Differential Extinction Corrections: Implications for the Cosmic Star Formation History

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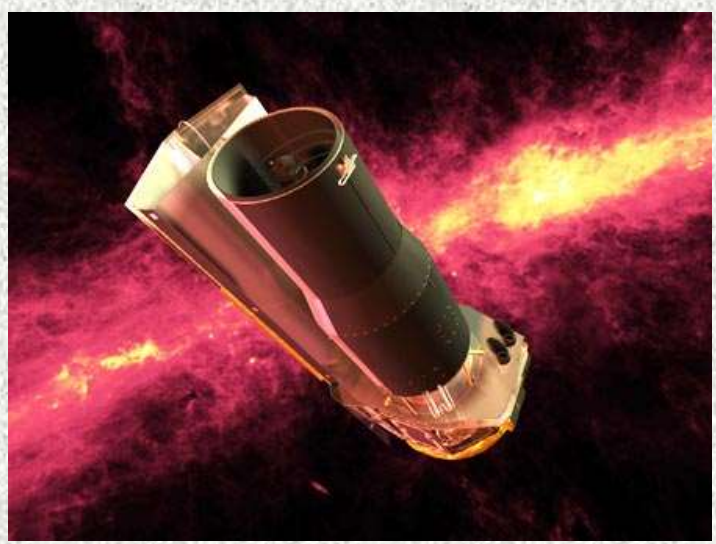
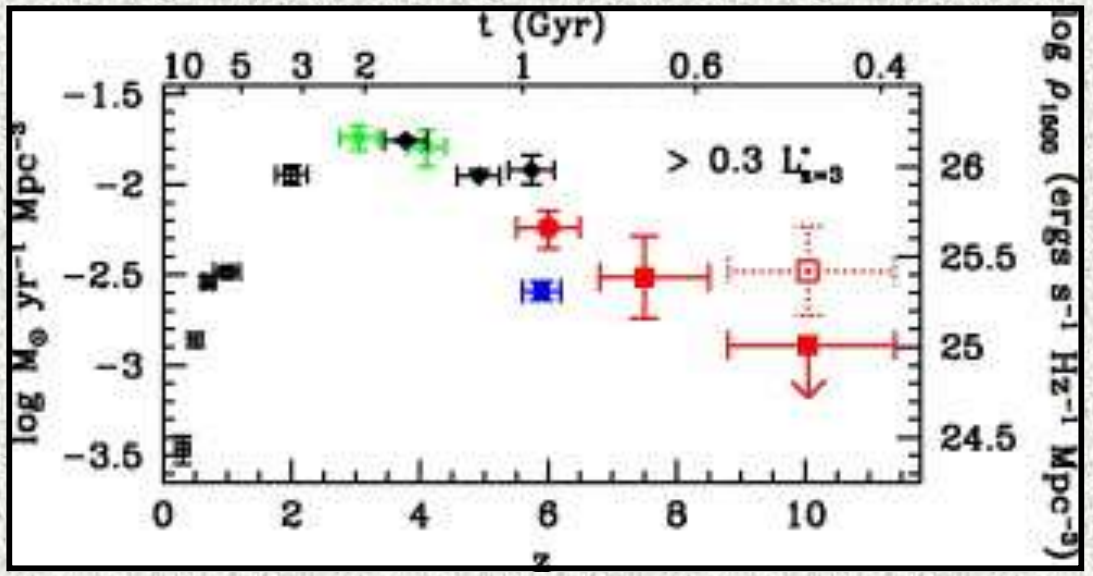
Massive Galaxies over Cosmic Time, Tucson, AZ, November 02, 2006



Background



Bouwens & Illingworth (2006)

Two ingredients for determining star formation and buildup of stellar mass in the universe:

