

Catalogs from Multiwavelength data

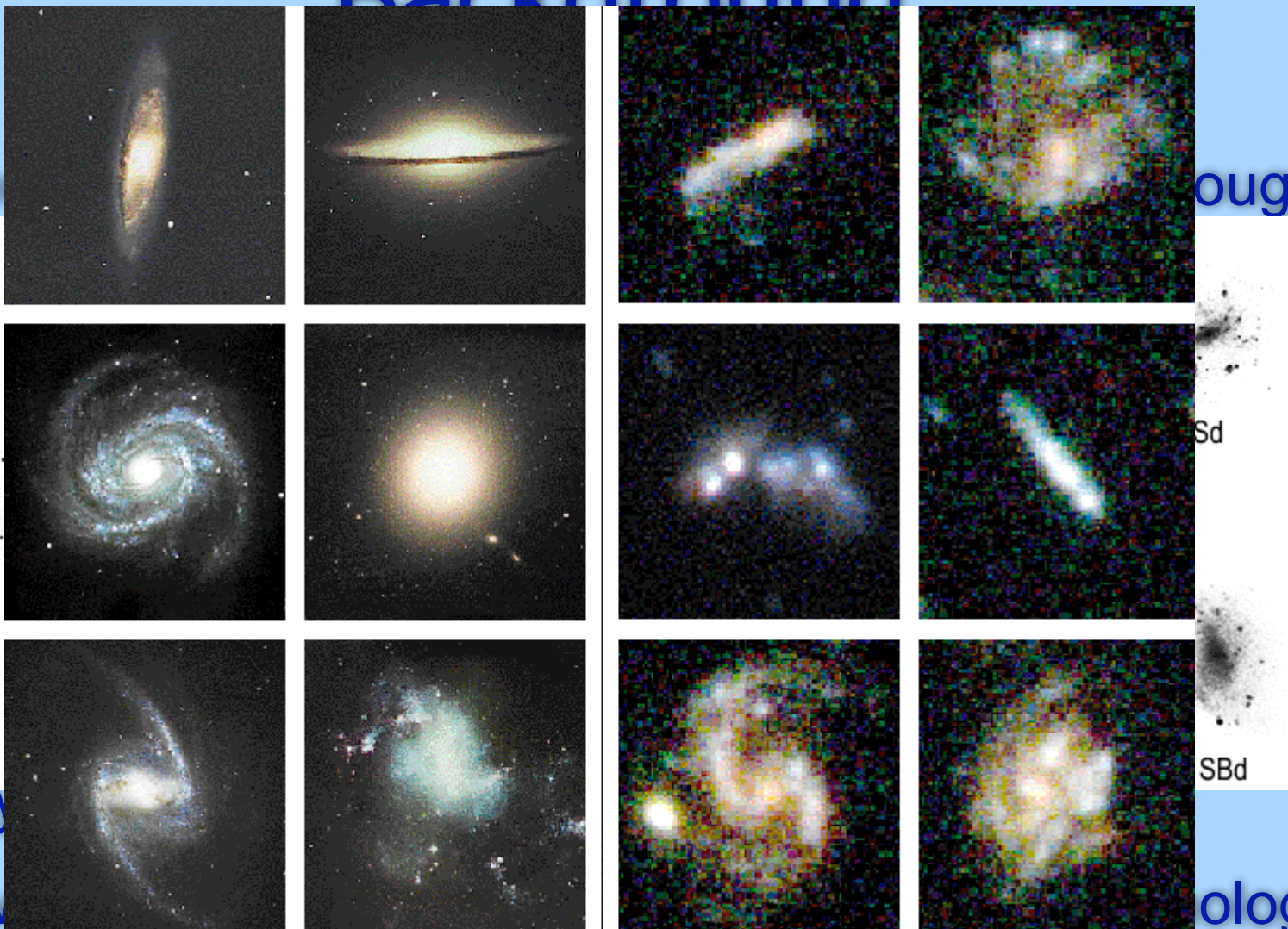
Mario Nonino (OATS-INAF)

Outline

- ◆ Motivation
- ◆ Methods
- ◆ Applications
- ◆ Example

Background

- Study the classification of galaxies
- The Hubble sequence
- What are the different types of galaxies?
- What is the role of dark matter in galaxy formation?
- How do galaxies evolve over time?



ough

Sd

SBd

ology?

Background 2

- ◆ Issues are addressed via multiwavelength obs. campaigns: from x-ray (CXO, XMM) to UV (Galex), Optical & Nir (ground and space based), Mid and Far Infrared (ISO, Spitzer) up to mm and radio wavelengths (VLA) .
- ◆ Examples: GOODS, COSMOS.

Distant

15'



