Spectrophotometry *Working Group*

main page

Mass estimations

Preliminary results

The spectrophotometric mass
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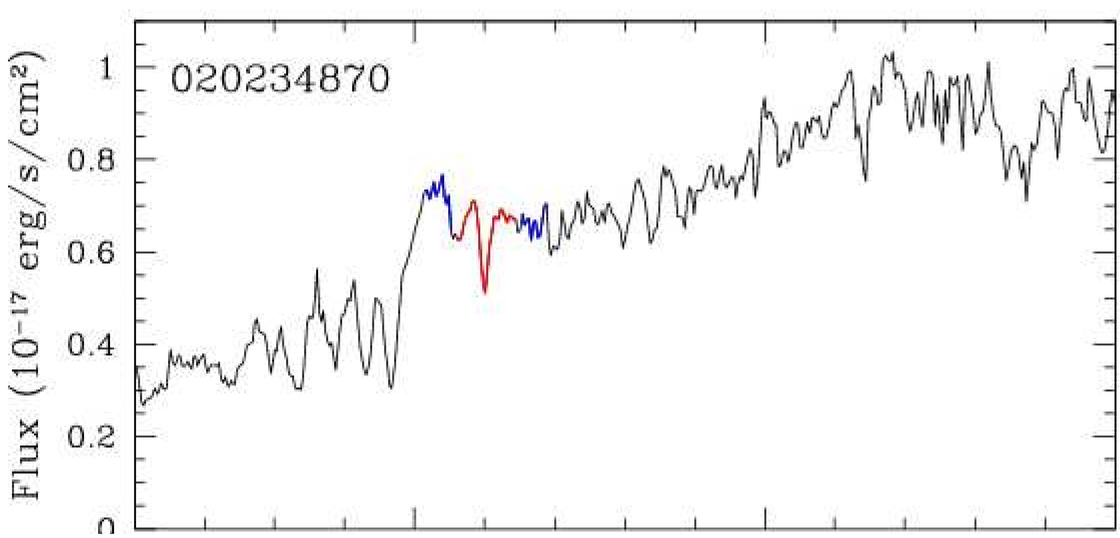
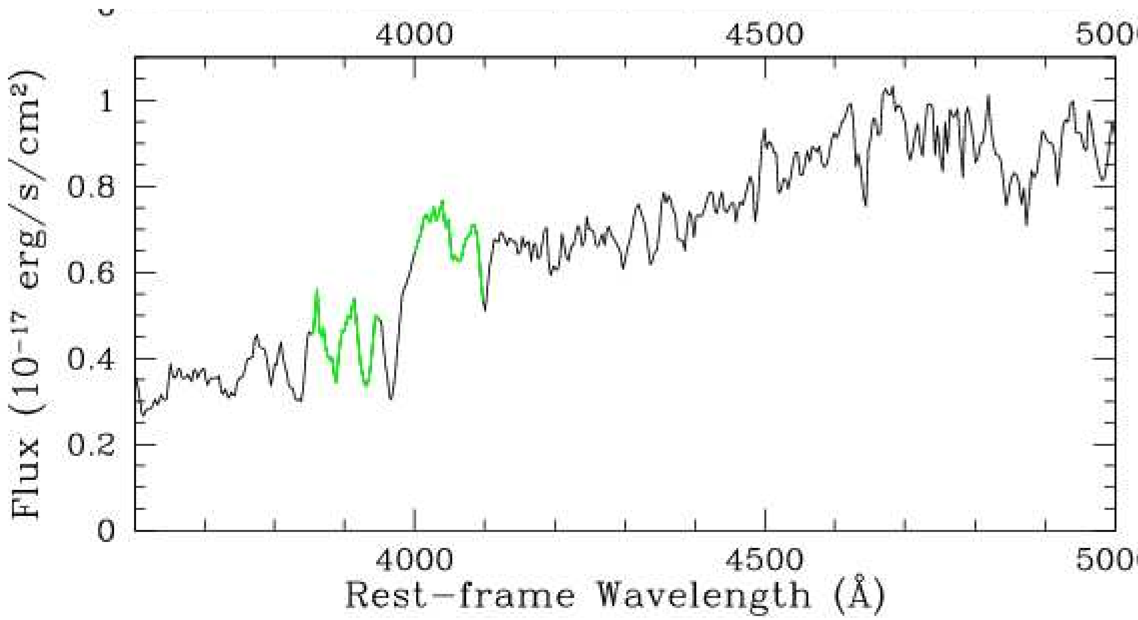
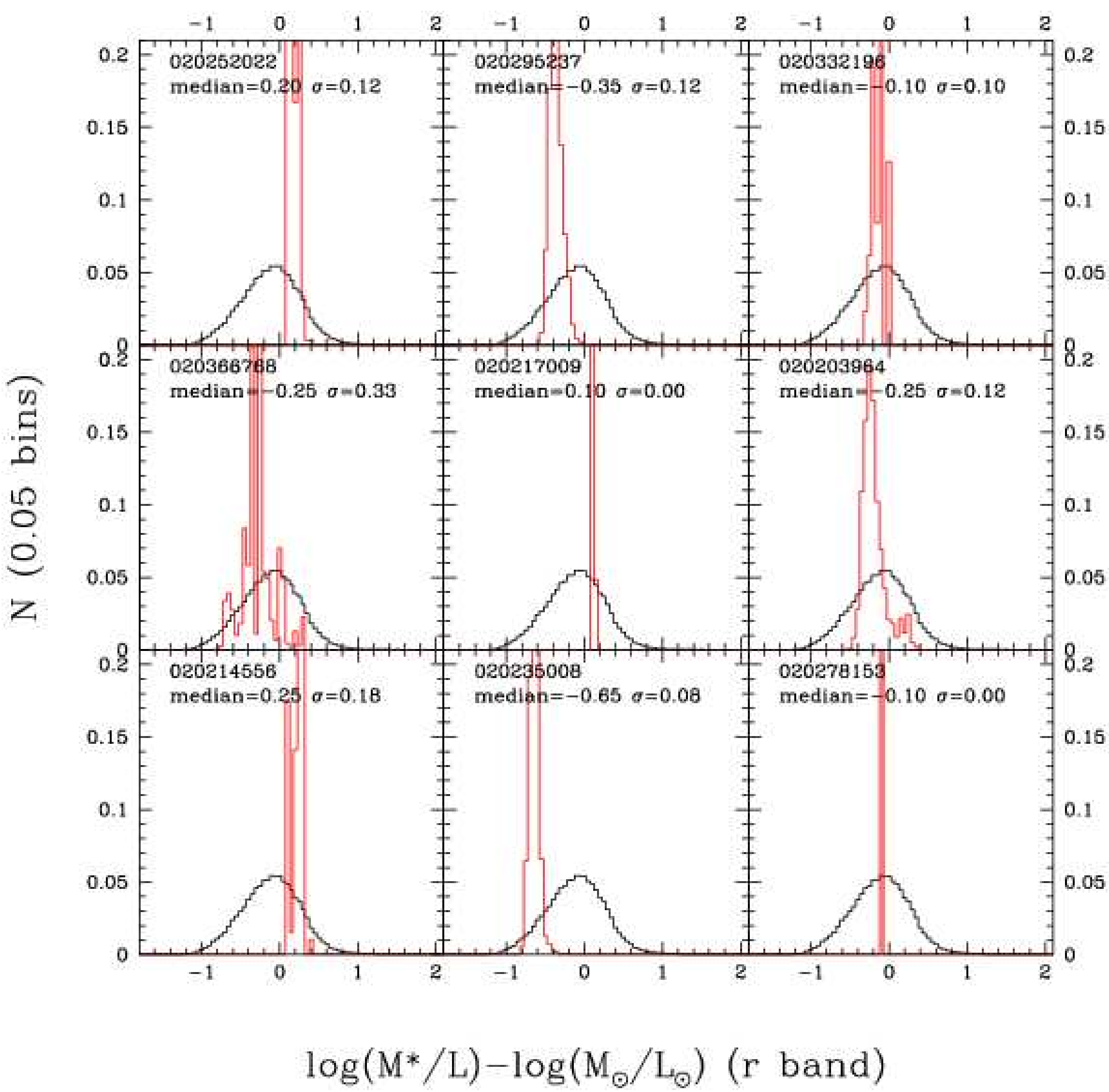
The spectrophotometric mass is based on the **4000Å break**, the **Hdelta absorption indice** (measured with platefit on emission-line substracted spectra), together with **all available photometric bands**.
We use 500 000 population syntehsis models from Bruzual & Charlot (2003). The spectral indices and observed-frame photometry (for each 0.1 redshift bins) are measured on each model spectrum, and fitted to the observed spectra with a Bayesian approach.
For each observed spectrum, we end up with a PDF (Probability Distribution Function) showing the likelihood of each physical parameter that defines a model: **stellar mass, age, star formation rate, dust**.
The parameter is estimated as the median of the PDF. The error is given by the 0.16 - 0.84 integrated likelihood interval.



