High resolution imaging of high redshift galaxies

Science question

- How do galaxies form?

It is easy to find galaxies

- Optical and/or Near-IR imaging
- Spectroscopic redshifts
- Photometric redshifts

However

Galaxies substantially different from nearby galaxies !

- Much smaller
- Many bright in the UV
- Irregular in HST imaging

What is the physics behind this ?

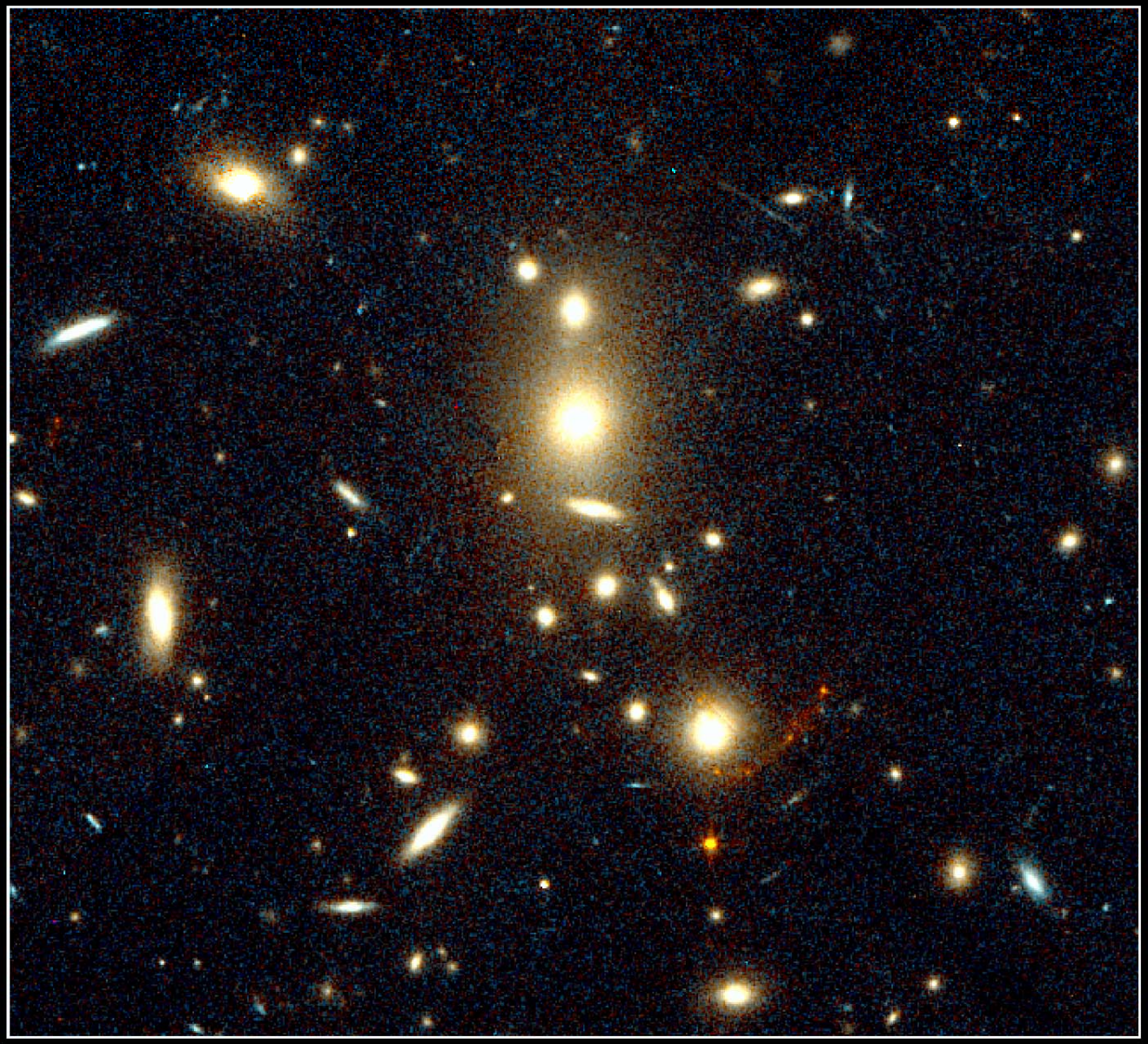
- All mergers ?
- Continuous gas infall ?
- Gas dominated galaxies working their way through dinner ?