NASA, E

C

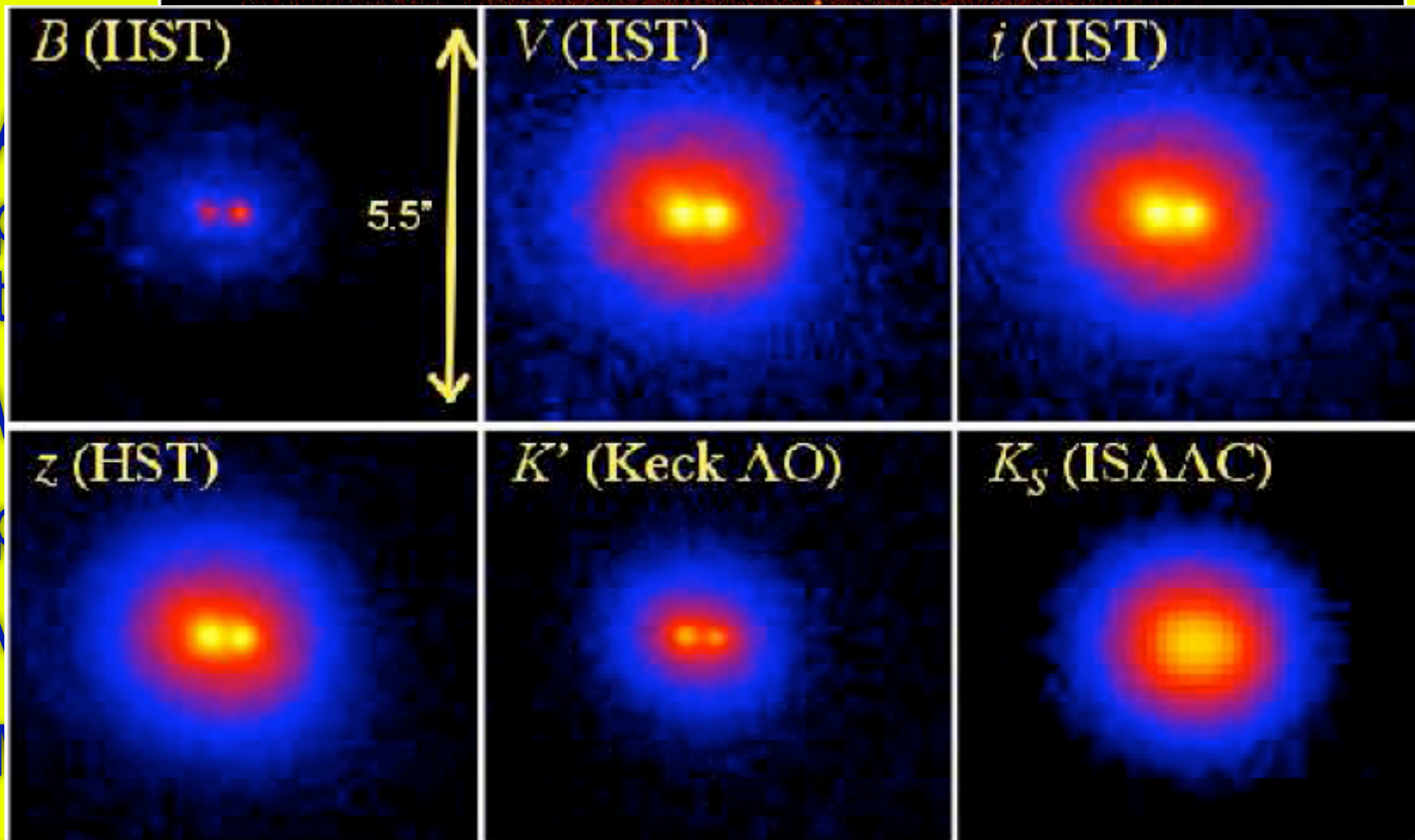


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Multi

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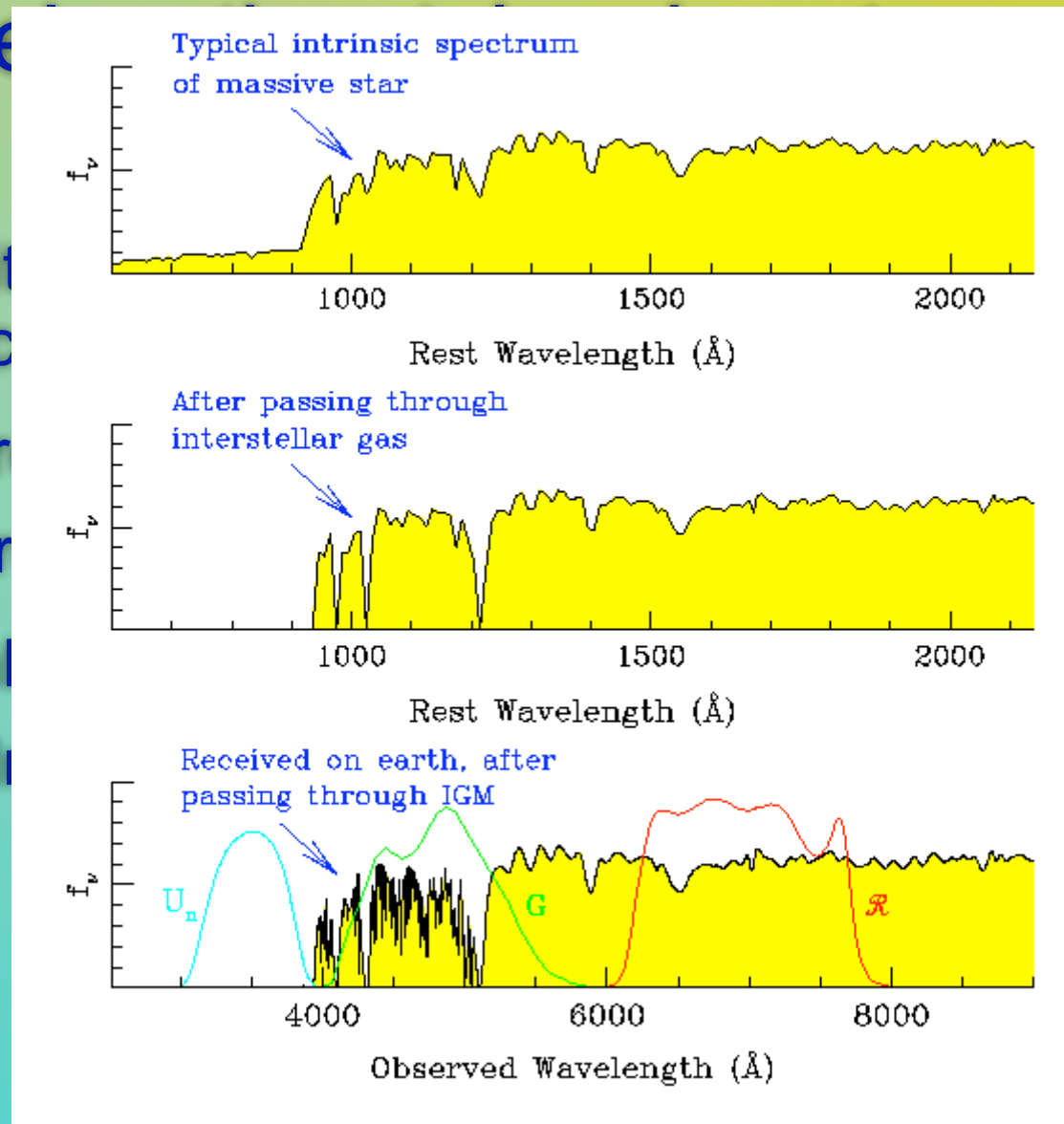


seen



Multiwave

- Same position
- astrometric
- Sources are
- catalogs are
- But what about
- Example of



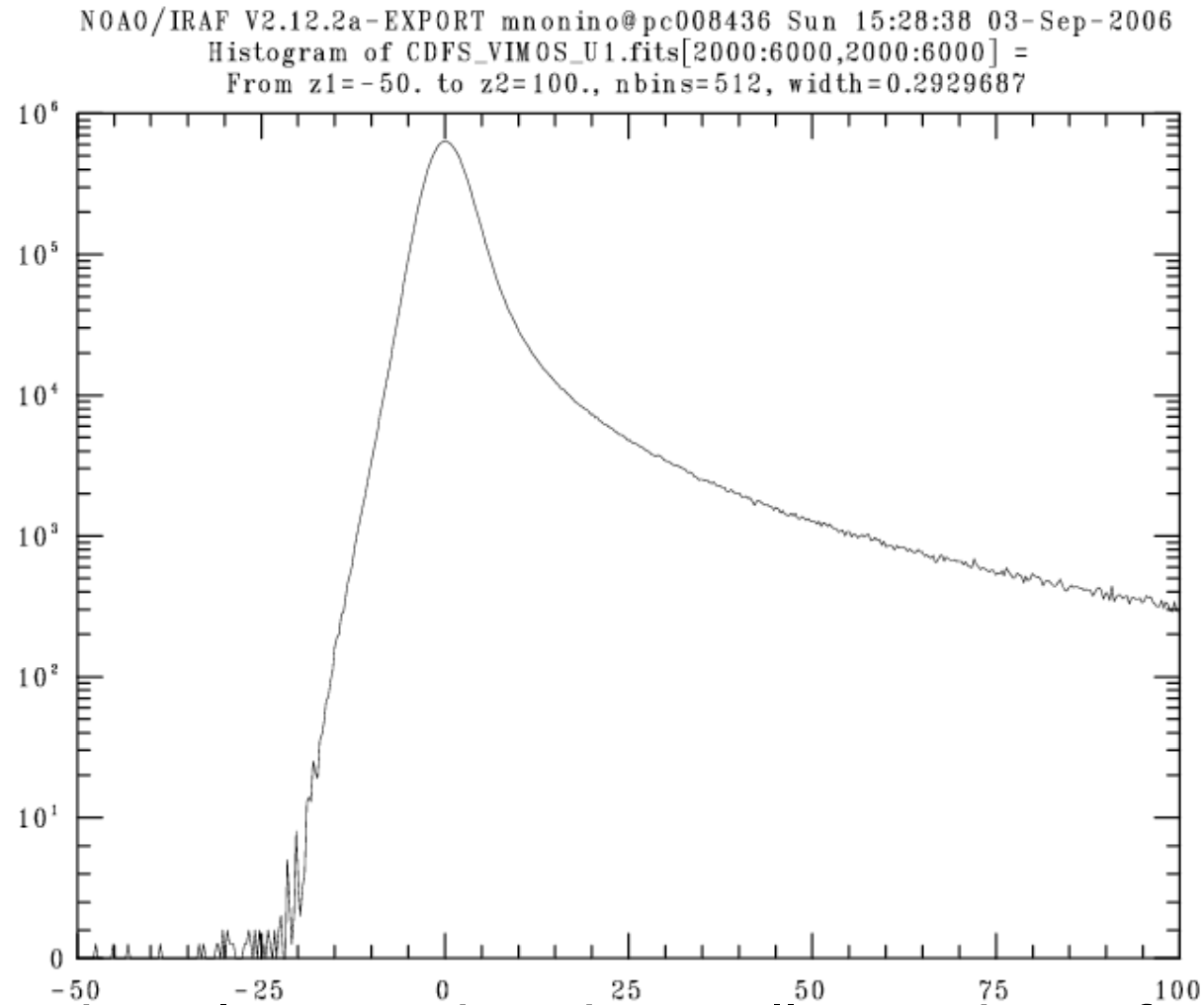
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Multi

