

# High Redshift Galaxy Evolution from the Infrared and Optical HST Observations in the Ultra Deep Field

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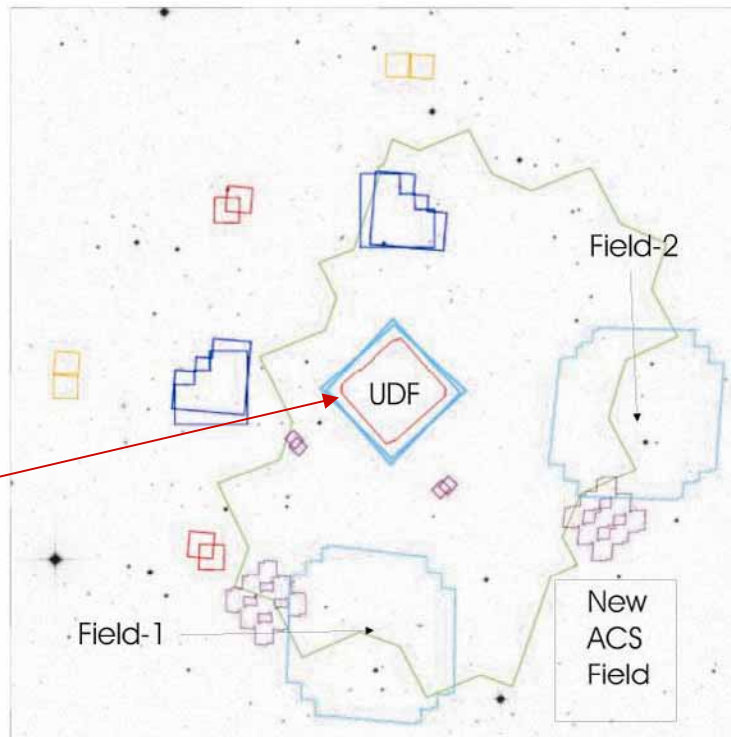
# Collaborators

- ◆ Garth Illingworth
- ◆ Rychard Bouwens
- ◆ Daniel Eisenstein
- ◆ Xiaohui Fan
- ◆ Mark Dickinson
- ◆ Marijin Franx
- ◆ Pieter VanDokkum
- ◆ Adam Riess

# Location of the UDF

NICMOS Image  
Outlined in Red.

The ACS Image  
is the blue outline.



