The growth of stellar mass

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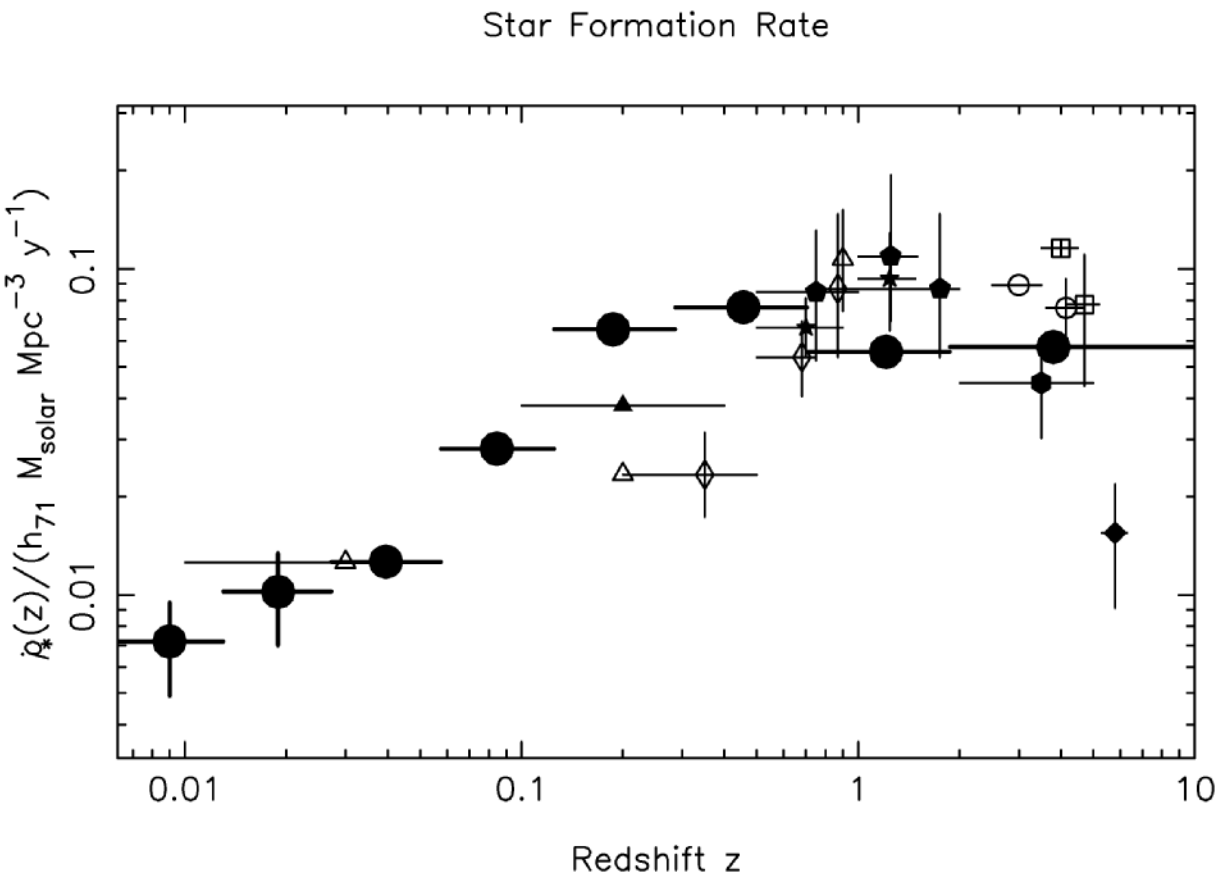
Cosmic star-formation history