(a) Census of Star-forming Galaxies

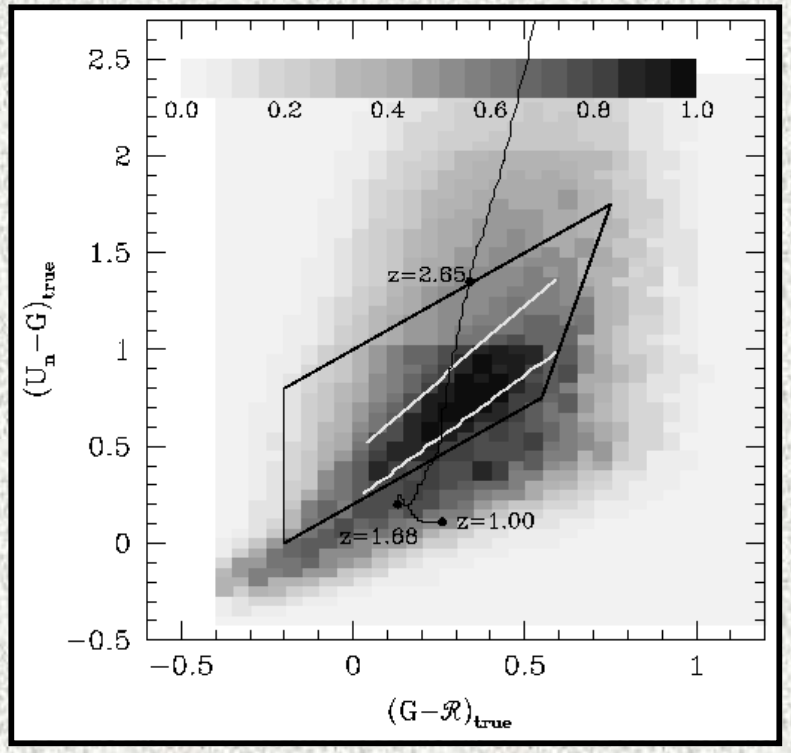
(b) Extinction Corrections

Maximum Likelihood Method

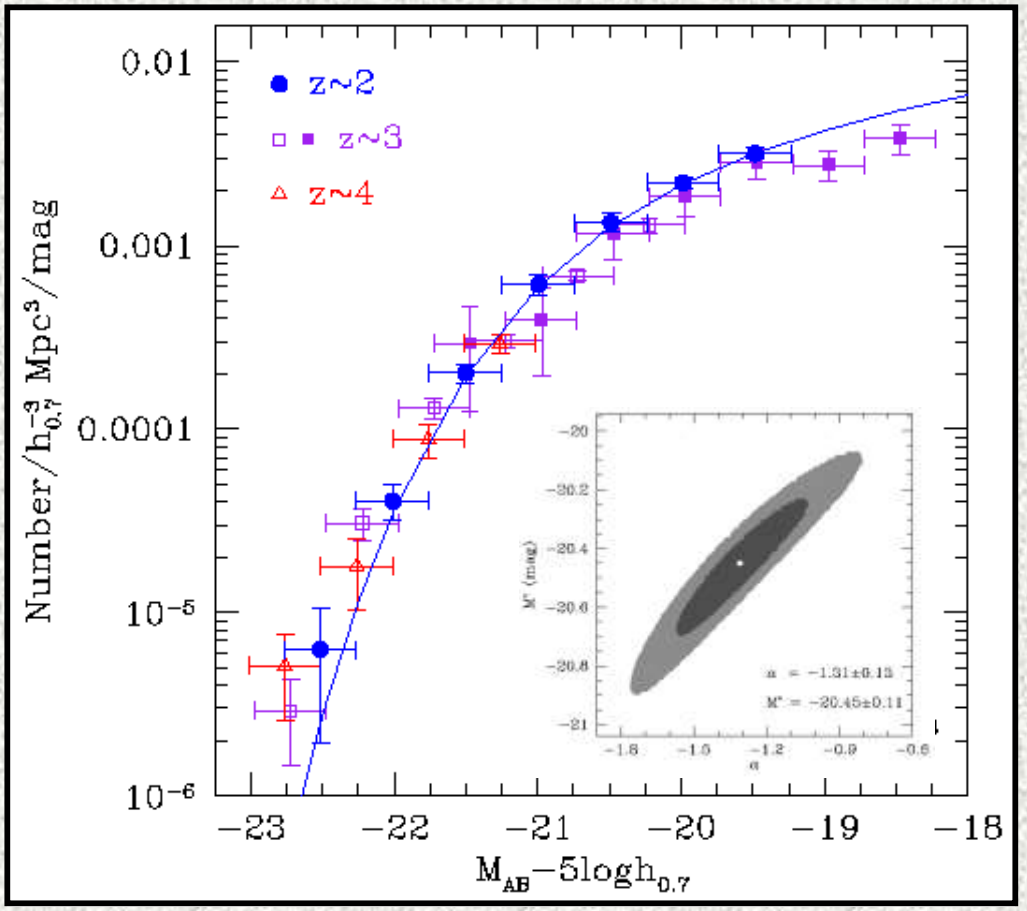
Systematic effects:

