

Observational and theoretical constraint on

Galaxy evolution at high redshift

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What is the evolution over the lifetime of the Universe of the relationship between stellar mass and Dark Halo mass?

Galaxies: system of **stars** and **gas** embedded in virialised **halos of dark matter**



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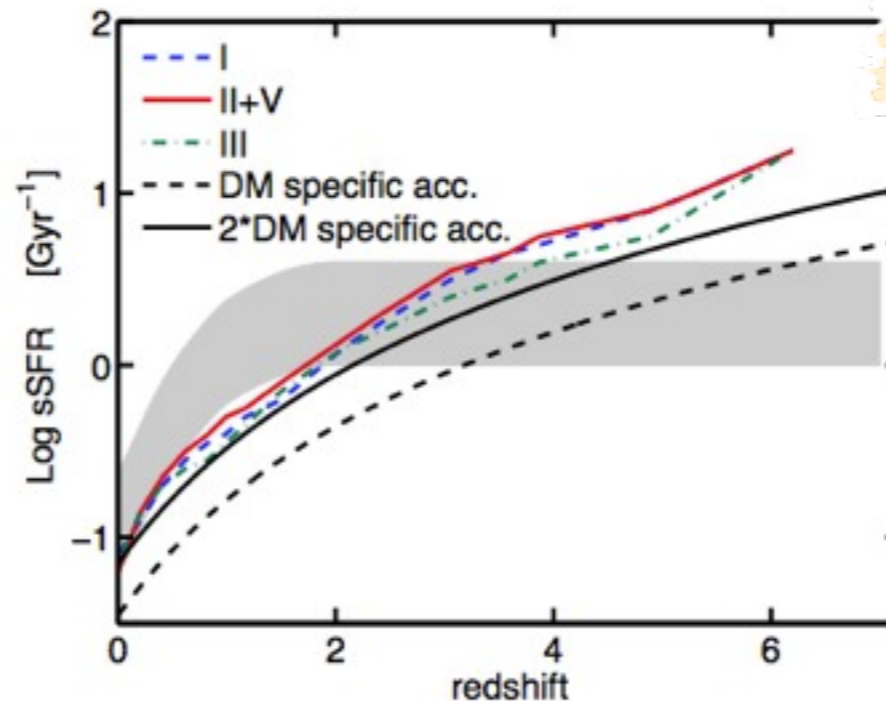
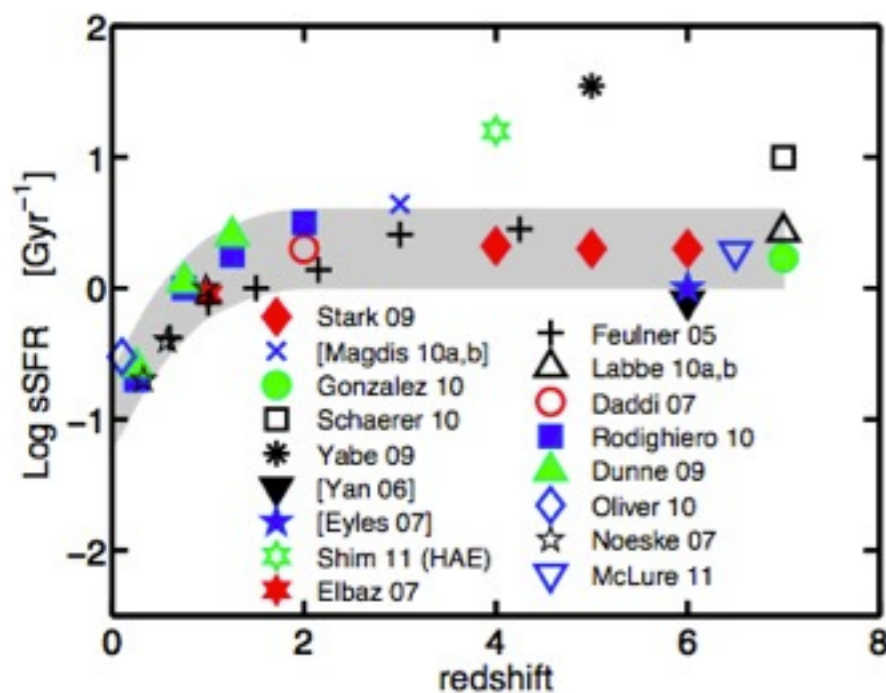
- **bimodality** in galaxies population



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sSFR as a function of z .
In grey, the profile for
observed data.