# The Ultra Deep Field

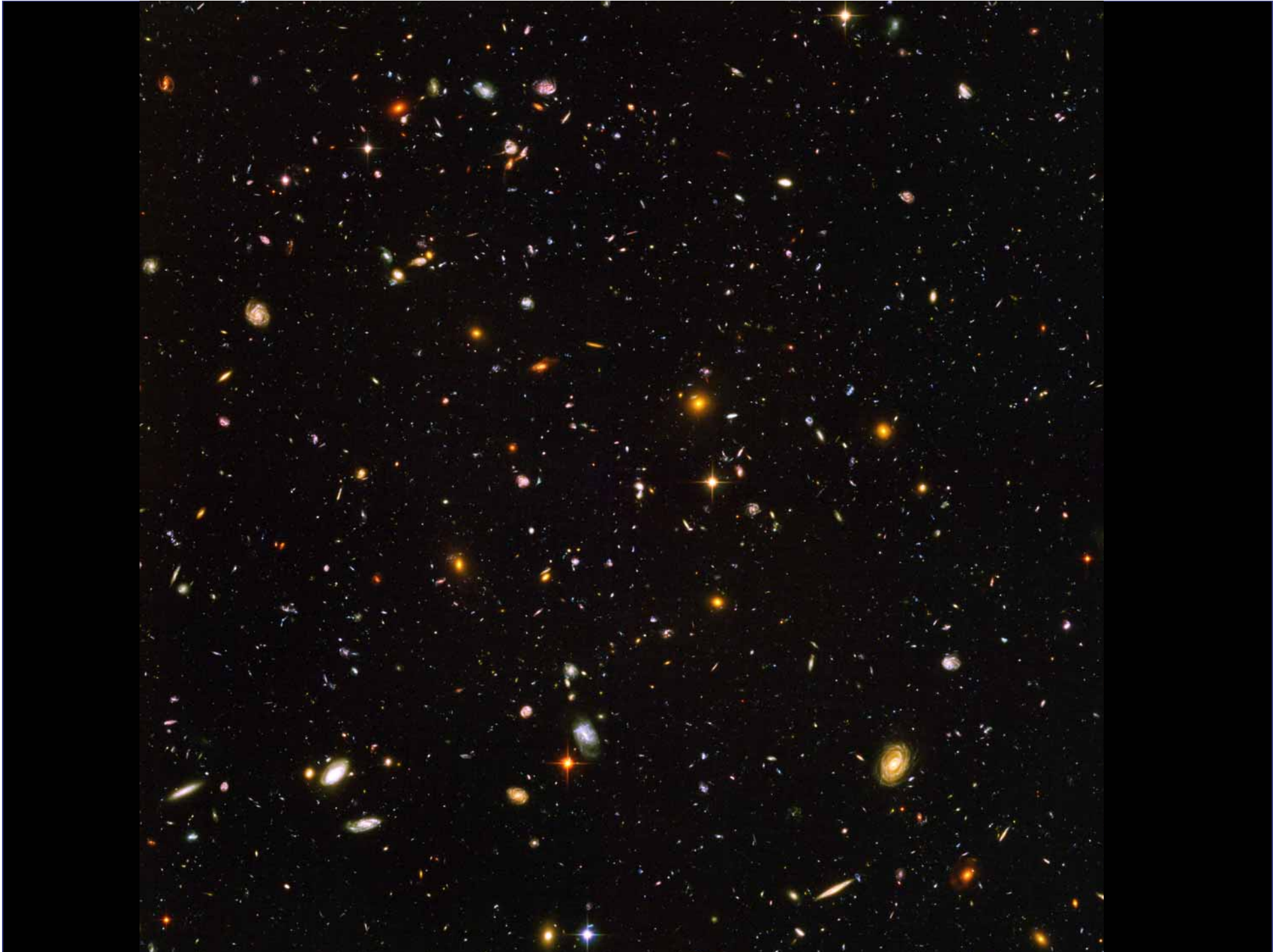
## ◆ ACS Images

- F435W, F606W, F775W, F850LP
- 400 Orbits
- $5\sigma$  AB Mag. 30-31

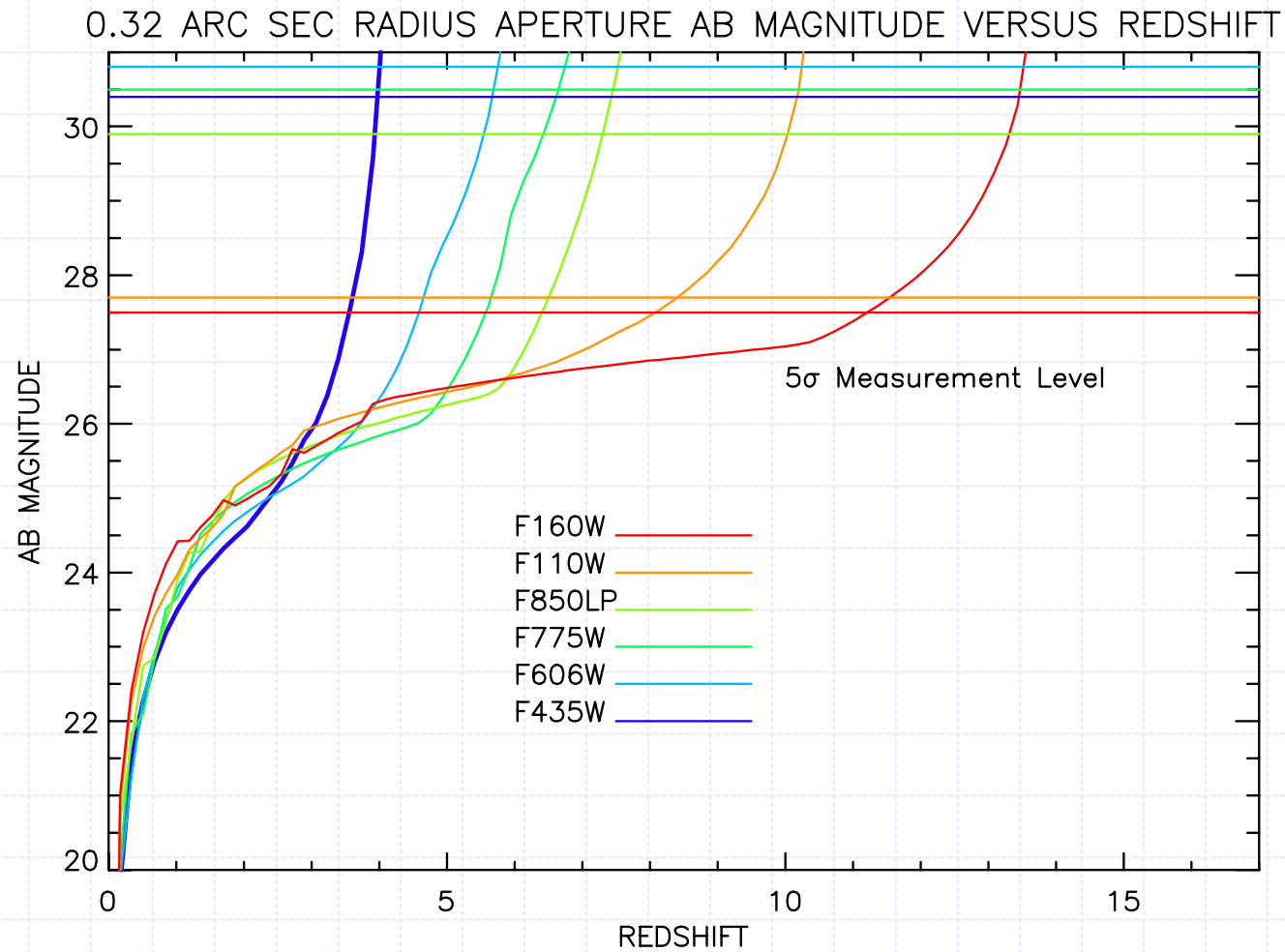
## ◆ NICMOS Images

- F110W, F160W
- 144 Orbits
- $5\sigma$  AB Mag. 29.0

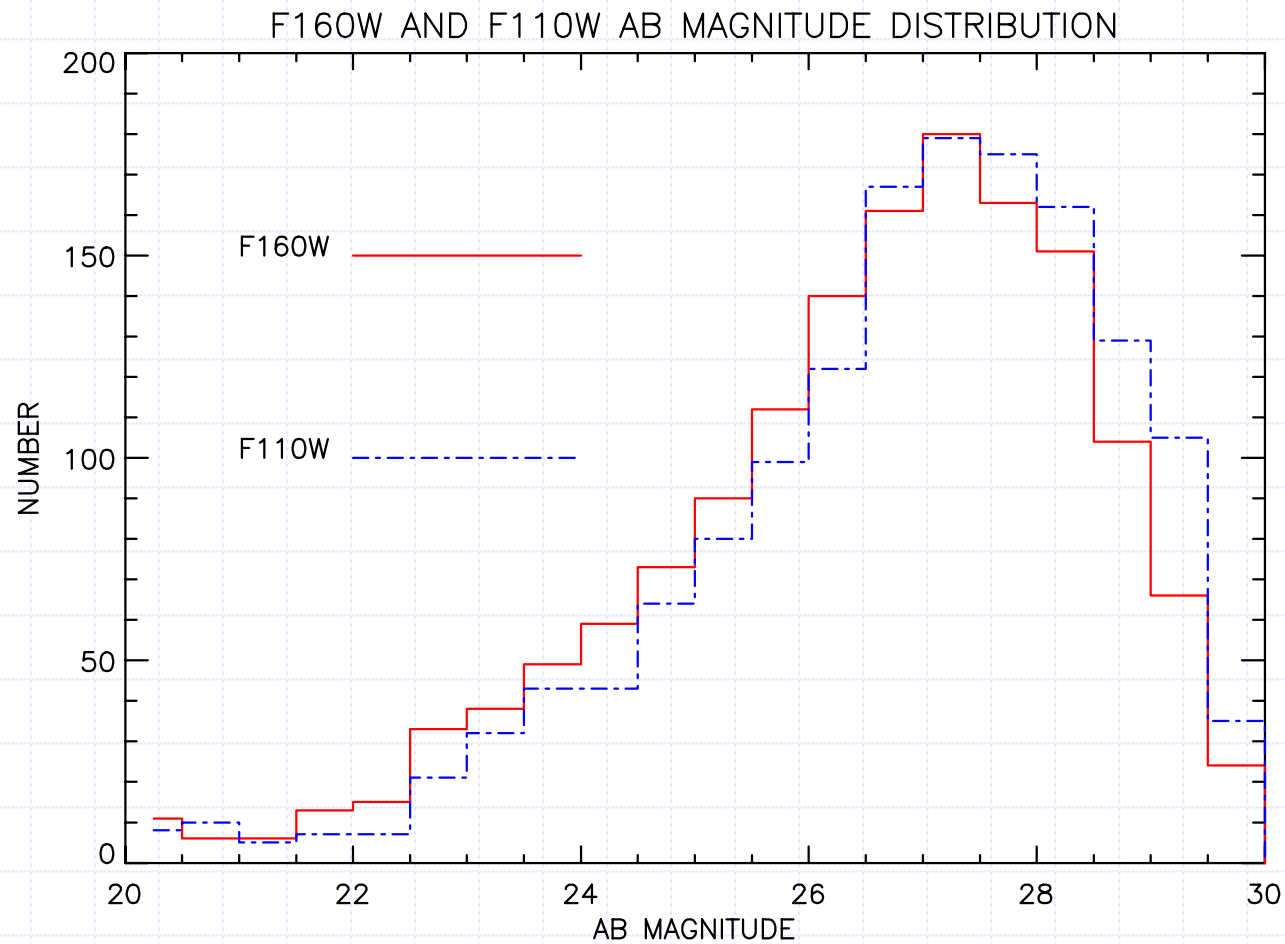