can be measured in several different/complementary ways

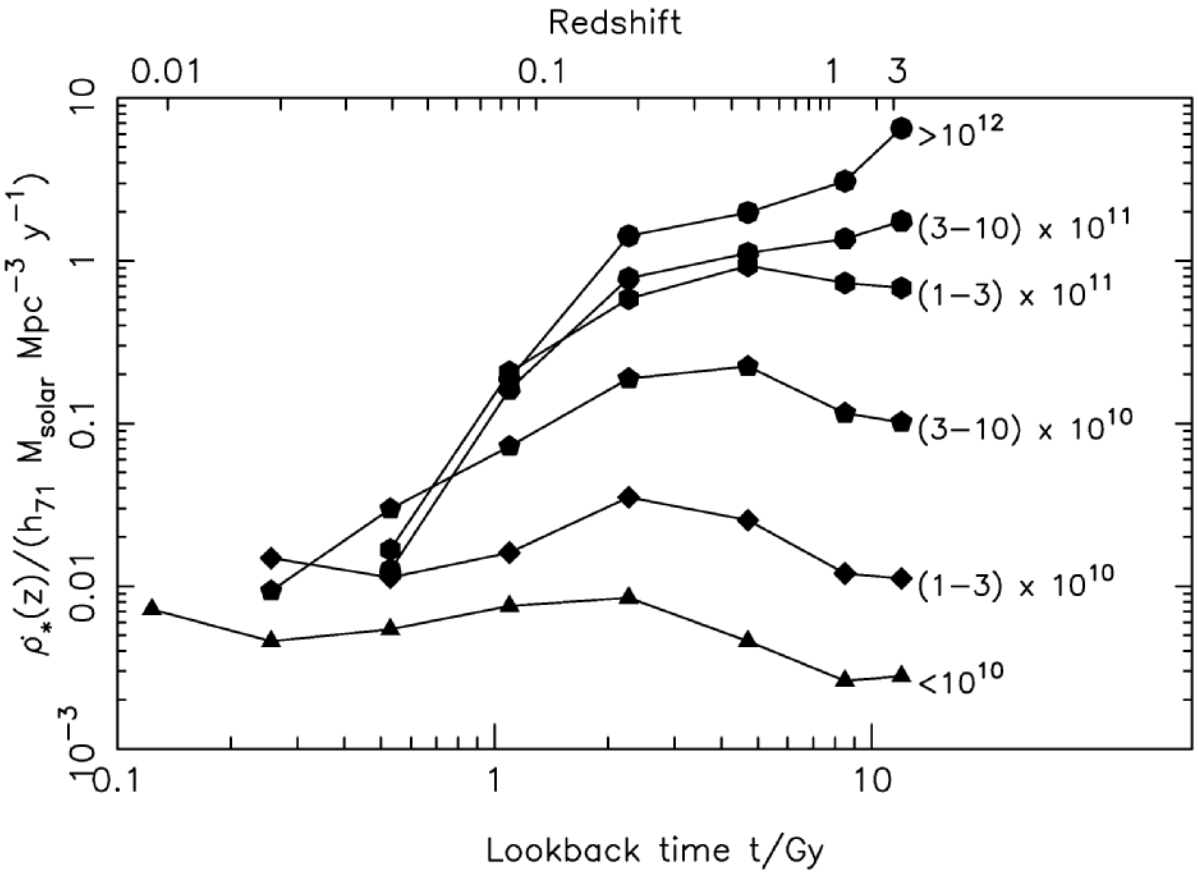
Delineating cosmic star-formation history

1) direct observation of star-formation activity with z



Delineating cosmic star-formation history

2) from the fossil record (e.g. Heavens et al. 2004)



