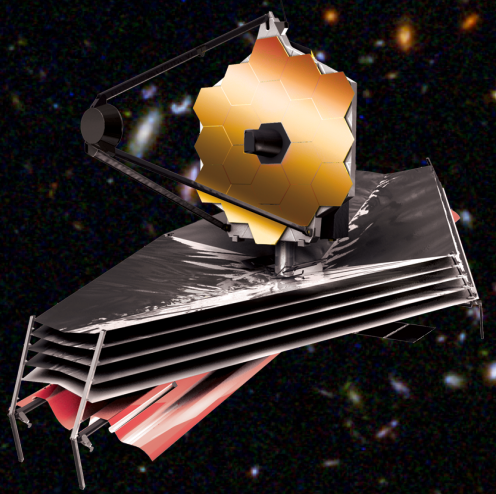
# Emission-Line Galaxies from WFC3 Early Release Science grism data & looking to the future with the NIRCam grisms

Amber N. Straughn

NASA Postdoctoral Program Fellow

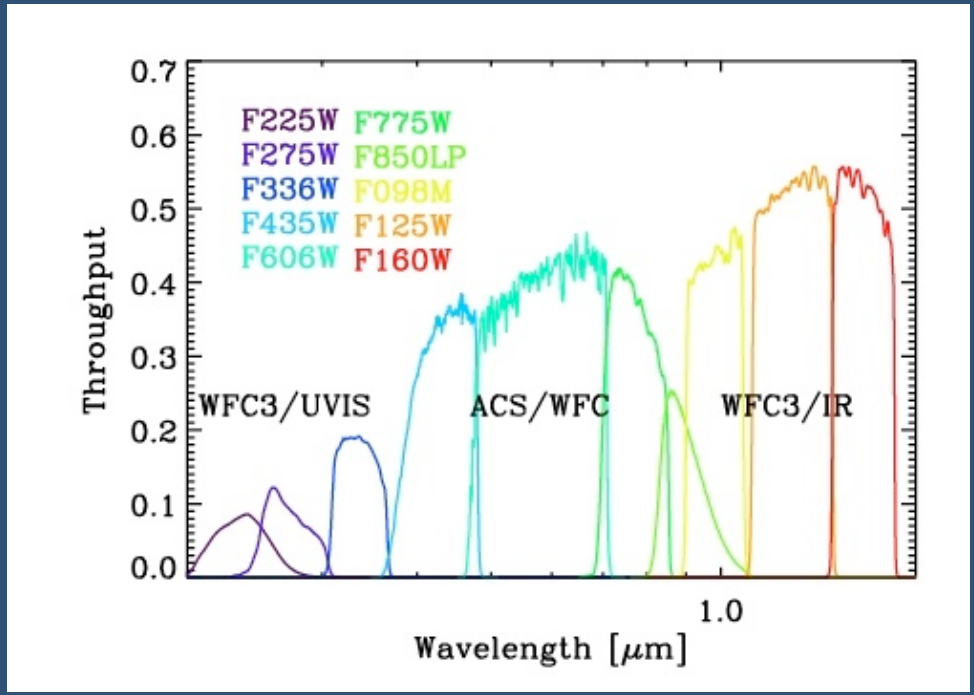
NASA's Goddard Space Flight Center

In Collaboration with: Jon Gardner (Advisor, GSFC), H. Kuntschner (ESO), M. Küemmell (ESO), N. Pirzkal (STScI), J. Walsh (ESO), S. Cohen (ASU), R. Windhorst (ASU), P. McCarthy (Carnegie) & the WFC3 SOC



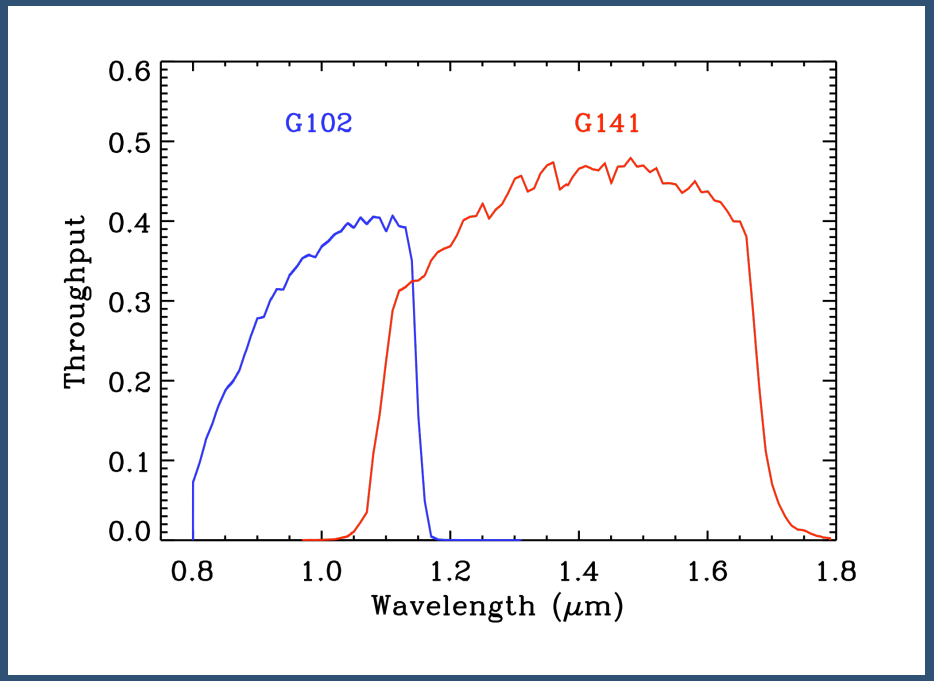
# WFC3 Early Release Science II Program

- Eight fields imaged with UVIS channel
  - F225W, F275W, and F336W
- Ten fields imaged with IR channel
  - F098M, F125W, F160W
  - 123 x 136 arcsec FOV; 0.13 arcsec/pix
- One grism field
  - G102 (R~210) & G141 (R~130)