Photometric Scatter, Lyα perturbations

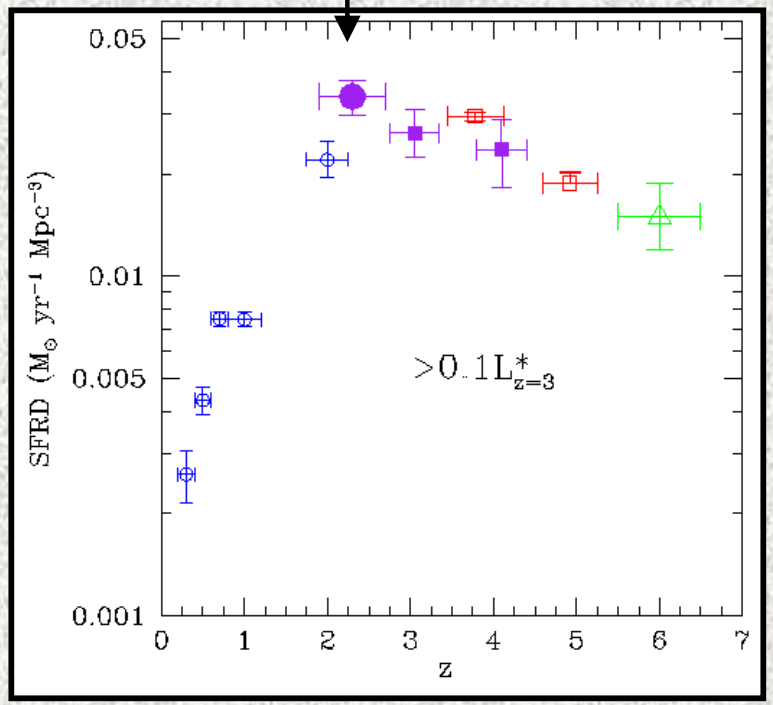
Constrain E(B-V) distribution to get LF



Rest-Frame UV Luminosity Function at z~2-4



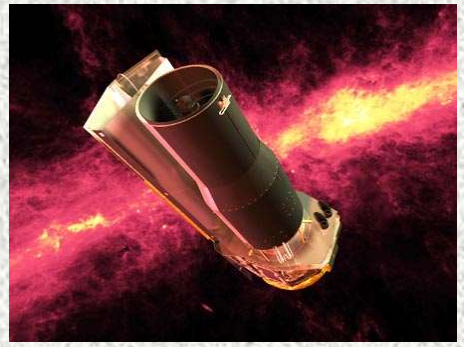
Z=2.2



Measuring Infrared Luminosities with *Spitzer*

Rest-frame UV spectroscopy → very accurate redshifts + photo-z's for near-IR selected galaxies