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- ◆ imag
- ◆ varia
- ◆ With

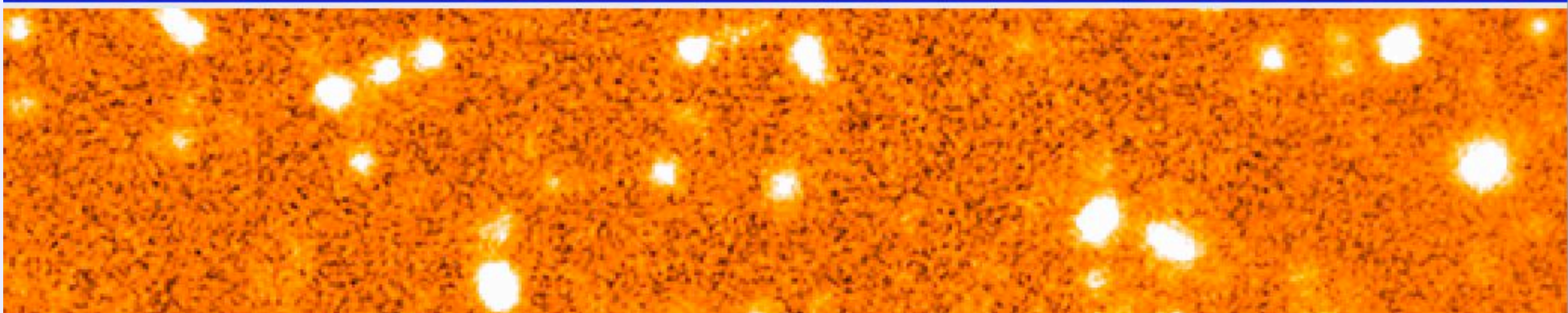
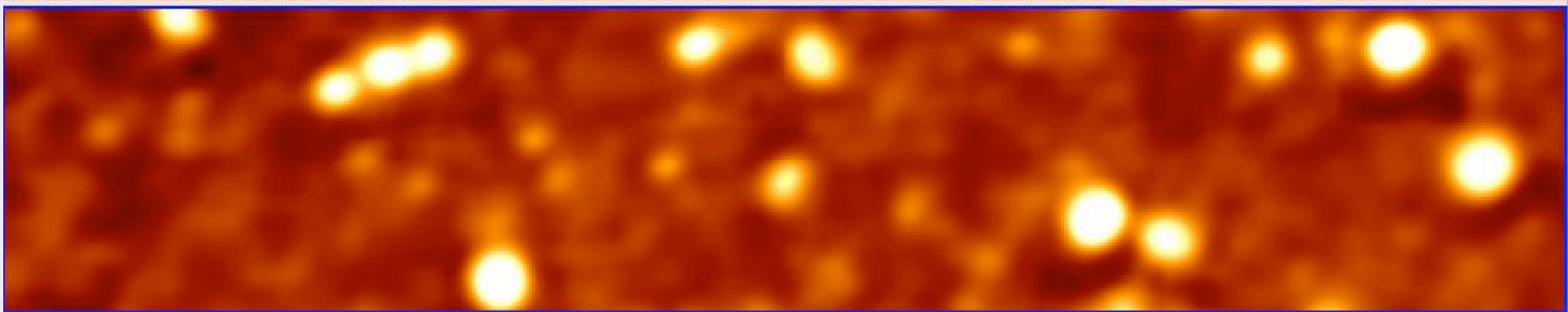
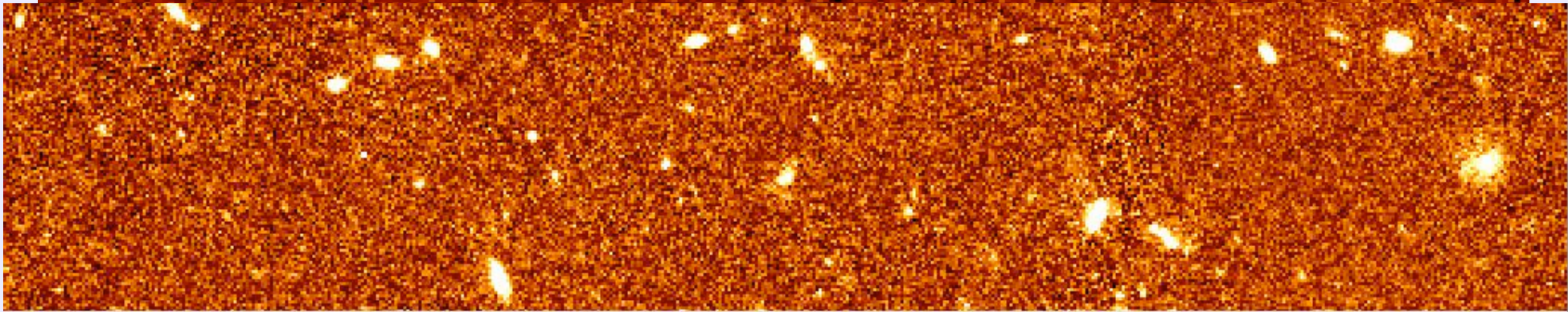
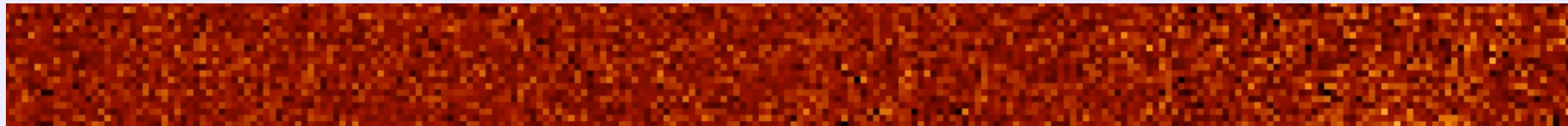