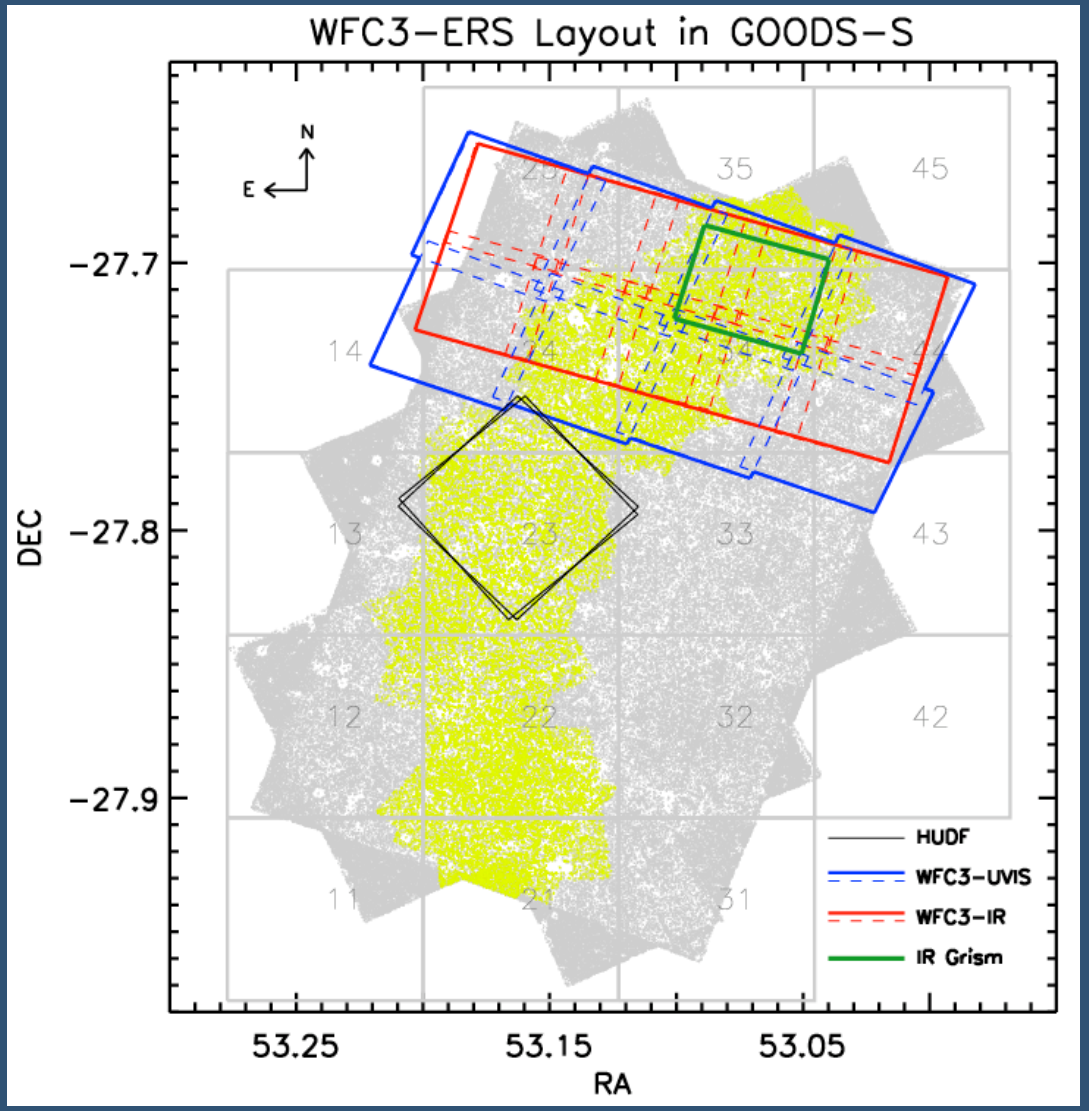


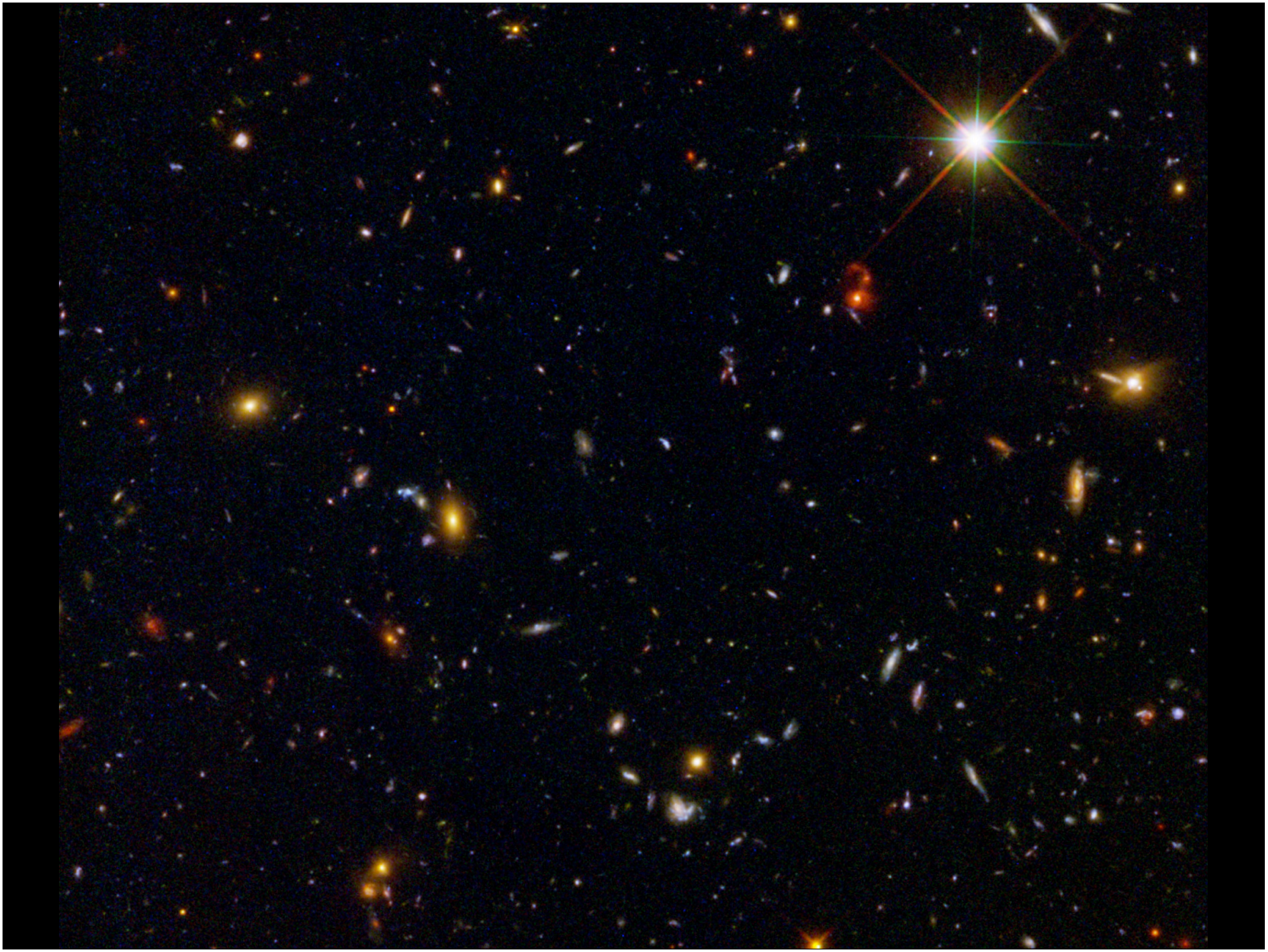
# WFC3 Early Release Science II Program

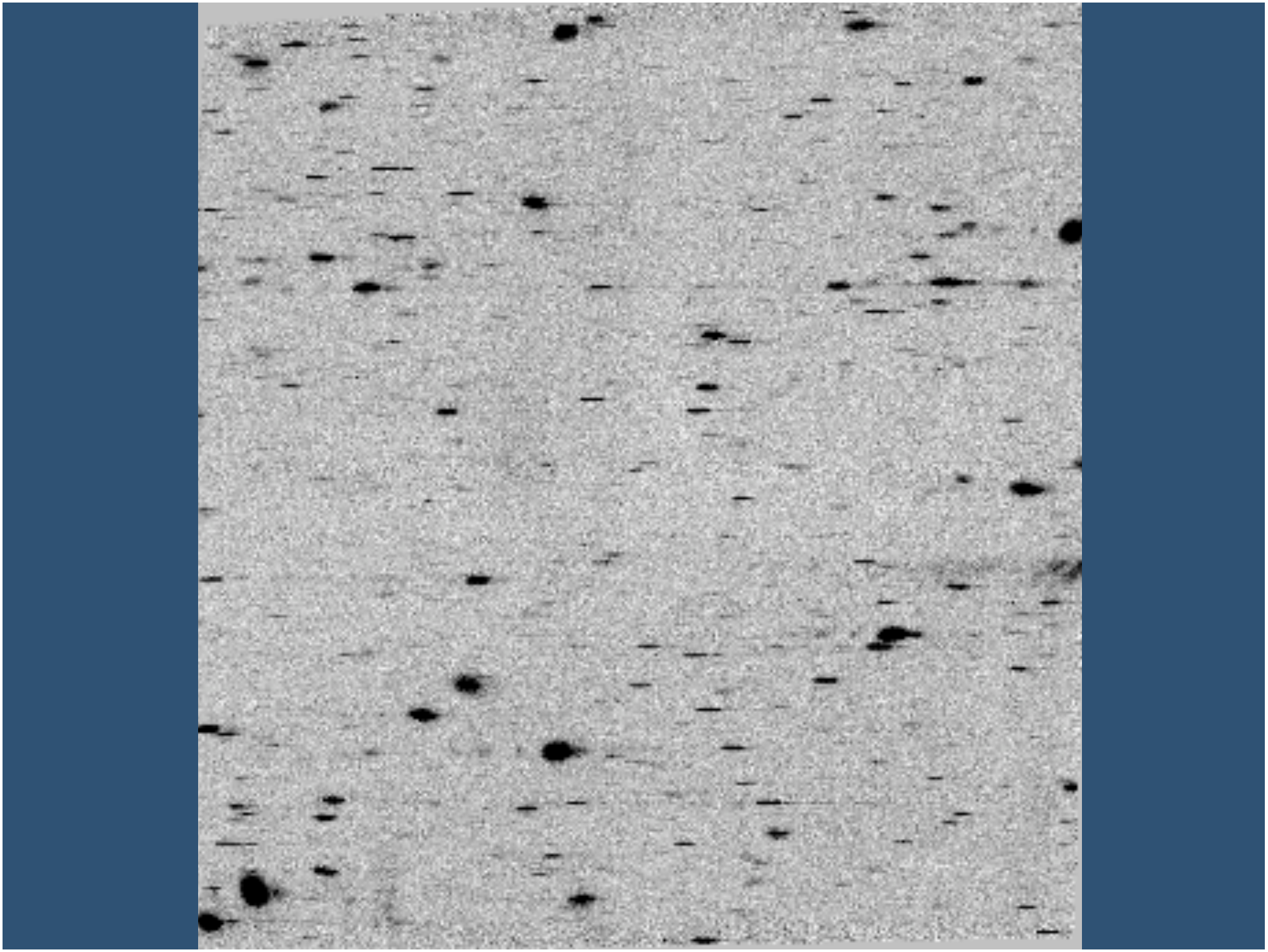
- Eight fields imaged with UVIS channel
  - F225W, F275W, and F336W
- Ten fields imaged with IR channel
  - F098M, F125W, F160W
  - 123 x 136 arcsec FOV; 0.13 arcsec/pix
- One grism field
  - G102 (R~210) & G141 (R~130)



