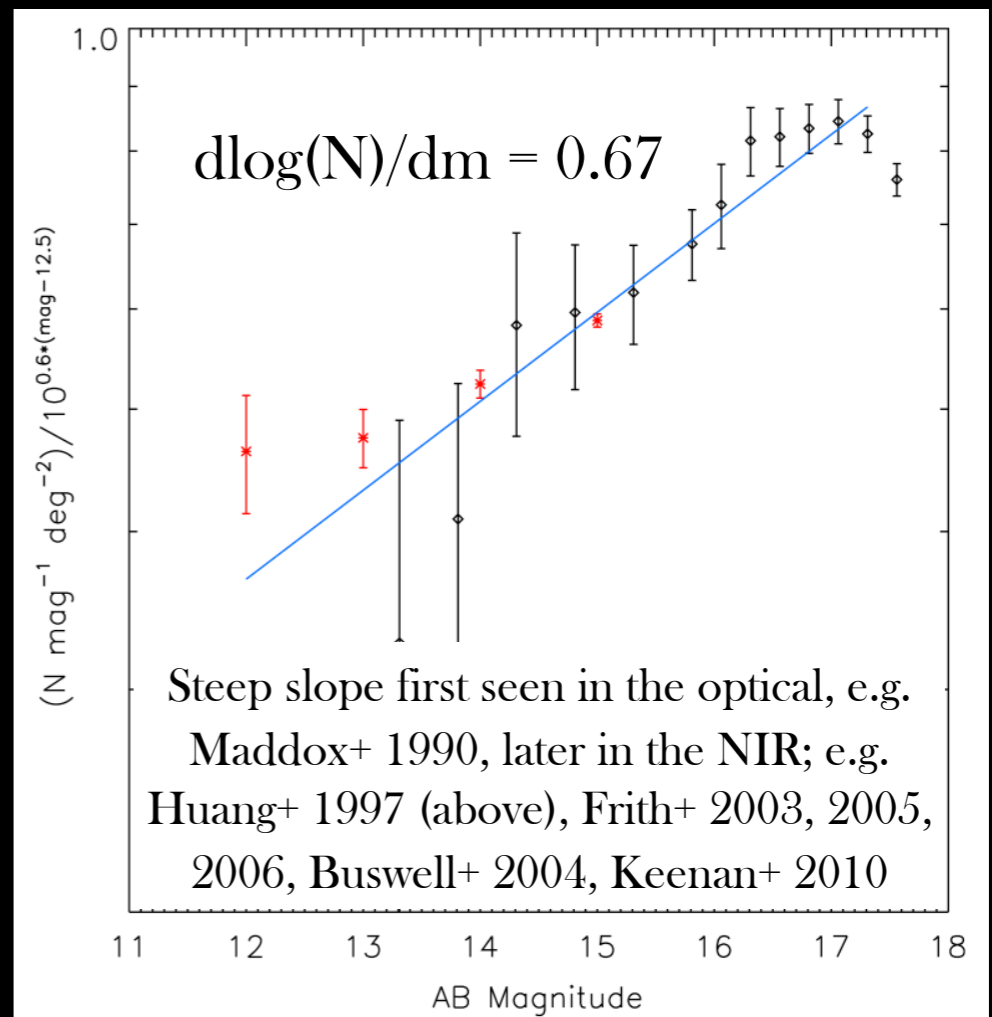
$$F \sim \frac{1}{R^2} \longrightarrow R \sim F^{-\frac{1}{2}}$$

$$N(F > F_0) = n_* V \sim R^3 \sim F^{-\frac{3}{2}}$$

$$m = -2.5 \log(F) \longrightarrow F = 10^{-0.4m}$$

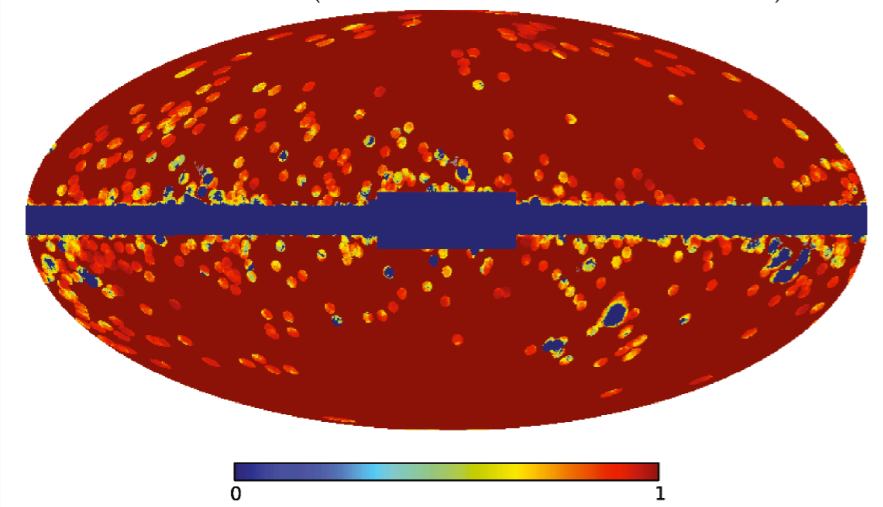
$$F^{-\frac{3}{2}} = 10^{0.6m} \sim N(m < m_0)$$

