

# Using BUCS to simulate ELT images

P.Rosati - ELT SWG Meeting 9 Oct 2007

BUCS slides courtesy of R.Bouwens

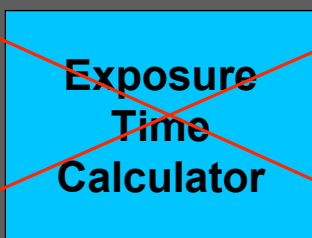


An Engine for Generating Realistic  
Imaging Data for Deep Galaxy Fields

by Rychard Bouwens and Dan Magee

## ~~Exposure Time Calculator~~

HST ACS WFC  
F606W  
3 orbit



28.4 AB  
10 sigma  
0.25" aperture

A useful feature would be the ability to generate **realistic** and **quantitatively accurate images** for both testing and visualization.

## Exposure Time Simulator

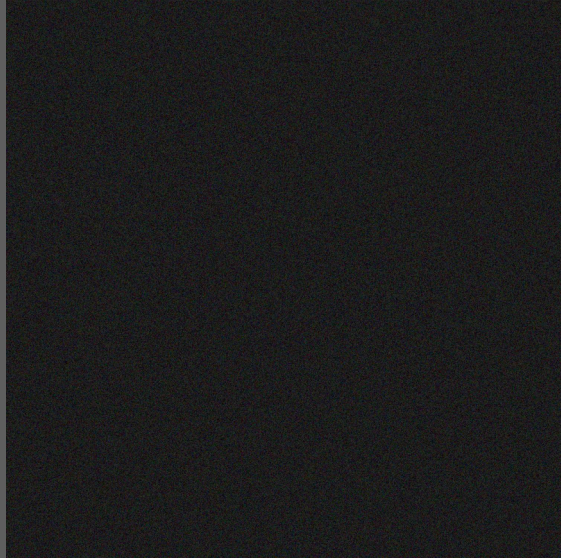
HST ACS WFC  
F606W  
3 orbit



**BUCS** (Bouwens Universe Construction Set):  
a C toolkit to simulate deep galaxy fields

**Features:**

Specify Telescope/Instrument/  
Filters



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Representative Sets of Galaxies



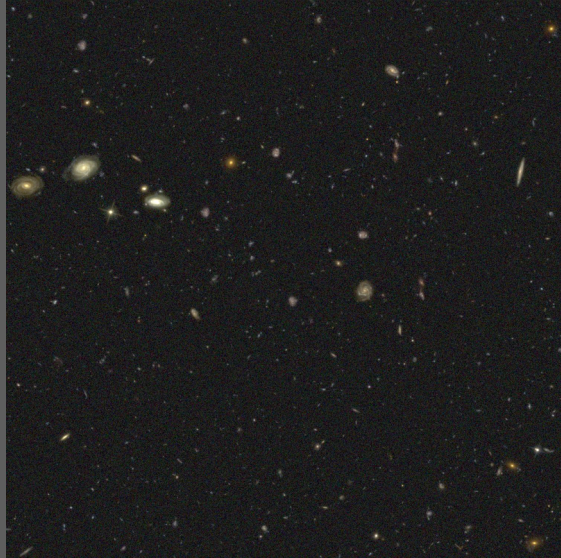
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Real Morphologies, with pixel-  
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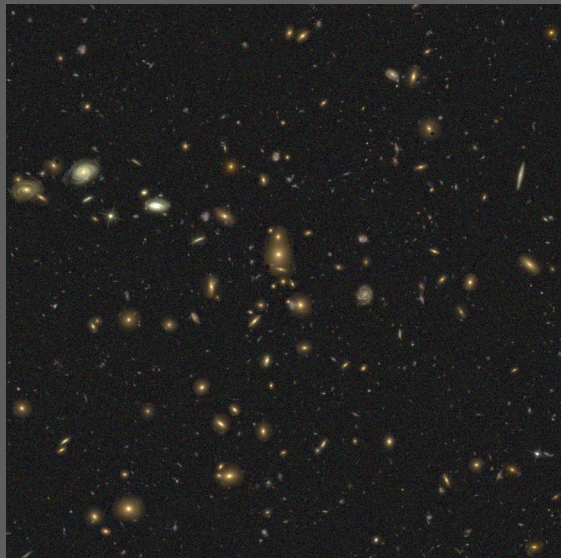
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Ability to Add Real Galaxy  
Clusters