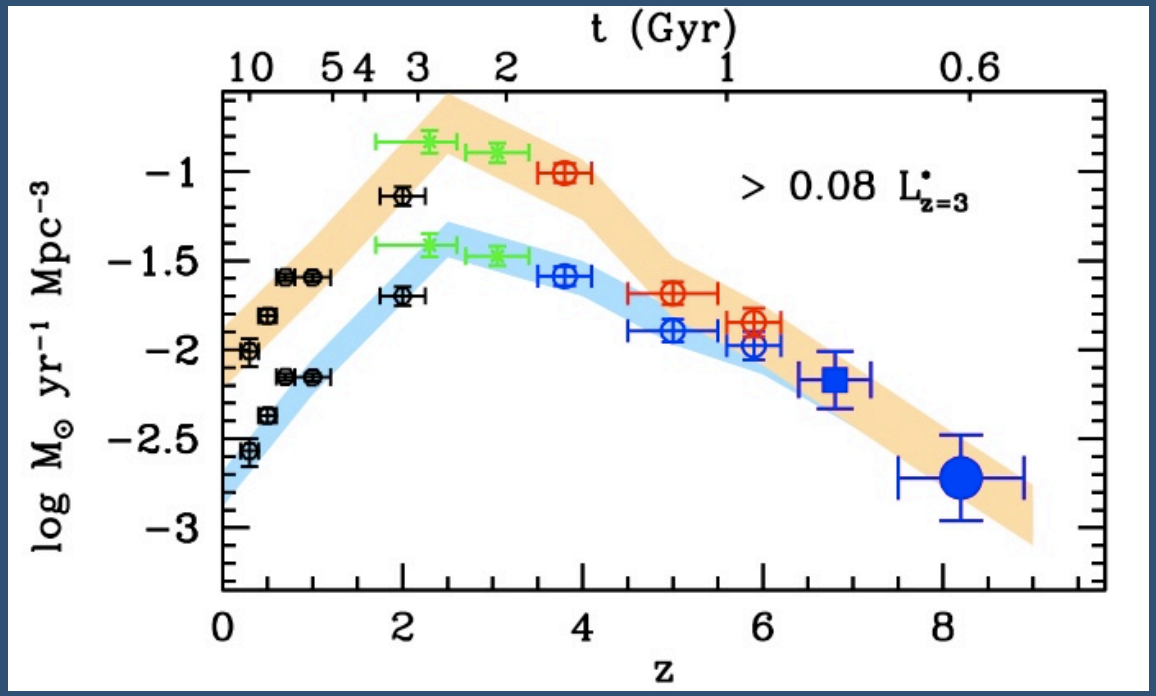
# WFC3 Early Release Science II Program







# Background: The Assembly of Galaxies & Star Formation across Cosmic Time

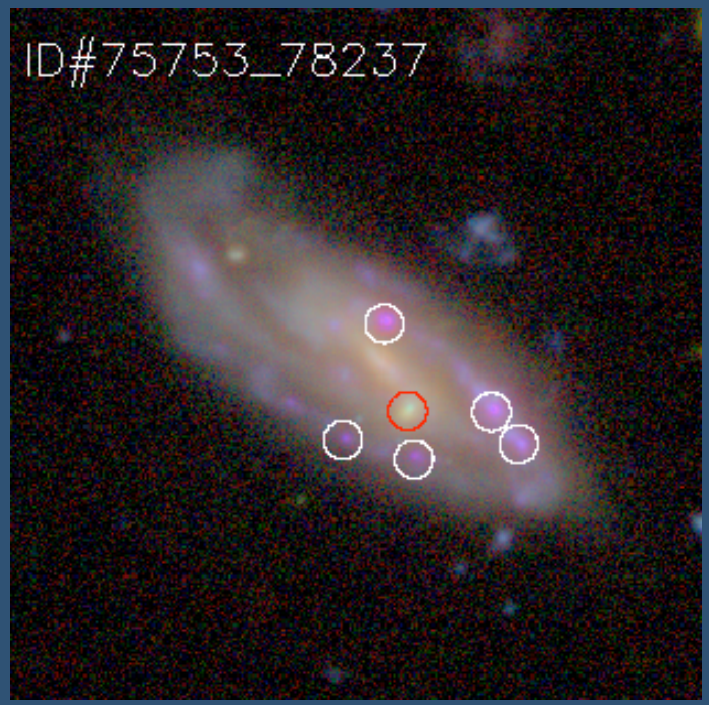


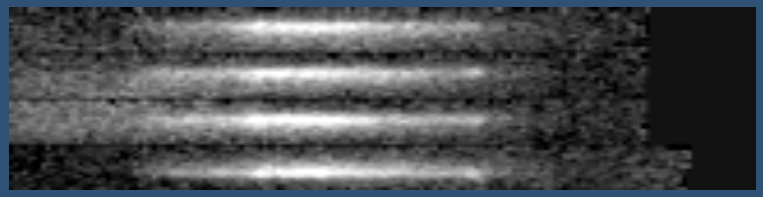

Bouwens et al. 2009, ApJ, 705, 936

- How & when did the Hubble sequence form?
- What physical processes regulate SF & BH growth?
- What role do starbursts & AGN play in hierarchical assembly?

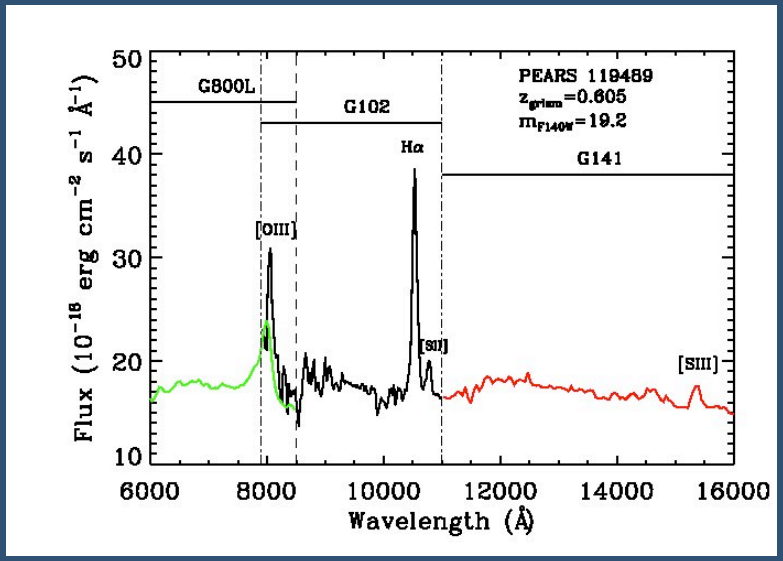
# Background: The *Probing Evolution And Reionization Spectroscopically* (PEARS) ACS Survey

