Stellar masses, ages, $A_V$ can (in principle) be determined from stellar population models using the combined HST and Spitzer/IRAC photometric information.

A typical galaxy at $z \sim 7$ has $[3.6]_{mag} \gtrsim 25$.

Recent WFC3/IR data over the GOODS-S provide much improved constraints in the UV.
Selection of $z \sim 4$, 5, and 6 sources over the ERS field

- Improved WFC/IR
- 23 hr of Spitzer/IRAC
- Stellar Mass determinations for:
  - $\sim 300$ $z \sim 4$
  - $\sim 100$ $z \sim 5$
  - $\sim 30$ $z \sim 6$
- BC03
- Metallicity: $0.2 \, Z_\odot$
- SFH: constant SFR
- Salpeter IMF (0.1-100 $M_\odot$)
- Models do not include emission lines.
The Stellar Mass – UV Luminosity Relation

Gonzalez et al. in prep.

-1.7 slope

Stark et al. 2009 find a shallower slope of -1.2

Gonzalez et al. in prep.

-1.7 slope
The evidence does not suggest strong evolution of the relation from $z \sim 6$ to $z \sim 4$. 

\[ \log_{10}(SFR_{\text{uncorr}} \ [M_\odot \text{yr}^{-1}]) \]

\[ \log_{10}(\frac{M}{M_\odot}) = -39.6 + 1.7 \times \log_{10}(\frac{L_{\text{1500}}}{\text{erg s}^{-1} \text{ Hz}^{-1}}) \]

Gonzalez et al. in prep.
And at Higher redshifts?

This relation is very similar to what has been observed at z~7

Only 2 sources have been detected in IRAC at z~8

Labbé/González et al. 2010b
At a given Luminosity or Mass
The specific SFR remains constant in time.

González et al. 2009
Photometric scatter could only account for 0.14 (0.34) dex at $M_{1500} = -20 (-19)$
The Stellar Mass Functions at $z \gtrsim 4$

- Completeness corrected low mass slopes: $\alpha_{MF} \sim -1.4 - -1.55$
- Luminosity Function slopes: $\alpha_{LF} \sim -1.7 - -1.9$
- Choi & Nagamine 2010 simulations: $\alpha_{MF} < -2.0$

Gonzalez et al. in prep.
The Stellar Mass Growth since z~8
(for galaxies brighter than $M_{\text{UV}}=-18$)

Gonzalez et al. in prep. + Marchesini et al. 2009
Track the evolution of the same population from $z \sim 7$ to $z \sim 4$ and compare the predicted mass growth from the SFR density and the Stellar Mass growth determined from SED fits.

Follow the population to a relative limit of $0.2L^*$
Stellar Mass Growth from the MFs

vs.

Integral of the SFR density from the LFs
Summary

• Stellar Masses provide very important information to understand the way galaxies built up at early epochs.

• The existence and apparent constancy of a Stellar Mass - L_{UV} relation suggests that galaxies used to grow up in a similar way.

• The M-L_{UV} relation has a sizable intrinsic scatter.

• The slope of the relation suggests fairly steep MFs.

• The Stellar Mass Density derived from the MFs roughly agrees with expectations based on the estimated SFR of approximately the same population. Important differences remain.