# Sensitivity to Young L\* Galaxies



# F110W and F160W Magnitude Distribution





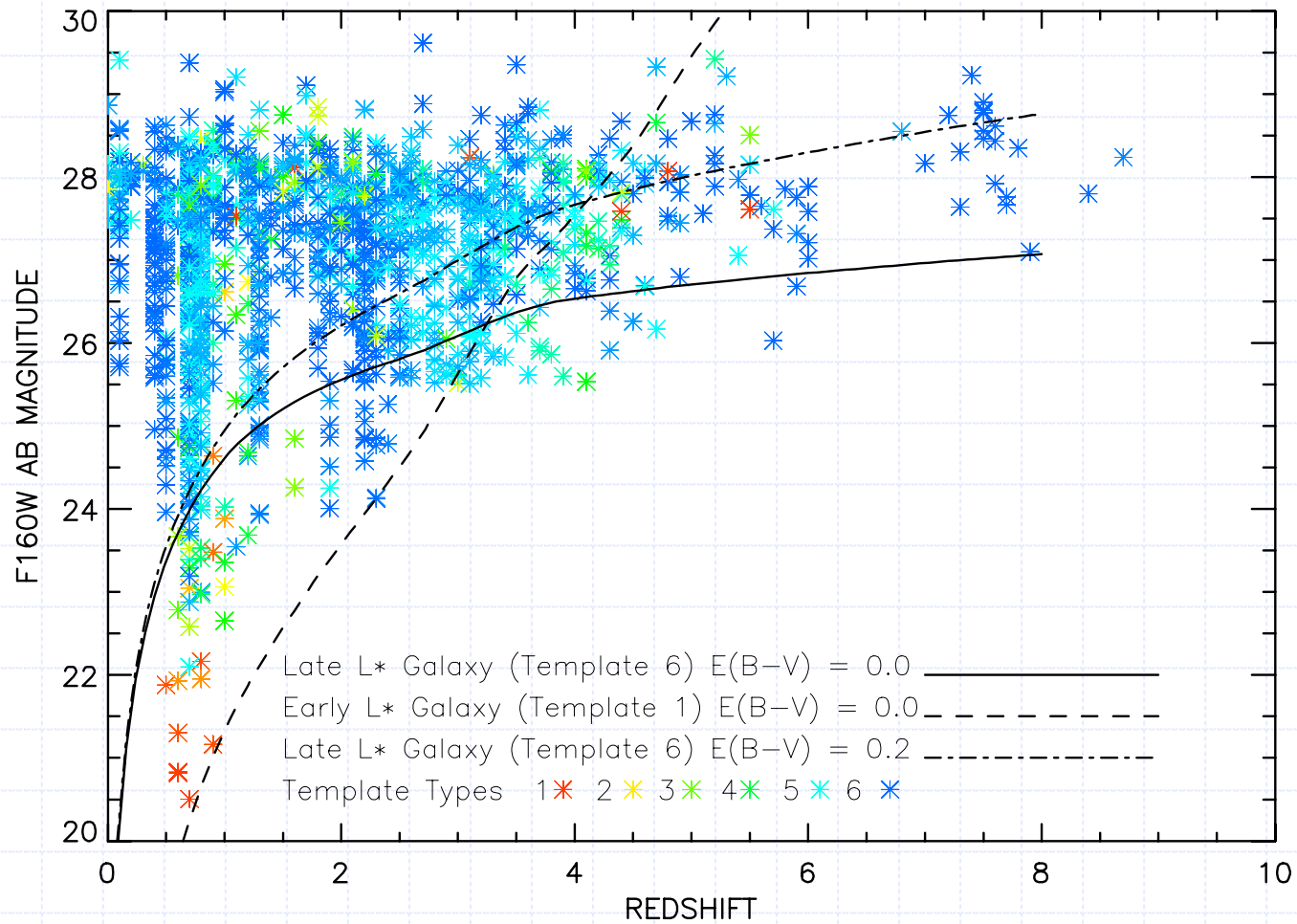
# Nature of the Galaxies

- ◆ 1518 Galaxies detected from a sum of the F110W and F160W images
- ◆ About a factor of 7 more galaxies detected in the infrared.
- ◆ Typical galaxy not detected in the infrared is a small faint blue galaxy.

# Data Analysis is Preliminary

- ◆ The UDF optical data were only released on March 9, almost a month after the original schedule
- ◆ The following analysis is in progress
- ◆ The questions are legitimate at this time but results are probably not