Example of spectrum with the indices used.

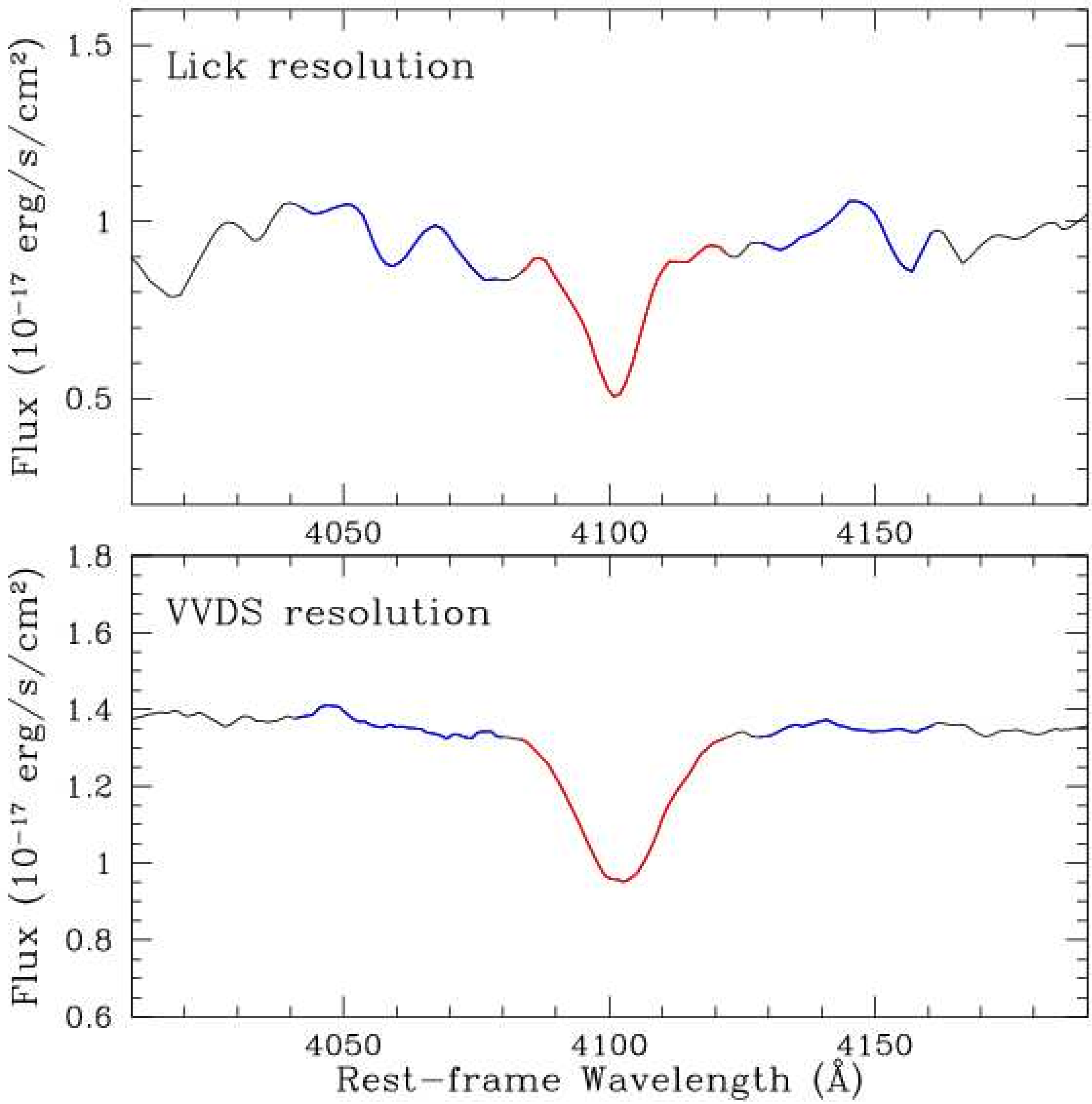




Examples of PDF for the mass-to-light ratio, compared to the models's distribution (prior).

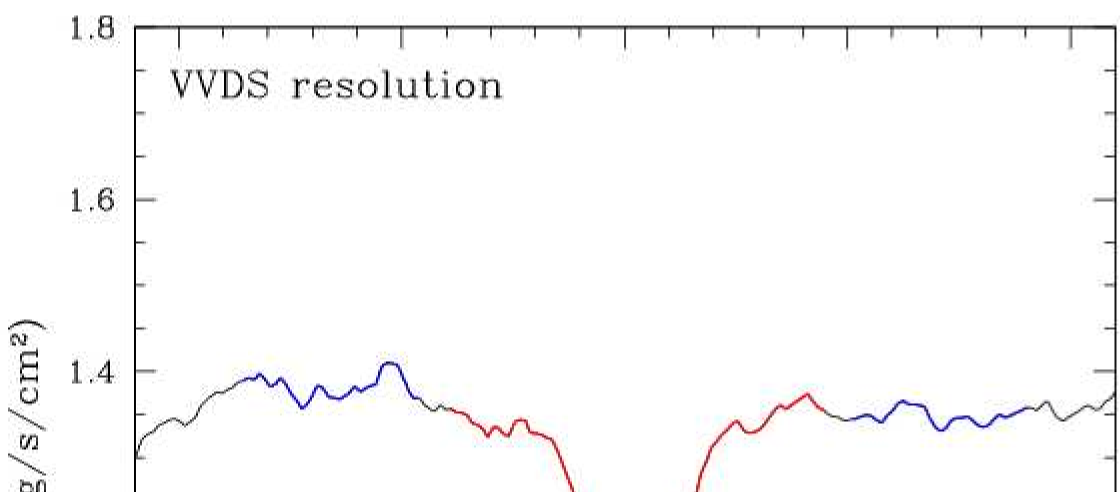
The new HdW indice

The Lick HdA indice commonly used in the mass determination is too narrow for the the VVDS resolution. Thus, we have defined a broad indice, called Hd_W, giving the Hdelta absorption for low-resolution spectra.