So, $\frac{d \log(N)}{dm} = 0.6$ expected from homogeneity

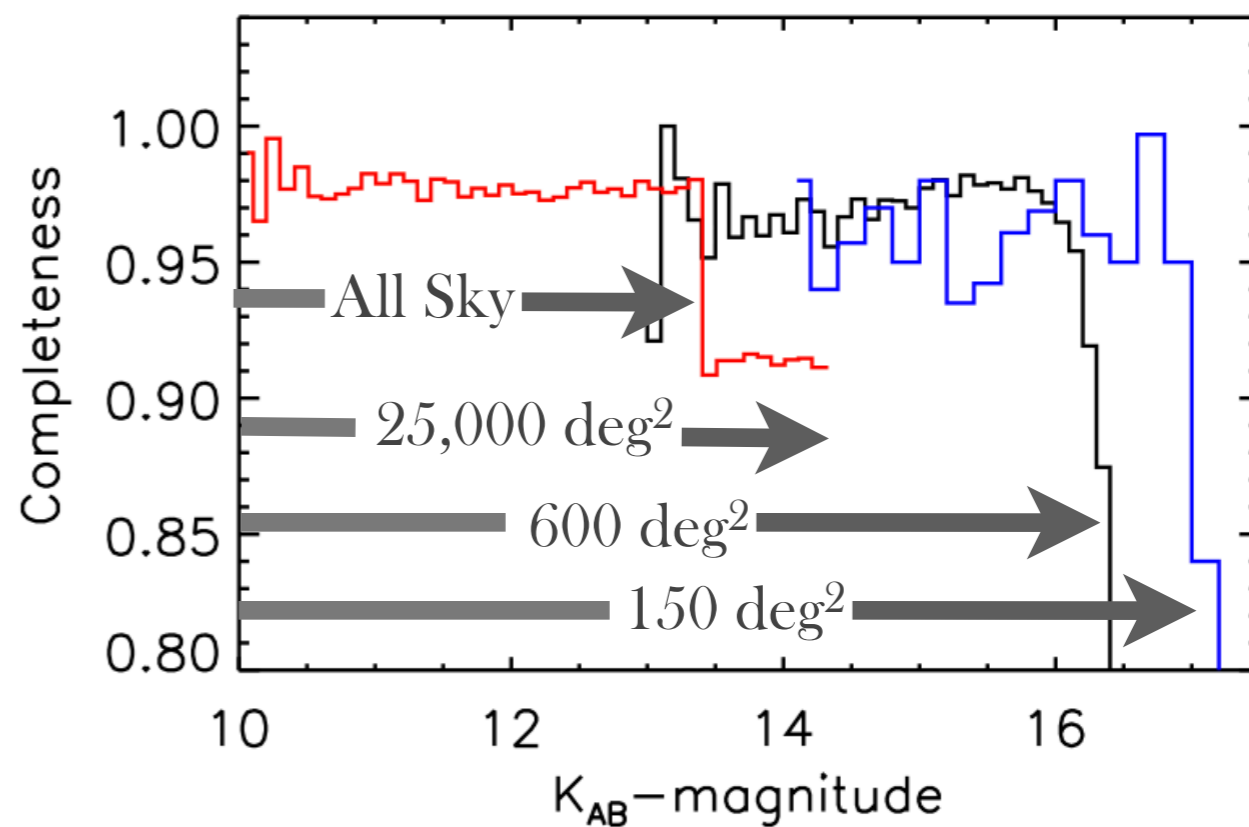
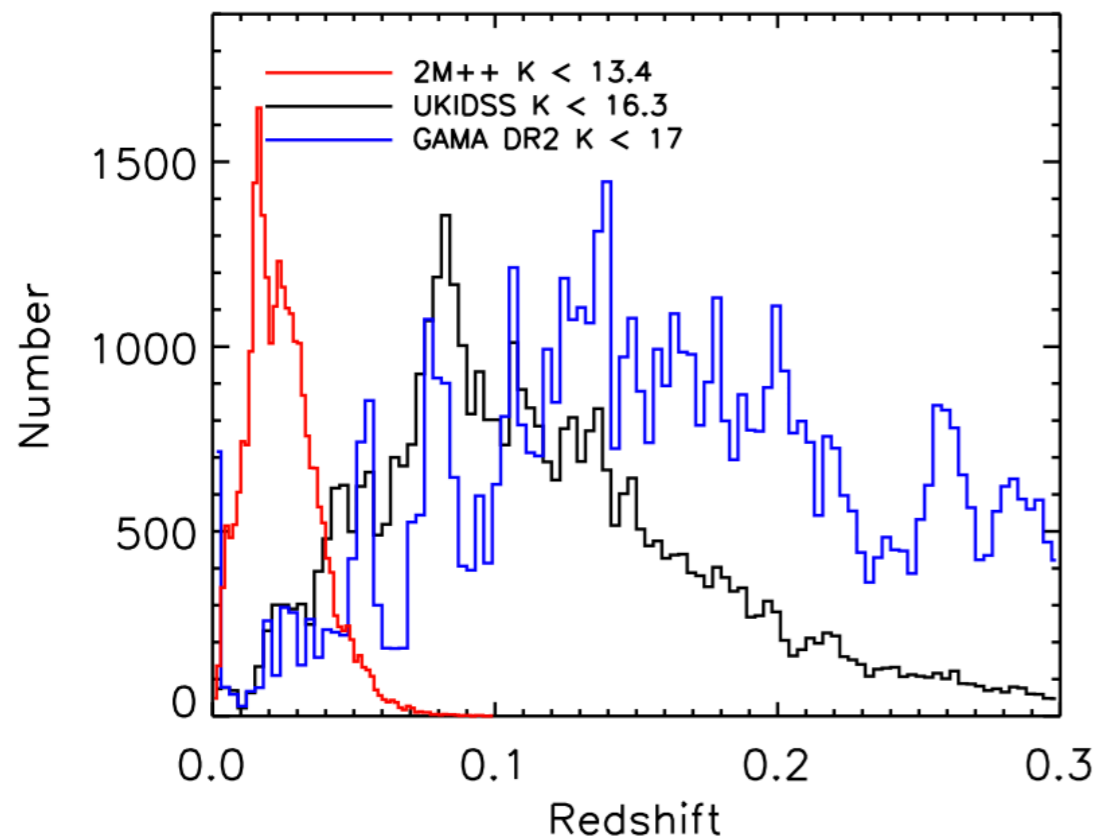
