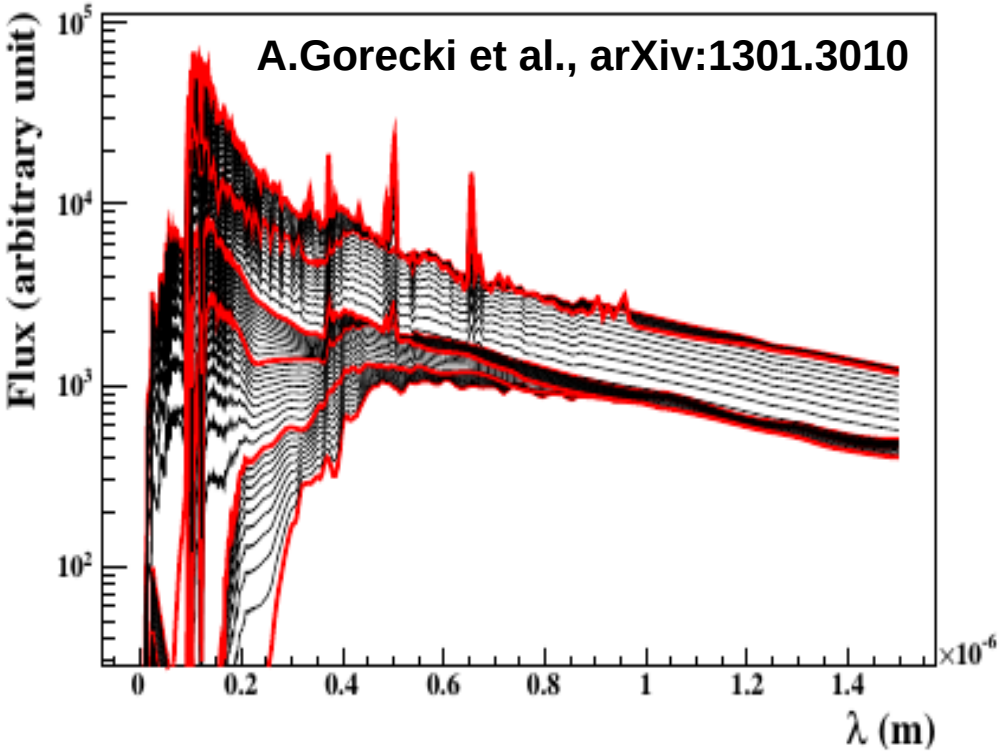
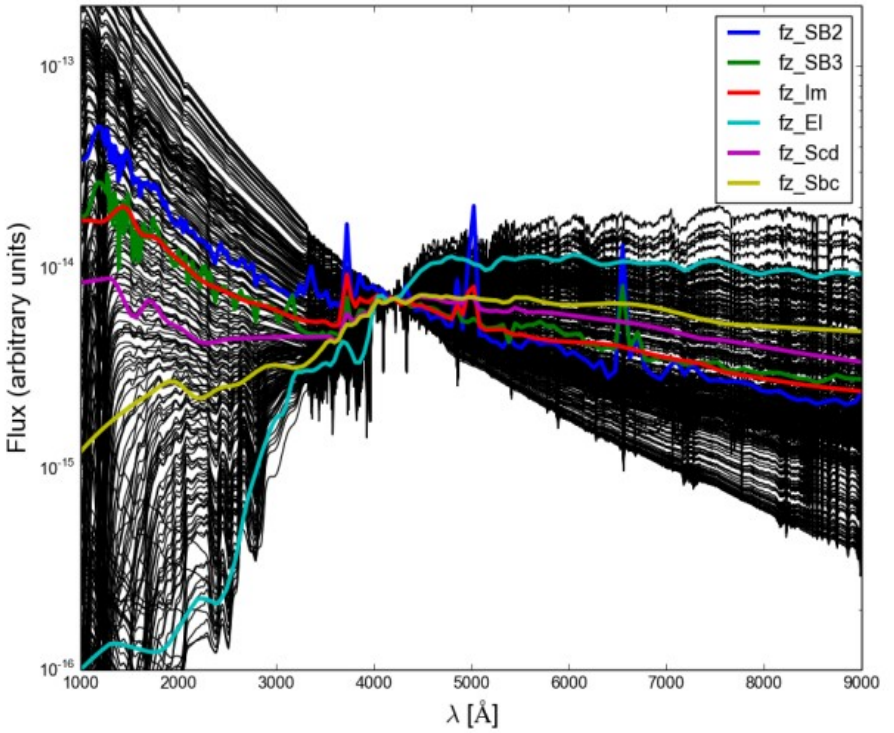
Status on FORS2 SED templates

Standard SEDs libraries for template fitting

Coleman et al (1980), Kinney et al (1996)



Brown et al atlas, arXiv:1312.3029



129 spectral energy distributions from the UV to mid-IR including :
spirals, merging galaxies, blue compact dwarfs and luminous infrared galaxies