## BUCS (Bouwens Universe Construction Set): a C toolkit to simulate deep galaxy fields

### Features:

Specify Telescope/Instrument/  
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Representative Sets of Galaxies

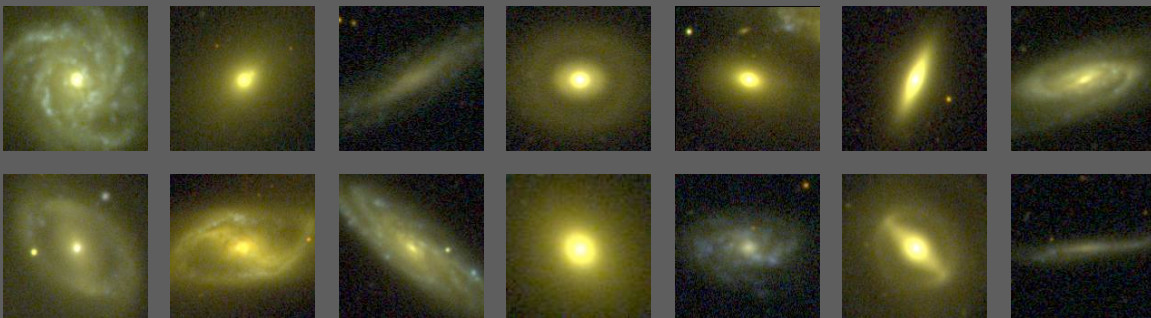
Real Morphologies, with pixel-  
by-pixel SEDs

Ability to Add Real Galaxy  
Clusters

Capacity to Include/Manipulate  
Other Galaxy Samples



## Representative Set of Galaxies



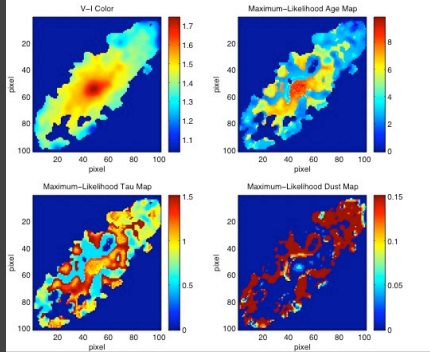
Realistic Simulations Require Representative Sampling of the Different Morphological Types with realistic volume densities

BUCS can use inputs from external catalogs (like the SDSS)