Delineating cosmic star-formation history

3) by measuring stellar mass in place as a function of z

Needs

- deep near-mid infrared surveys

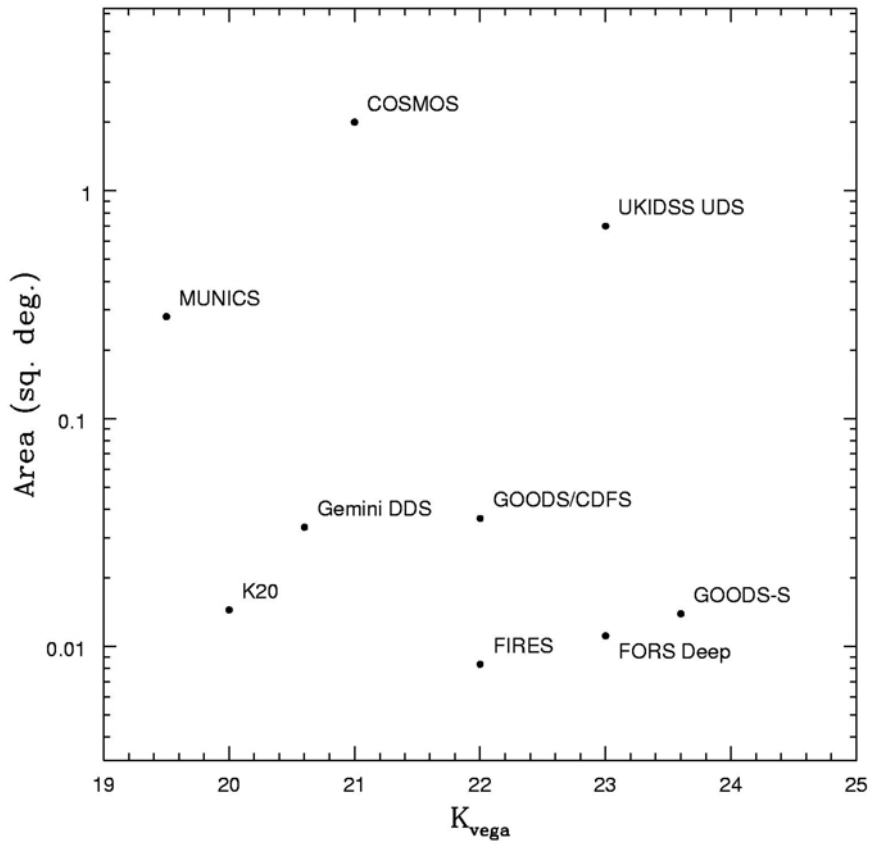
with

- multi-frequency supporting data

Deep IR surveys

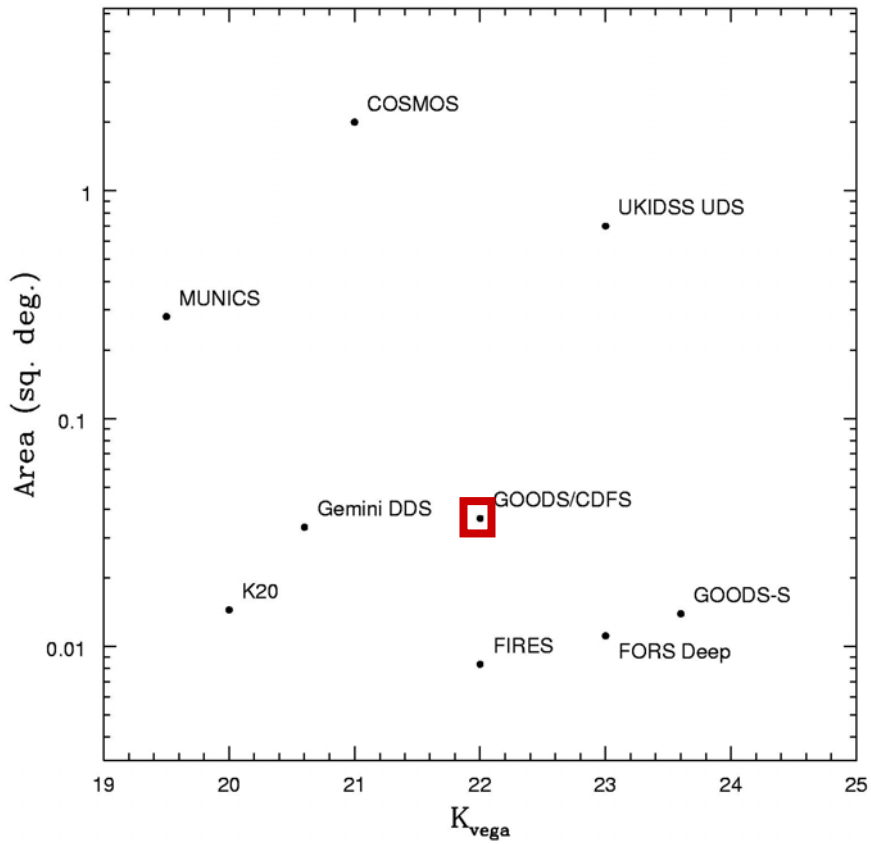
Obtaining redshift information for IR-selected galaxy samples is now a major industry

eg K20, FIRES, MUNICS, GDDS, K21, GMASS...



Edinburgh effort focussed on GOODS/CDFS

1) catalogues and clustering of EROs *(Roche et al. 2002, 2003)*
2) photometric redshifts, masses etc. *(Caputi et al. 2004, 2005)*
3) GMOS spectroscopy of EROs *(Roche et al. 2006)*



New results from Caputi et al. 2006

2905 galaxies with K < 21.5 from ISAAC VLT imaging of 131 arcmin²

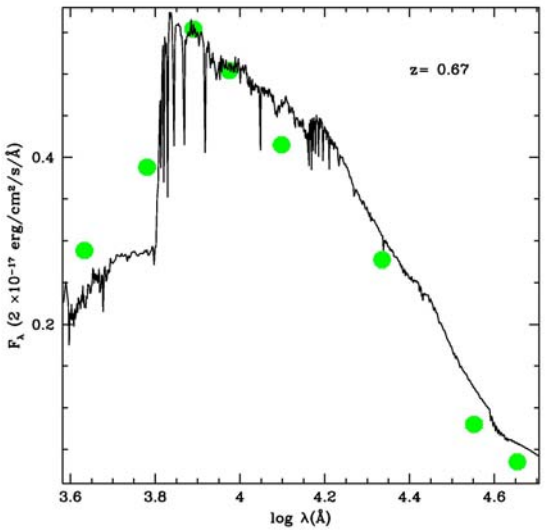
686 with spectroscopic redshifts
629 with COMBO 17 redshifts
1590 requiring broad-band photometric redshifts