18 illustrative spectra that could be used as basic templates

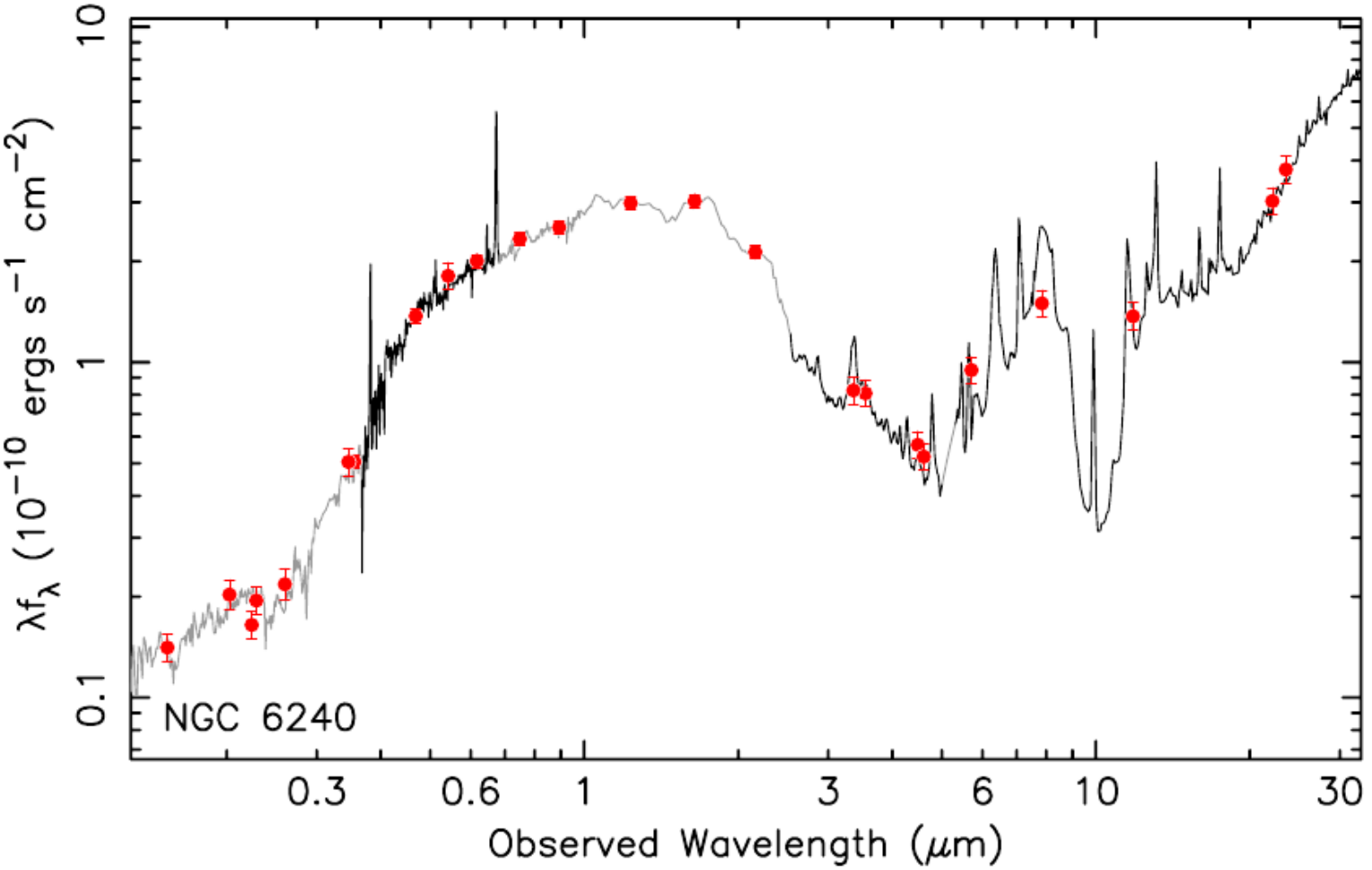
Brown

- 129 nearby galaxies : z < 0.05

- UV to mid-infrared data (Spitzer, Akari, Swift, GALEX, SDSS, 2MASS, WISE, ...)

- Galaxy SEDs modeling using models of stellar populations, nebular emission lines, dust obscuration and dust emission

- Multi-wavelength Analysis of Galaxy Physical Properties code (MAGPHYS; da Cunha et al. 2008)



FORS2 data

Giraud et al atlas (arXiv:1011.1947) :
Redshift and flux distribution of 654 galaxies obtained with the FORS2 instrument (VLT UT1)

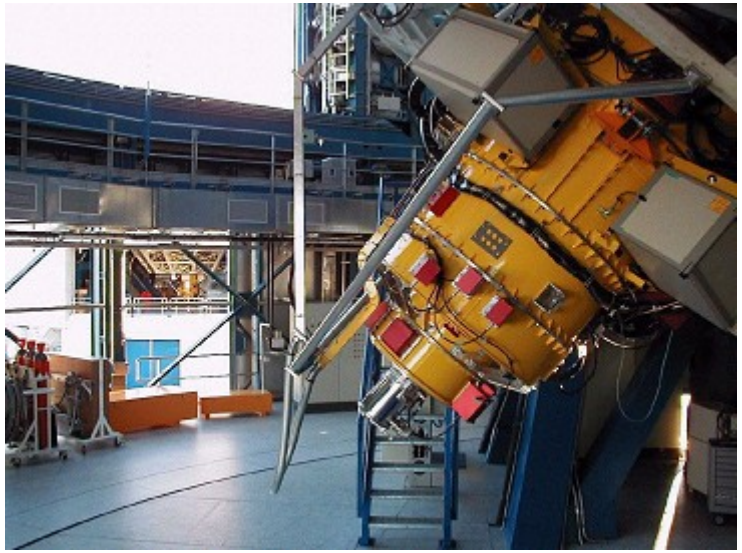
Redshifts : 0.275 < z < 1.05 down to R=23