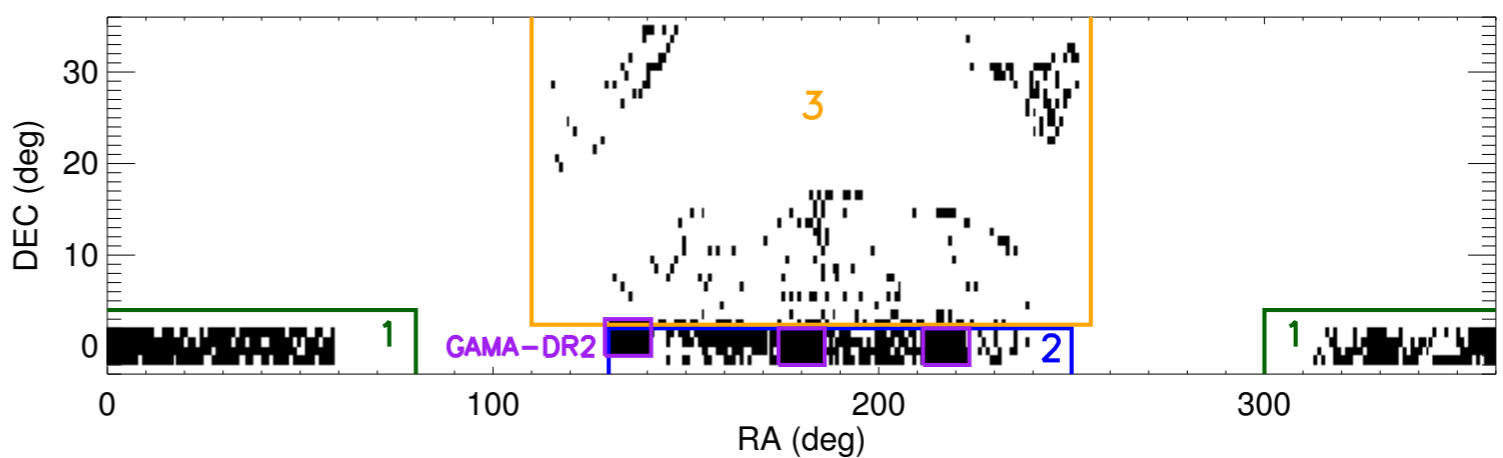


K-band (UKIDSS/2MASS) + Redshifts (SDSS, 2DF, 6DF, 2MR, GAMA)