- **Star formation** rapidly increase, peaking at $z \sim 2$. At the same time, quenching of massive star-forming systems
- tension between observations and simulations to reproduce the constant sSFR for $2 < z < 7$ (“plateau”).

What is the evolution over the lifetime of the Universe of the relationship between stellar mass and Dark Halo mass?

1) photometry of the galaxies

2) derive the **photometric redshift**

3) derive the **stellar Mass, SFR**

4) measure the **angular clustering** as a function of redshift

5) derive the main **parameters of Dark Halos** from Halo Model

6) study the relationship between Dark Halos and stellar mass

need ...

- ... deep enough data to observe “classical” galaxies at $z \sim 2$
- ... simulations to derive comparable observables and constrain the model (lightcone)

Outline of the Phd

1) Extract the galaxies catalog from COSMOS field ✓

photo-z

Mstar

SFR

2) Derive the properties of DH

- clustering measurement
- HOD model assumption
- Study the relationship between stellar mass of the galaxies and DH mass.

minimum DH mass

average halo mass

SHM ratio

transition mass

4) Use Hz-AGN lightcone to:

- produce synthetic observables of the simulated galaxies: spectra, colours, magnitudes, create mock catalog and compare directly observations with simulations

UltraVISTA DR2 on COSMOS

2deg²

1 < z < 6

UltraVista Collaboration

Horizon-AGN Lightcone

1deg²

1 < z < 6

SPIN(E) collaboration

Presentation of the data

UltraVISTA: deepest public Survey

deep

UltraVISTA DR2: NIR data

increase in exposure time in 4 ultra-deep stripes
compare to DR1

large

2 deg²: the largest survey with this depth:
~600 000 objects

multi-wavelength survey

UltraVISTA+Subaru+CFHTLS + GALEX+IRAC

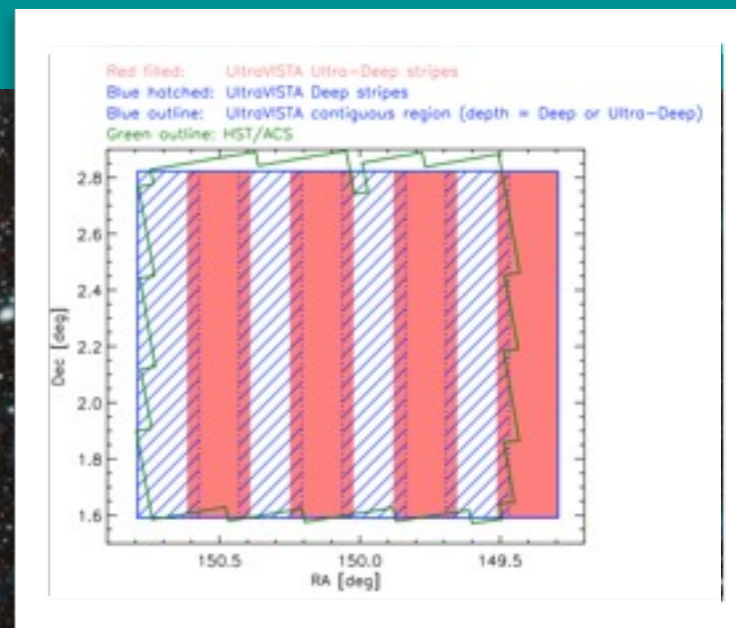
+

~30 000 spectroscopic redshift on COSMOS

=

photo-z redshift with a good precision even for faintest
objects

Le Phare, Arnouts et al, 2002



Construction of the galaxy catalog

I) Homogenization of the PSF in all the fields

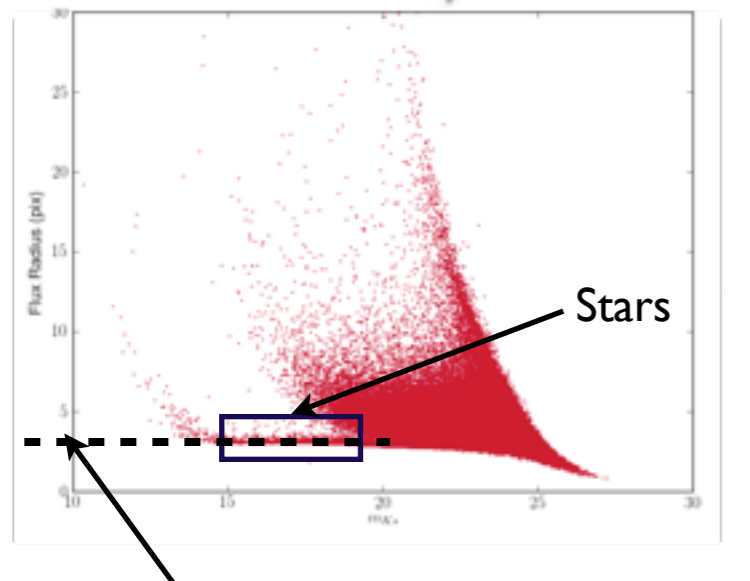
PSFex, Bertin

Fit with a Moffat Profile

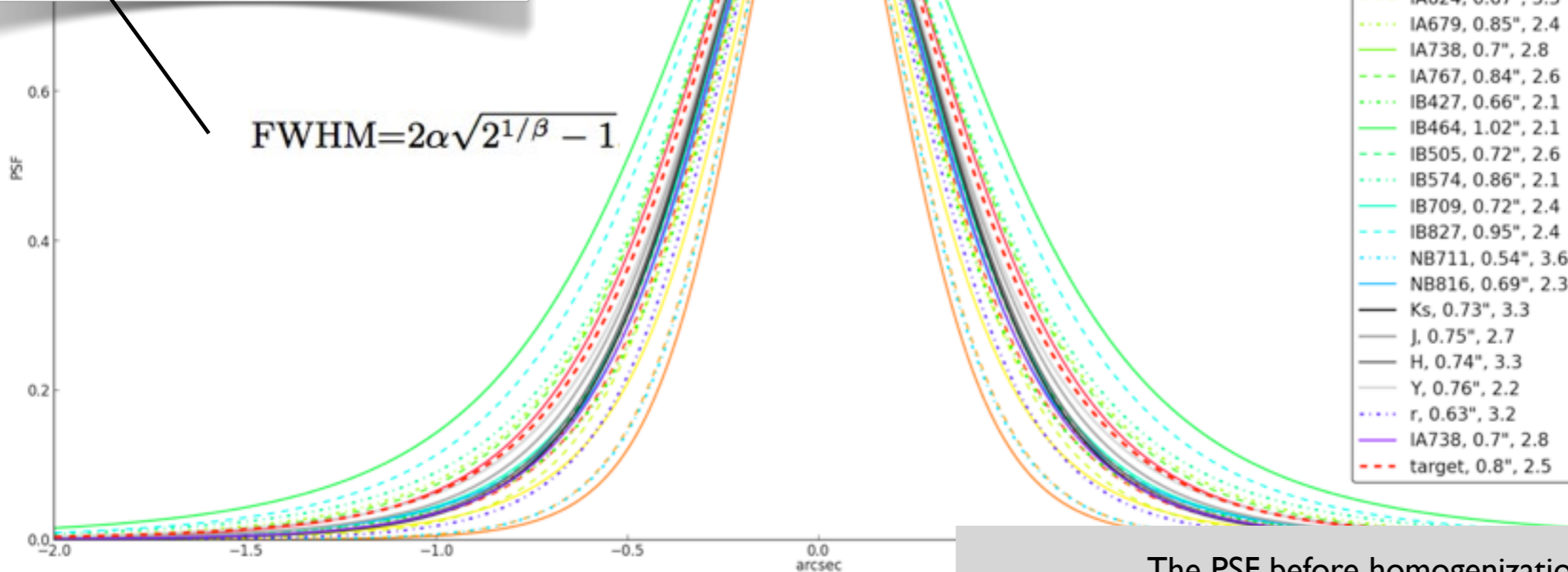
$$\text{PSF}(r) = \left[1 + \left(\frac{r}{\alpha} \right)^2 \right]^{-\beta}$$