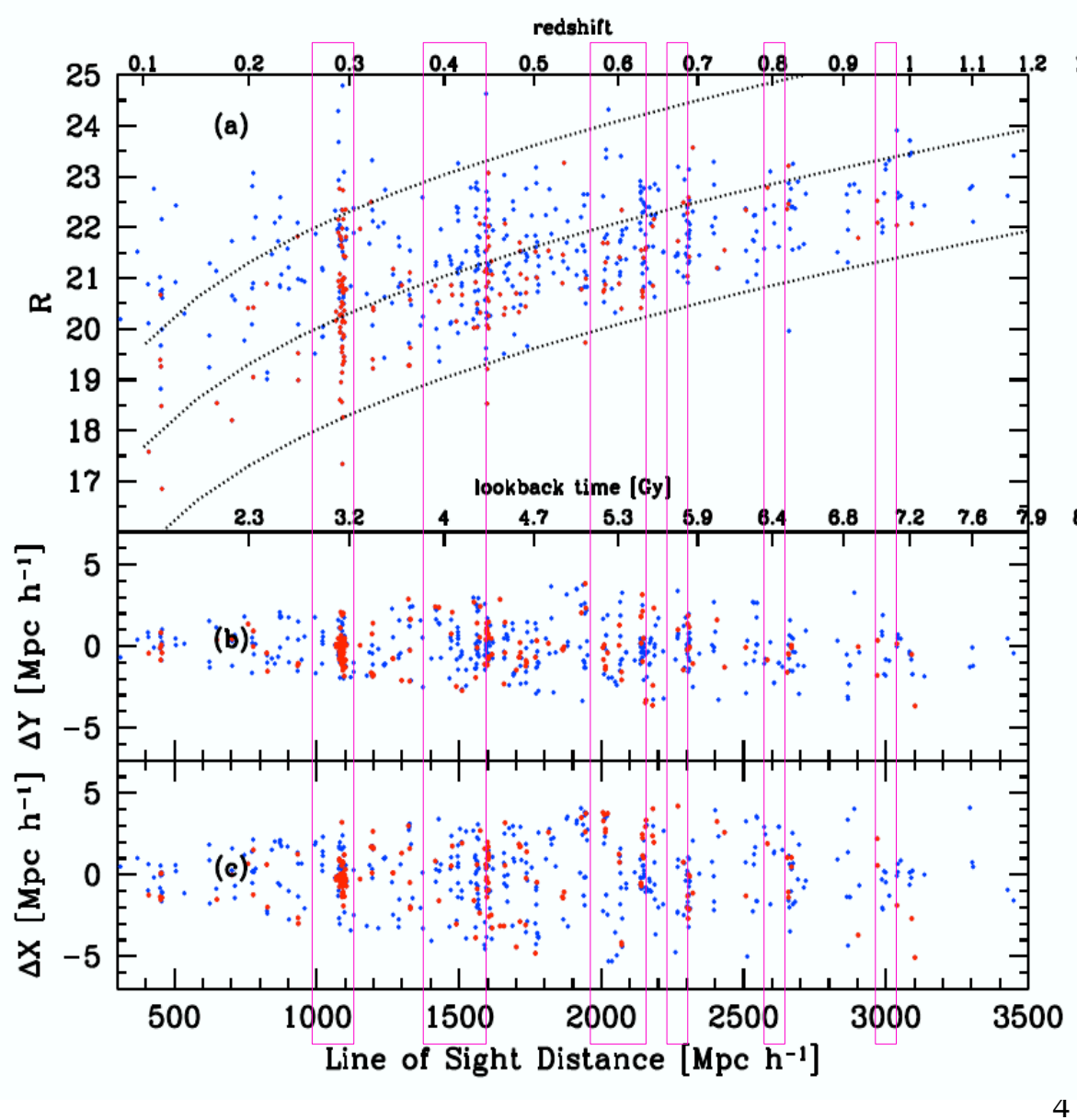
Rest frame window : 3000 Å < λ < 6000 Å

Averaged spectra divided in 4 classes :
- **blue or red SEDs;**
- **absorption or emission lines**

and redshift bins from z=0.3 to z=1
(z ~ 0.3, 0.4, 0.6, 0.8, 0.9, 1)

→ **STEP 1 :**
67 averaged spectra
over ~600 raw spectra





A new SED Atlas using FORS2 physical spectra. Comparing SED library performances with Le Phare

- **Underlying question:**

  In a given specific 'high' redshift interval, does SED templates derived from FORS2 real spectra lead to better photo-z results than small-z SED templates ?
  Brown (z<0.05) SEDs versus FORS2 (0.275 < z < 1.05)

- **Building a general procedure to create SED library from physical spectra :**

1/ Methodology :
Stellar mixing and synthetic spectra derived from fit on physical spectra using evolutionary stellar population models