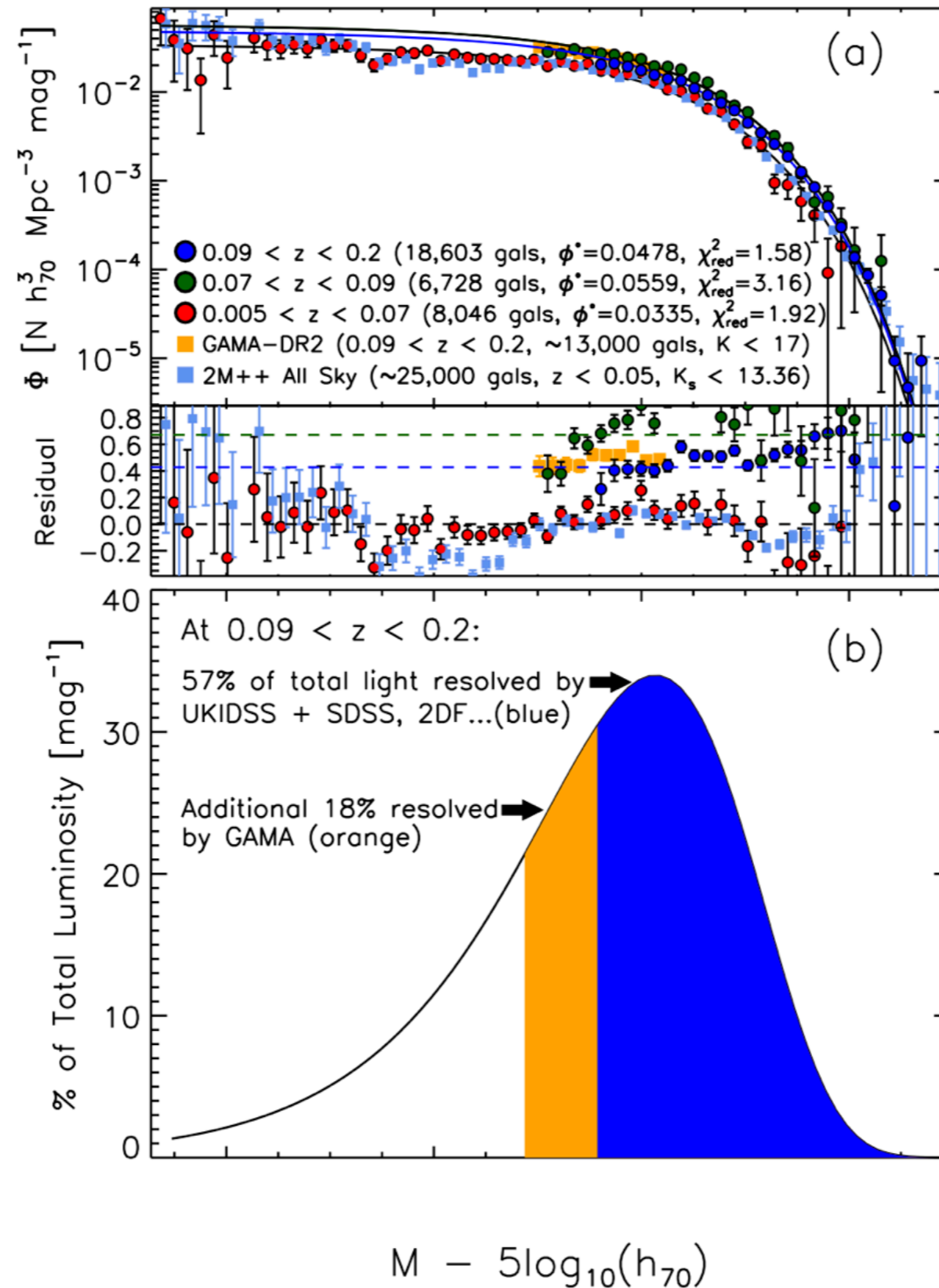
2M++ K < 13.4 (Lavaux & Hudson 2011)