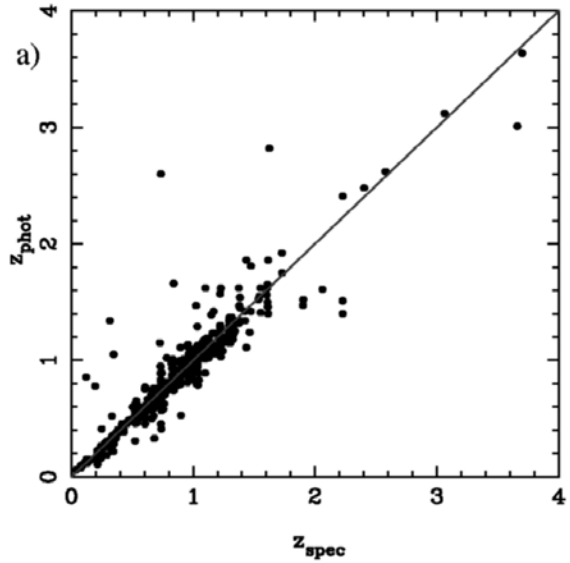
8 waveband photometry available

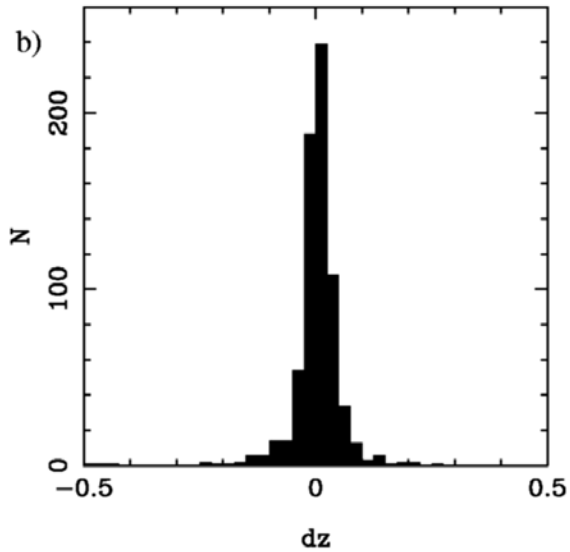
HST ACS	B,V,I,z
VLT ISAAC	J, K
Spitzer IRAC	3.6, 4.5 microns