# Pixel-by-Pixel SED modelling

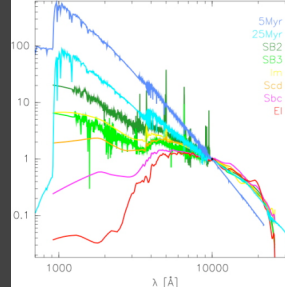
## Pixel-by-Pixel Modelling



Creates object module



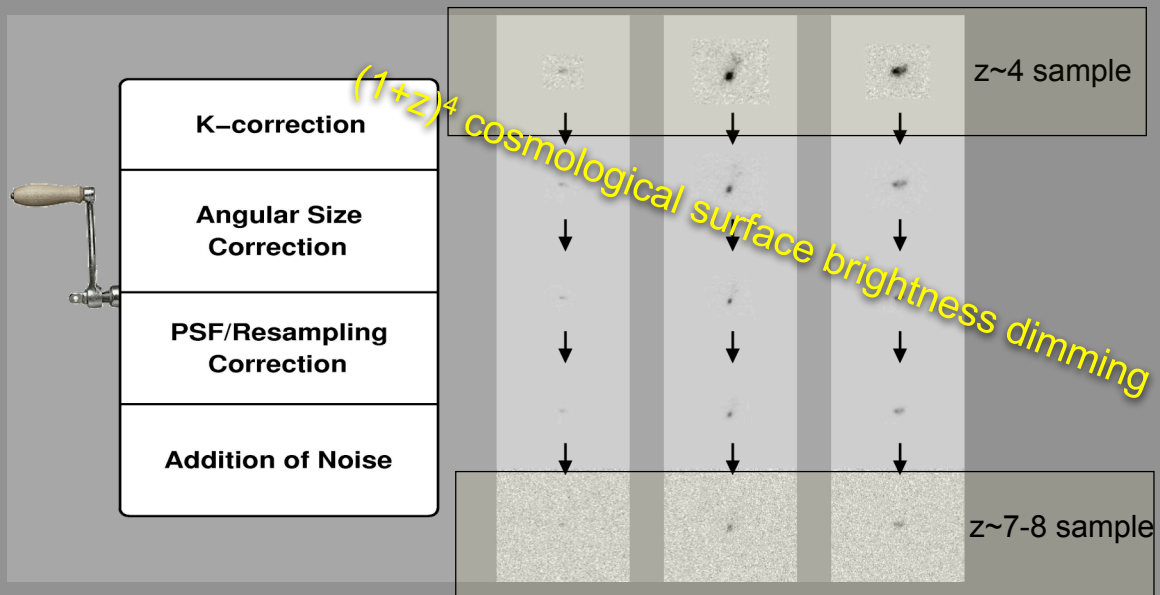
## SED templates



- Magnitudes
- Size
- Pixel-by-Pixel Spectral Energy Dists (SEDs)
- PSF information encoded