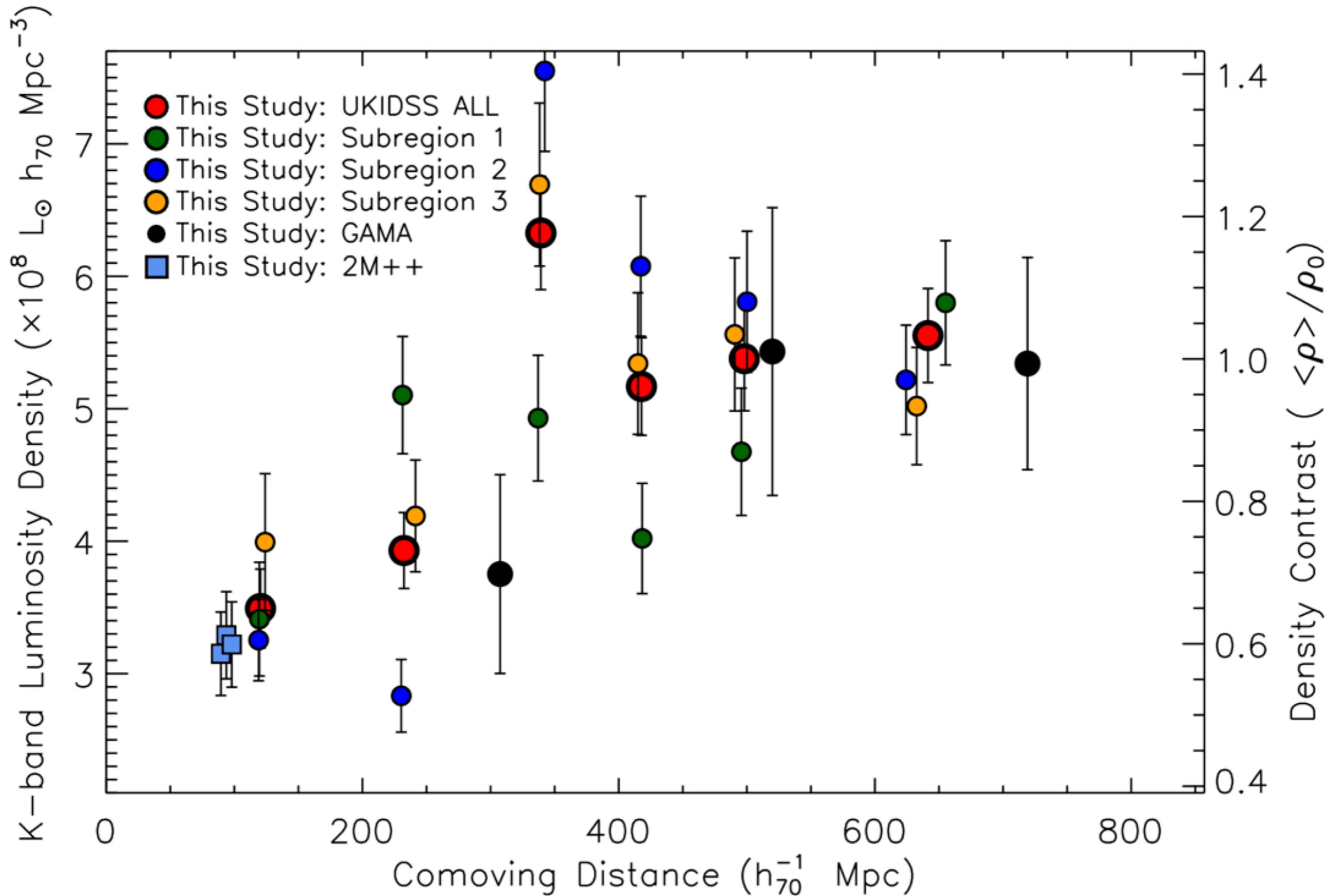
UKIDSS LAS K < 16.3 & GAMA-DR2 K < 17



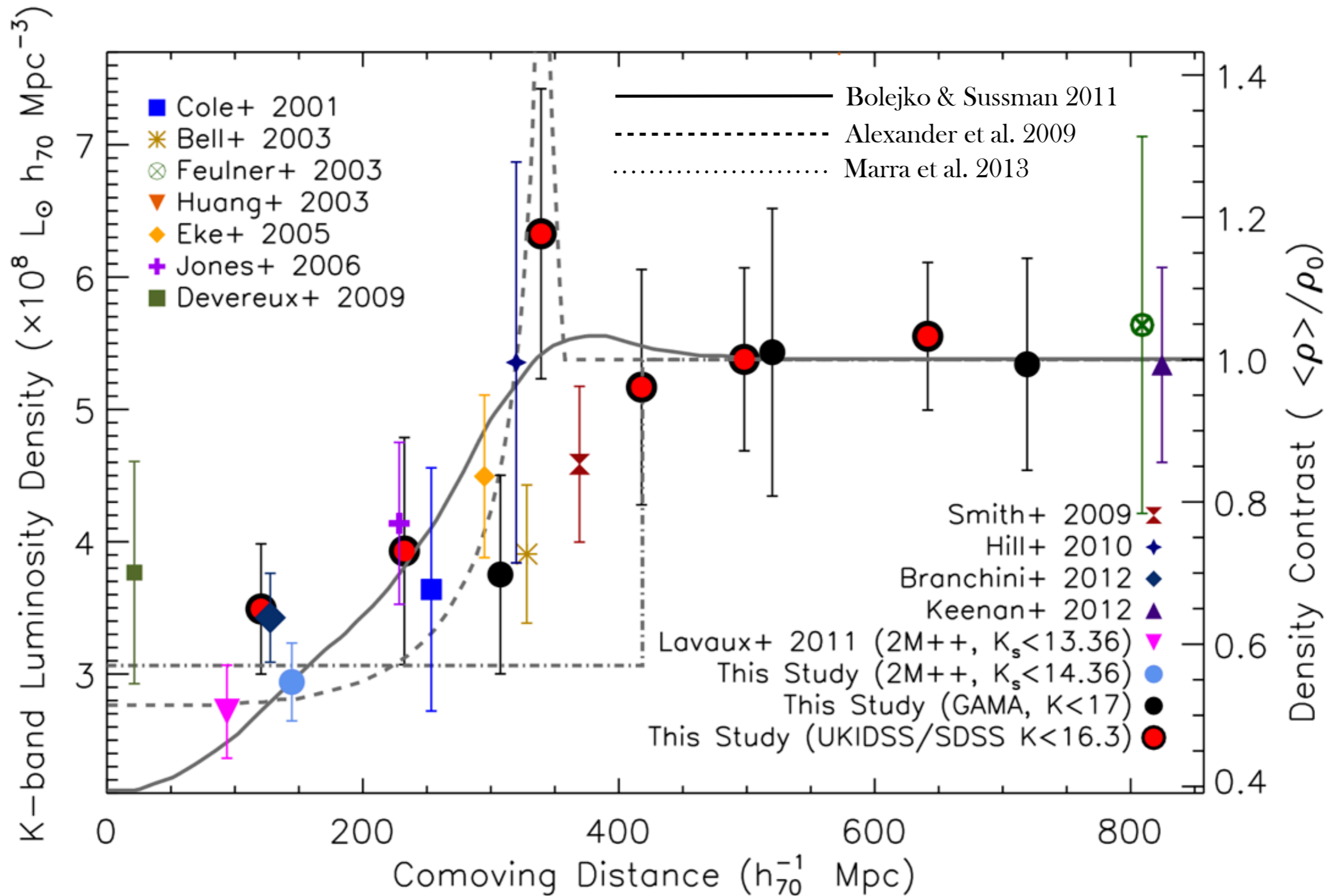
LF As a Function of Redshift



Luminosity Density vs. Distance