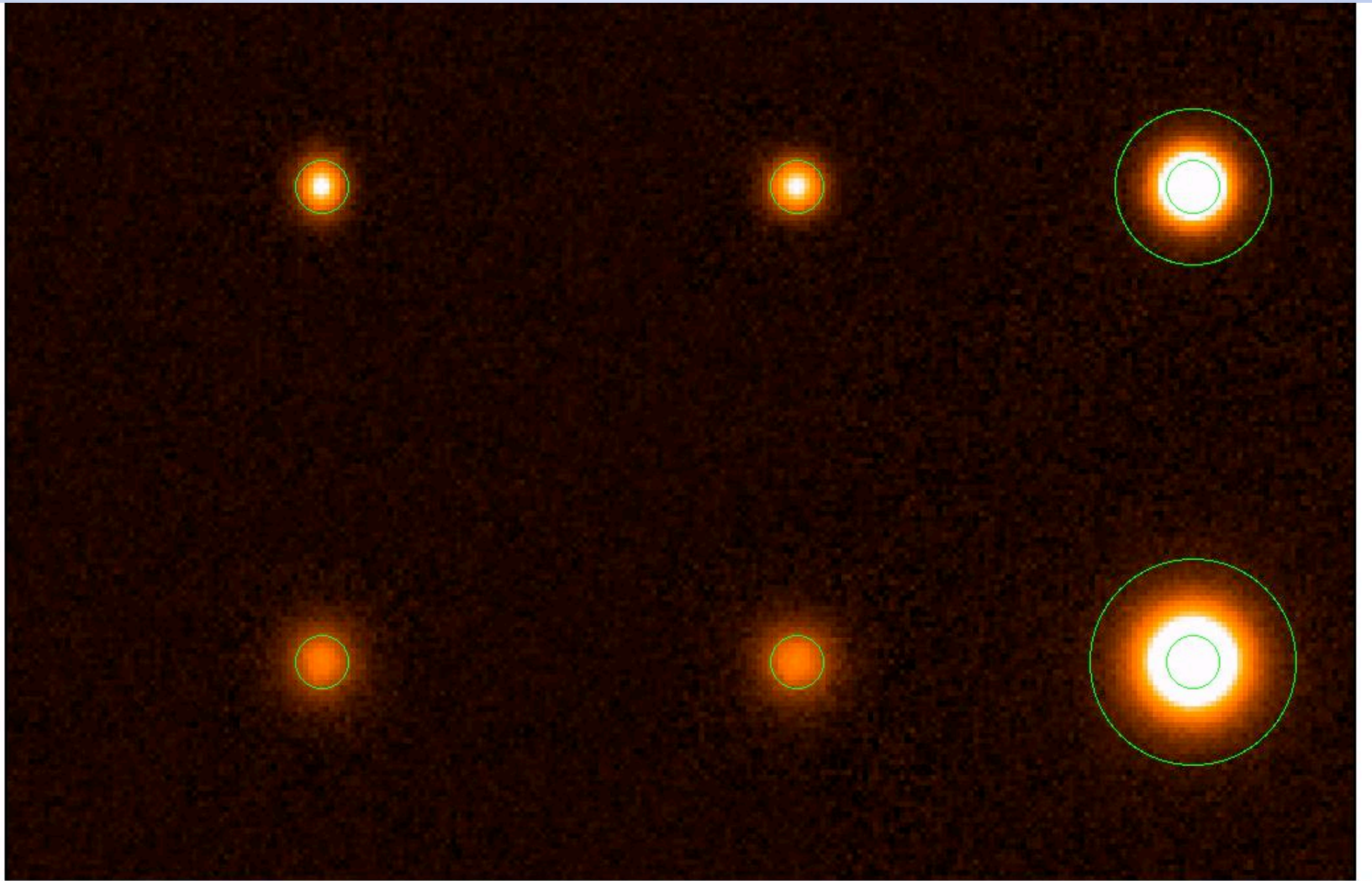
it

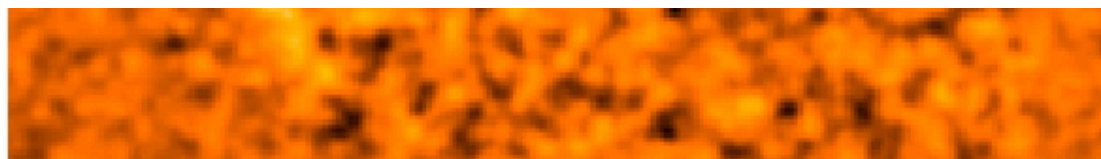
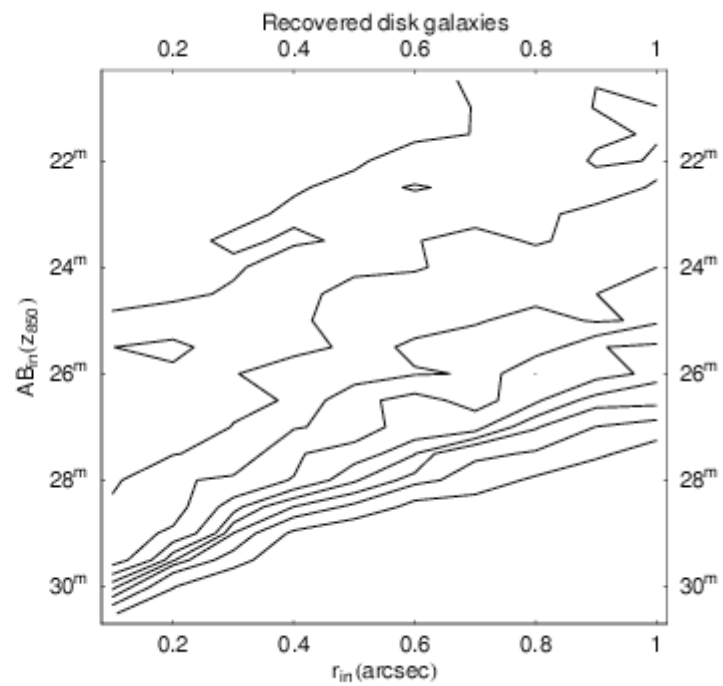
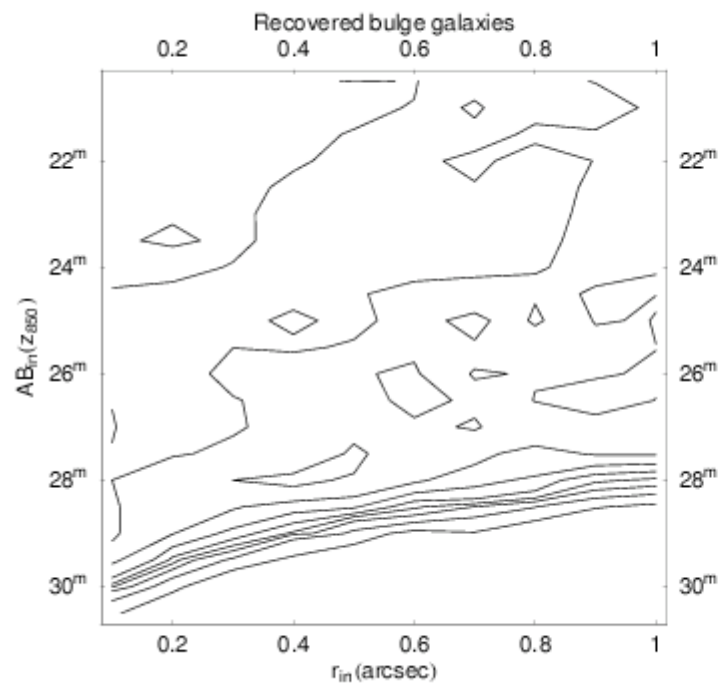
Simpler approach: select one band, usually a red one for the detection and all the others for measure only.

Multiwavelength catalog: generation

- A common requirement for these steps is that the PSF effects should be taken into account!
- $I = T \otimes P + N$: the observed image (I) is the convolution of the true image (T) with the PSF (P) plus the noise (N)
- Different instruments/observing conditions result in different PSF

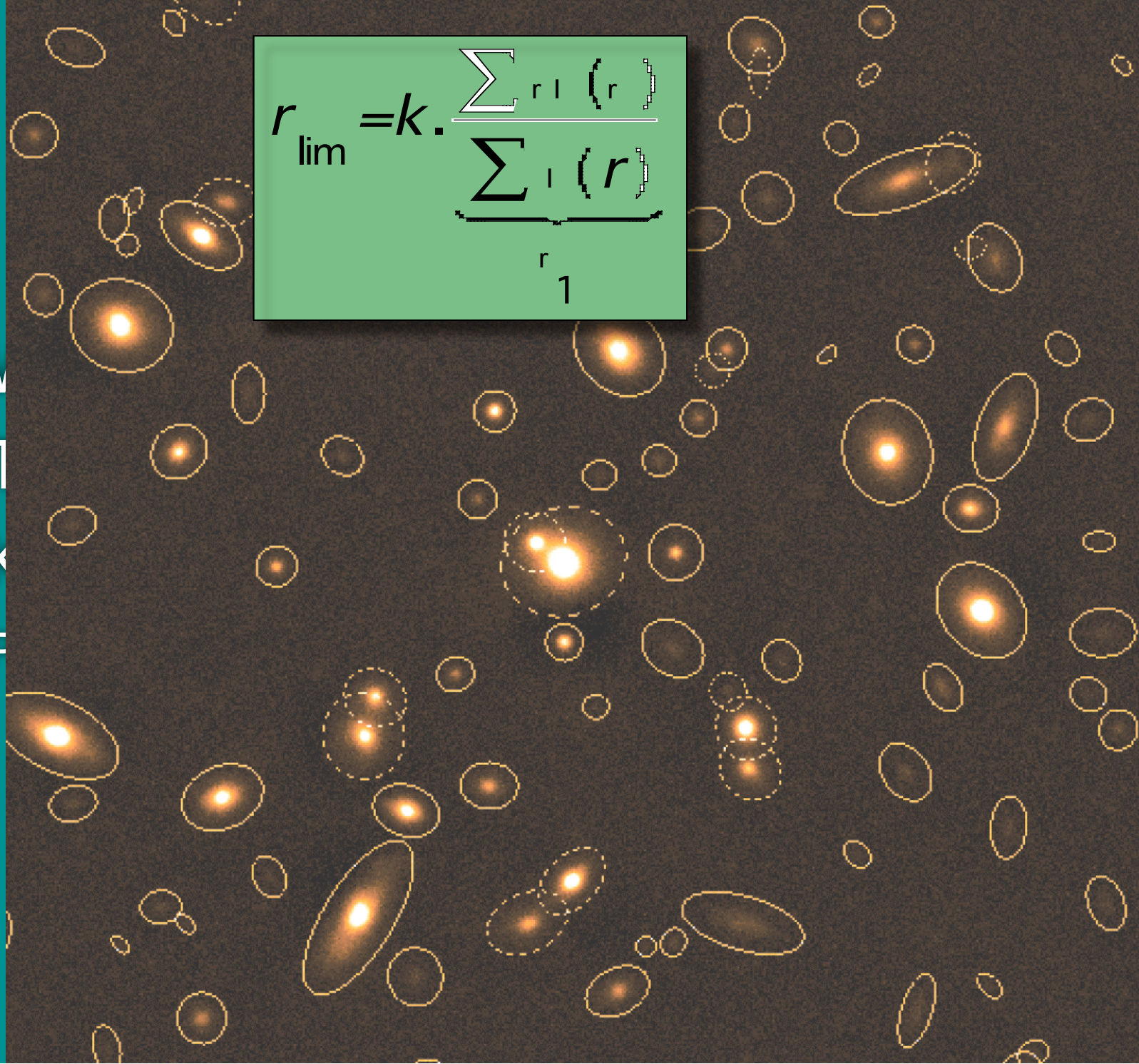






$$r_{\text{lim}} = k \cdot \frac{\sum_{r=1}^{\infty} r^k}{\sum_{r=1}^{\infty} r}$$

- ◆ V
- ◆ T
- ◆ K
- ◆ F



- ◆ From
- The AB magnitude when f
- The advantage is directly

$$\text{mag}_{\text{Vega}}(\text{Obj}) = -2.5 \log_{10} \left(\frac{f(\text{Obj}) * S * dl}{f(\text{Vega}) * S * dl} \right)$$

$$\begin{aligned} \text{mag}_{\text{AB}}(\text{OBJ}) &= -2.5 \log_{10} \left(\frac{f(\text{Obj}) * S * dl}{f(\text{Vega}) * S * dl} \right) - 48.6 \end{aligned}$$

AB correction: Vega mag in AB system:
 $-2.5 \log_{10} \left(\frac{f(\text{Vega}) * S * dl}{f(\text{Vega}) * S * dl} \right)$

$$\text{mag}_{\text{AB}}(\text{Obj}) = \text{mag}_{\text{Vega}}(\text{Obj}) + \text{mag}_{\text{AB}}(\text{Vega})$$

$$\text{mag}_{\text{AB}}(\text{Obj}) = \text{mag}_{\text{Vega}}(\text{Obj}) + \text{AB}_{\text{correction}}$$