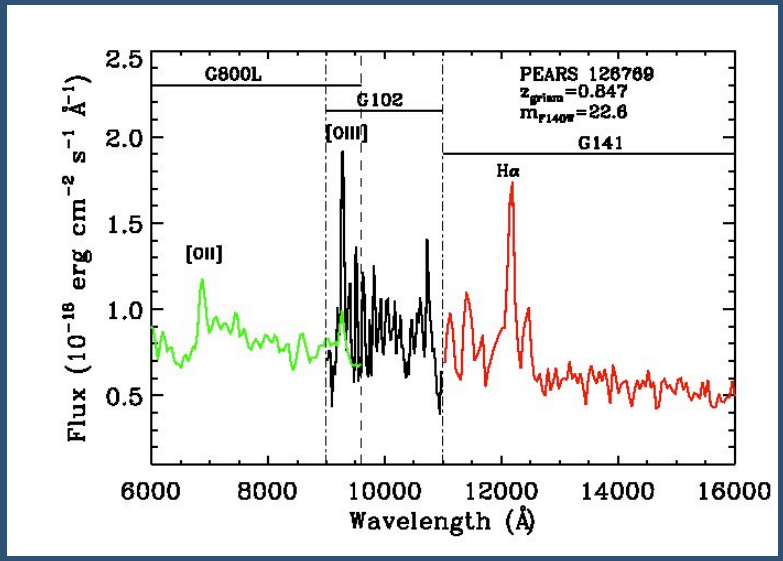
- Sample of >200 faint emission-line galaxies in GOODS-South (Straughn et al. 2008, 2009)
- HST/ACS G800L grism (6000-9500 Å; R~100)
- Majority of sources have a single line; line ID & grism redshift determination possible with photz