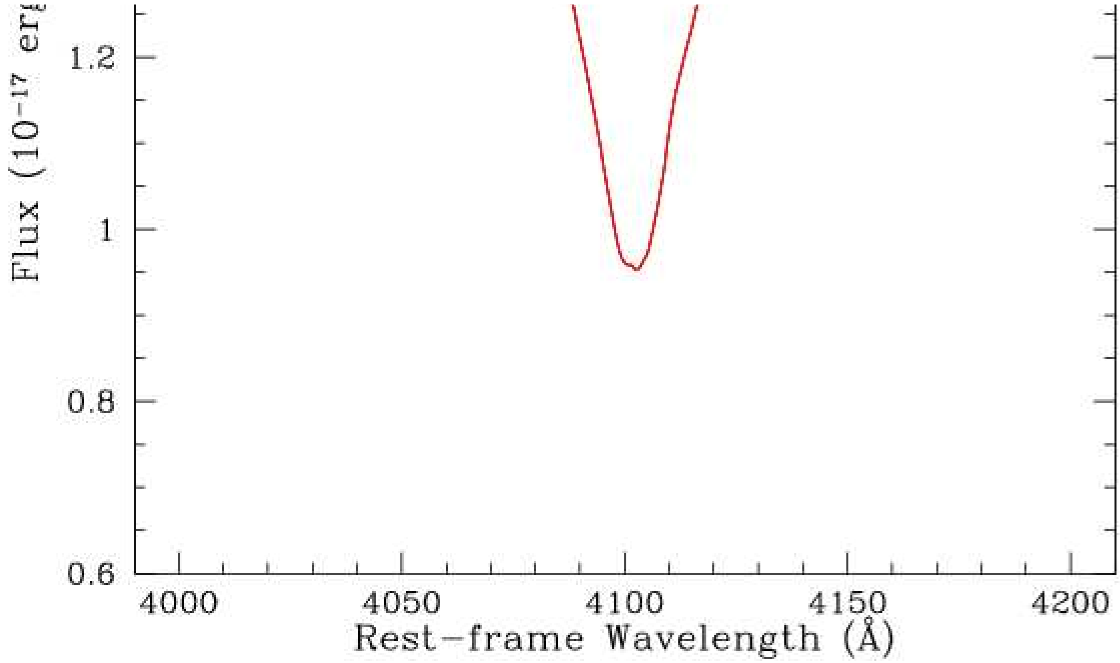


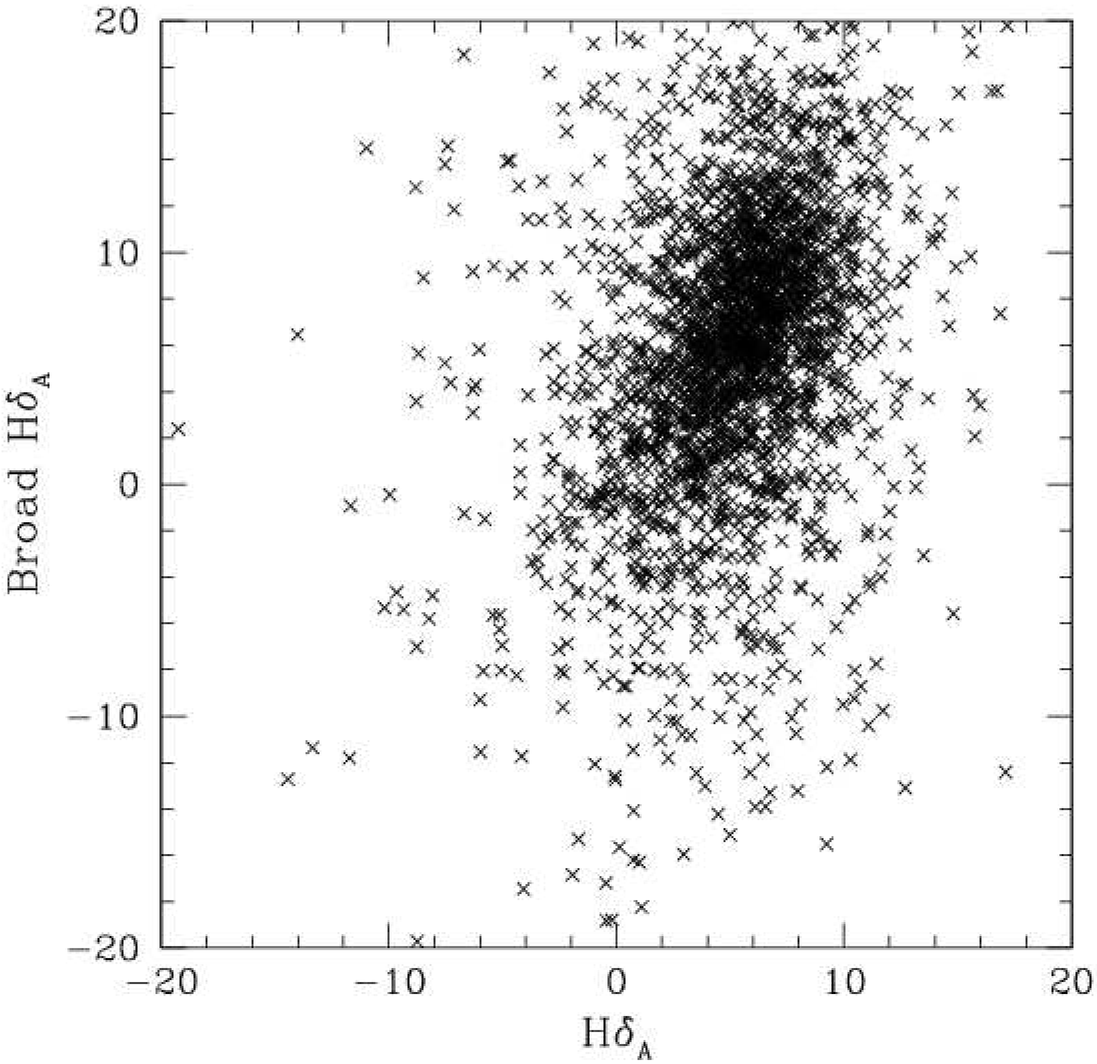
The Hd_A indice:
line: 4083,5 - 4122,25 Å
blue continuum: 4041,6 - 4079,75 Å
red continuum: 4128,5 - 4161 Å

At Lick resolution: the line fits entirely inside the indice region.
At VVDS resolution: the wings are not included.

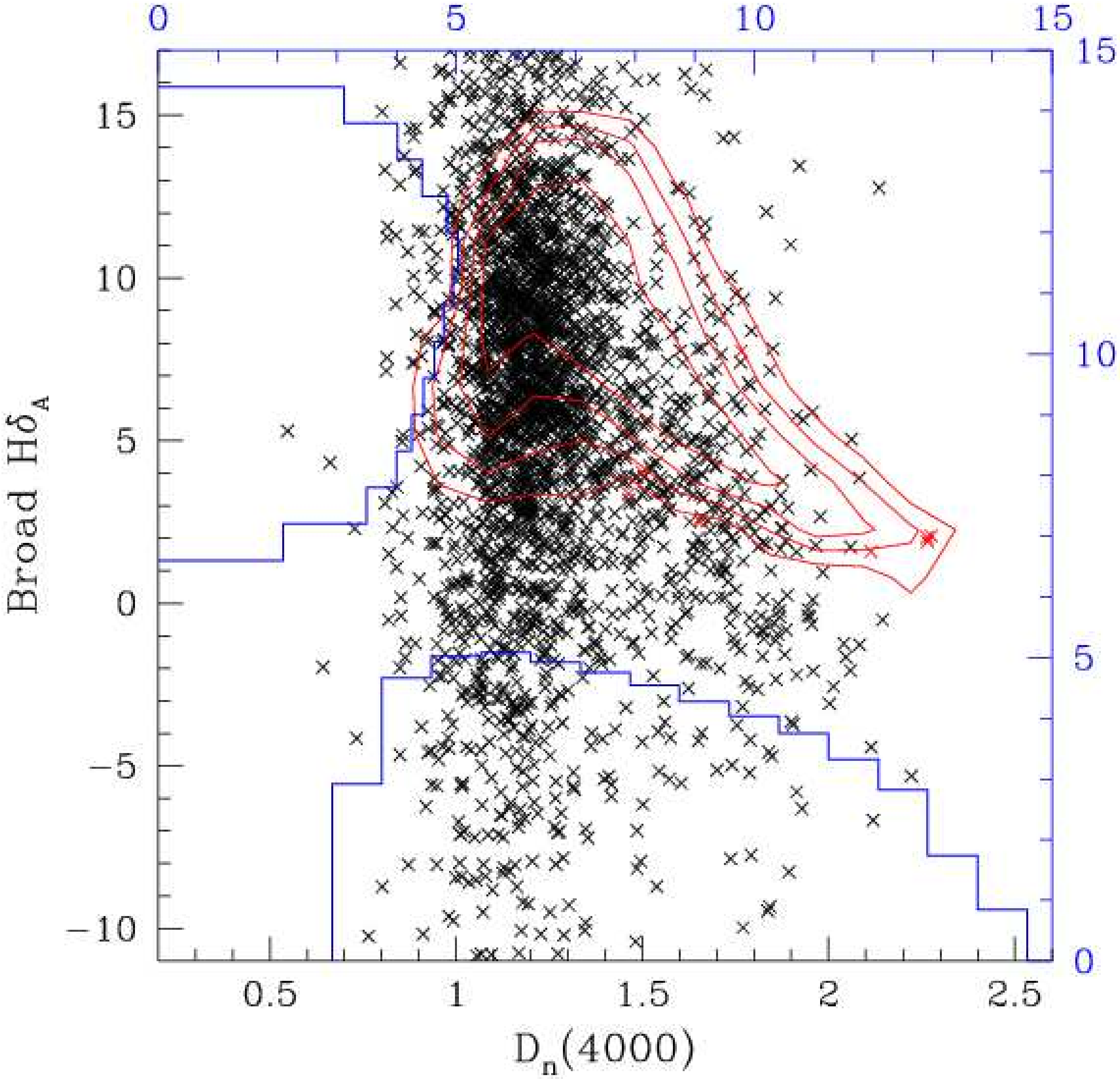


The Hd_W indice:
line: 4060,5 - 4145 Å
blue continuum: 4014 - 4054 Å
red continuum: 4151 - 4191 Å