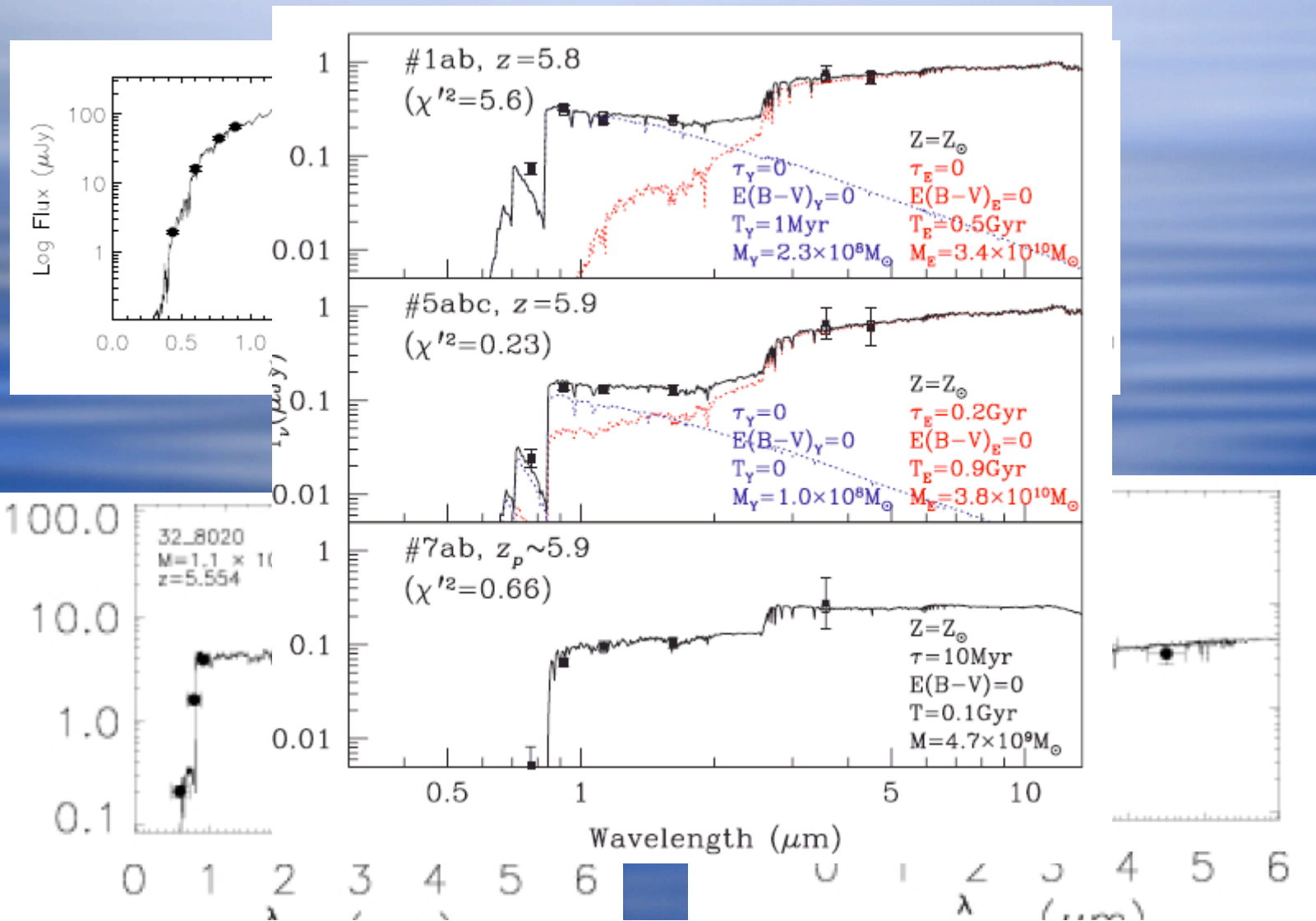
) (48.57)

-1

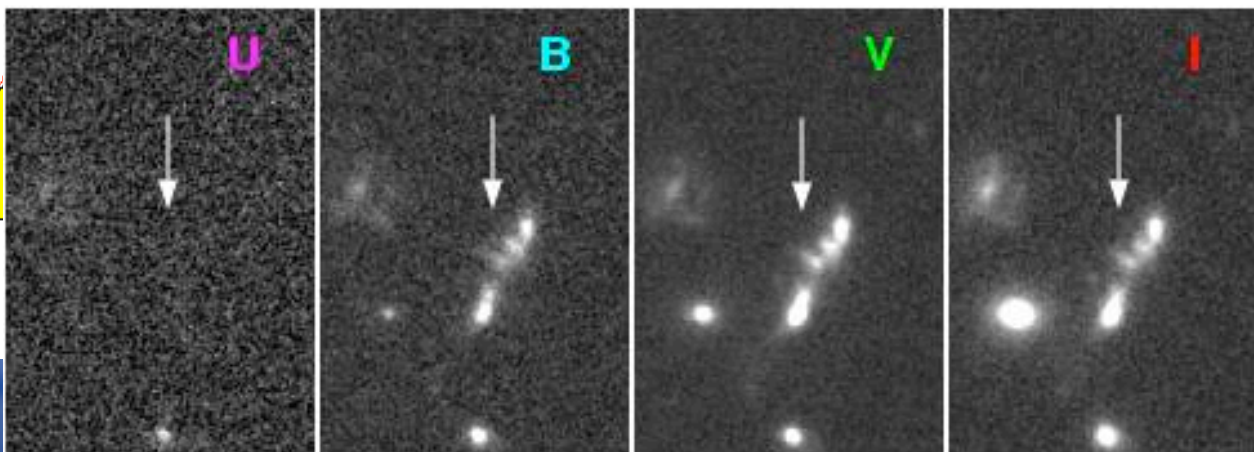
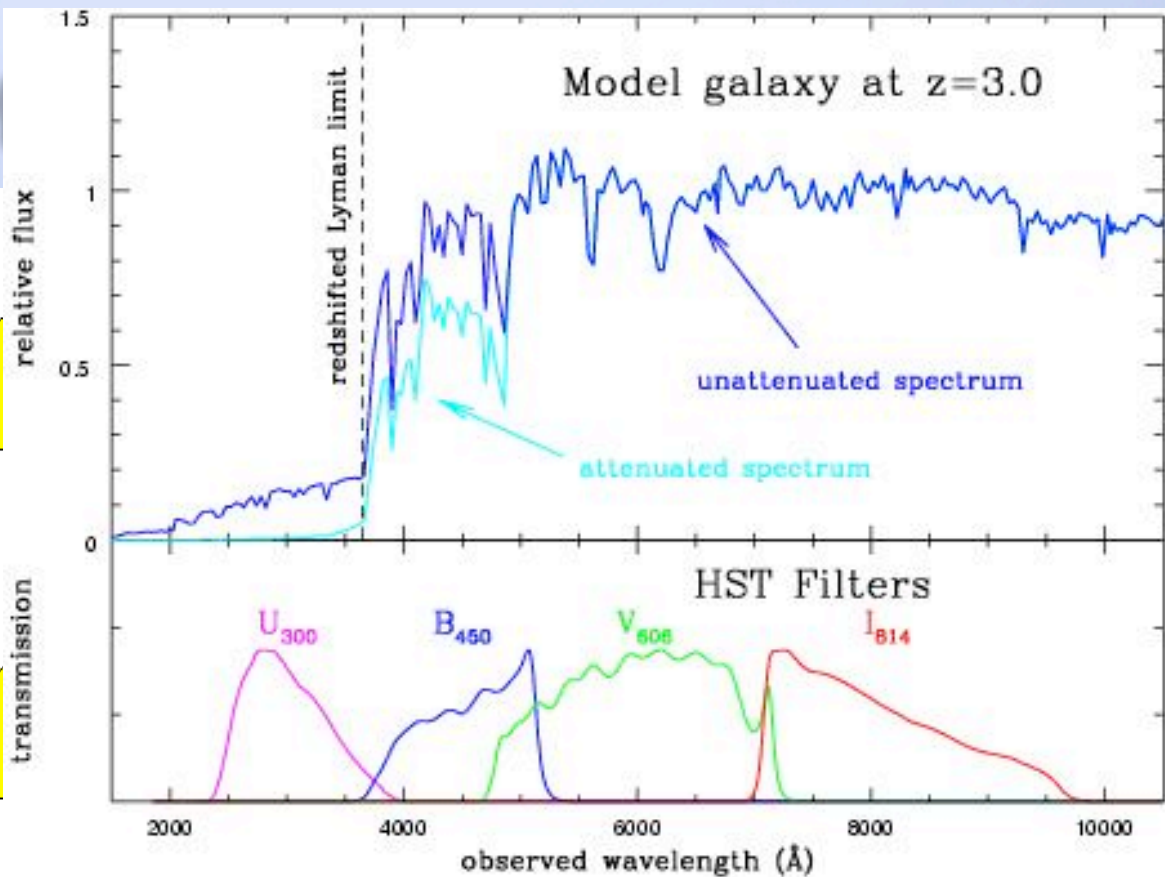
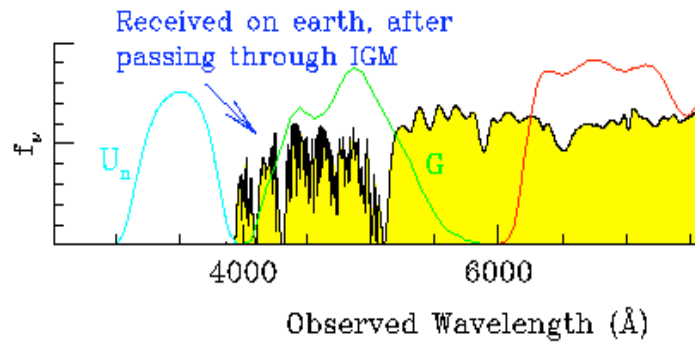
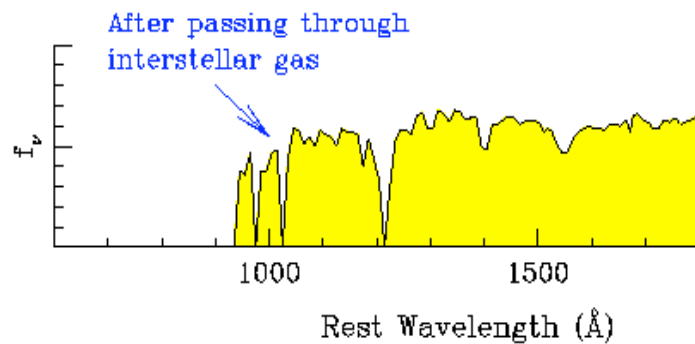
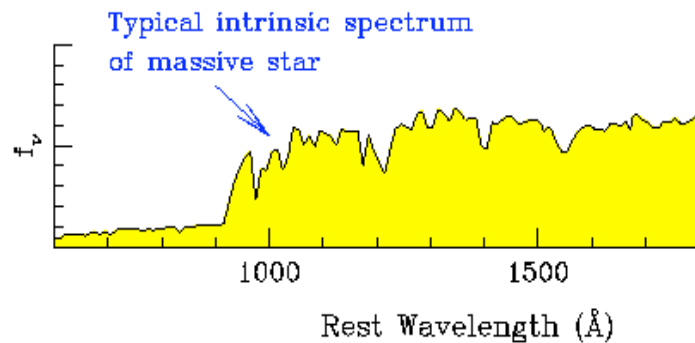
itudes are