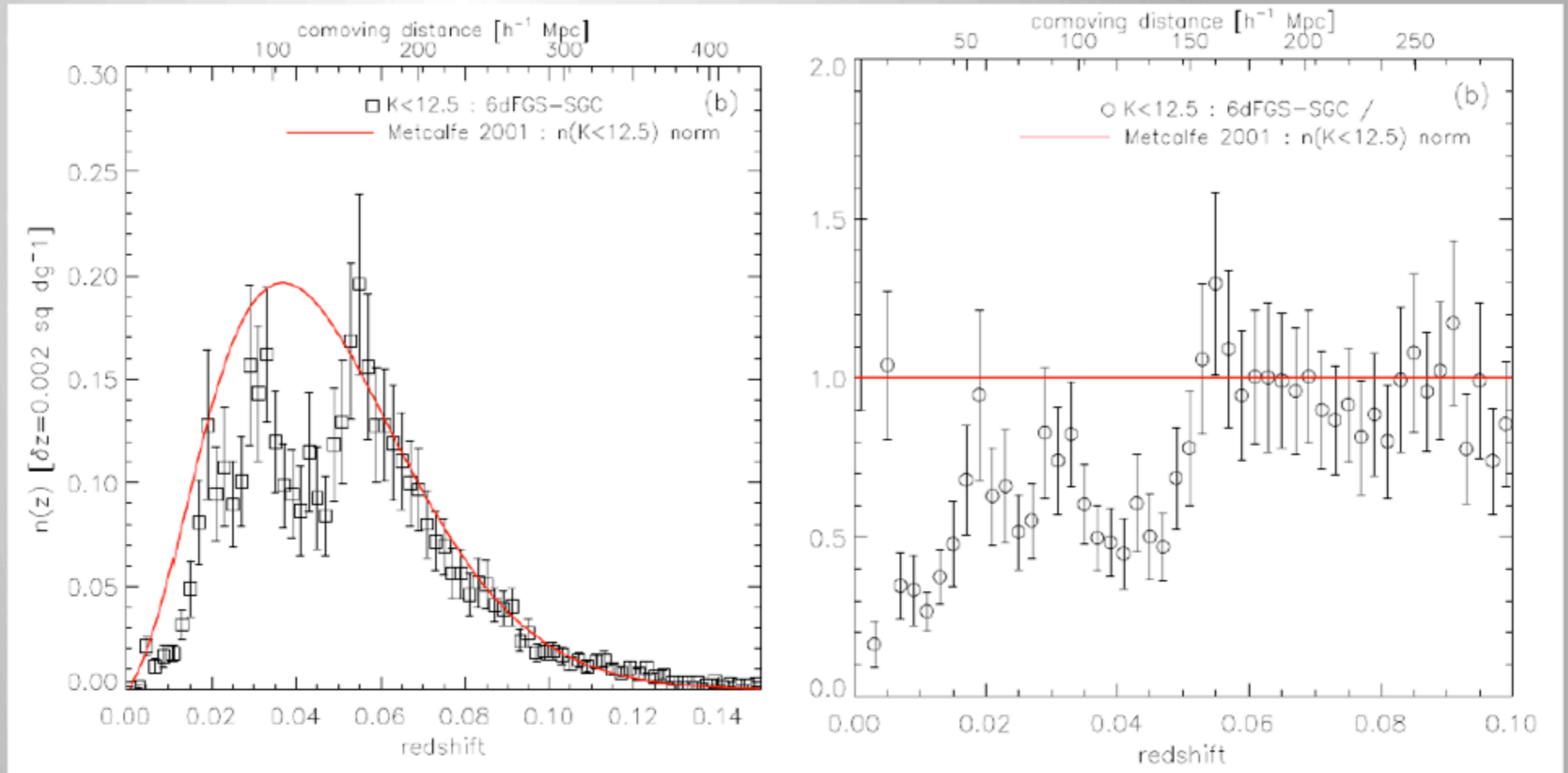


Luminosity Density vs. Distance

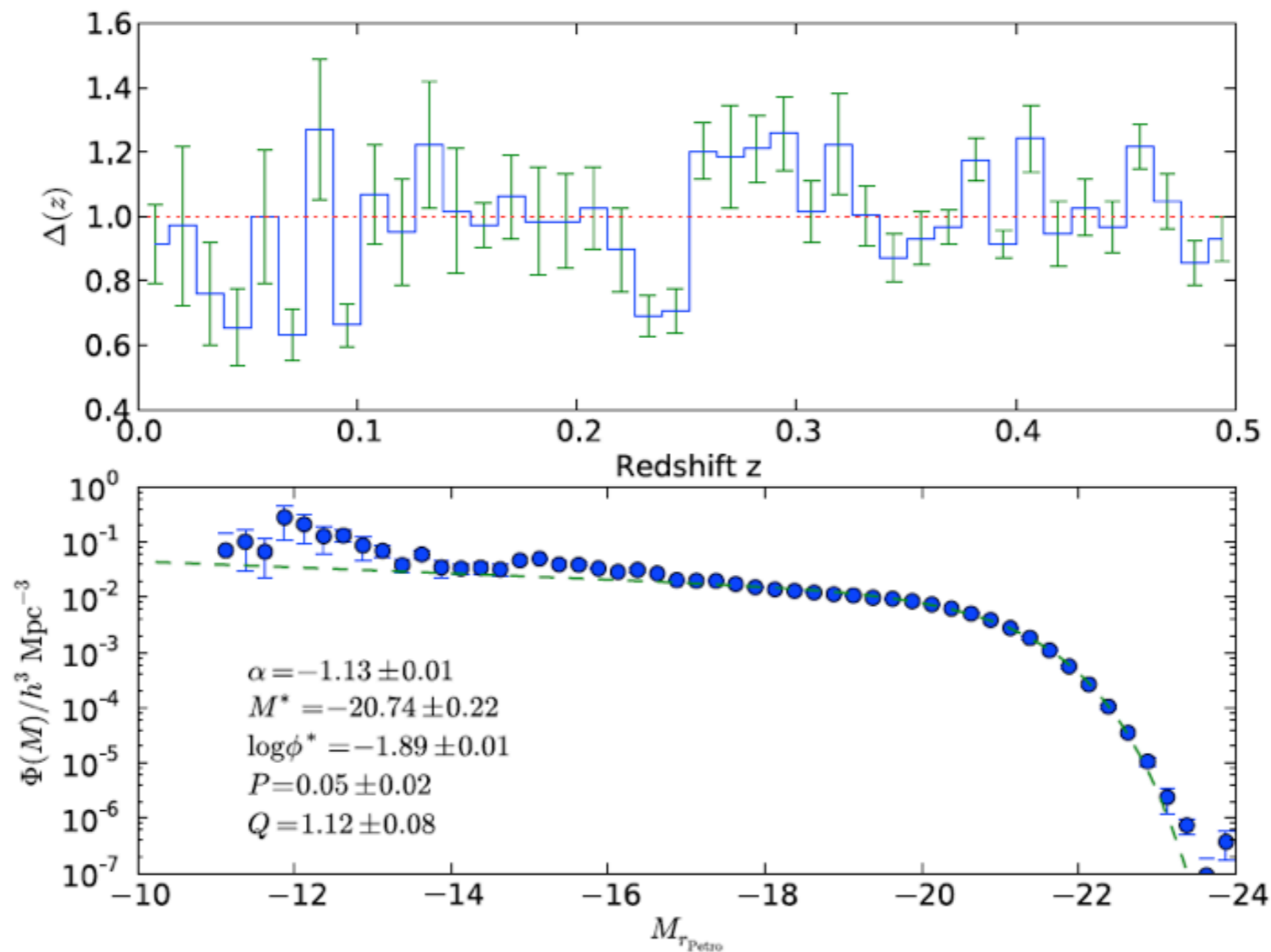


J. Whitbourn & T. Shanks

$n(z)$: 6DF-GALACTIC SOUTH