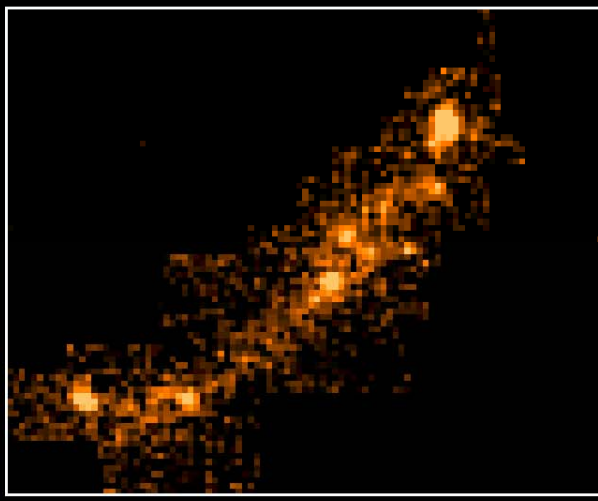
Solution

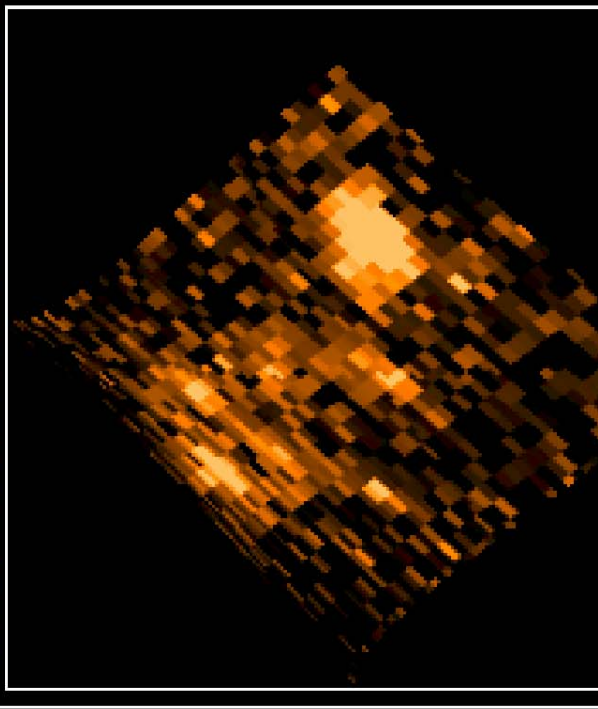
1) High spatial resolution spectroscopy

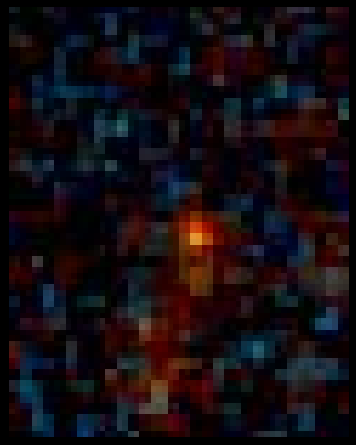
limited spatial resolution, and limited sample