The SEAGal/STARLIGHT Project
http://www.starlight.ufsc.br/

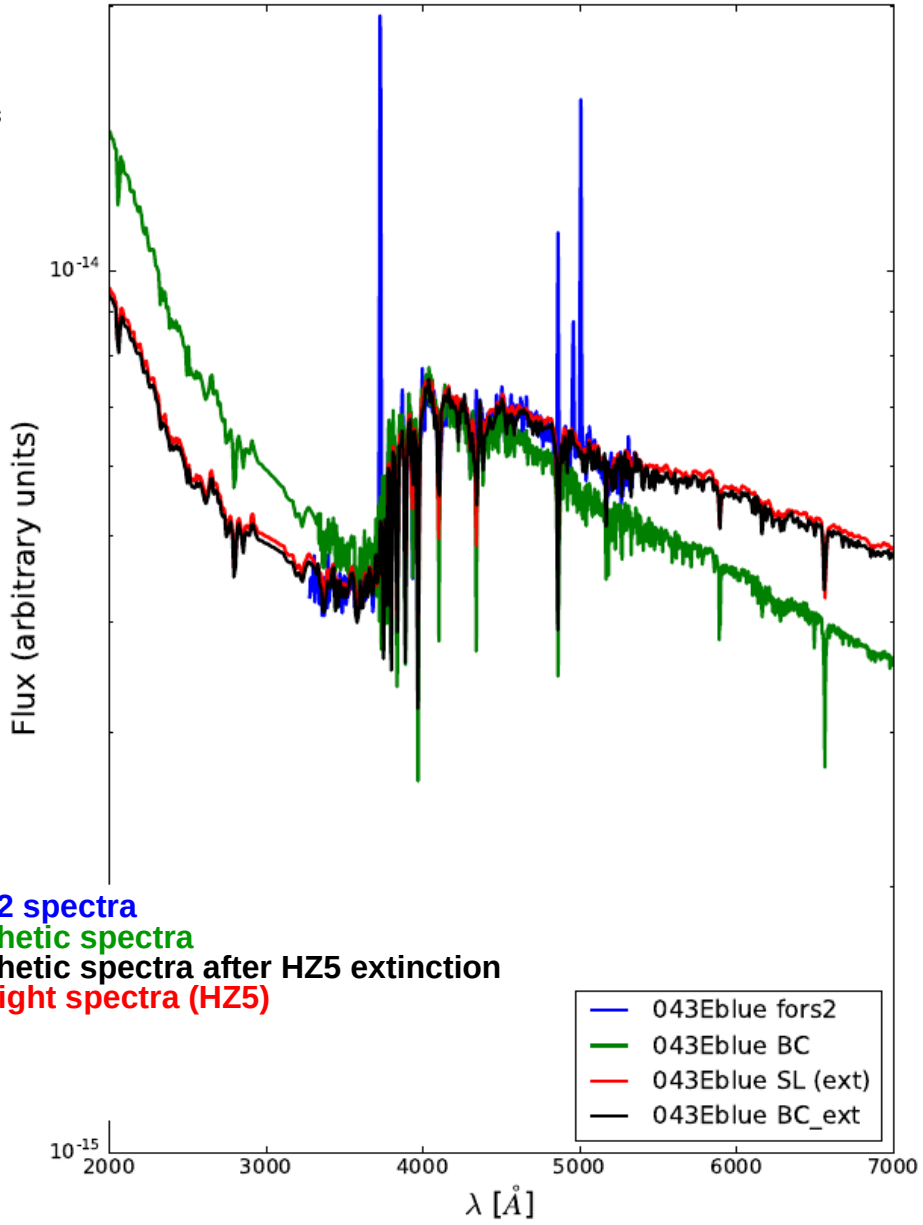
Resulting continuum spectra extrapolated to 700 Å < l < 20000 Å

The Starlight team :

Example of Starlight output

```
## Some input info
0414.51901.393.cxt                          [arq_obs]
Base.BC03.N                                 [arq_base]
Mask.0414.51901.393.cxt.sc1.CRAP.gm.BN      [arq_masks]
StCv04.C11.config                           [arq_config]
   45                                       [N_base]
    0                                       [N_YAV_components = # of components with extra extinct
    0                                       [i_FitPowerLaw (1/0 = Yes/No)]
-9.99                                       [alpha_PowerLaw]
CAL                                         [red_law_option]
 1.355739                                   [q_norm = A(l_norm)/A(V)]
```

# j	x_j(%)	Mini_j(%)	Mcor_j(%)	age_j(yr)	Z_j	(L/M)_j	YAV?	Mstars	component_j	a/Fe...
1	15.0005	8.5233E-01	1.4041E+00	1.000000E+06	0.00400	1.114E-02	0	1.0000	age020_m42	0.0000
2	7.8143	1.2144E-01	2.0004E-01	3.160000E+06	0.00400	4.073E-02	0	0.9999	age045_m42	0.0000
3	0.0000	0.0000E+00	0.0000E+00	5.010000E+06	0.00400	2.534E-02	0	0.9488	age055_m42	0.0000
4	3.9879	1.9860E-01	2.8994E-01	1.000000E+07	0.00400	1.271E-02	0	0.8862	age070_m42	0.0000
5	0.0032	4.0396E-04	5.4396E-04	2.512000E+07	0.00400	5.070E-03	0	0.8174	age090_m42	0.0000
6	3.8530	6.9583E-01	8.9997E-01	4.000000E+07	0.00400	3.505E-03	0	0.7851	age104_m42	0.0000
7	9.5516	2.6658E+00	3.1650E+00	1.015200E+08	0.00400	2.268E-03	0	0.7207	age116_m42	0.0000
8	8.1674	4.7913E+00	5.2197E+00	2.861200E+08	0.00400	1.079E-03	0	0.6613	age125_m42	0.0000
9	2.2559	2.8126E+00	2.8714E+00	6.405400E+08	0.00400	5.077E-04	0	0.6197	age132_m42	0.0000
10	2.3293	4.1708E+00	4.1390E+00	9.047900E+08	0.00400	3.535E-04	0	0.6024	age135_m42	0.0000
...										



Fors2 spectra
Synthetic spectra
Synthetic spectra after HZ5 extinction
Starlight spectra (HZ5)

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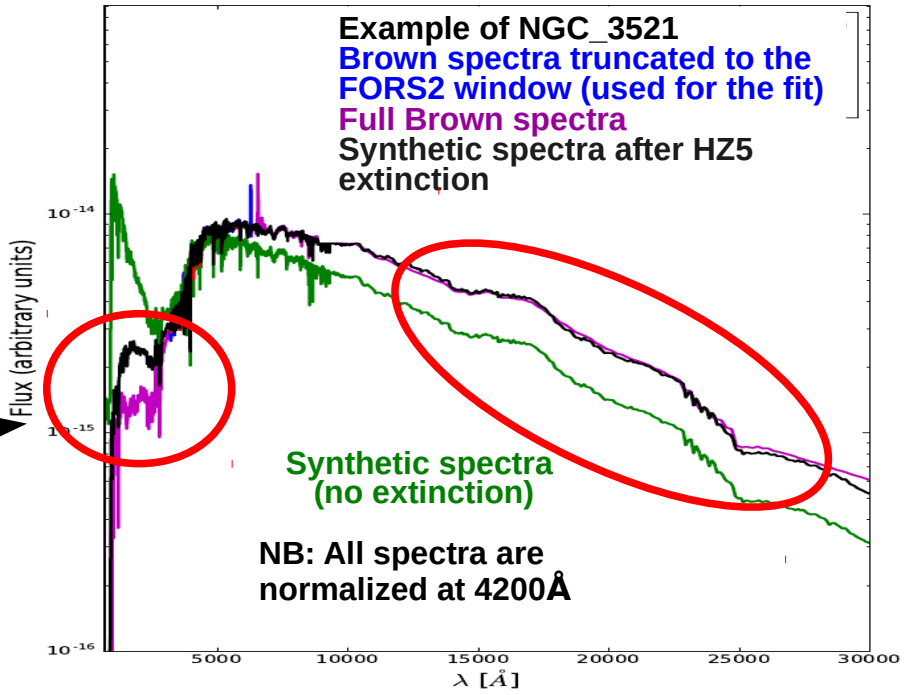
Resulting continuum spectra extrapolated to 700 Å < λ < 20000 Å