+

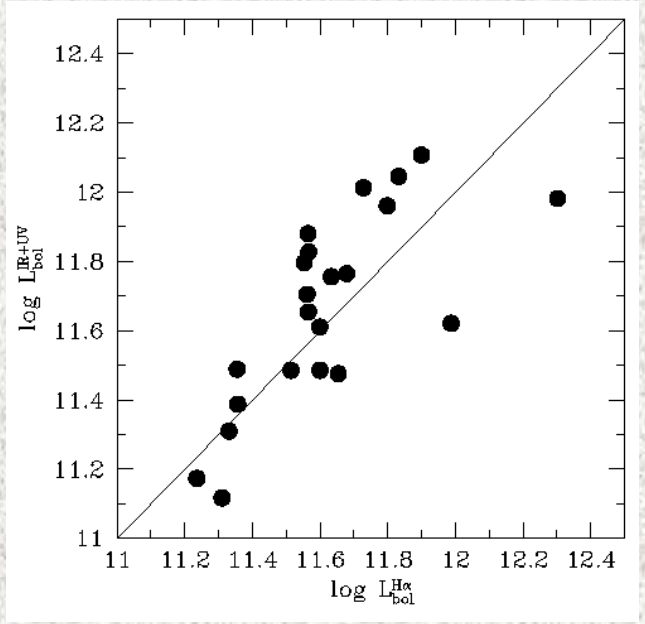


MIPS 24 micron fluxes → individual detections for L* galaxies at z~2

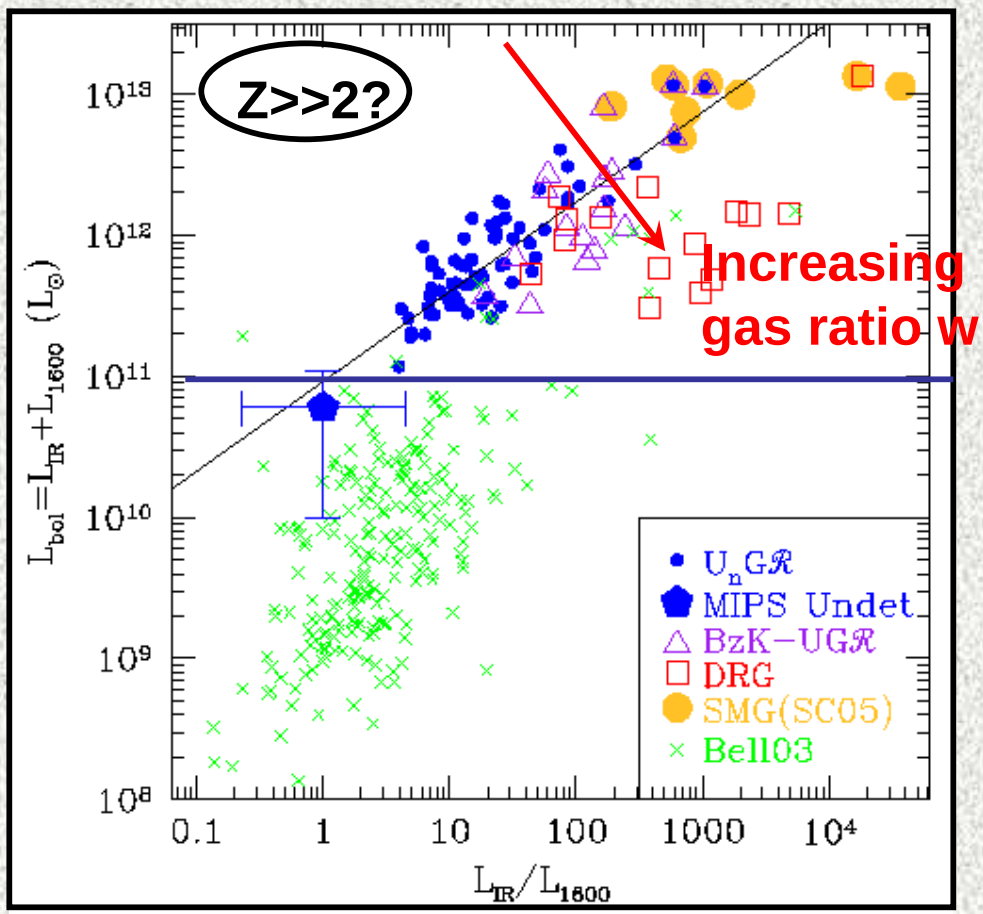
→