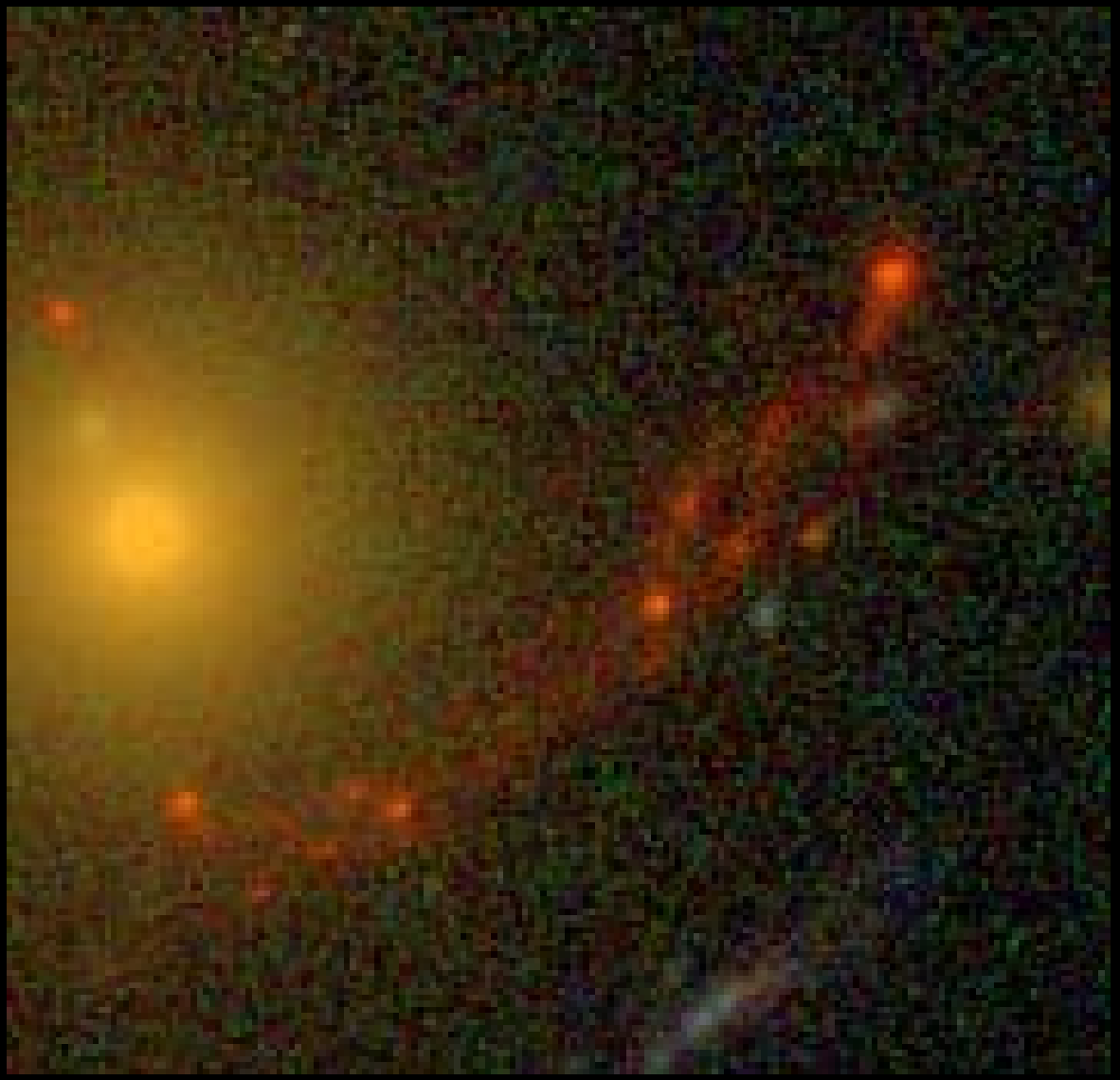
2) Diffraction limited imaging on large sample











Integration times

- Assume surface brightness of 20.2 in Hab (observed at z=2-3)
- S/N=25 in pixel of 5mas in 10 hours
- Notice: quite large spread in surface brightnesses observed