## Artificial Redshifting "Cloning" Engine



Bouwens 1998a,b; Bouwens et al 2003a; Bouwens 2005c



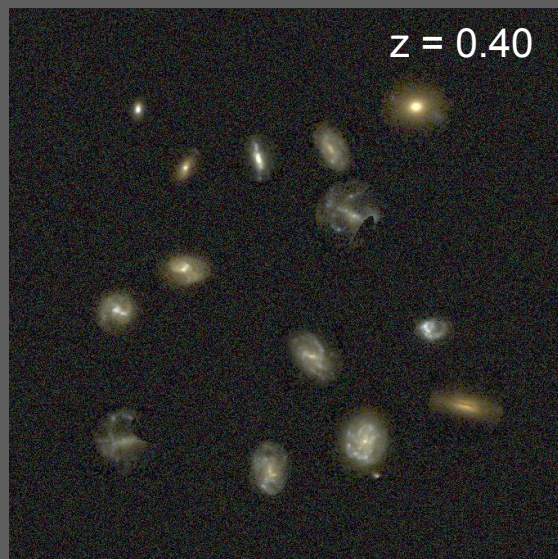
# Artificial Redshifting Capacity

Low Redshift Galaxies



# Artificial Redshifting Capacity

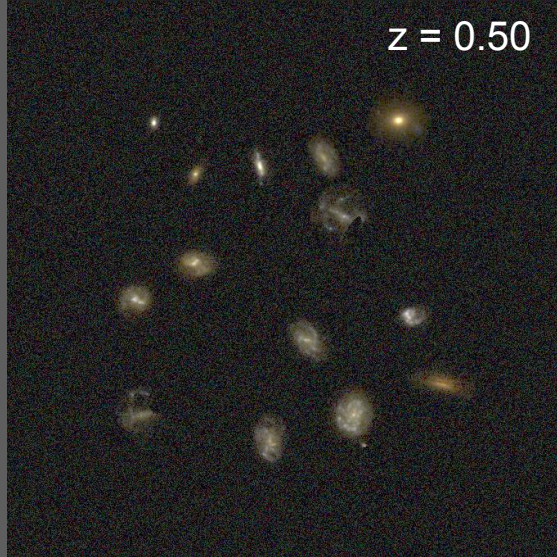
Low Redshift Galaxies



# Artificial Redshifting Capacity

Low Redshift Galaxies

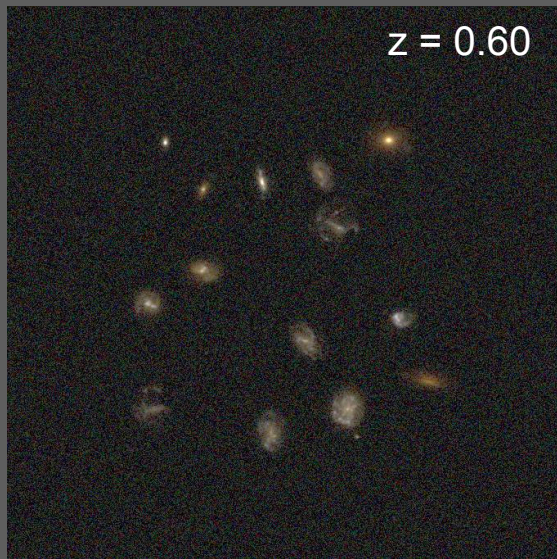
$z = 0.50$



# Artificial Redshifting Capacity

Low Redshift Galaxies

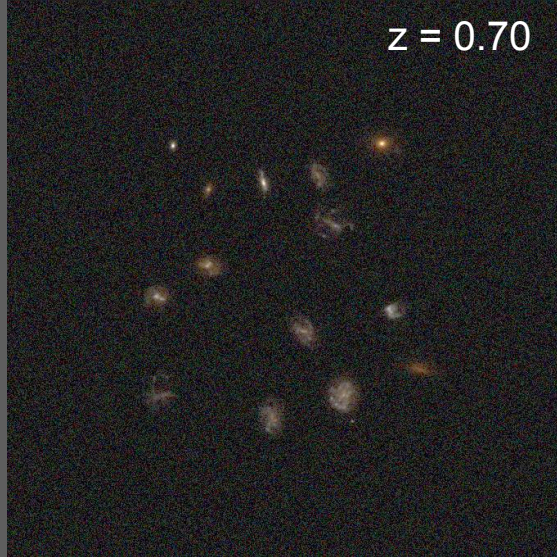
$z = 0.60$



# Artificial Redshifting Capacity

Low Redshift Galaxies

$z = 0.70$



# Artificial Redshifting Capacity

Low Redshift Galaxies

$z = 0.80$





# Artificial Redshifting Capacity

Low Redshift Galaxies