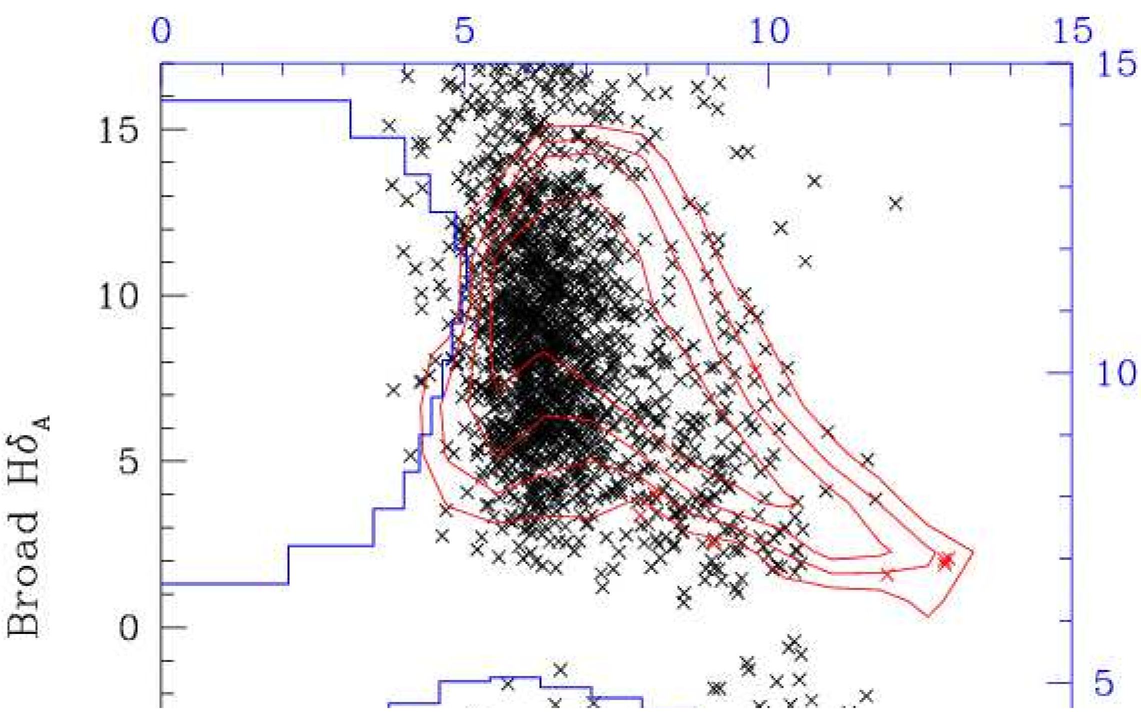


The Hd_A and Hd_W are not linked on a y=x line, Hd_W includes more informations.

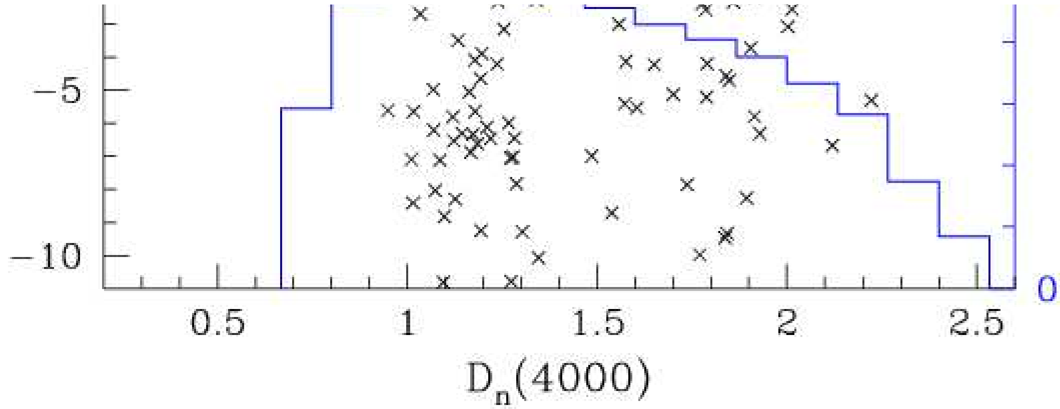


The observations (black points) and the models (red contours, and blue histograms) in the Hd_W vs. 4000Å break plane.

The lowest points are bad SNR spectra.

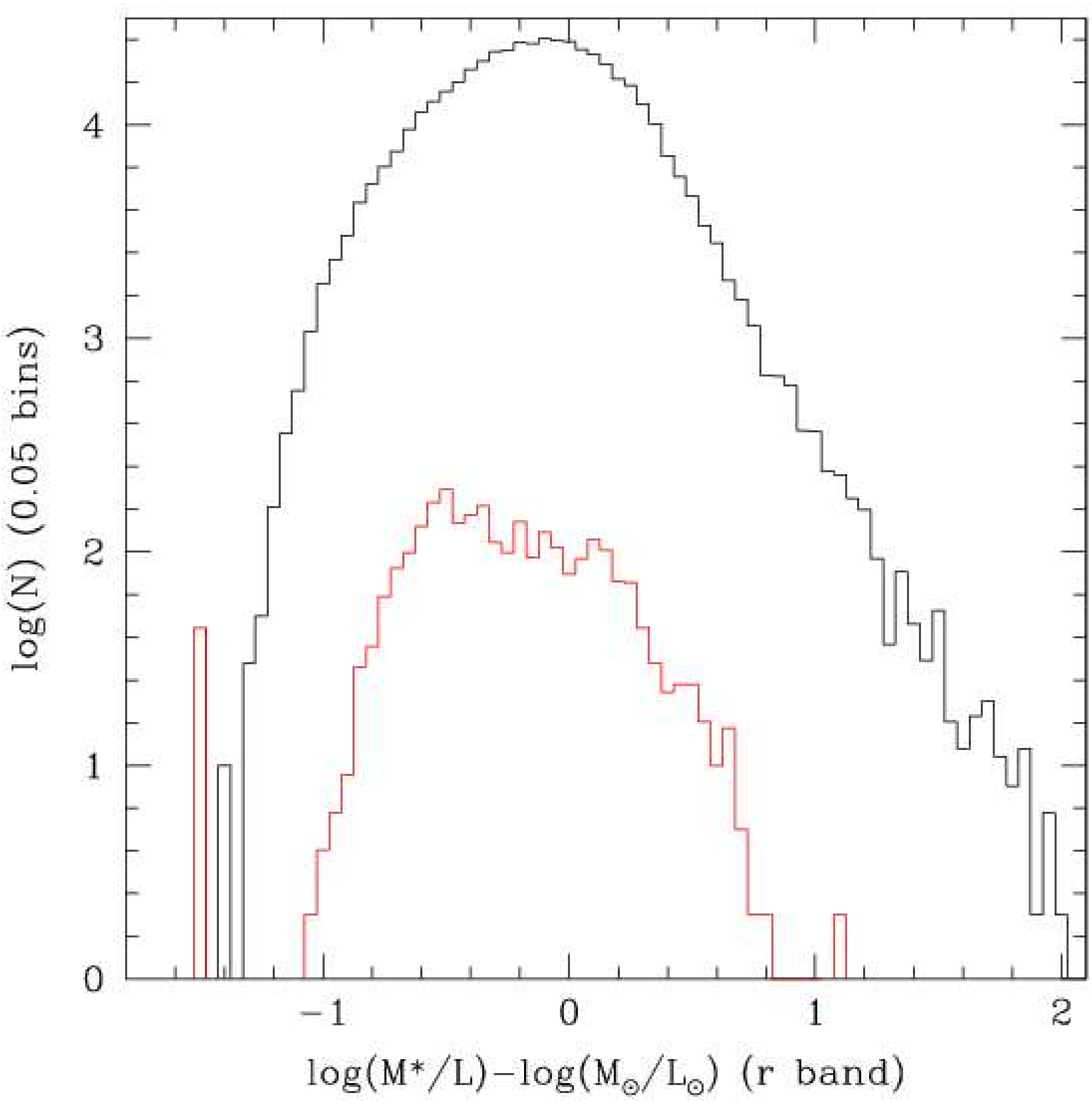


Only points with relative error <50%.