Integration times

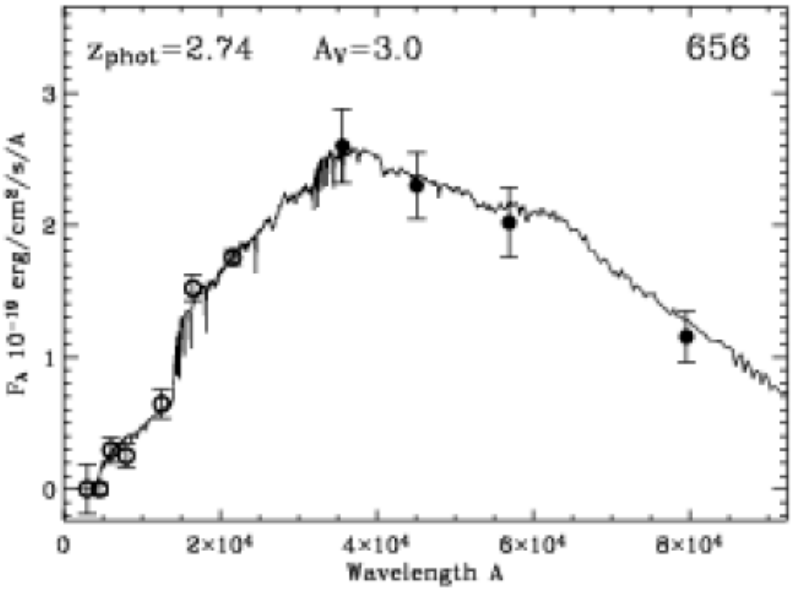
- Observe 1e4 galaxies around L*
- 5-10 per sq arcmin
- Image 1000 sq arcmin
- 2 arcmin FOV -> 500 hours total
- 2 filters -> 1000 hours