2/ Proof of concept using Brown (physical) spectra :
Restricting the fit to the FORS2 rest frame window (3000 Å < λ < 6000 Å)
→ most of the 129 Brown spectra are well reconstructed
NB: UV contribution is overestimated for some spectra



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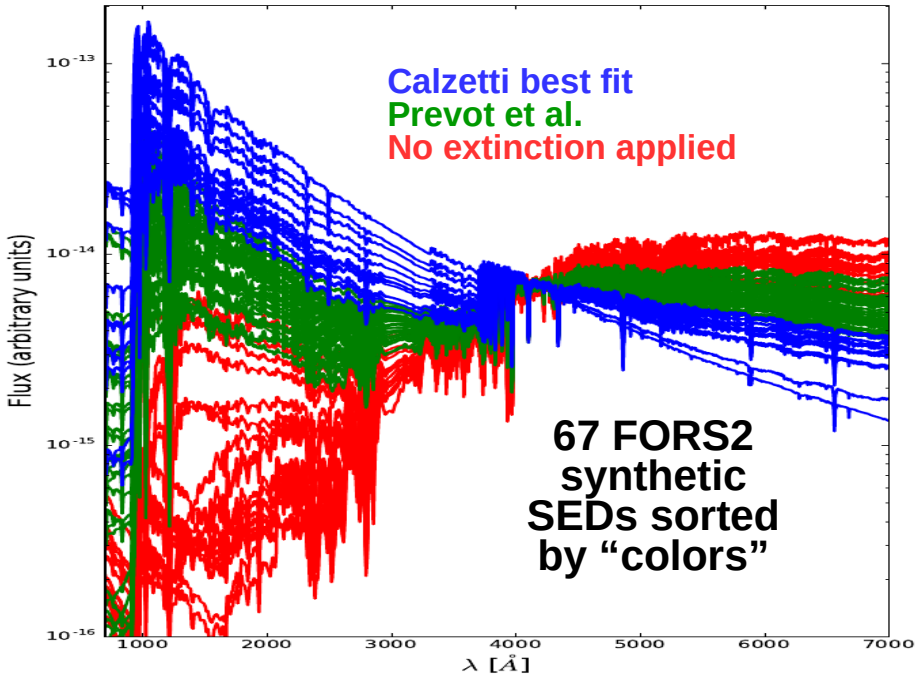
3/ Same procedure applied to FOR2 dataset (averaged spectra, no AGNs) :
→ 67 spectra used as new SED templates



SED library performance comparison

4 catalogs used :

CFHTLS (U, G, R, I, Z)

1) D1 (VVDS LAM database)
   0 < z < 6
   4663 objects
2) W1 (VIPERS)
   0 < z < 2
   19594 objects
3) W4, 8933 objects

4) Candels GOODS-S (HST)
   0 < z < 5
   U, f435w, f606w, f775w,
   f850lp, f125w, f160w, Ks
   1068 objects

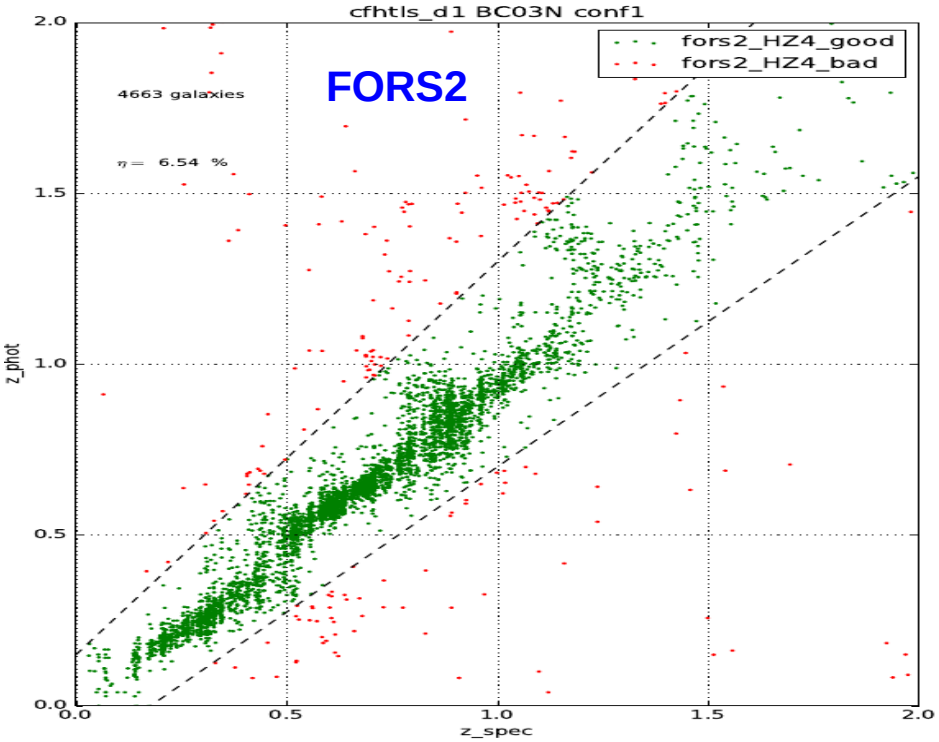
4) Cosmos + DEIMOS (in progress)
   1 182 108++ objects