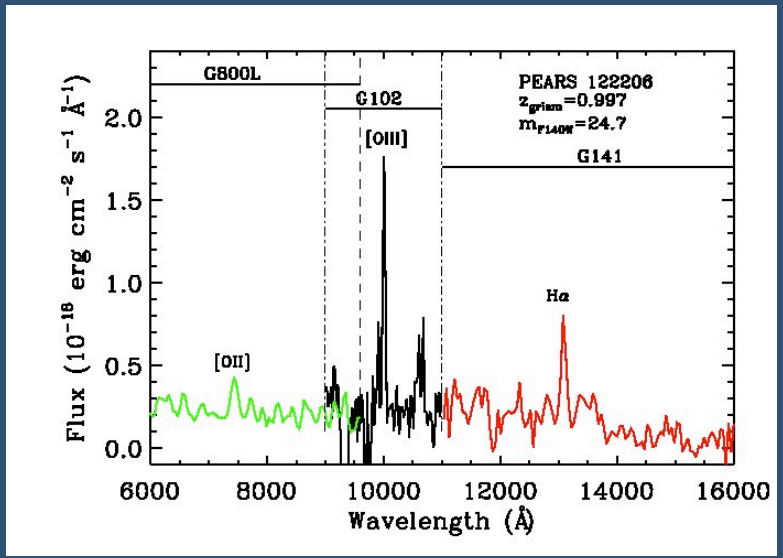


# Emission-line Galaxies Pre-selected from ACS/PEARS



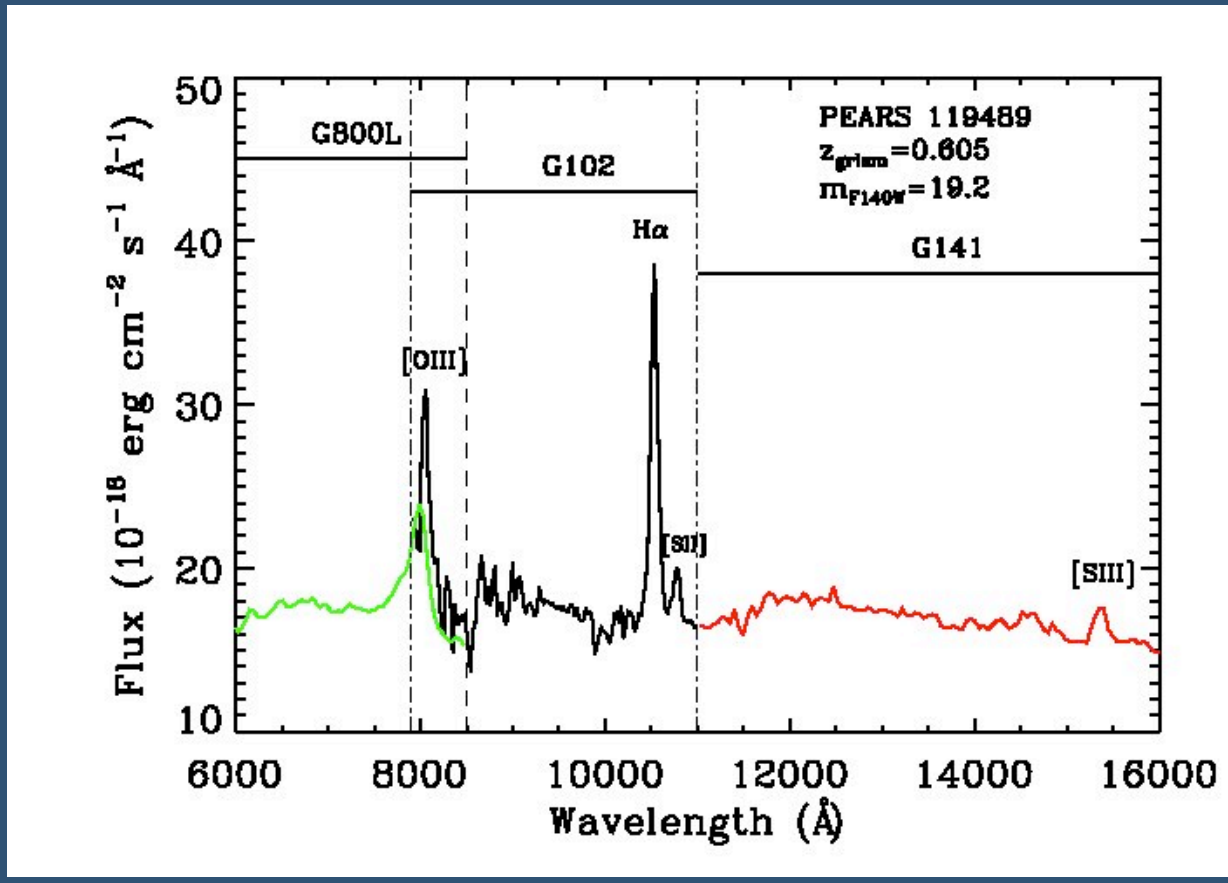



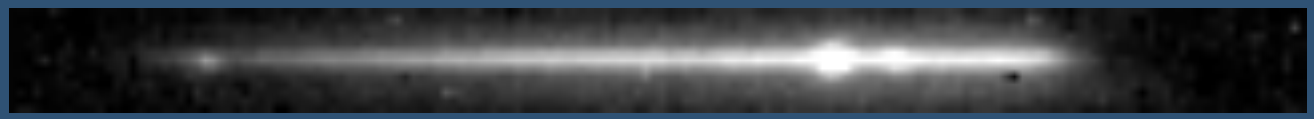




-15 PEARS pre-selected ELGs with lines in IR

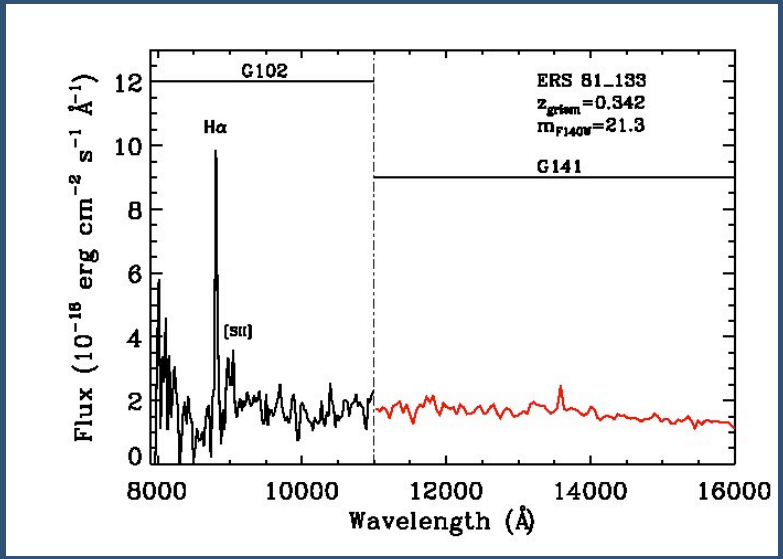
- Avg. cont. magnitude $m_{F098m}$=22.9
- [OIII] λλ4959,5007 resolved

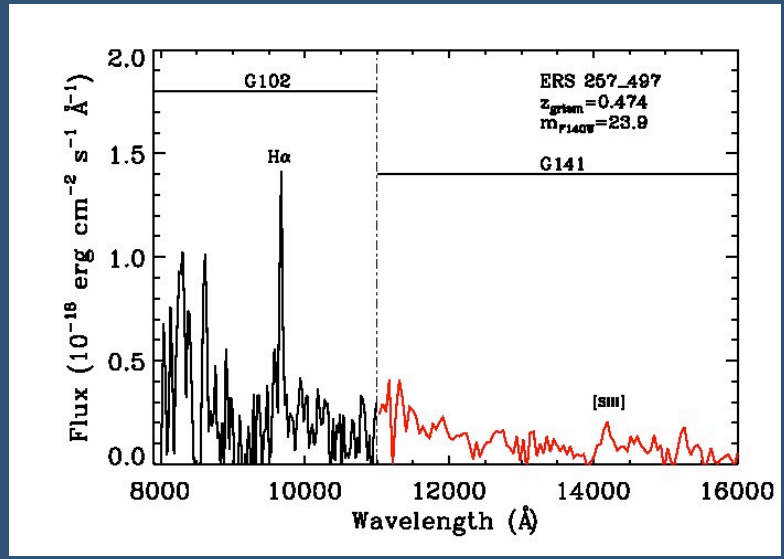
# Emission-line Galaxies Pre-selected from ACS/PEARS