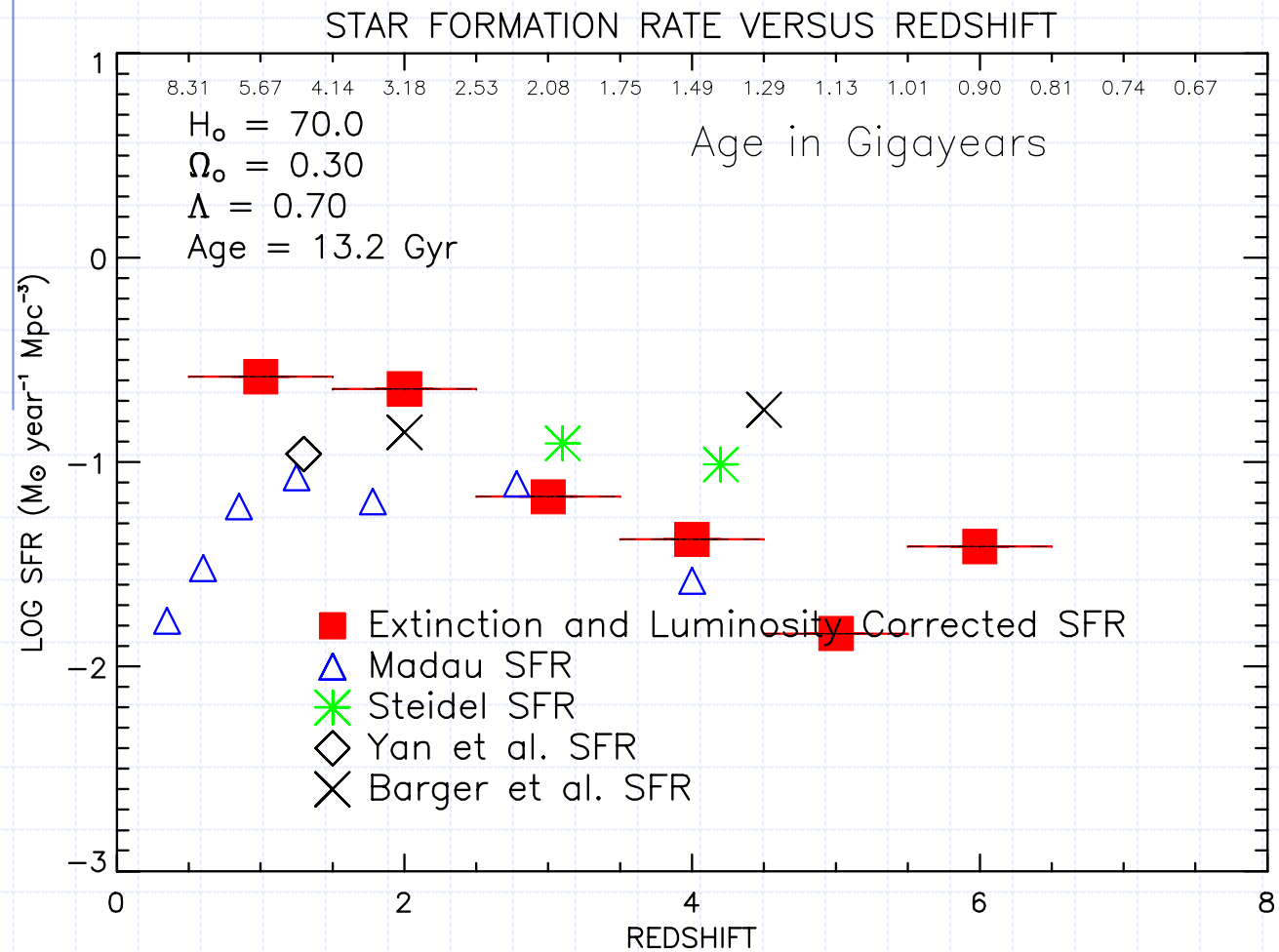
# H AB Magnitude Redshift Distribution



# Magnitude-Redshift Conclusions

- ◆ General trend is consistent with expectations.
- ◆ Some early galaxies indicated at high  $z$
- ◆ Photometric redshifts depend on an accurate ACS to NICMOS photometric calibration which is still in progress
- ◆ Final calibration may alter the results

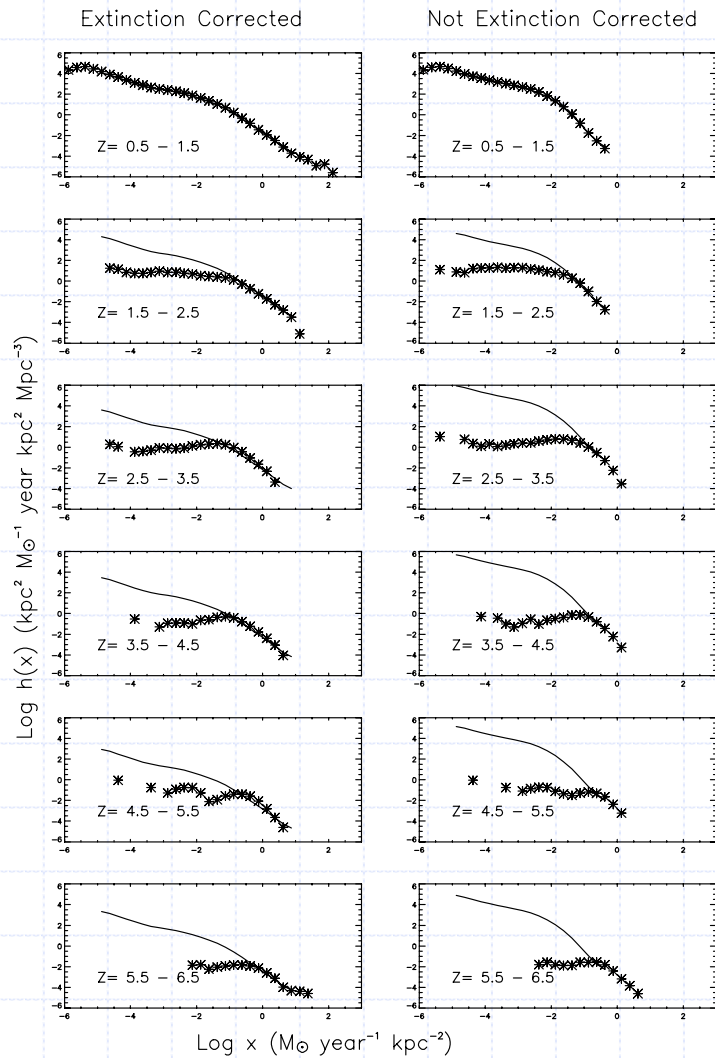
# Star Formation Rates



# Star Formation Rates

- ◆ Considerably different from NHDF which shows a constant star formation rate from  $z = 1$  to 6 which is consistent with the Steidel and Barger rates.
- ◆ Can not have a significant decrease in the UV luminosity (SFR) and be consistent with reionization.
- ◆ Analysis is too preliminary for any conclusions at this time.

# Star Formation Intensity Distribution Function $h(x)$



$$SFR = \int xh(x)dx$$

# Distribution Function

- ◆ The distribution function is consistent with previous determinations in the NHDF
- ◆ The uncorrected for extinction distribution function gives an erroneously climbing SFR with redshift.



# Conclusions

- ◆ The UDF is a rich data source for cosmological and galaxy evolution studies.
- ◆ The results shown here are in progress and subject to change
- ◆ We expect the UDF to put new constraints on the objects that reionized the universe.

# Current and Future Work

- ◆ Complete paper describing the details of the NICMOS Treasury Products catalog.
- ◆ Compare dropouts with predictions
  - Independent of photometric redshifts
- ◆ Catalog of photometric redshifts, extinctions and SEDs
- ◆ Star formation History in the UDF