$$f(\nu) = 3720 * \text{dex}(-0.4 * m_{\text{AB}}) \text{ Jy}$$

Mass estimation (e.g. Bruzual & Charlot, MNRAS, 2003, 344)

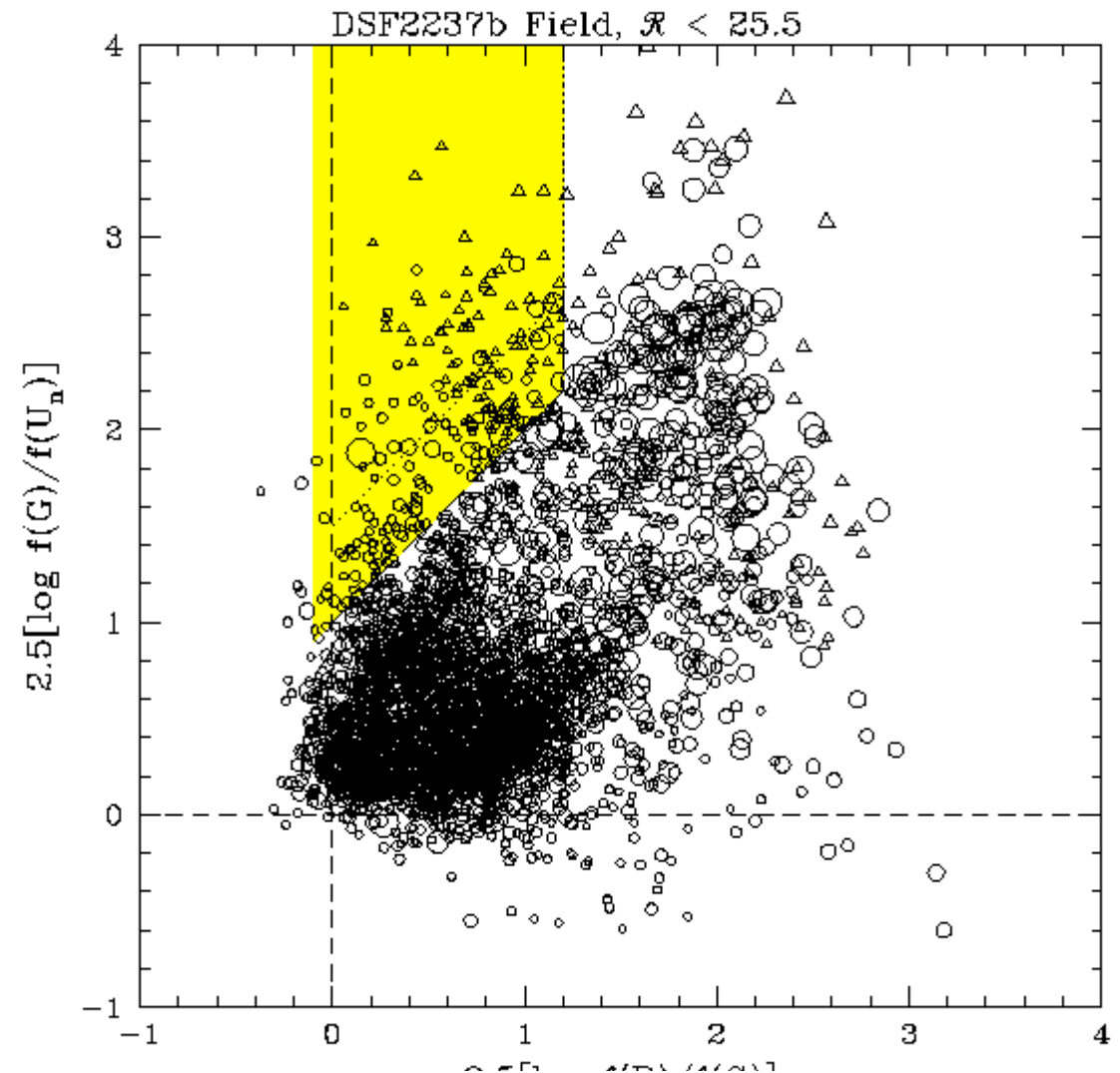
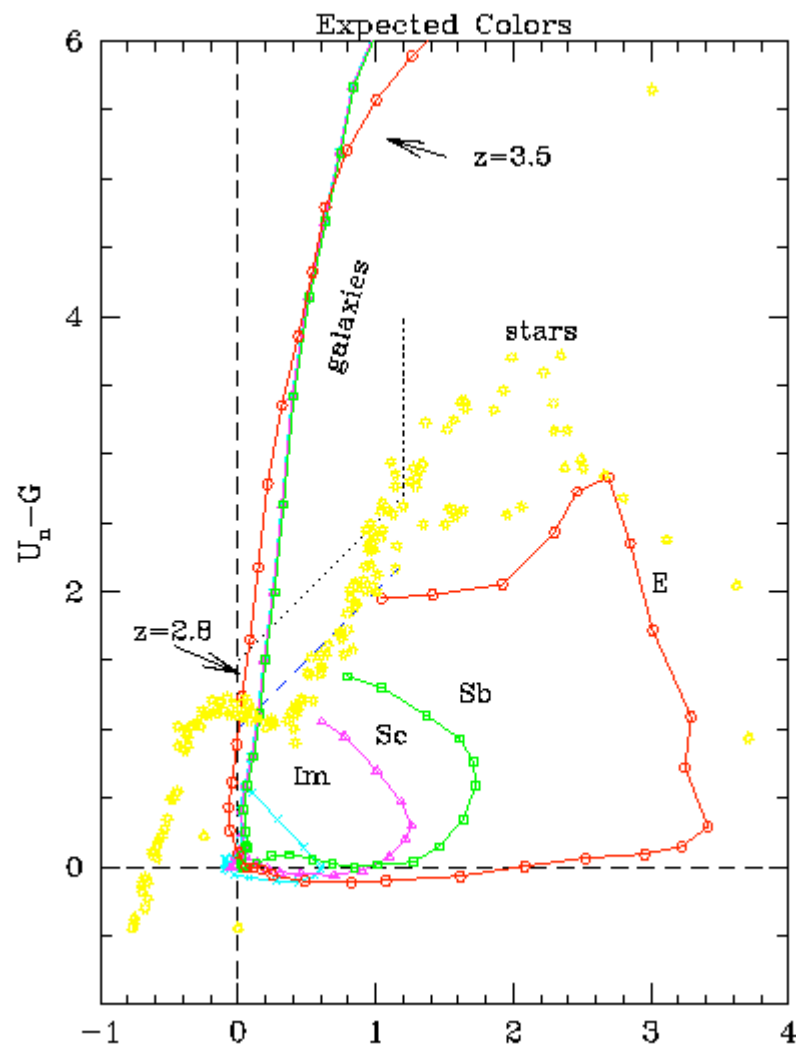