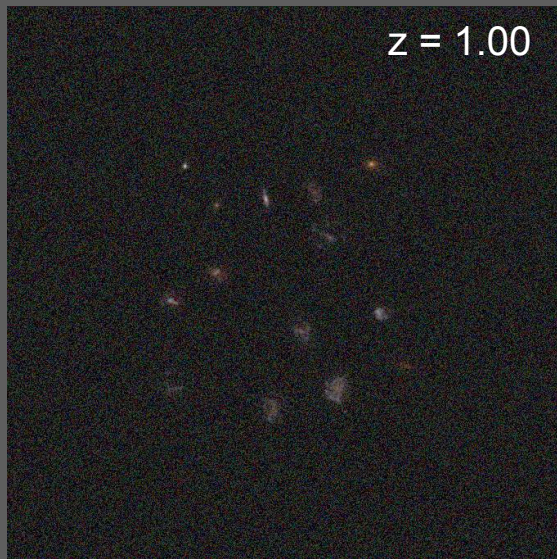
$z = 0.90$



# Artificial Redshifting Capacity

Low Redshift Galaxies

$z = 1.00$



# Artificial Redshifting Capacity

Low Redshift Galaxies

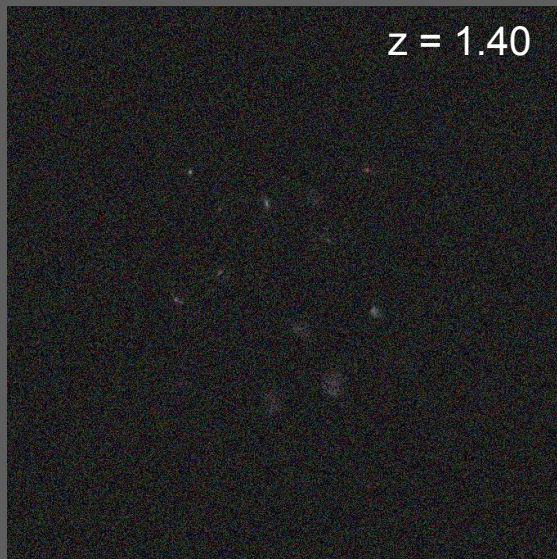
$z = 1.20$



# Artificial Redshifting Capacity

Low Redshift Galaxies

$z = 1.40$



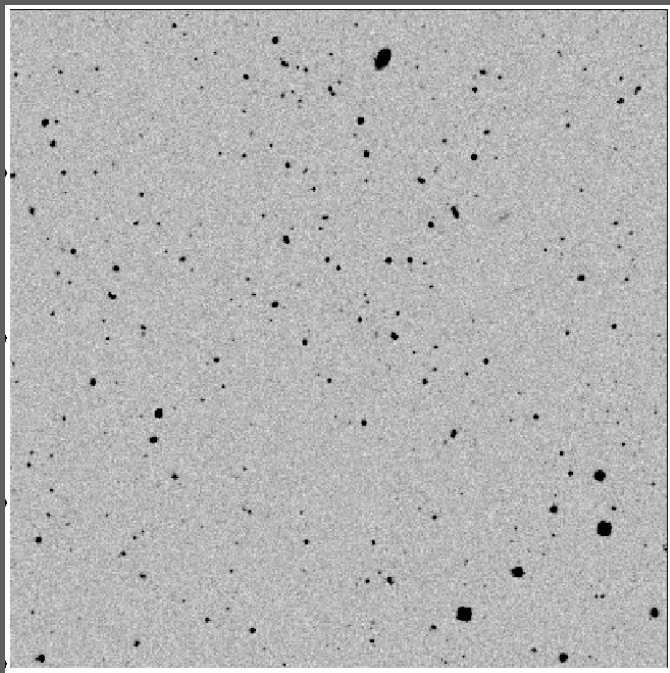
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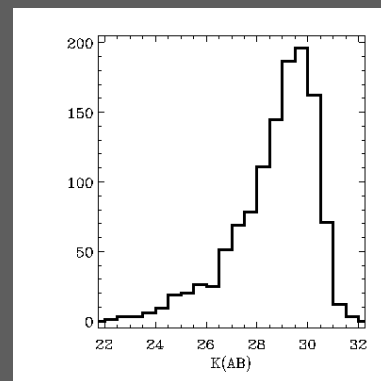
$z = 1.60$



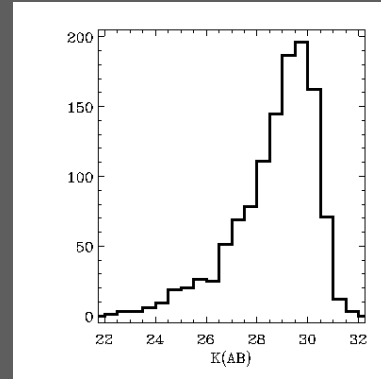
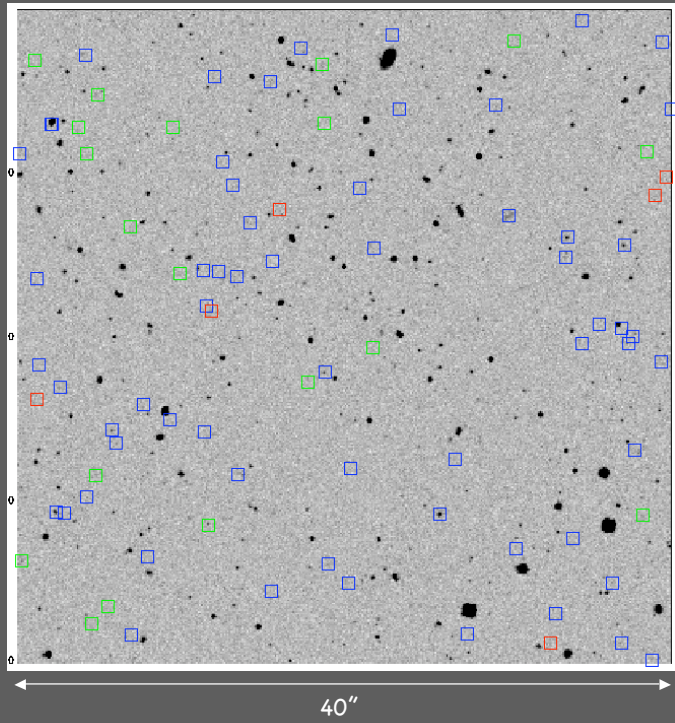
VLT/ISAAC - 30 hr exp K-band (seeing=0.45")



40"



"ELT" - 1 hr exposure K-band (FWHM=0.1")



Need to include PSF  
for a given AO case !

- $z > 9$
- $z > 7$
- $z > 5$