Estimate the seeing require to correctly separate galaxies/ stars.

Use the stars catalogue from ACS (Leauthaud et al. 2007)



Stars



UV



IR

The PSF before homogenization

Construction of the galaxy catalog

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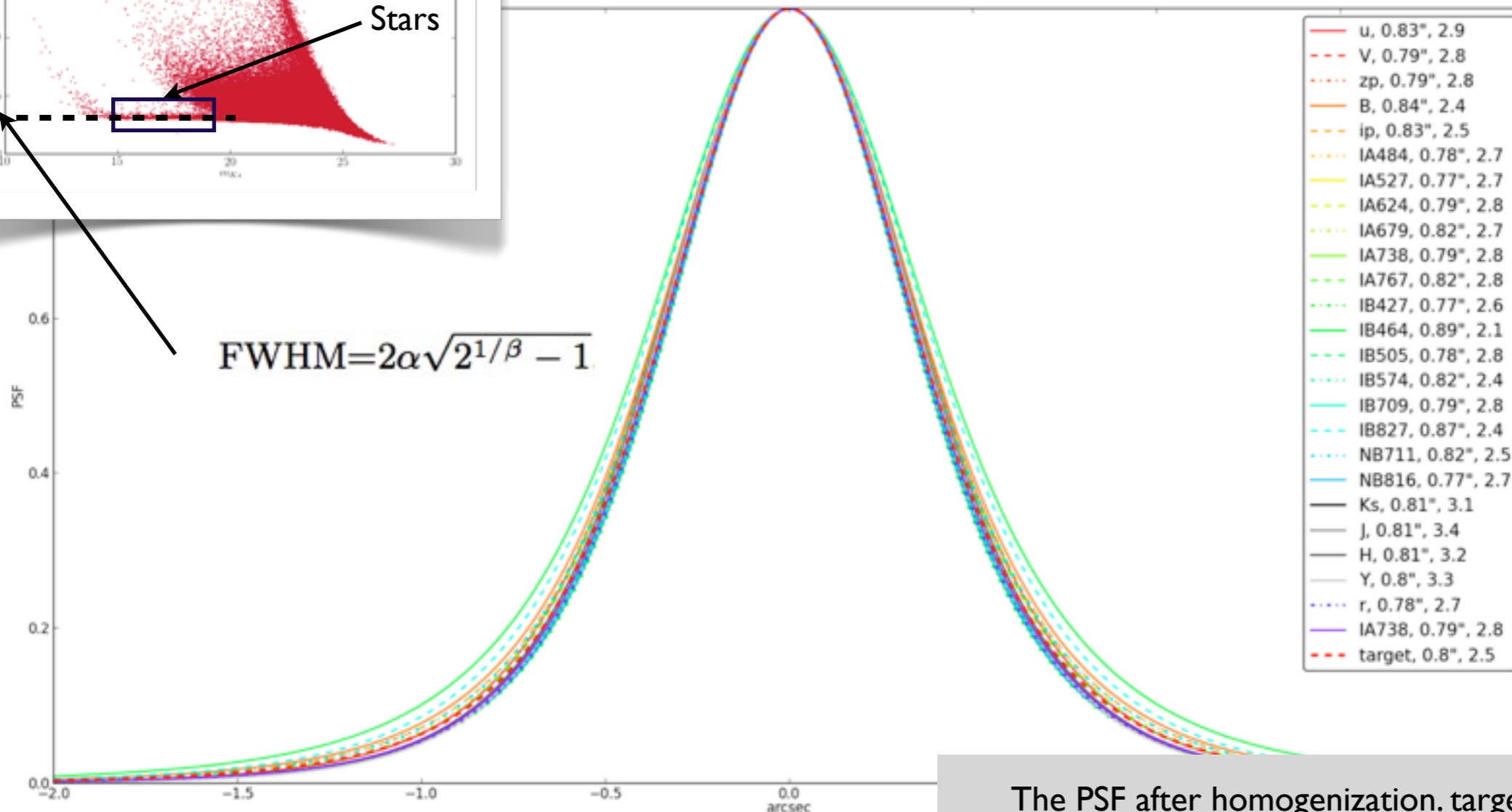
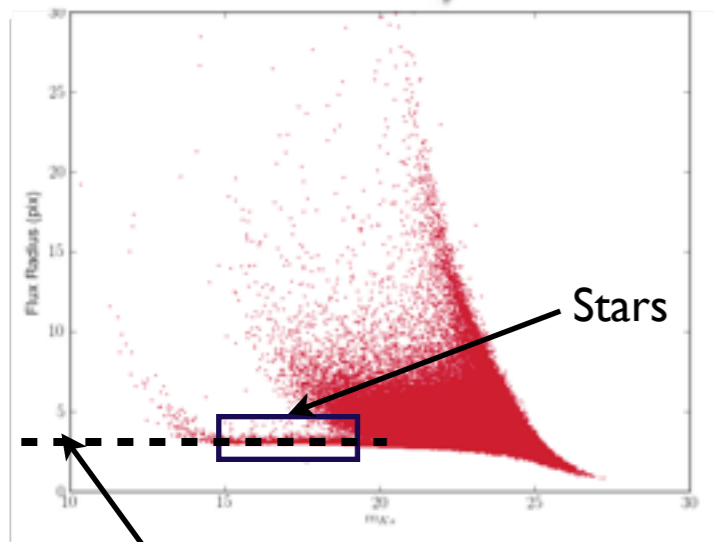
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