Dro



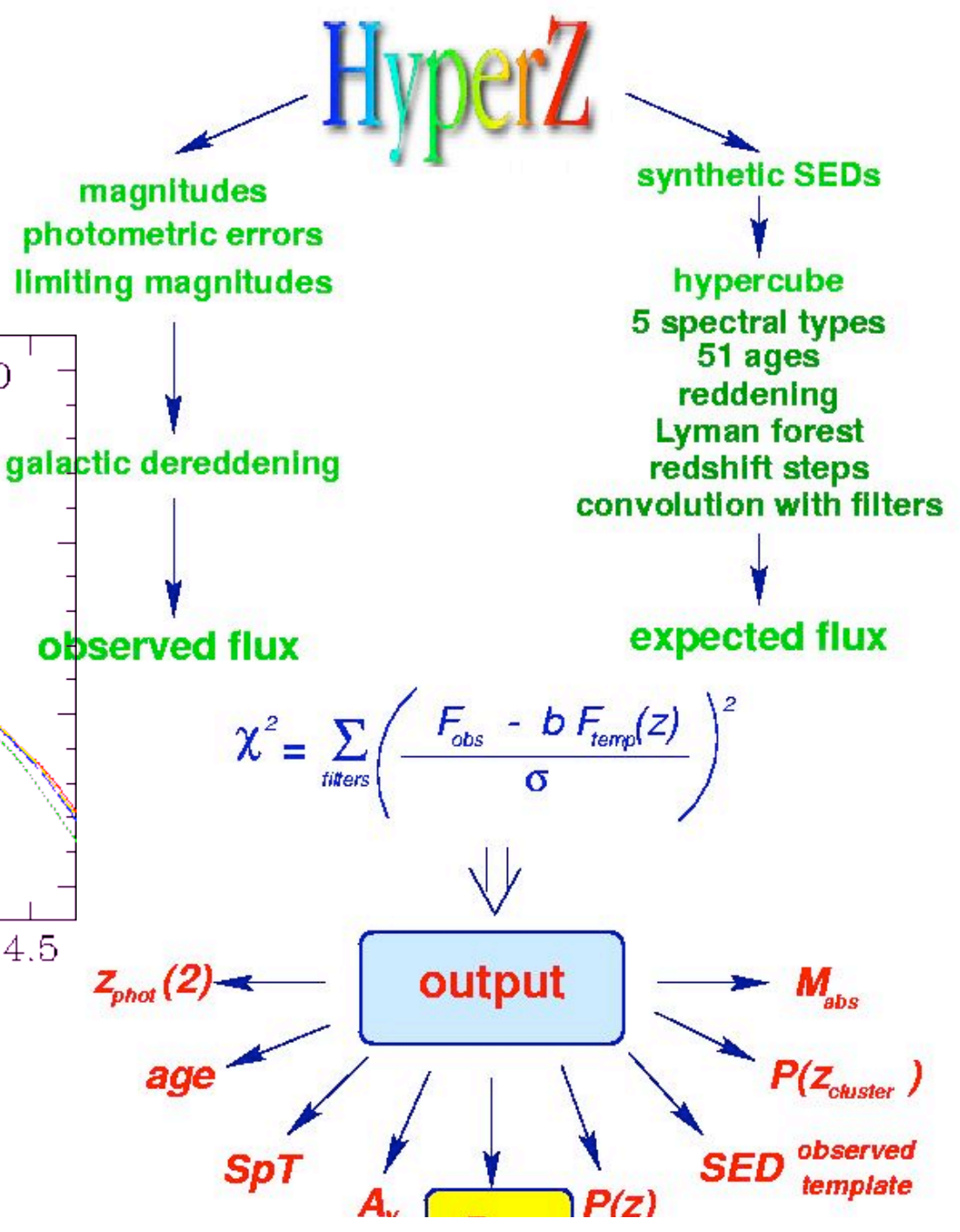
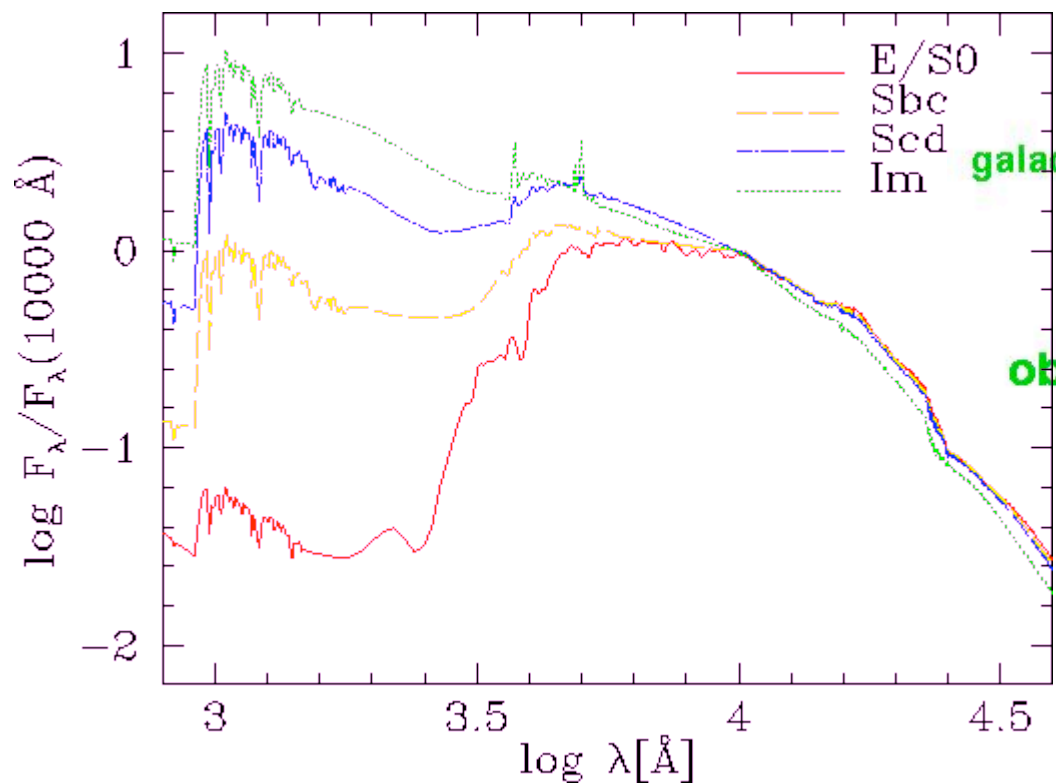
Using multicolor cat. for drop out search

◆ Color-color plots

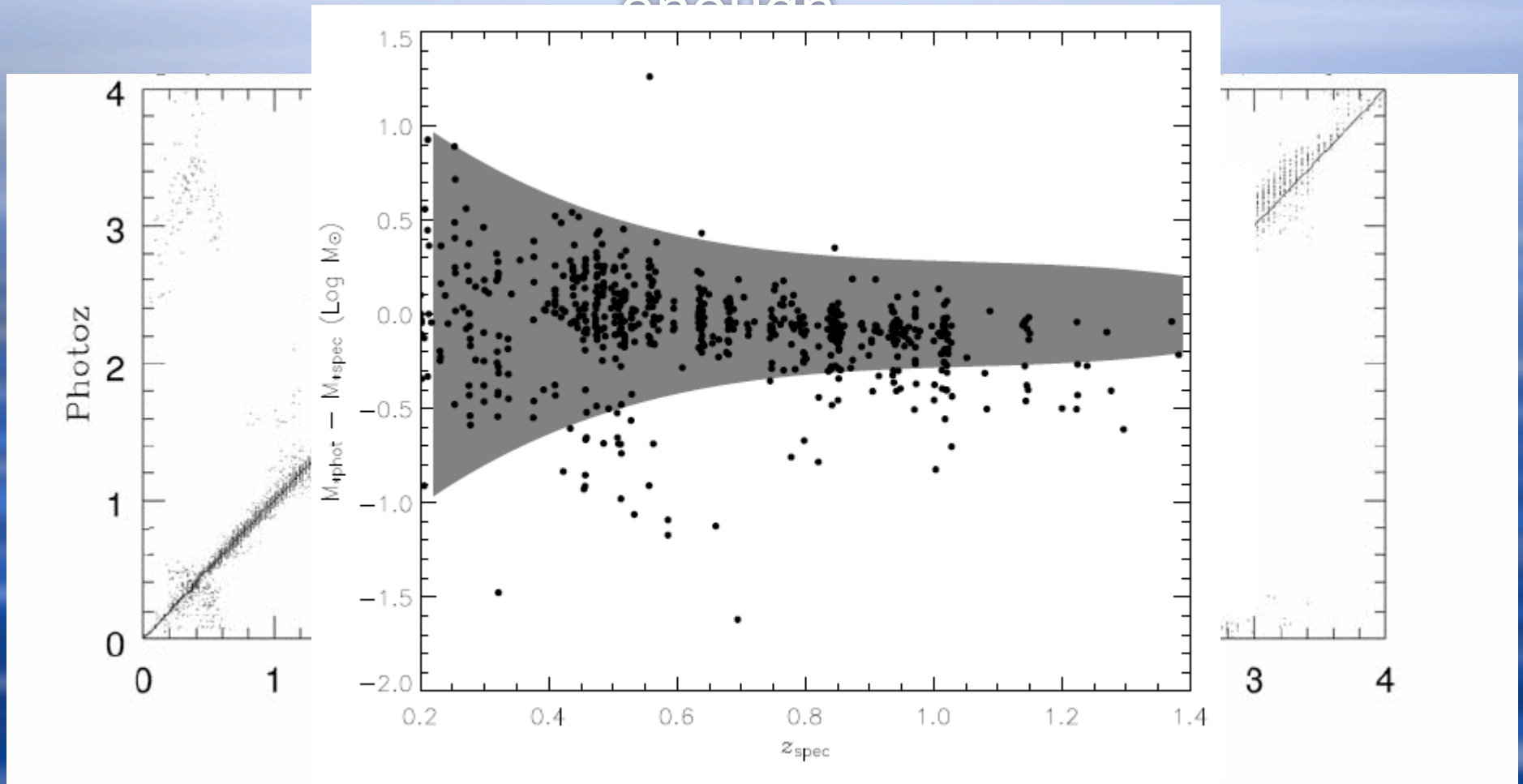


Photometric redshift:

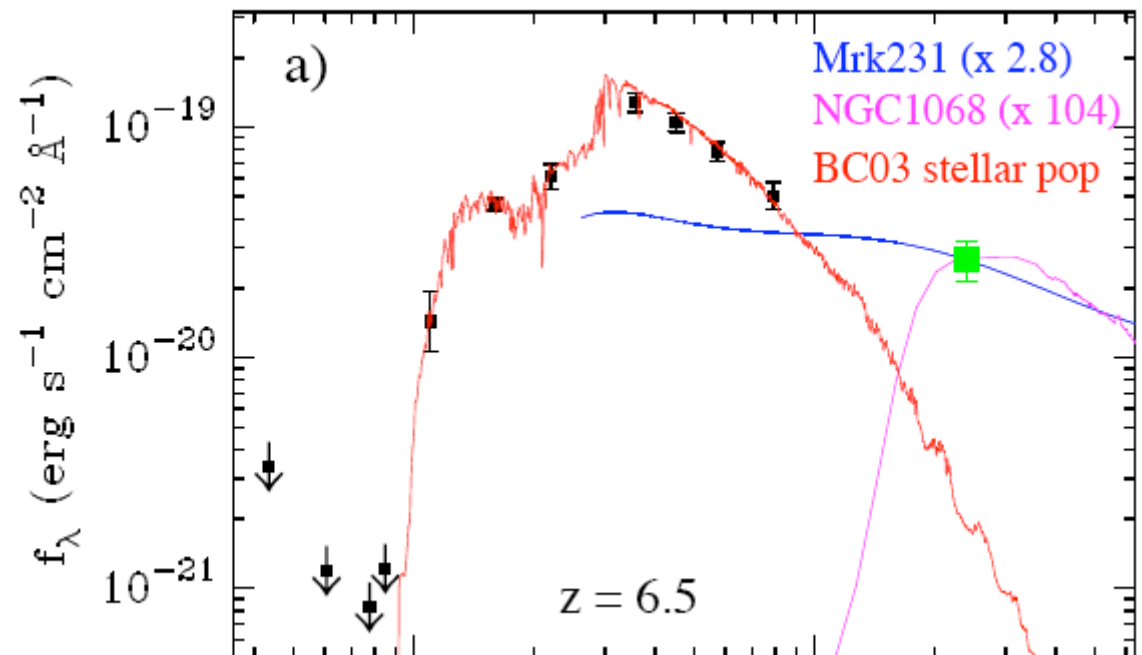
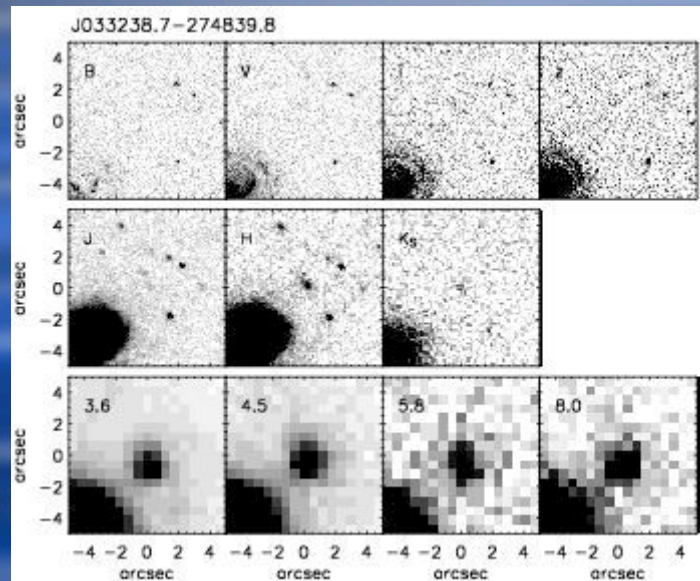
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Photometric redshift: when spectroscopy is not enough



Very distant galaxy (candidate...)

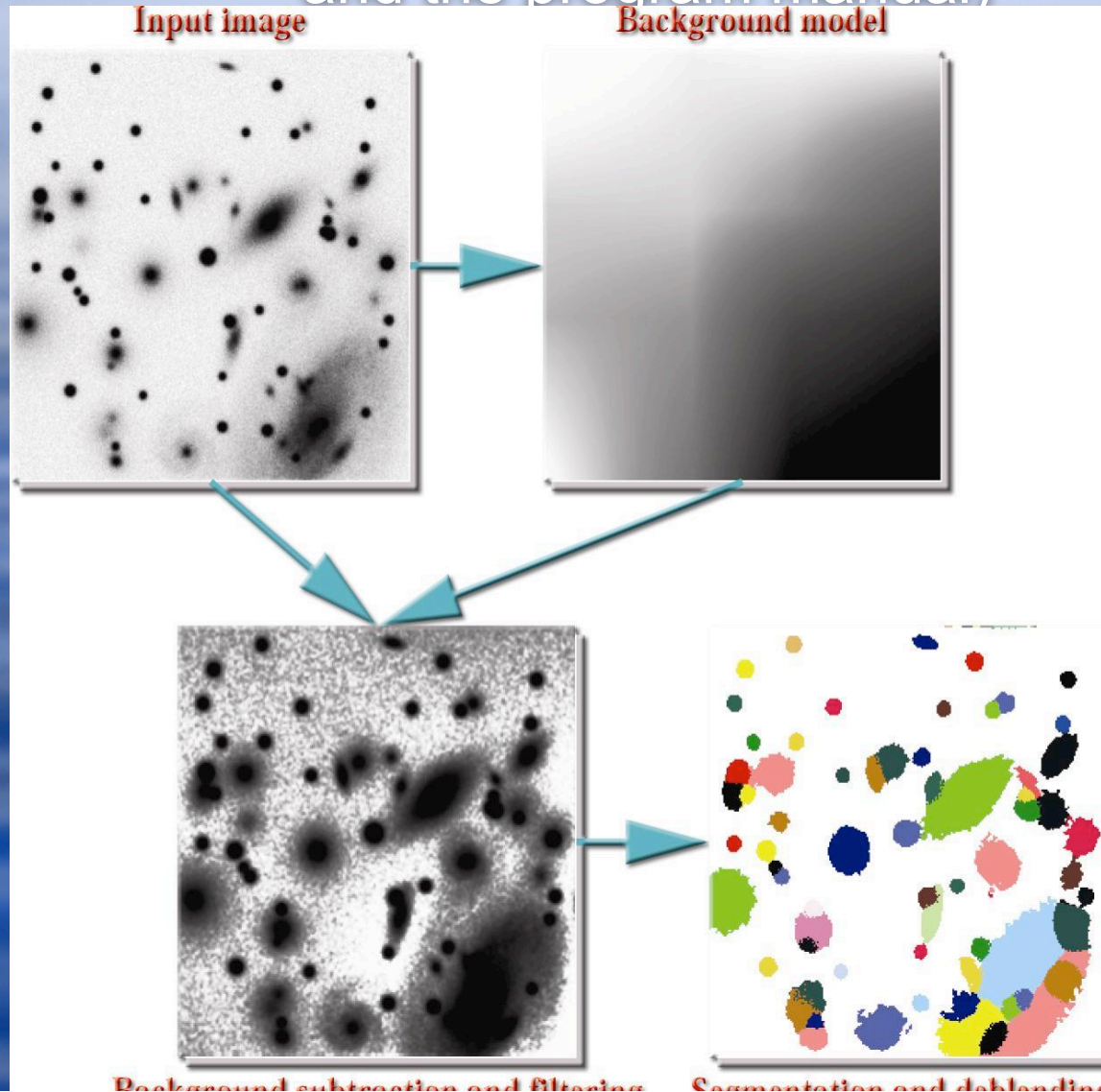


A really short introduction to sextractor

(e.g. [http://www-](http://www-int.stsci.edu/~holwerda/OldHomepage/se.html)

[int.stsci.edu/~holwerda/OldHomepage/se.html](http://www-int.stsci.edu/~holwerda/OldHomepage/se.html)

and the program manual)



Background subtraction and filtering

Segmentation and deblending

How to run it: now the practical session...

◆ `sex -c <config_file> <input_image> -
PARAMETER parameter_value`

- ◆ Remember to change: *CATALOG_NAME*, *MAG_ZEROPOINT*!
- ◆ The zeropoints to be used are:
 - U: 33.53
 - R: 34.05
 - z (F850LP) : 24.84
 - Ks: 26.0
 - IRAC: 22.42
- ◆ To extract a meaningful catalog, remember to exclude the regions NOT in common in all bands. A quick way to do this is: display all images, taken note of the minimum and maximum good values for x and y. Then just type : `cat your_catalog_name | awk ' {if ($4 > xmin && $4 < xmax && $5 > ymin && $5 < ymax) print $0}' > sub_catalog_name.`
- ◆ To paste all catalogs together: `paste cat1 cat2 cat3 .. > colour.cat`

Preview