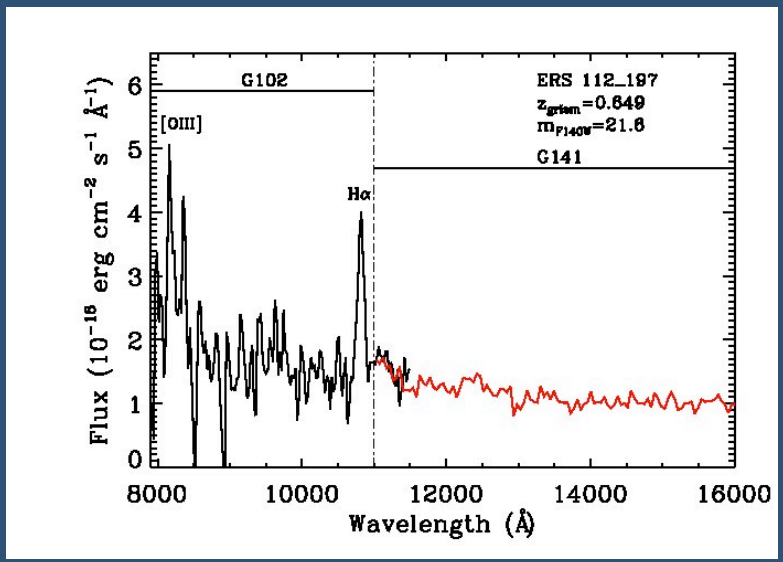


# New WFC3-only ELGs



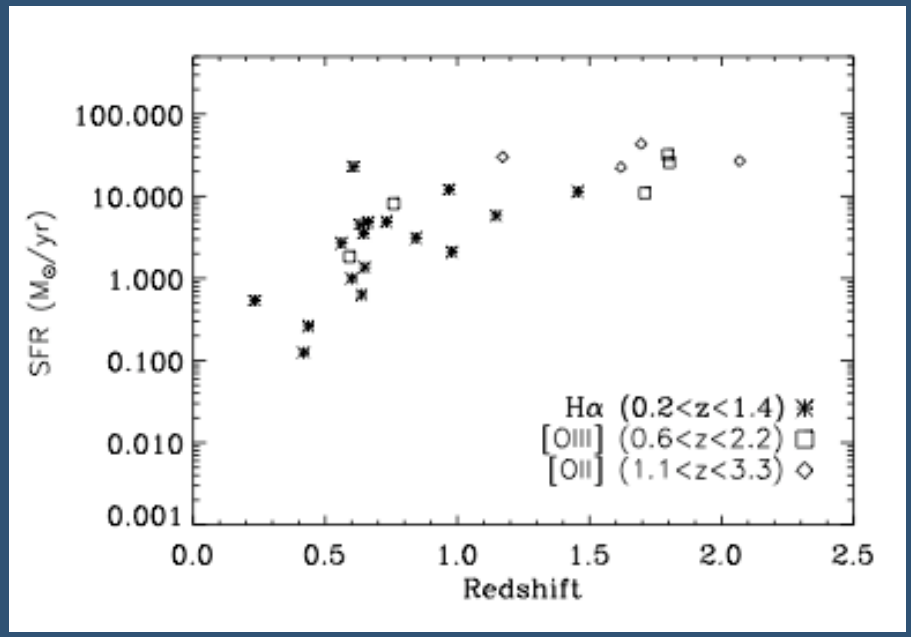




-15 new WFC3 ELGs

- Avg. cont. magnitude $m_{F098m}$=22.9

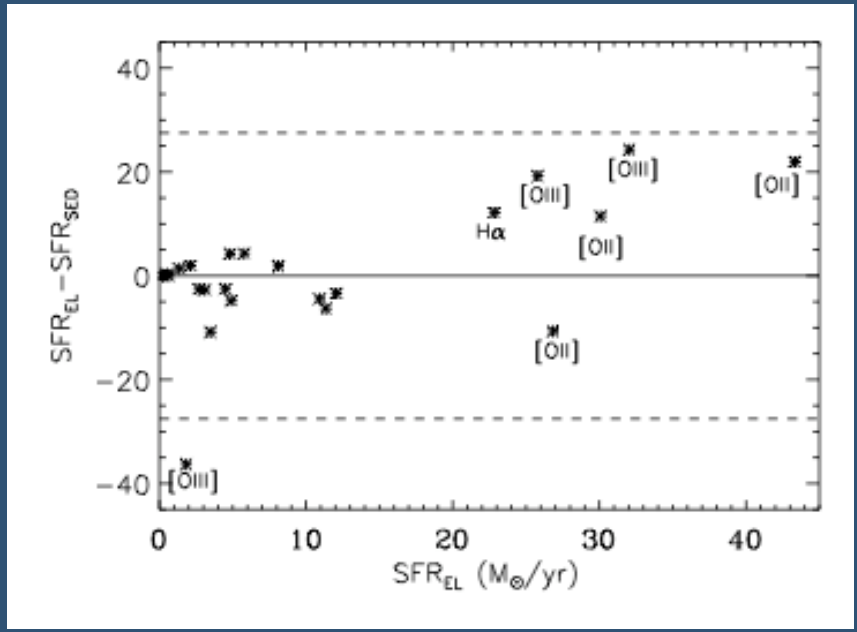
# Star-formation Rates of ELGs

- SFRs calculated using Hα, [OII], & [OIII]
- Compare $SFR_{EL}$ to $SFR_{SED}$
- Lowest $SFR_{EL}$:$SFR_{SED}$ galaxies generally redder; highest are blue and compact

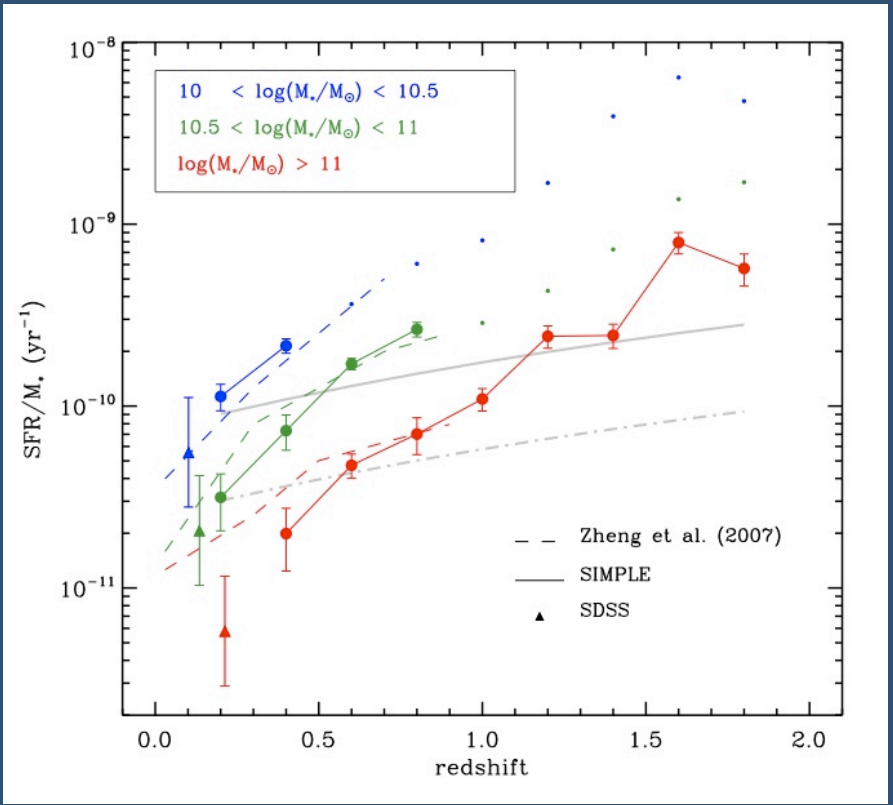


# Star-formation Rates of ELGs

- SFRs calculated using Hα, [OII], & [OIII]
- Compare $SFR_{EL}$ to $SFR_{SED}$
- Lowest $SFR_{EL}$:$SFR_{SED}$ galaxies generally redder; highest are blue and compact