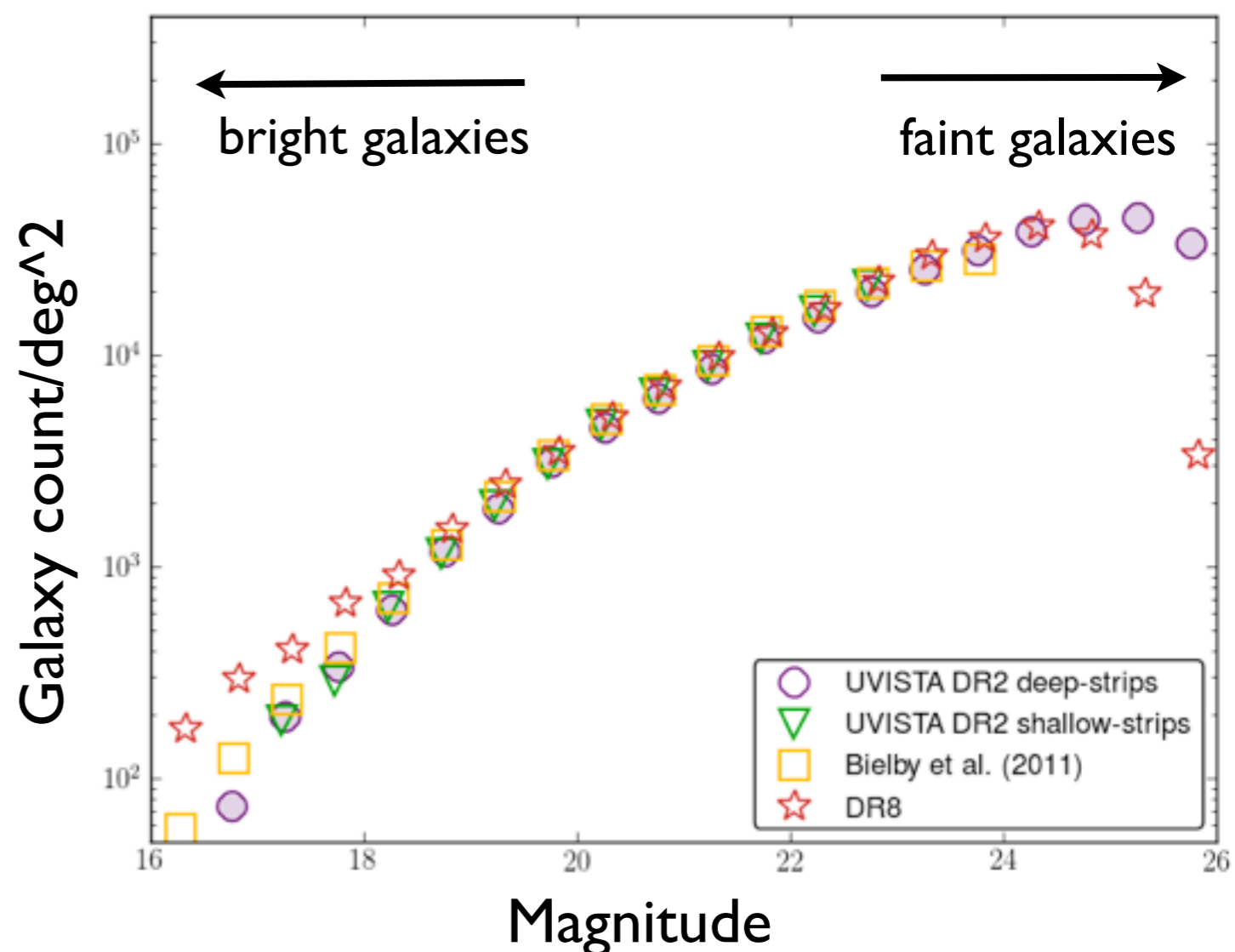
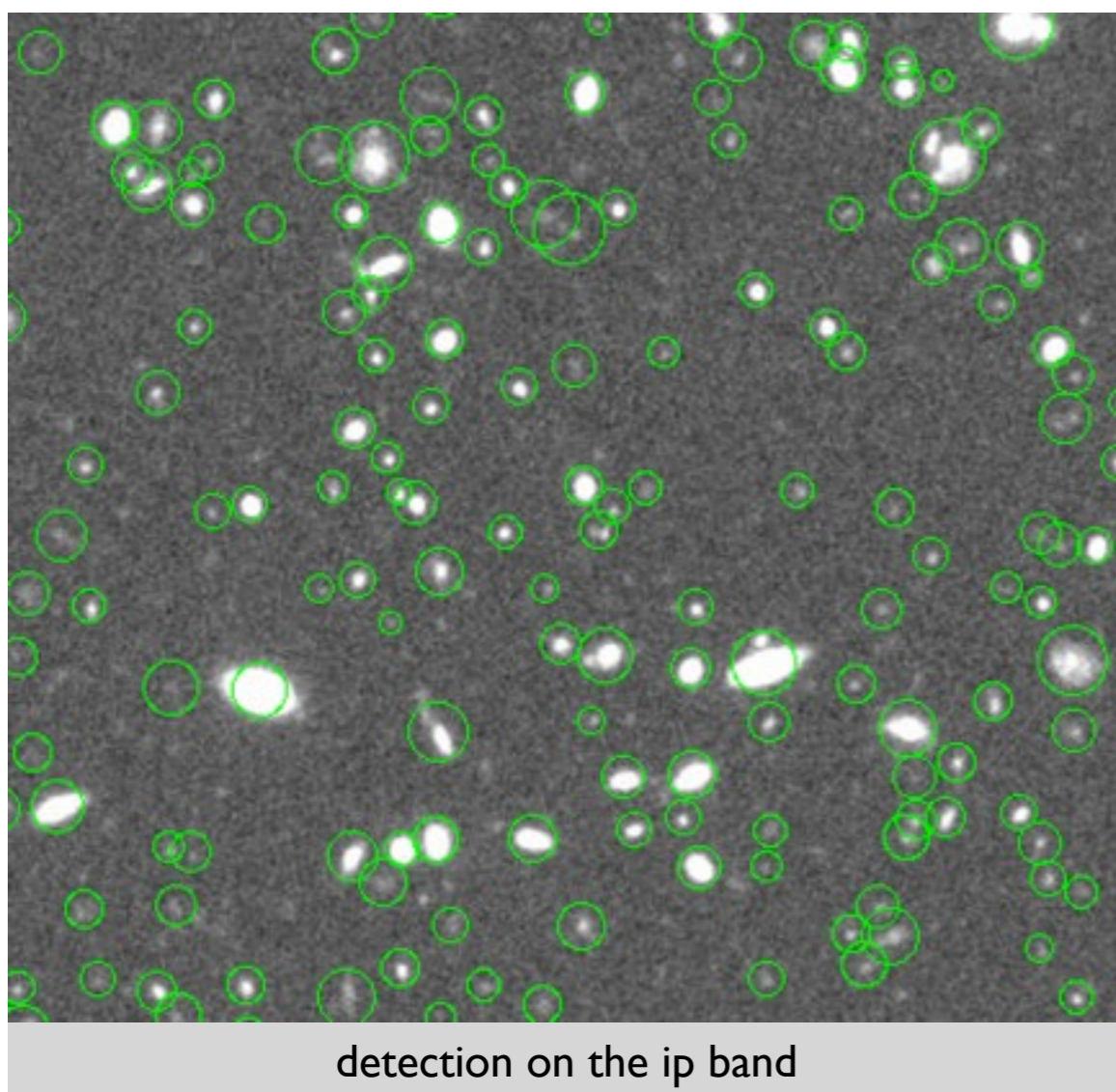
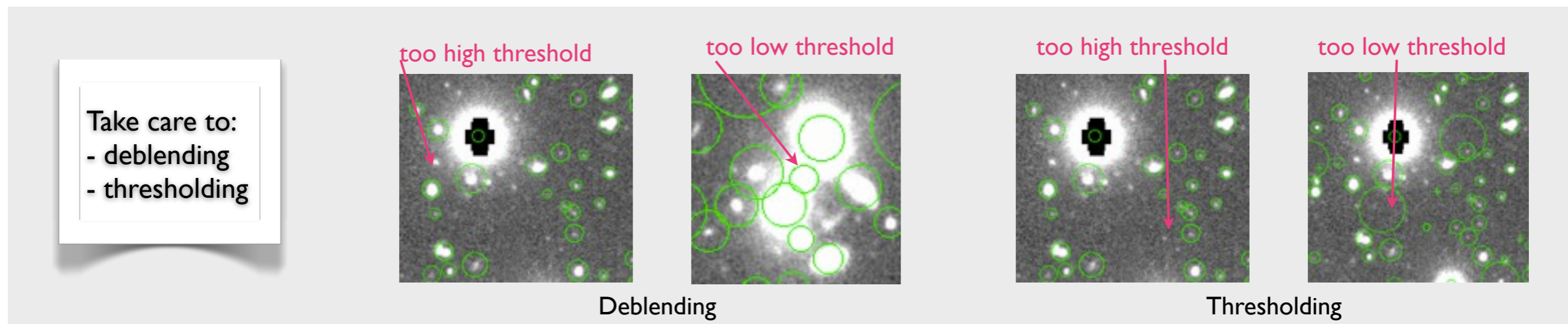
IR