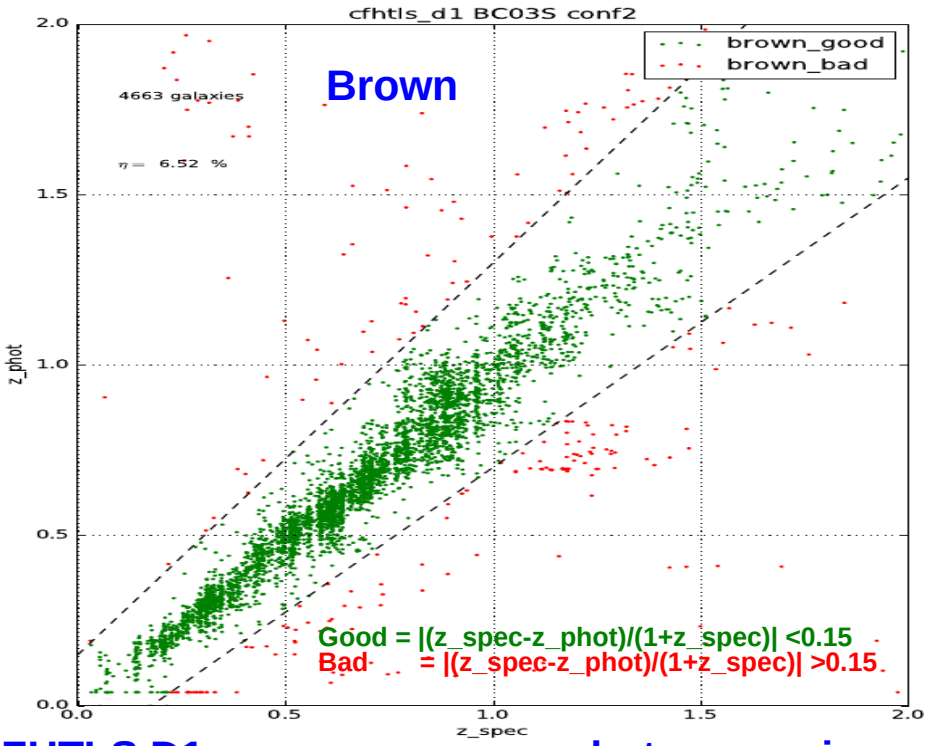
Photo-z code :

Le Phare, Arnouts S. & Ilbert O.
with extinction(Calzetti++ or Prevot)

SED libraries :

- 66 “CWW” SED
- 129 Brown SEDs (z<0.05)
- 67 FORS2 SEDs (0.275<z<1.05)