Accurately constrain infrared luminosities of redshift 1.5<z<2.6 galaxies

MIPS vs. Hα

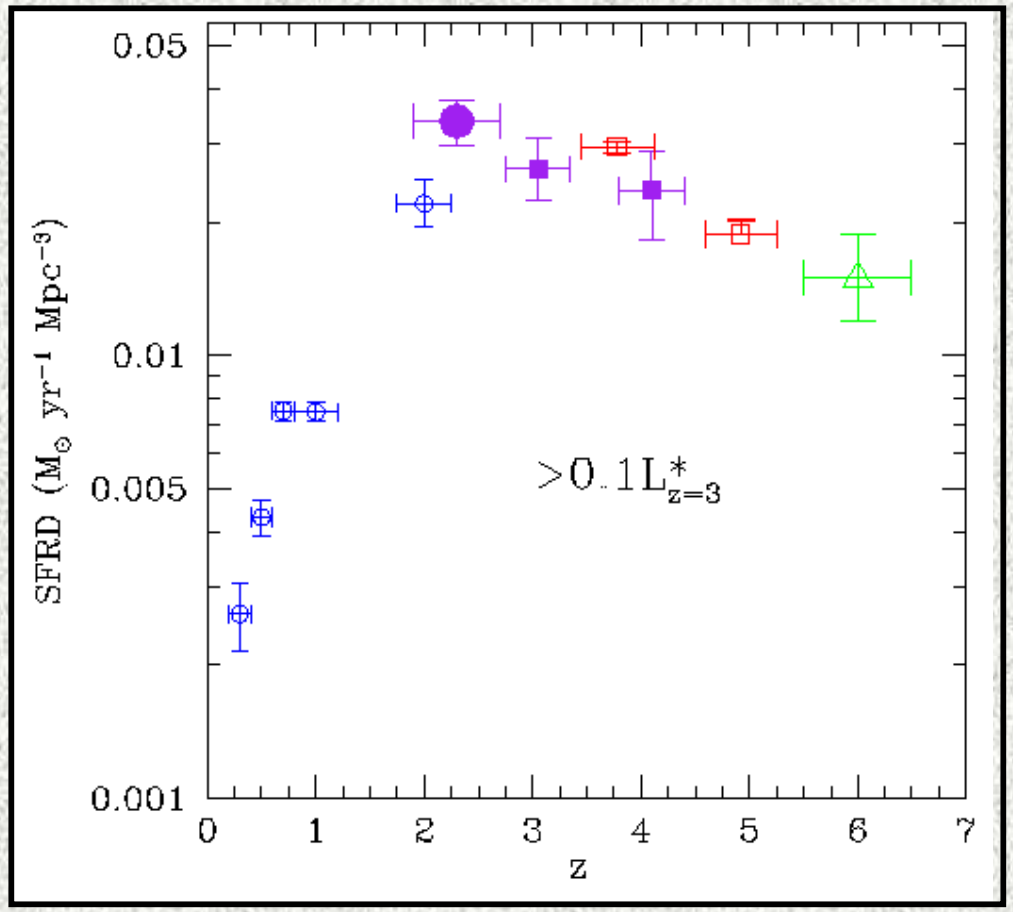


Relationship between Obscuration and L(bol)