Estimating redshifts

want masses as well as z – need to fit models

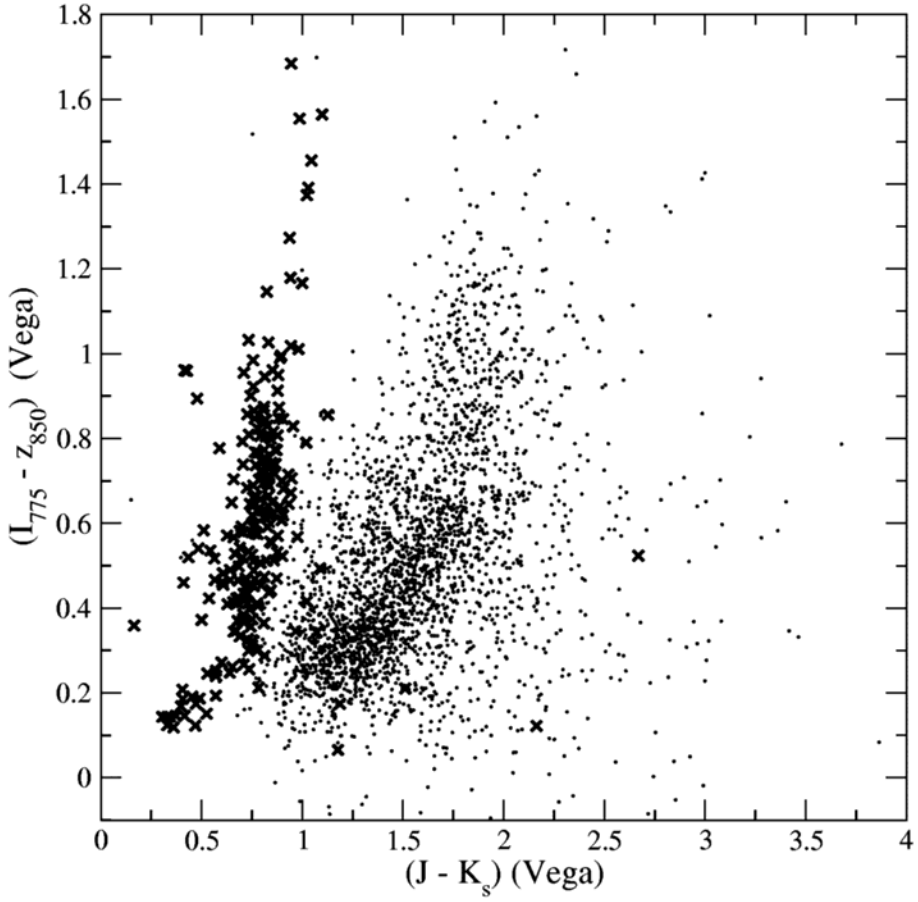




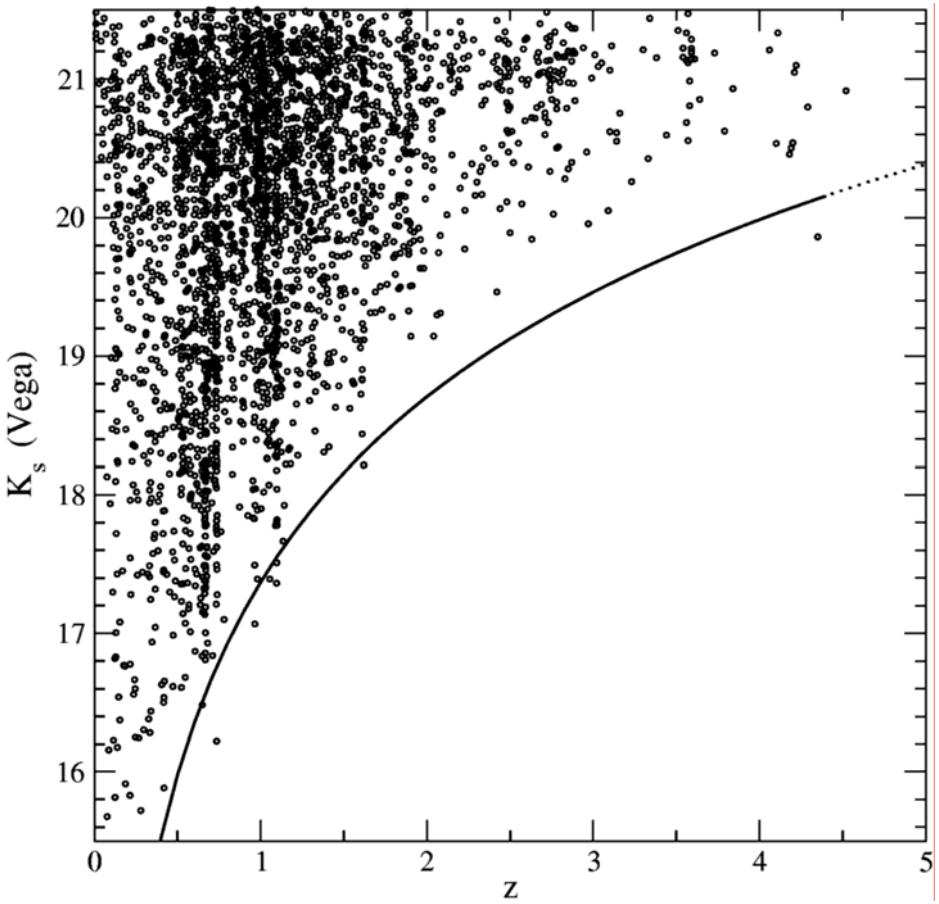


Star/Galaxy separation

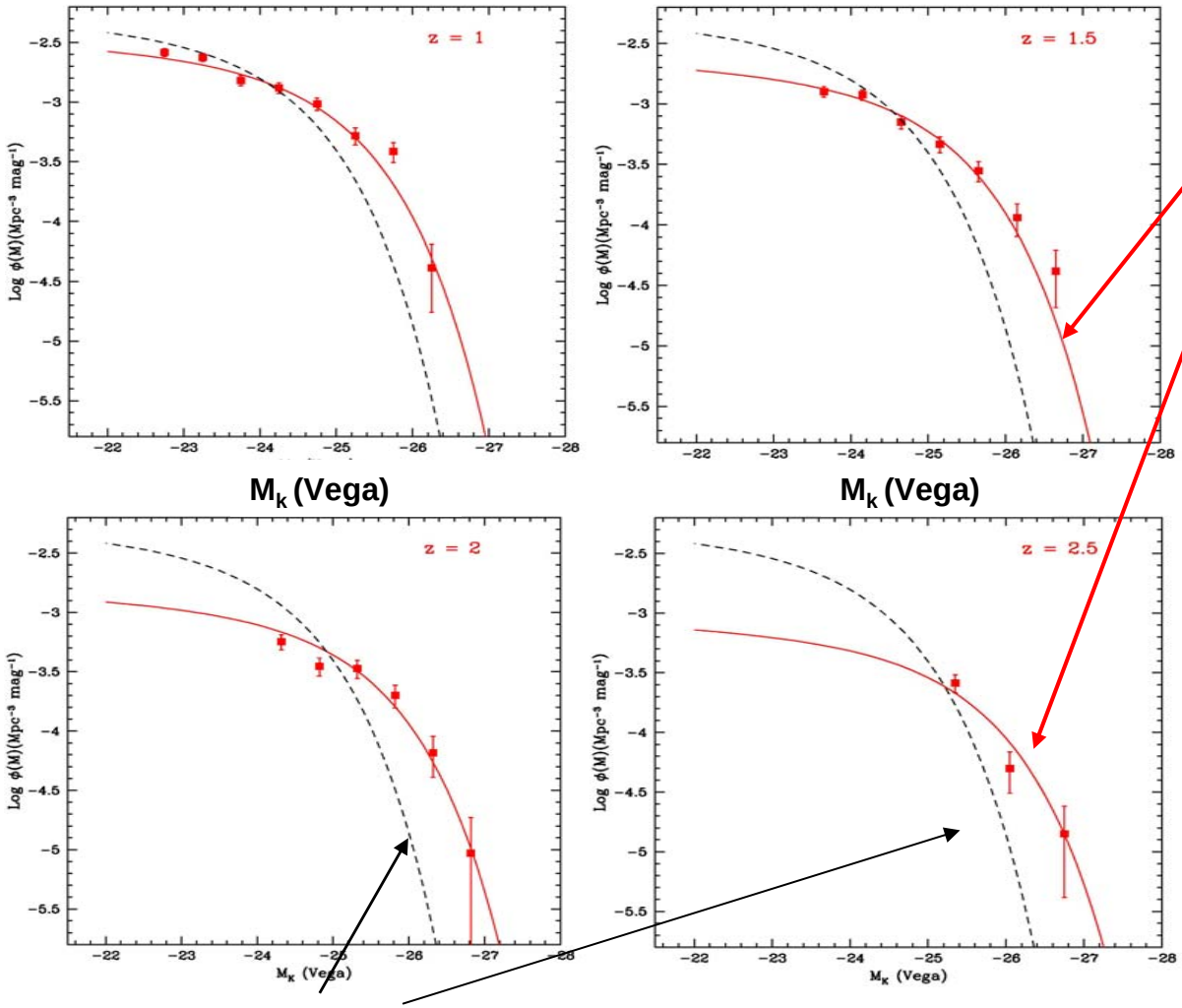
Crosses = stellarity > 0.8 from HST ACS z-band