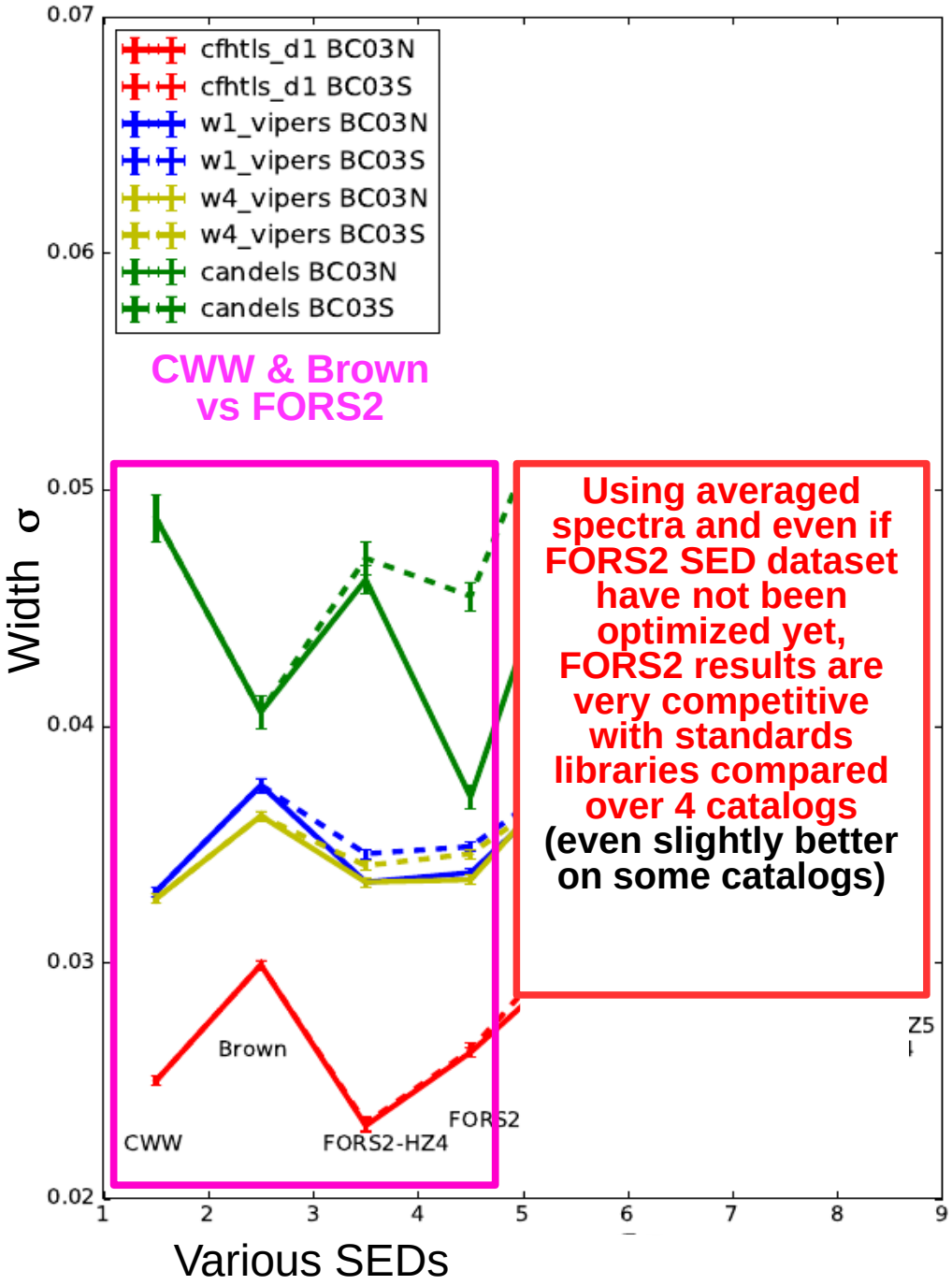




Example of CFHTLS D1 z_spec versus z_phot comparison

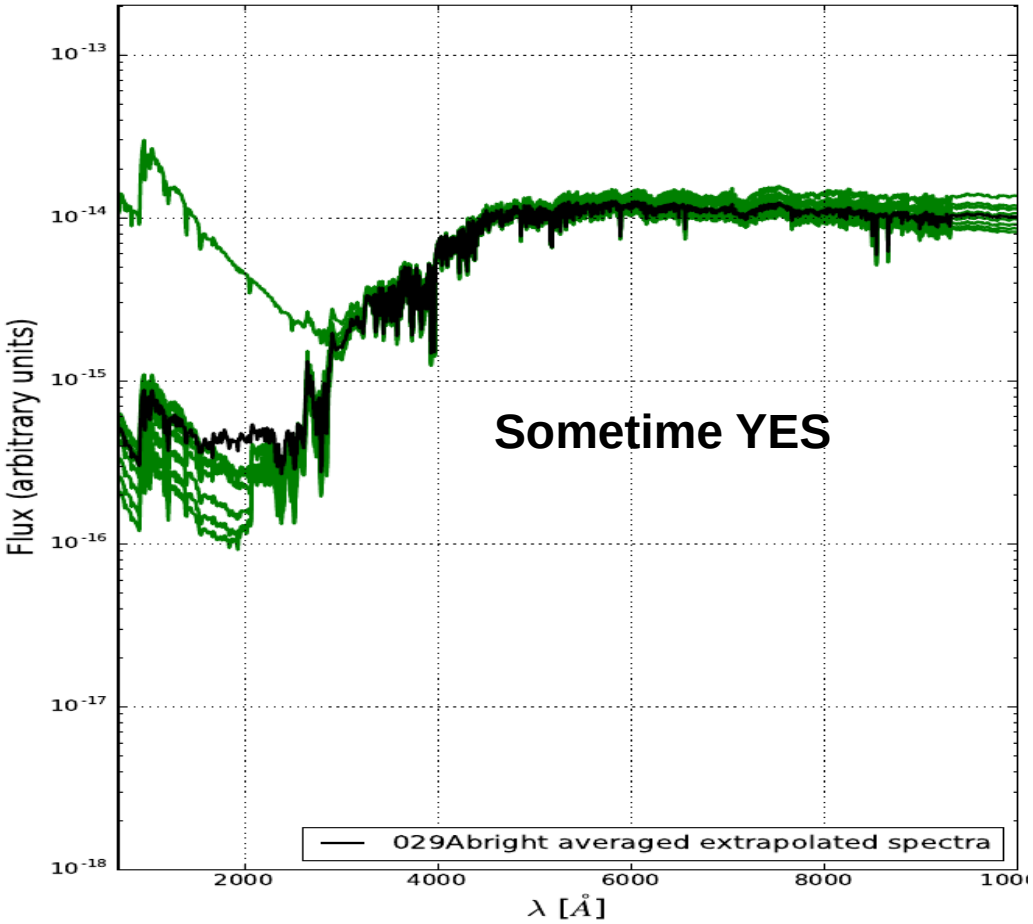
SED library performance comparison. Gaussian fit