The PSF after homogenization. target seeing: 0.8".

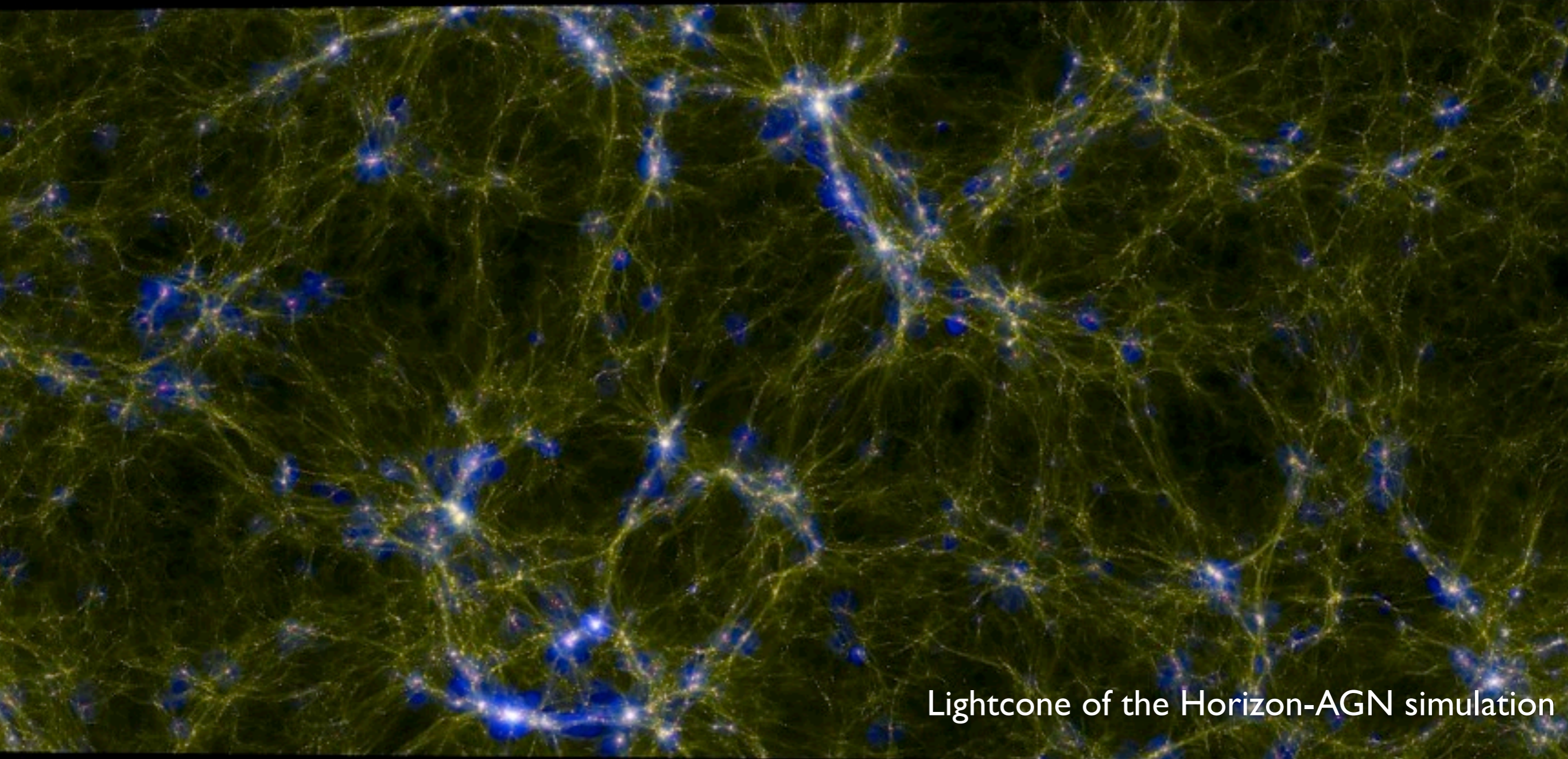
Construction of the galaxy catalog

SExtractor, Bertin et Arnouts 1999

2) Extract the catalog with SExtractor in dual-image mode detection image: chi2 image YJHKs+zpp



Thanks for your attention!



Lightcone of the Horizon-AGN simulation