K - z diagram



K-band Luminosity Function



Local K-band LF from 2MASS

Schechter function
with

Luminosity evolution

$$M^*(z) = M^*(0) - \left(\frac{z}{z_M}\right)^{k_M}$$

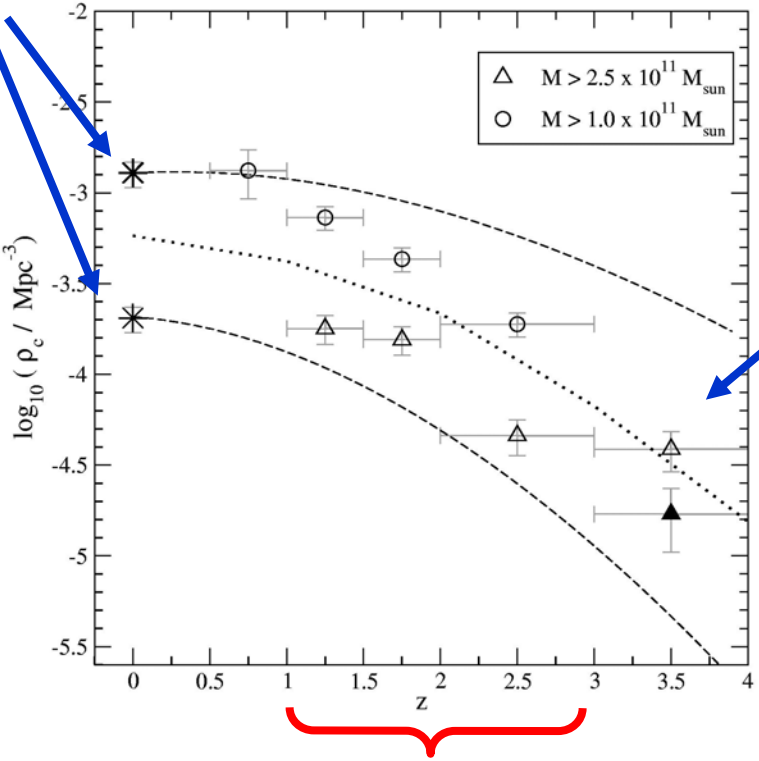
+

Density evolution

$$\phi_0(z) = \phi_0(0) \times \exp\left[-\left(\frac{z}{z_\phi}\right)^{k_\phi}\right]$$