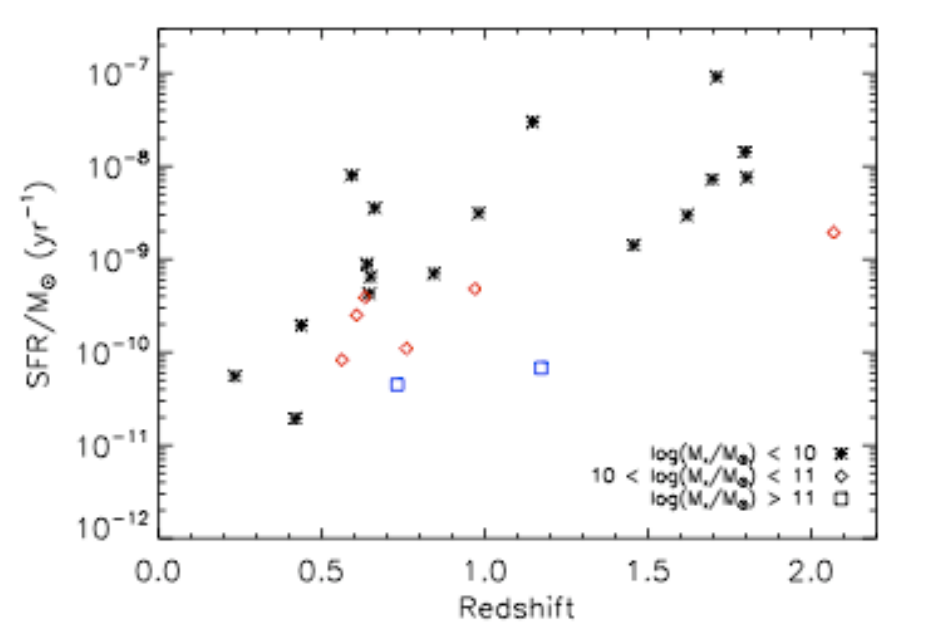
# Specific Star-formation Rate of ELGs




Damen et al. 2009, ApJ, 690, 937

- Previous studies of SSFR vs. z have used very large galaxy samples (e.g., GOODS, COMBO-17, SIMPLE etc.)
  - Damen+09, Zheng+07, Martin+07, Perez-Gonzalez +08
- Find lower SSFR for higher mass galaxies

# Specific Star-formation Rate of ELGs




Straughn et al. 2010

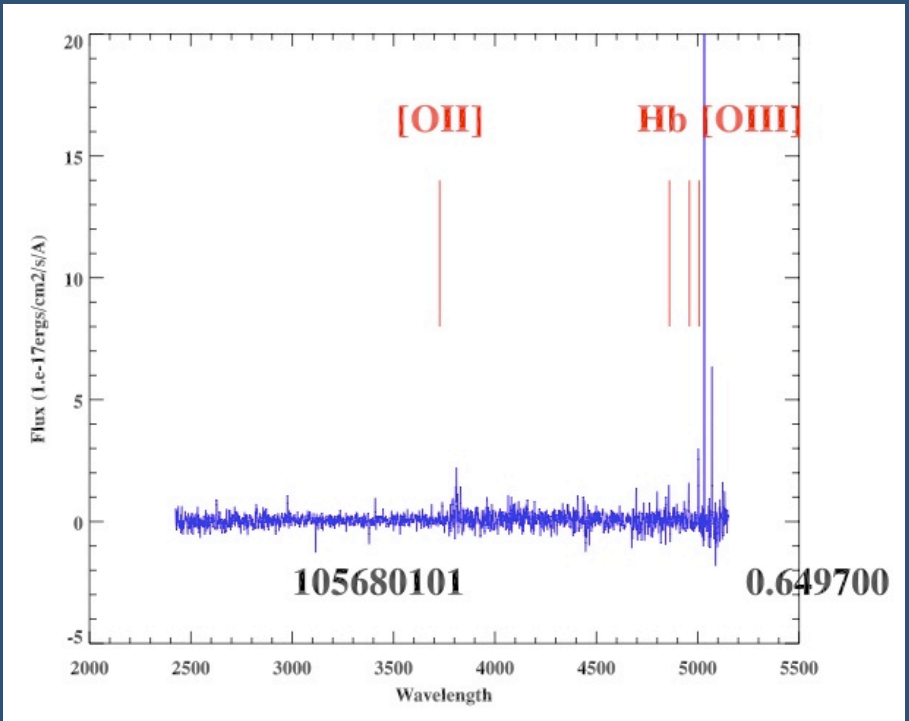
- Previous studies of SSFR vs. z have used very large galaxy samples (e.g., GOODS, COMBO-17, SIMPLE etc.)
  - Damen+09, Zheng+07, Martin+07, Perez-Gonzalez +08
- Find lower SSFR for higher mass galaxies

*We detect this general trend with just two orbits of HST time.*

# The next era: NIRCam grisms

- Two identical long wavelength grisms
- Used for coarse phasing
- Also science applications (see, eg., Greene et al. 2007 for detailed discussion on exoplanets)
- Some advantages over NIRSpec for particular science objectives:
  - Higher spatial resolution spectroscopic obs.
  - No slit losses
  - Ability to dither slitless spectra: better flat-fielding
  - Sample entire NIRCam FOV
- Emission lines to much higher redshifts

# ELGs with JWST & ELTs




*General strategy:*

*Imaging*

*Grism*

*Ground-based spectroscopy*

# The next era: NIRCam grisms