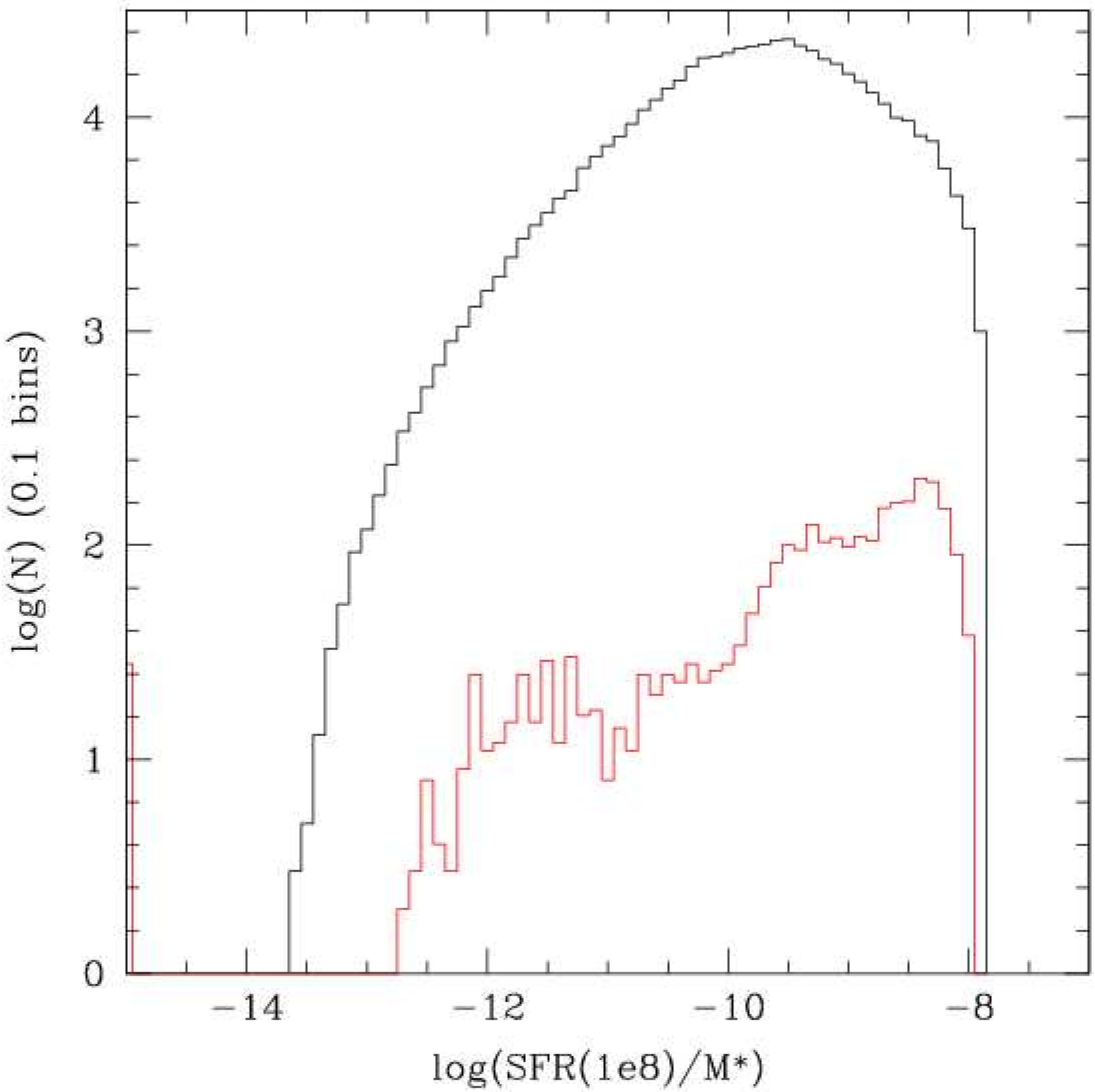
The results

Here we show the results obtained on the F02 field, with flag 3 and 4 objects, and 0.4<z<1.4.



Mass-to-ligth ratio

black: prior
red: output distribution



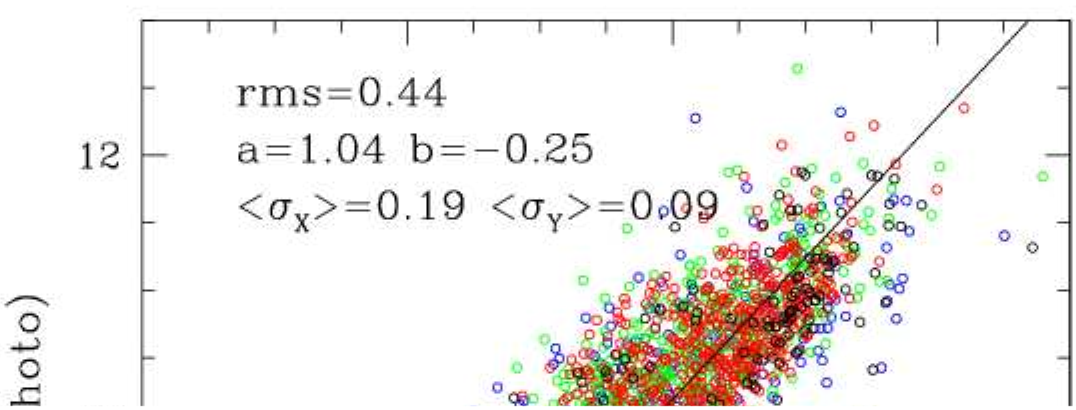
Specific Star Formation Rate

black: prior
red: output distribution

This is the mean SFR during the last 10^8 years.

Comparaison between spectroscopic and photometric masses

We show the differences between the masses derived only with spectroscopic constraints, and only with photometric constraints.

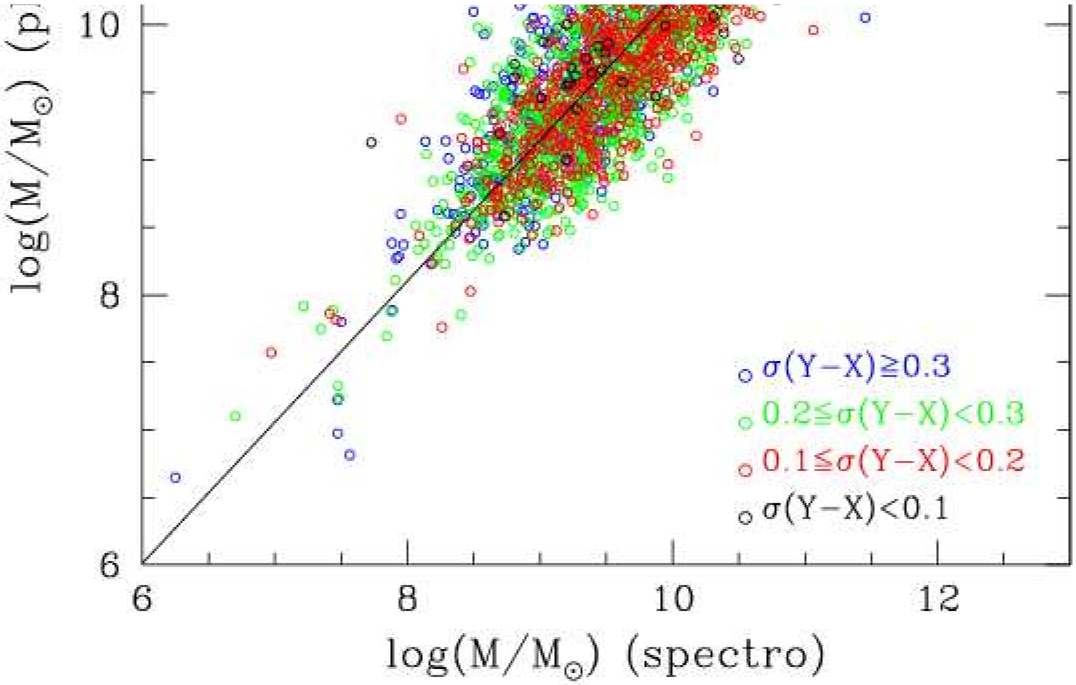


The two determinations are coherent (on the y=x line).

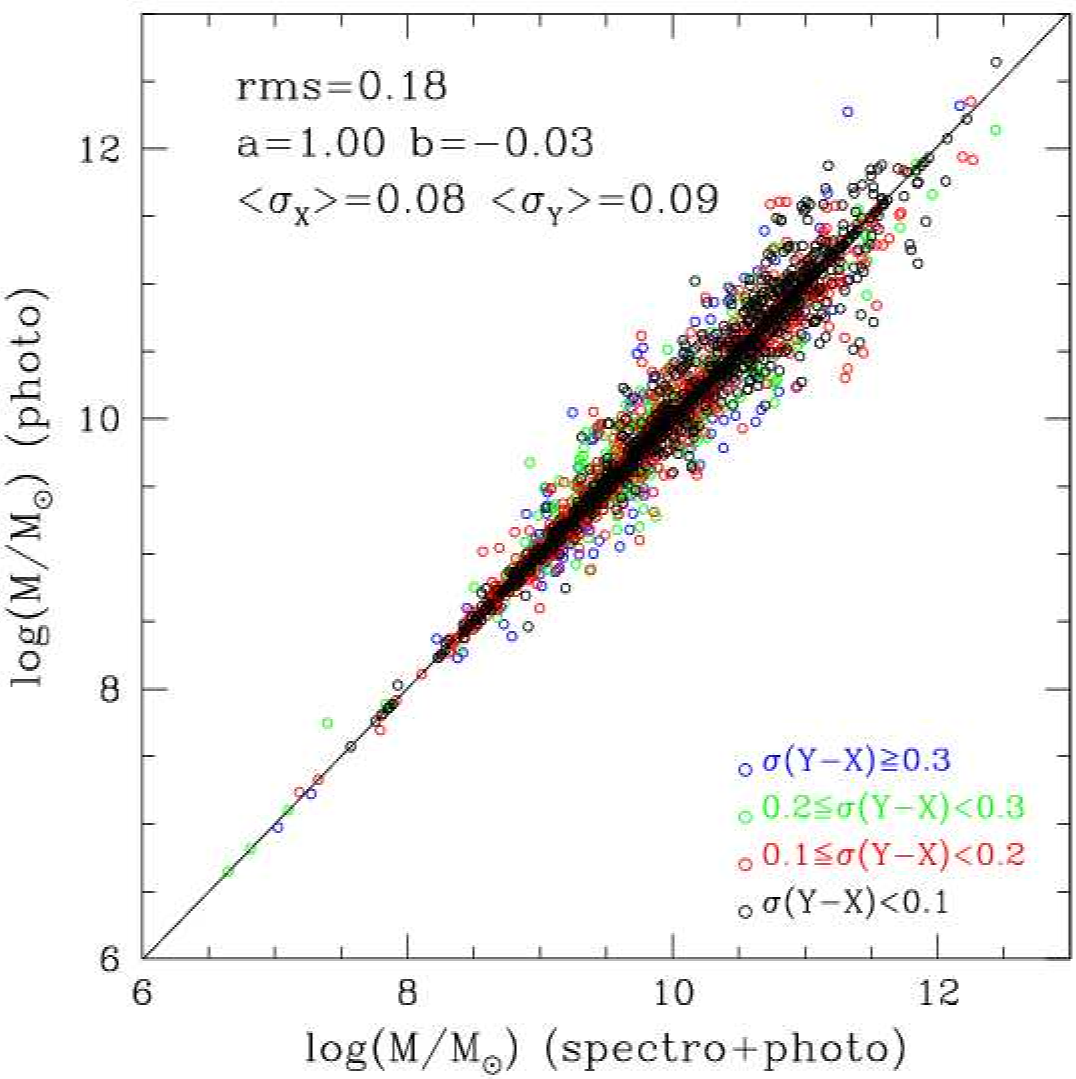
Better mean error with photometry (more constraints).