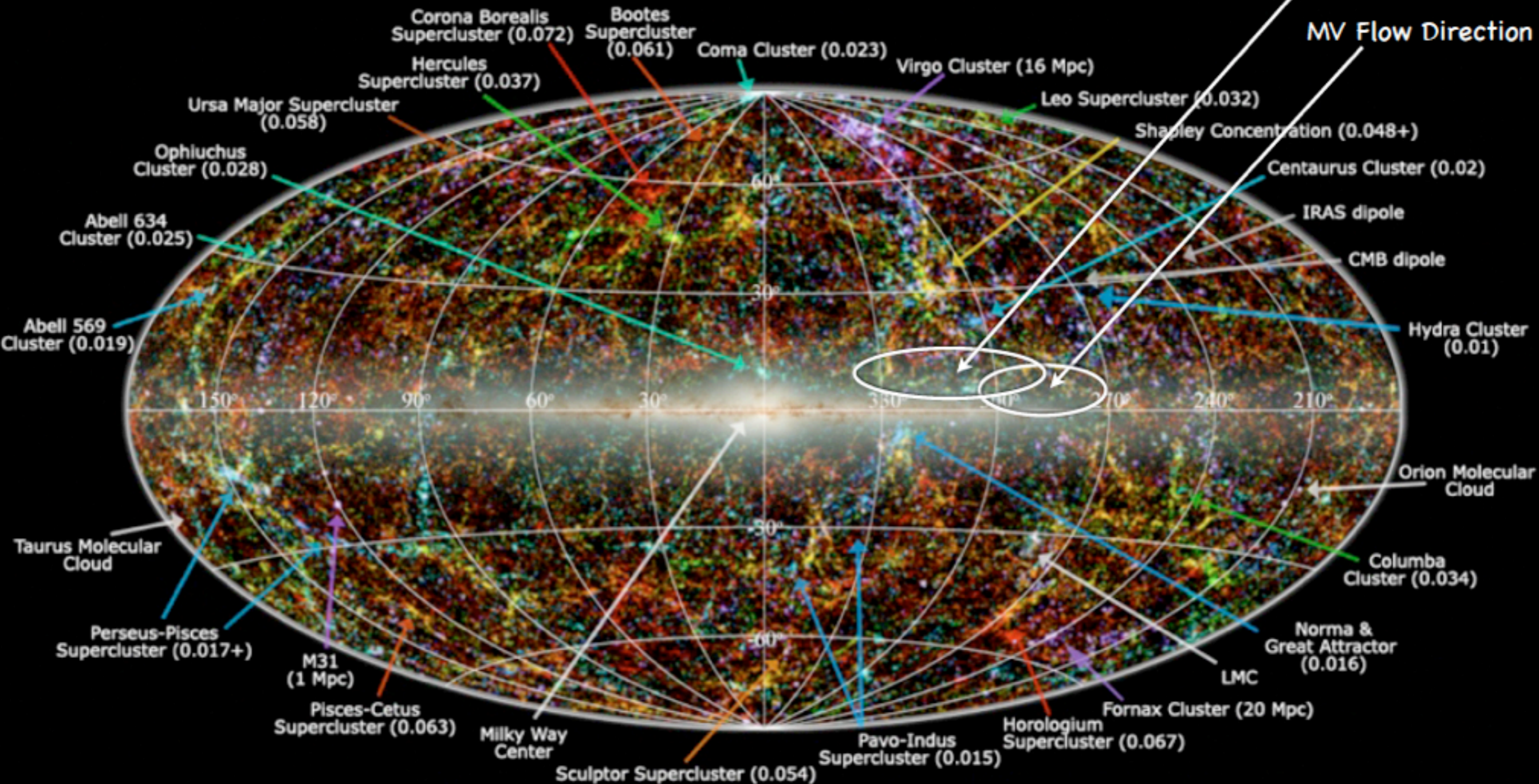
GAMA-II *r*-band LF



Large Scale Structure in the Local Universe

6dF Flow Direction

MV Flow Direction



Legend: image shows 2MASS galaxies color coded by redshift (Jarrett 2004); familiar galaxy clusters/superclusters are labeled (numbers in parenthesis represent redshift).
Graphic created by T. Jarrett (IPAC/Caltech)

Luminosity Density vs. Distance