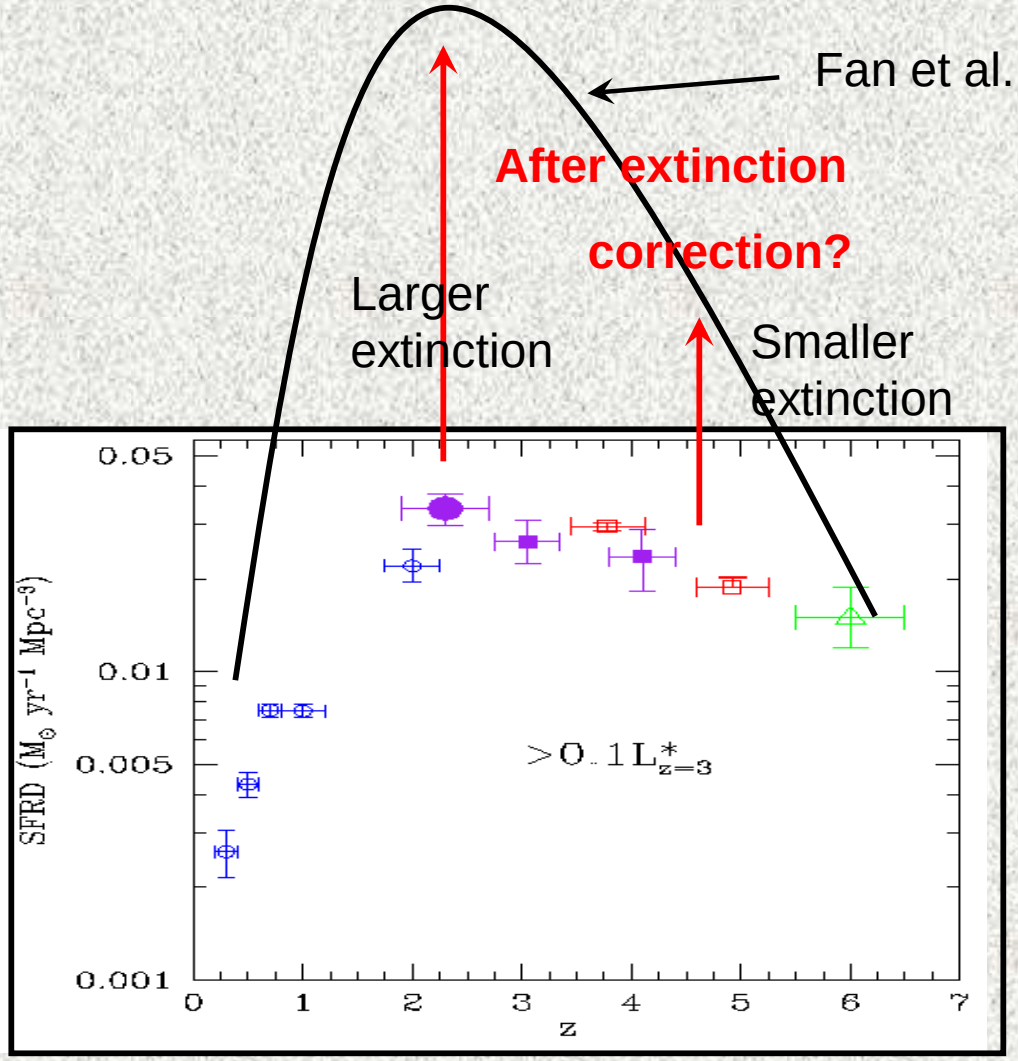
Implications…

Evolution in average dust attenuation →



Implications for the Cosmic SFRD…

Evolution in average dust attenuation →



Conclusions

- Local extinction laws apply to most high redshift galaxies (X-ray, radio, dust-corrected UV, MIPS); typical galaxies at z~2 are LIRGs

- Strong correlation between bolometric luminosity and dust obscuration, but z~2 galaxies are factor of ~10 less obscured that local galaxies of a given L(bol)

- Specific SFRs indicate wide range in evolutionary state of z~2 galaxies

- Differential attenuation as function of redshift has implications for slope of extinction-corrected Madau diagram at high z

$\Rightarrow$ ***Systematics important in constraining SFRD***

(a) Extinction correction as function of z to fixed value of L*(bol)

(b) Extinction correction at sub-L* luminosities

(c) SFRD to same rest-frame optical luminosity limit as stellar mass density studies