High dispersion.

The dispersion



decreases with the error on the two determinations (blue to black distributions).

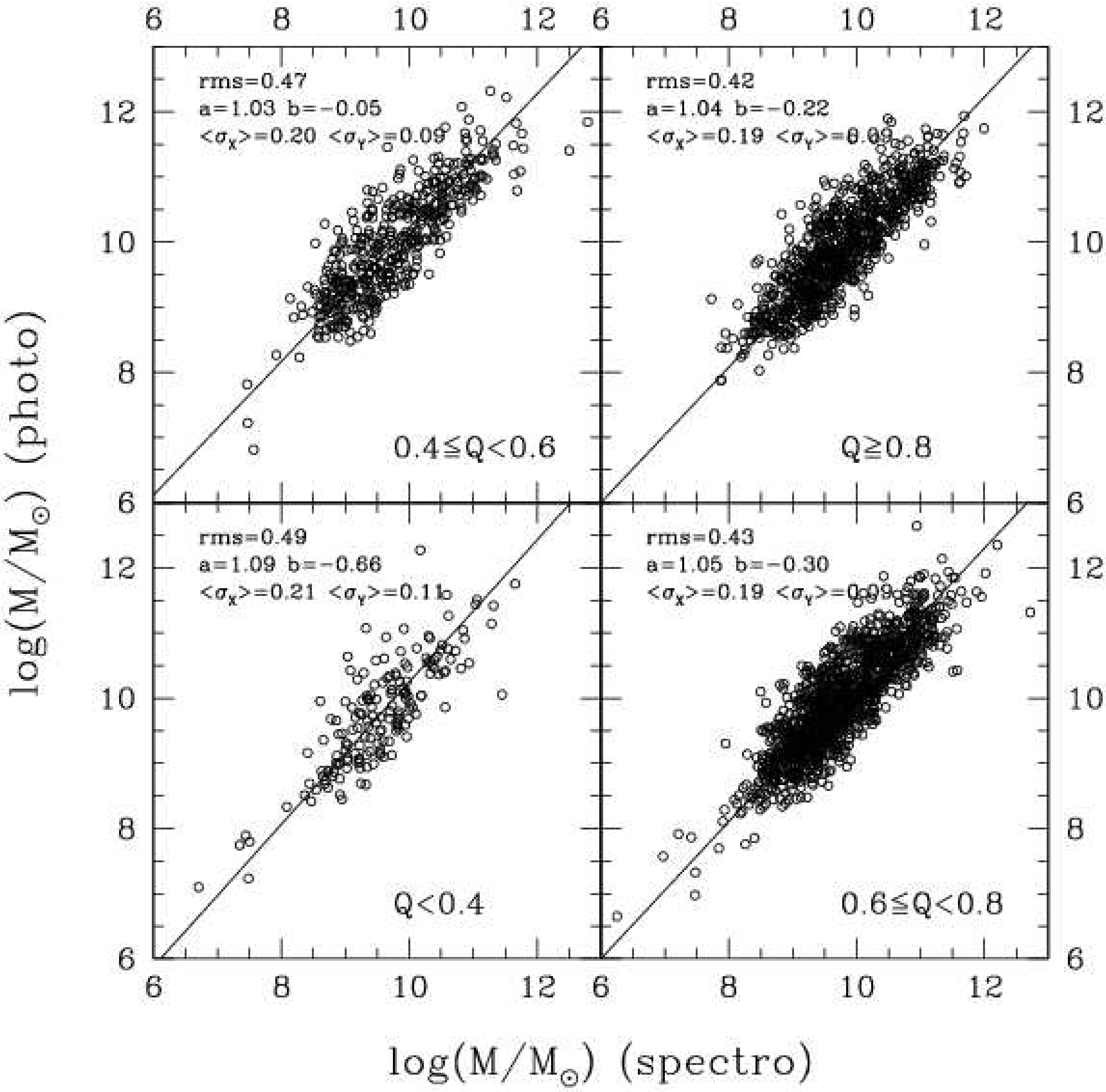


Comparing the photo+spectro masses to the photo-alone masses:

The spectroscopic indices add more constraints: the mean error decreases.

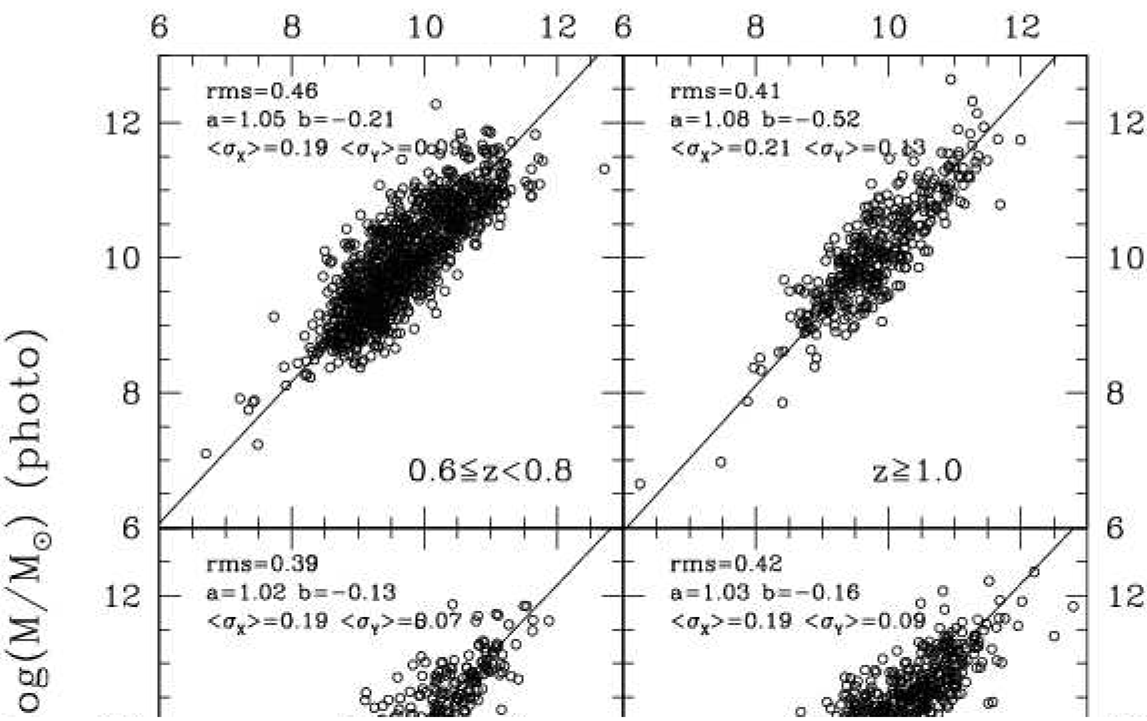
The dispersion is low, but points with low error (black) can show non-neglictible shifts when adding spectroscopy.

Keep in mind: the use of the spectroscopy adds important constraints for estimating the star formation rate and is less sensitive to the dust.

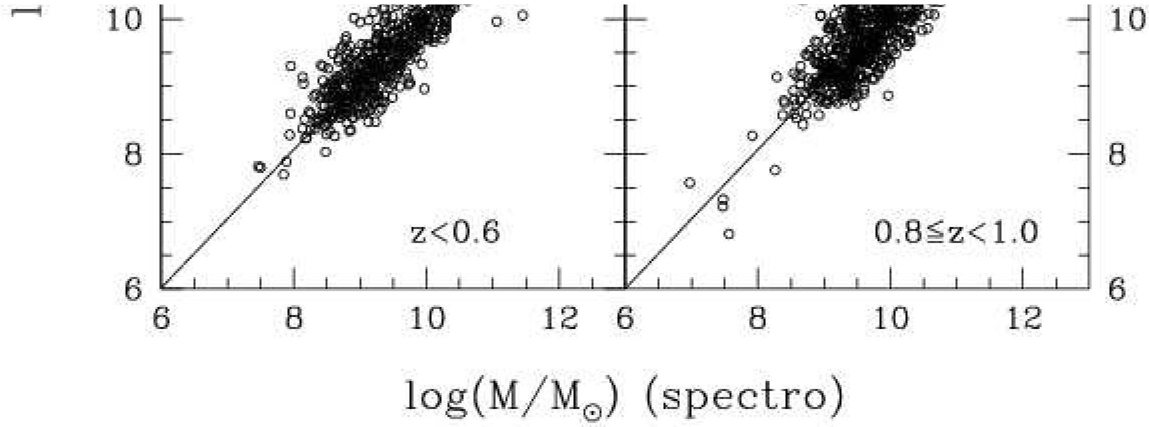


No dependance of the dispersion with the "Overall quality parameter".