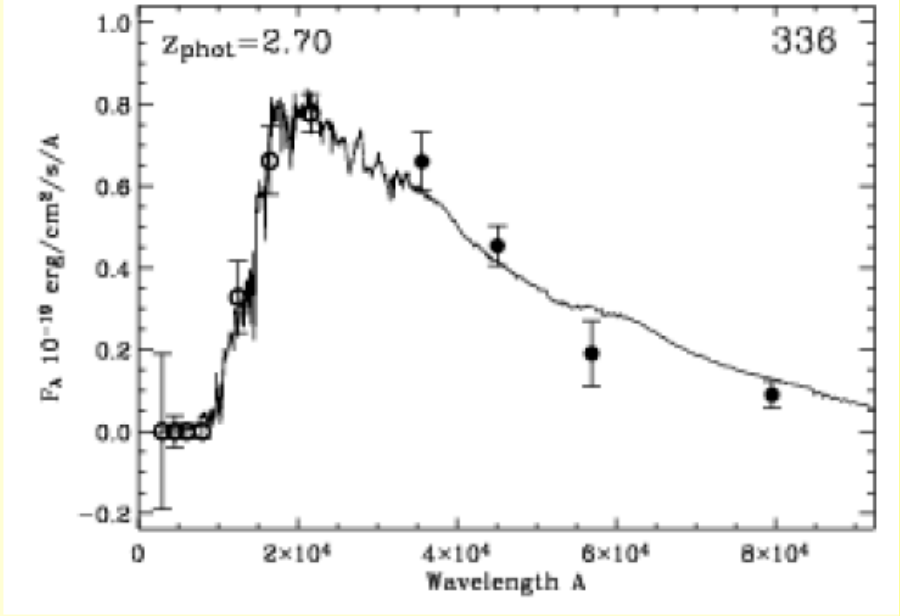
- Benefit: many sub-L* galaxies

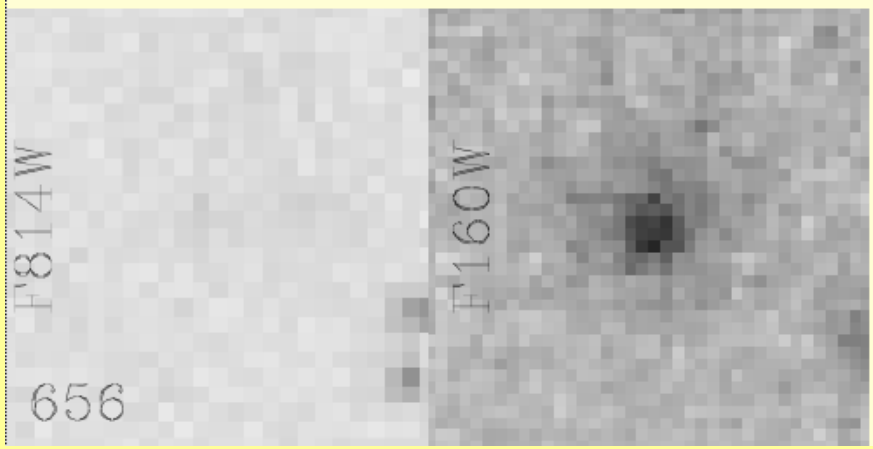
```
# 10 sigma
# 1e4 seconds ------------------------  10 hours ----
#
#  NIRCAM..................................... ELT
#       2.3x4.6 arcmin                          1 arcmin ?
#
#best numbers in june 2006
#
#filter nJy      encirc  ext.     ab
#                energy  rad
070      18.7    0.43    2.5      28.25   28.89   31.4
090      12.5    0.57    2.5      28.68
115      11.0    0.60    2.5      28.83   29.47   30.9
150      10.2    0.58    2.5                      30.3
200       8.3    0.62    2.5      29.13   29.77   29.6
277      10.9    0.70    2.5
356      11.2    0.65    2.5
444      18.7    0.6     2.7
```

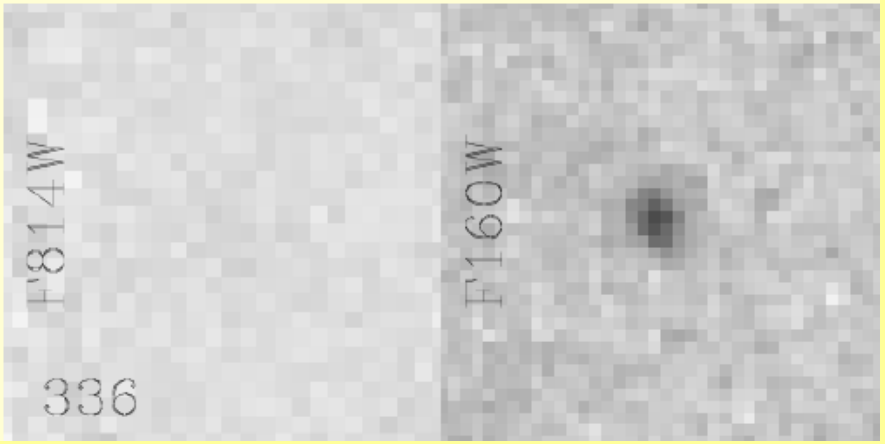
Simulations needed

- Simulate imaging of UV bright starbursts through ELT in several passbands
- Simulate PSF deconvolution of MCAO imaging
- Trade-off K versus J
  - Thermal performance !


z_{phot}=2.74
A_V=3.0
656
F_λ 10^{-19} erg/cm^2/s/A
Wavelength A
0
2×10^4
4×10^4
6×10^4
8×10^4


z_{phot}=2.70
336
F_λ 10^{-19} erg/cm^2/s/A
Wavelength A
1.0
0.8
0.6
0.4
0.2
0.0
−0.2
0
2×10^4
4×10^4
6×10^4
8×10^4


F814W
F160W
656


F814W
F160W
336