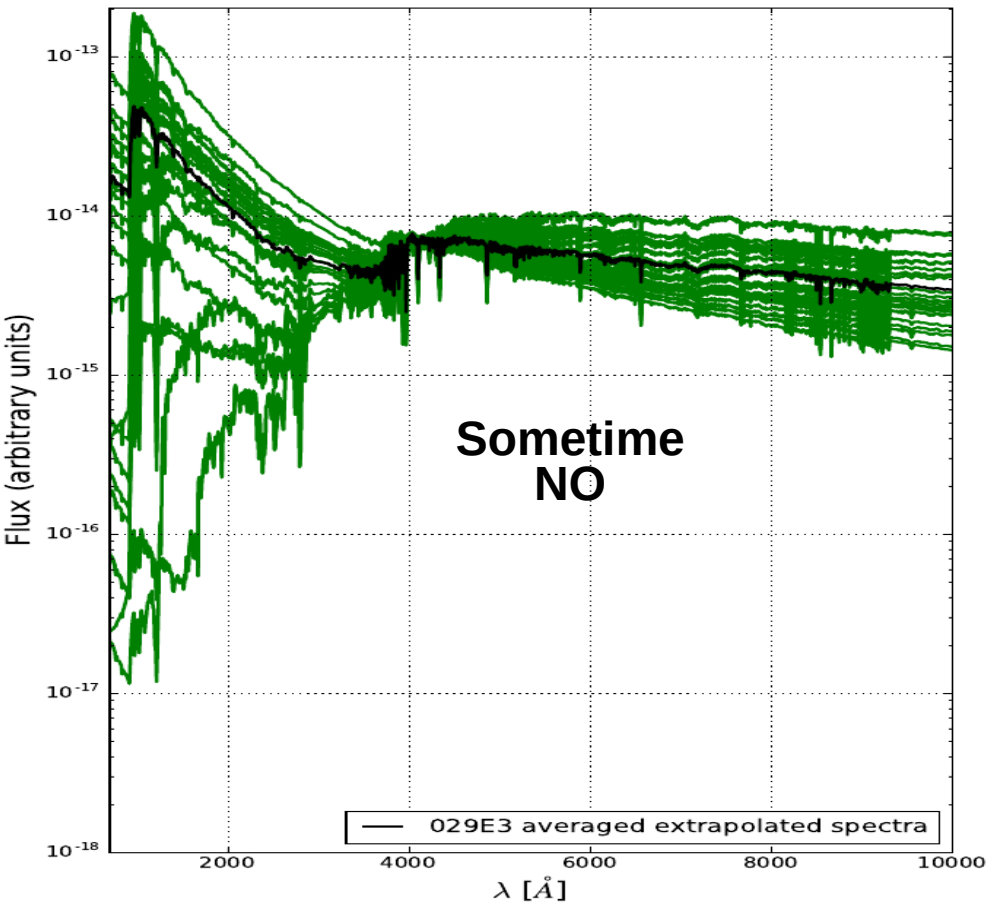
Width versus SEDs for various catalogs



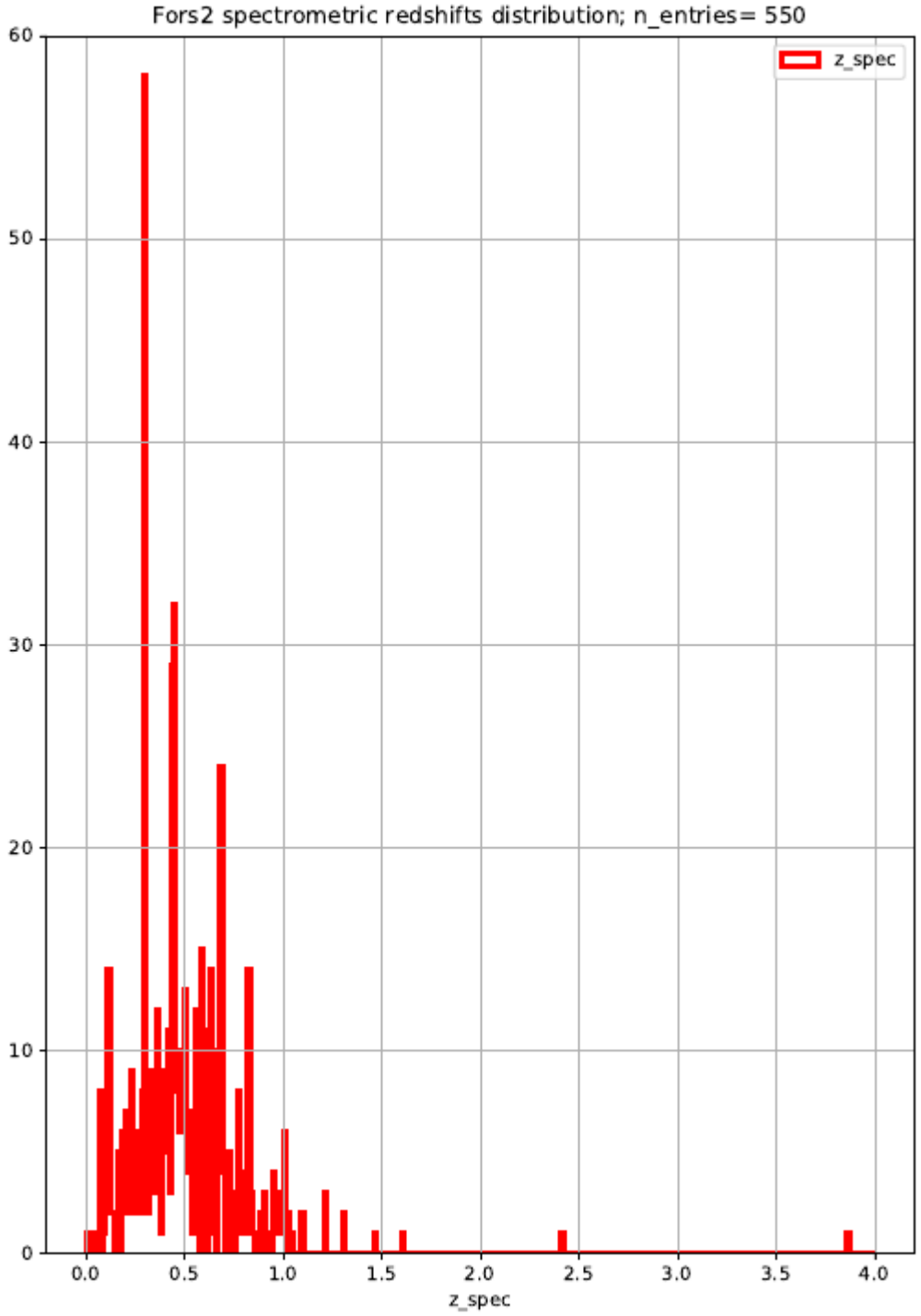
Questions ...

Does extrapolation of SEDs used to compute the averaged spectra follows the extrapolation of the averaged spectra ?





STEP2 (ongoing work) :
*** We decided to work on the full FORS2 dataset instead on averaged spectra**
→ 654 (actually 551 up to now) potential SEDs instead of 64
*** 551 SEDs have been extrapolated**
*** quality selection and redundancy tools are ready**
*** need to optimise the dataset for SED template fittting**
*** comparison with other SEDs on COSMOS catalog**
*** move to Lephare++**


Fors2 spectrometric redshifts distribution; n_entries= 550
z_spec
60
50
40
30
20
10
0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
z_spec