The dispersion is intrinsic.

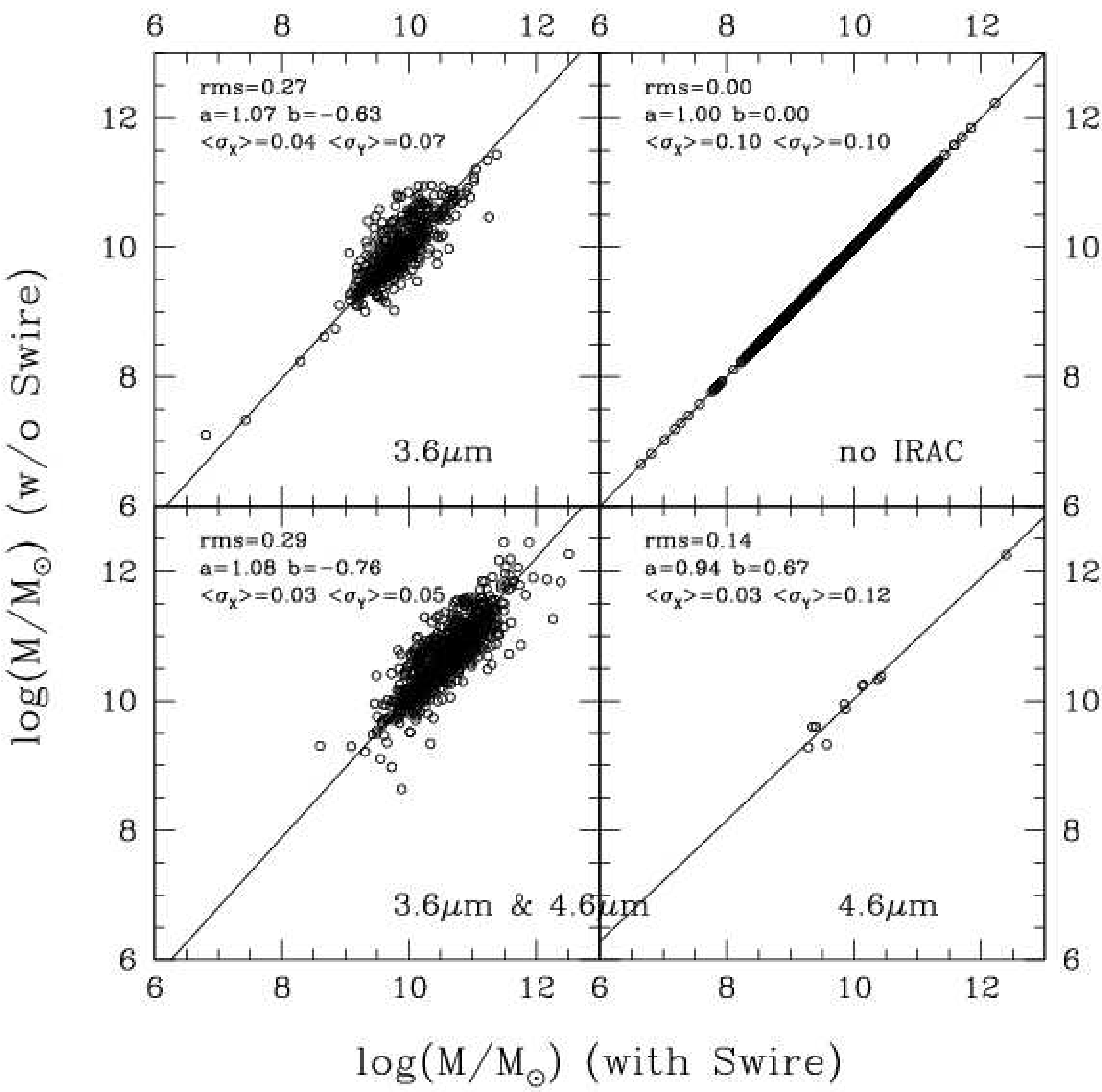


Dependance with redshift: no particular trend.



Adding non-optical constraints

We have tested the effect of adding SWIRE data.



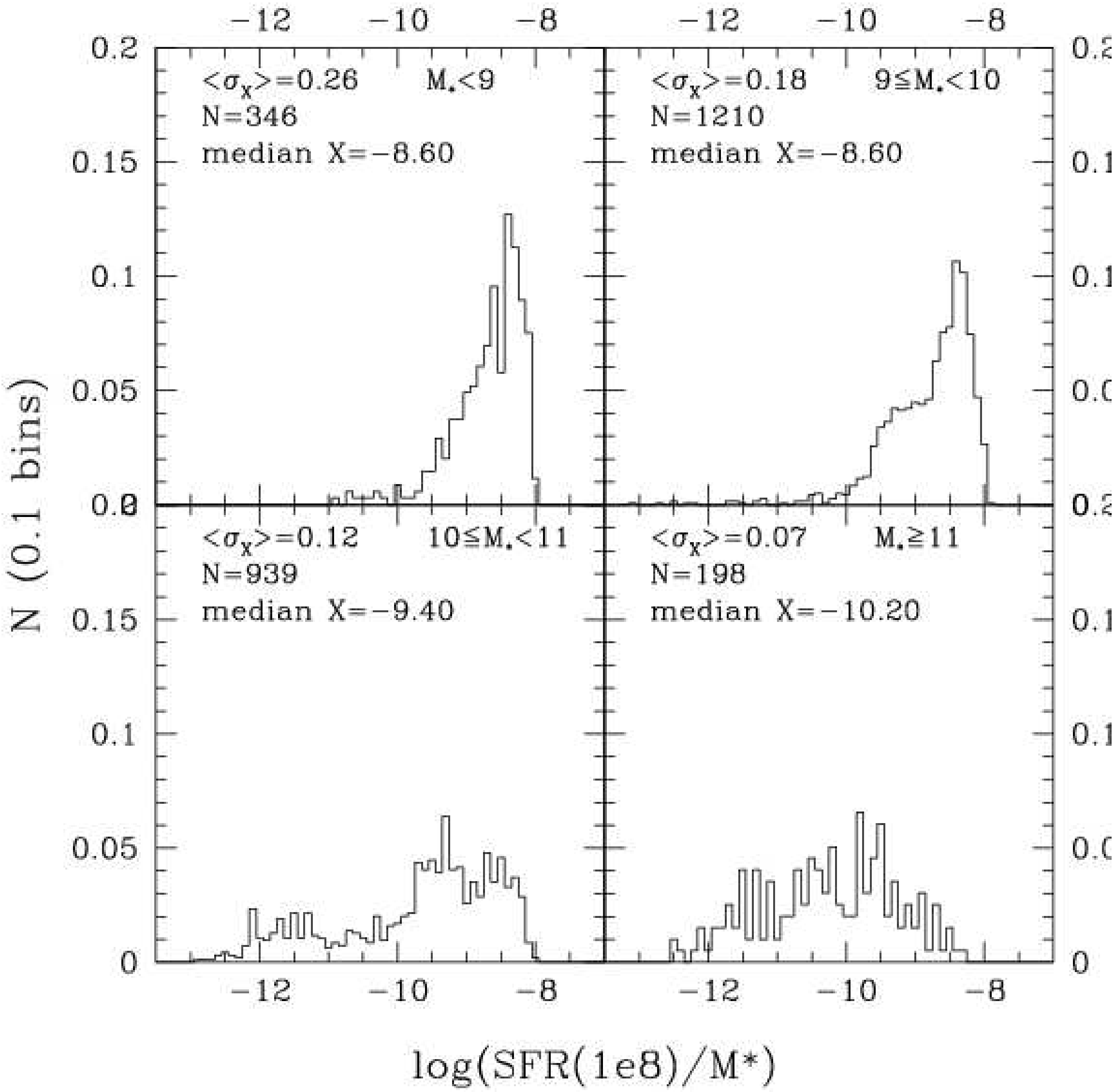
By now we don't use observed magnitudes which are upper limits.

-> include upper limits in the Chi2 (replacing <n by n/2±n/2) or use it as a yes/no flag for eliminating models ?

The mean error decreases by a factor ~2 when adding IRAC bands.