Space density

Local space density

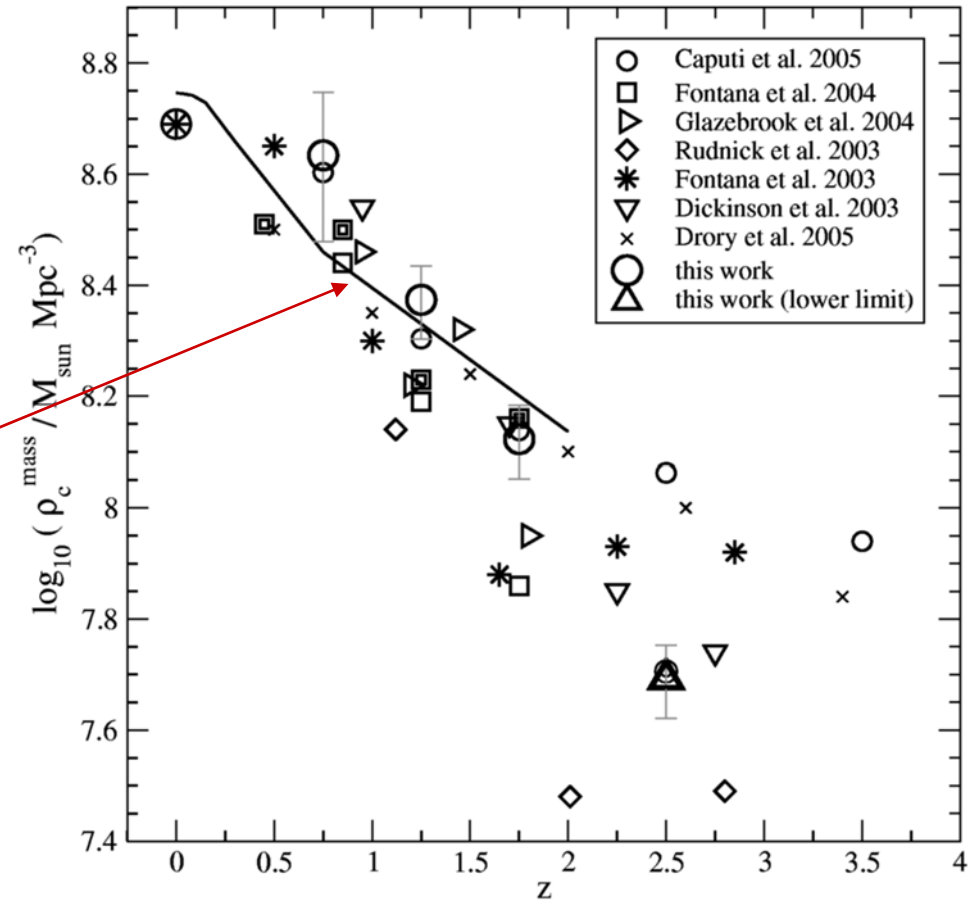


15 – 20 % of local massive galaxies in place before z=3

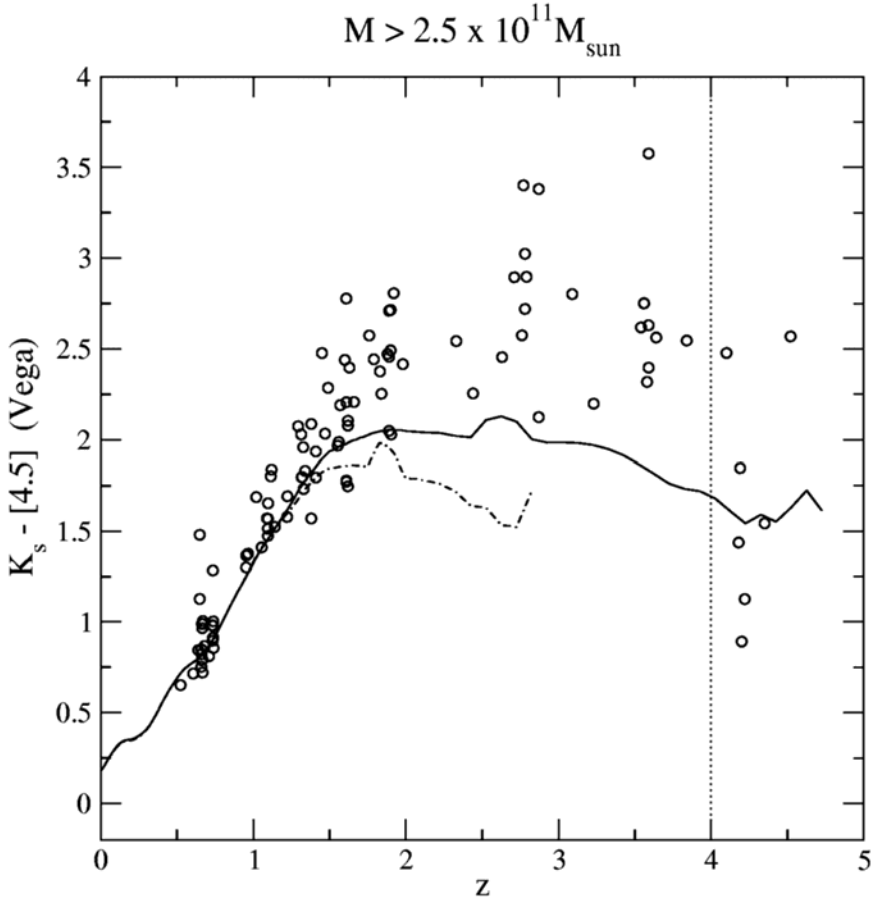
The assembling of 90% of massive galaxies occurs in the range 1 < z < 3