The specific star formation rate

Here we study the evolution of the specific star formation rate (in year^-1) with mass and redshift.

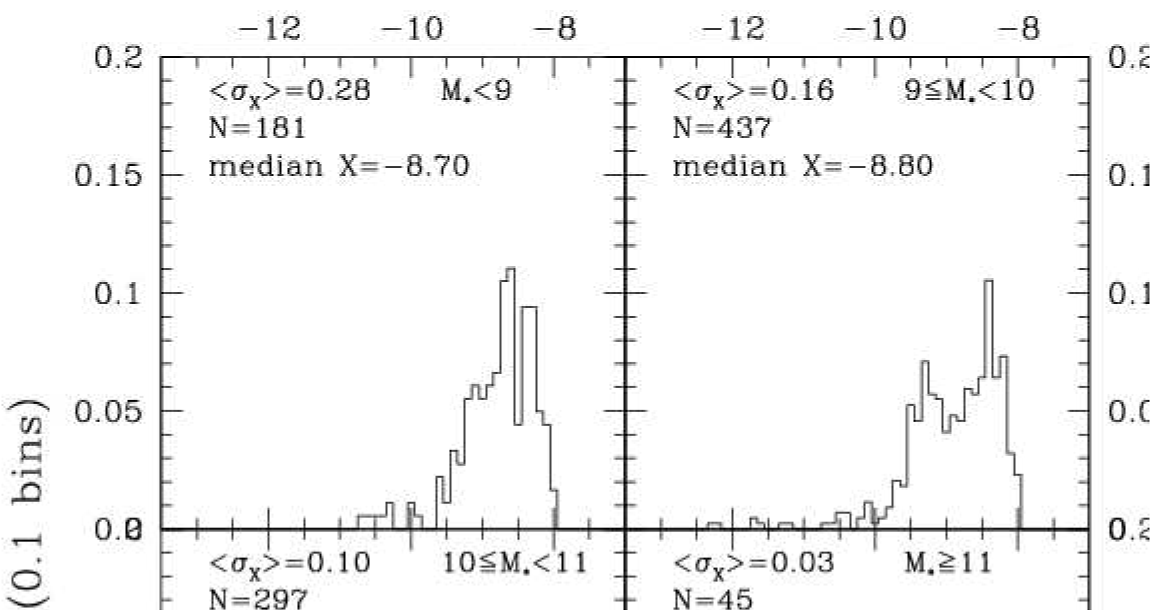


All redshifts.

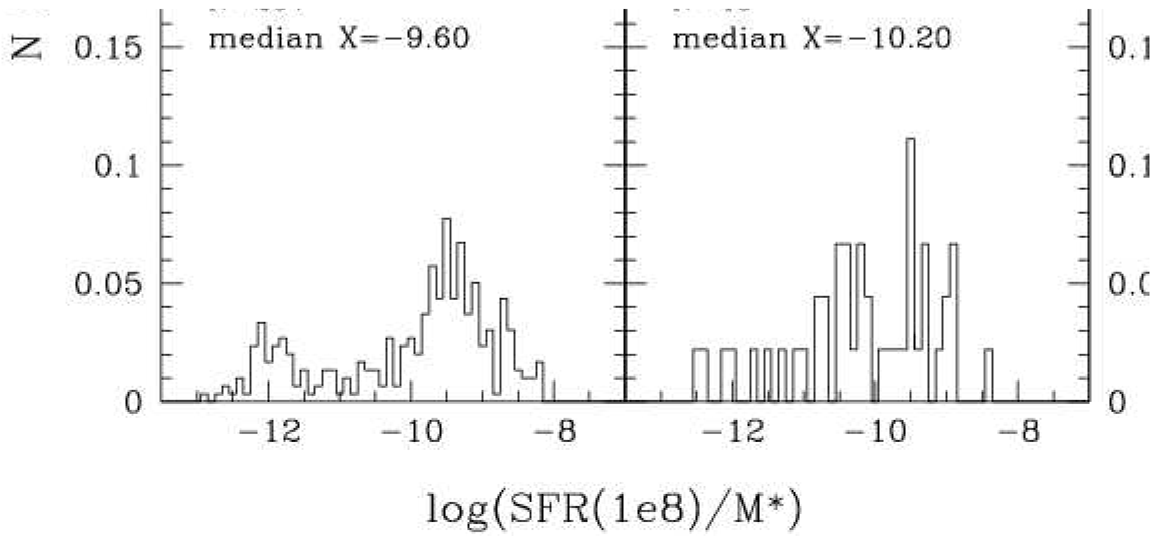
The specific star formation rate decreases with mass, as in local Universe.

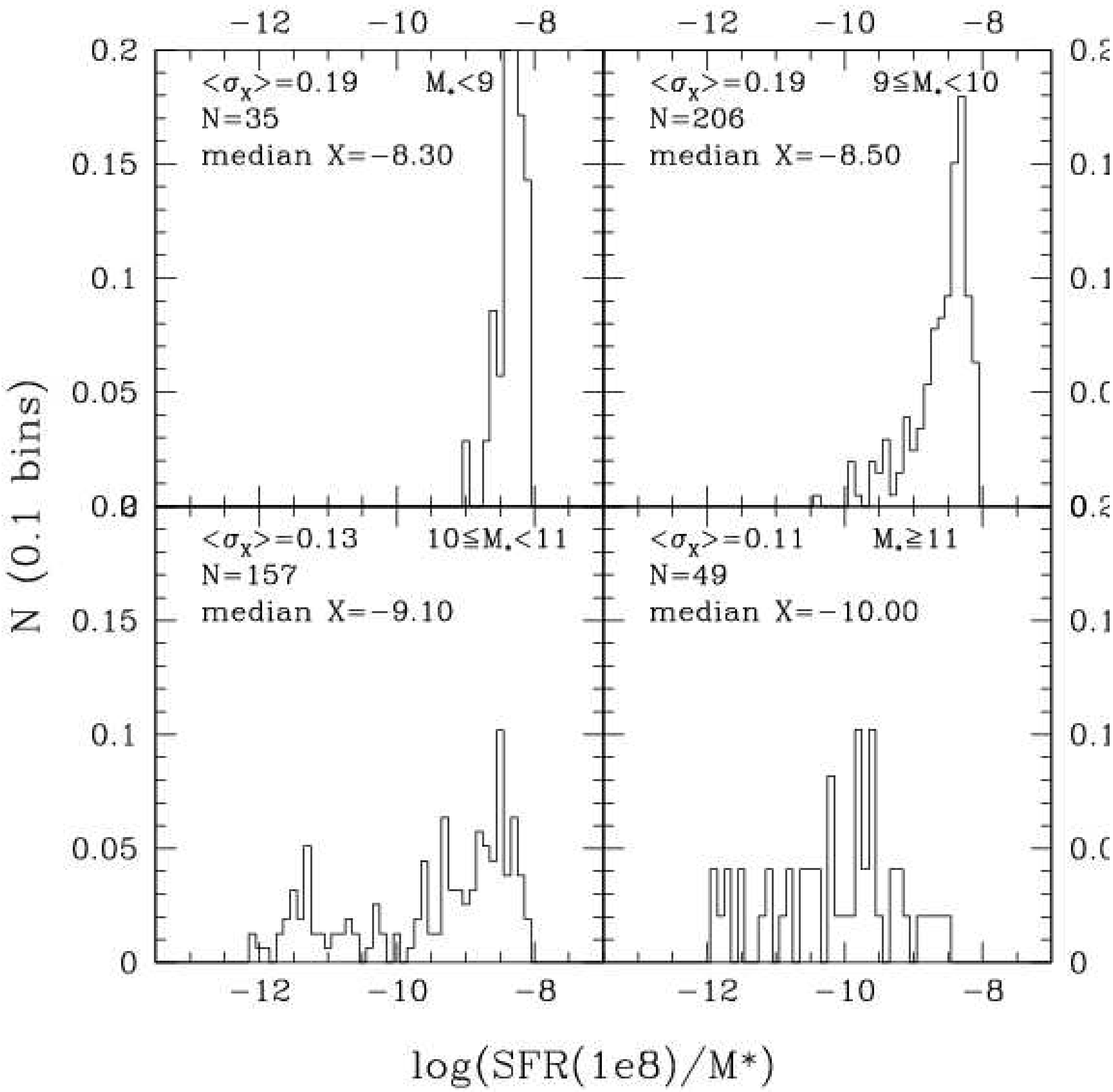
Low mass galaxies show bursty star formation, high mass galaxies continuous star formation.

The most massive galaxies show higher star formation rate than in the local Universe (median = -11.5 for M*>11).



z =~ 0.6
Mass limit for completeness: 9,72





z =~ 0.6
Mass limit for completeness: 10,47

The specific star formation rate increases clearly with redshift. All the distribution is actually shifted.

Galaxies at high redshift are in a formation process.

Need more statistic !

main page

2005, April 26th
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