The growth of stellar mass

Inferred from Heavens et al. 2004



Very massive galaxies form early



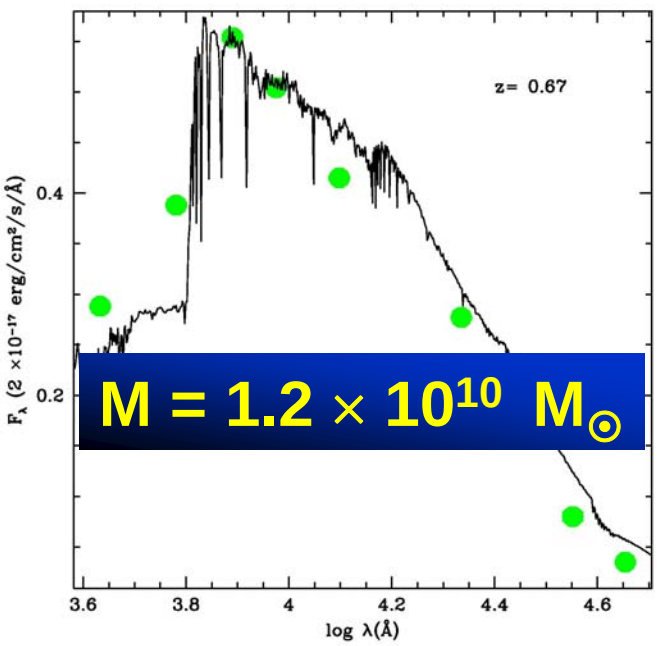
Coming soon……

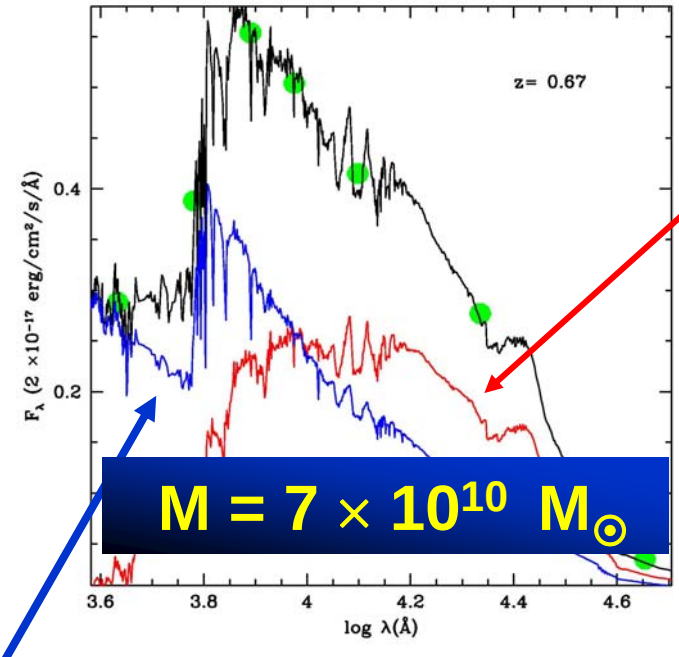
- Improved redshifts and mass estimates (Cirasuolo et al. 2006)
- Morphologies as function of z, mass, age (McLure et al. 2006)
- Comparison with semi-analytic models (Dunlop et al. 2006)

Refining mass estimation

Implementing a code for photometric redshift/mass estimation with a 2-components SED fit

Age = 0.1 Gyr A_V = 1.6

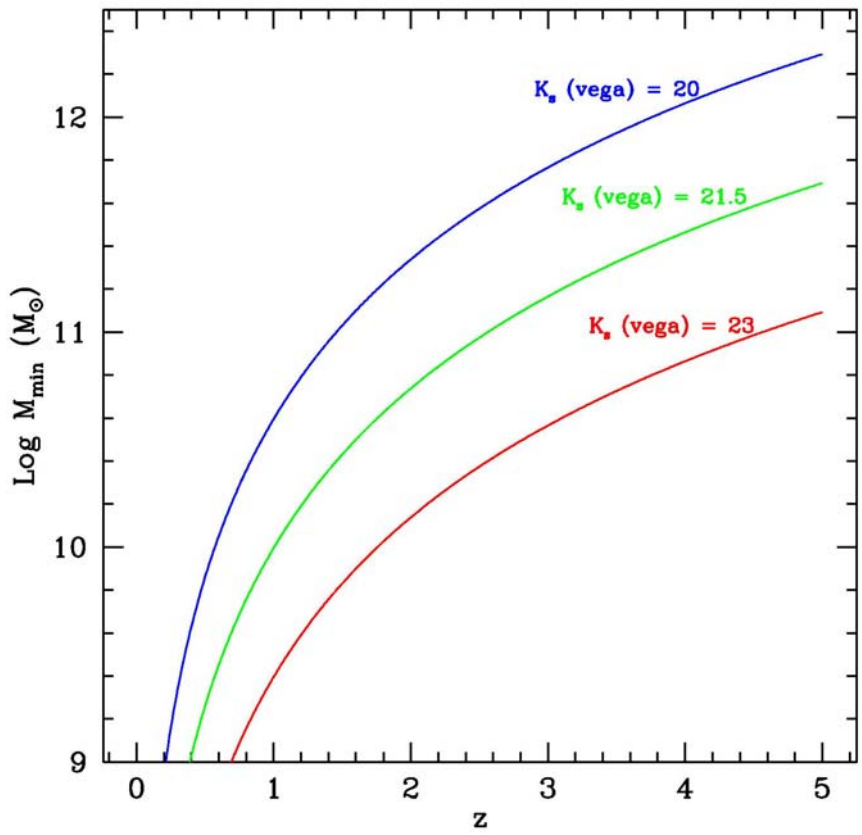




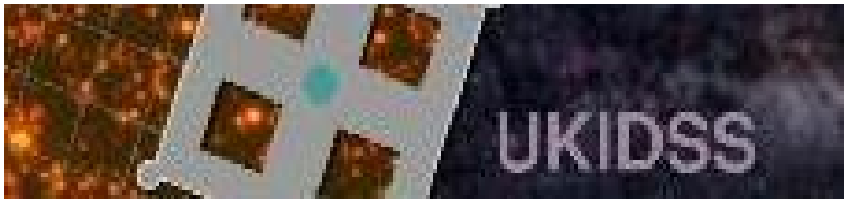
Age = 7Gyr

Age = 1Gyr with ~ 10% of the mass

The power of deeper/bigger surveys



UKIDSS UDS



UKIRT Infra-red Deep Sky Survey

Ultra Deep Survey (UDS)

K_{vega} = 23

Area 0.7 sq. deg.