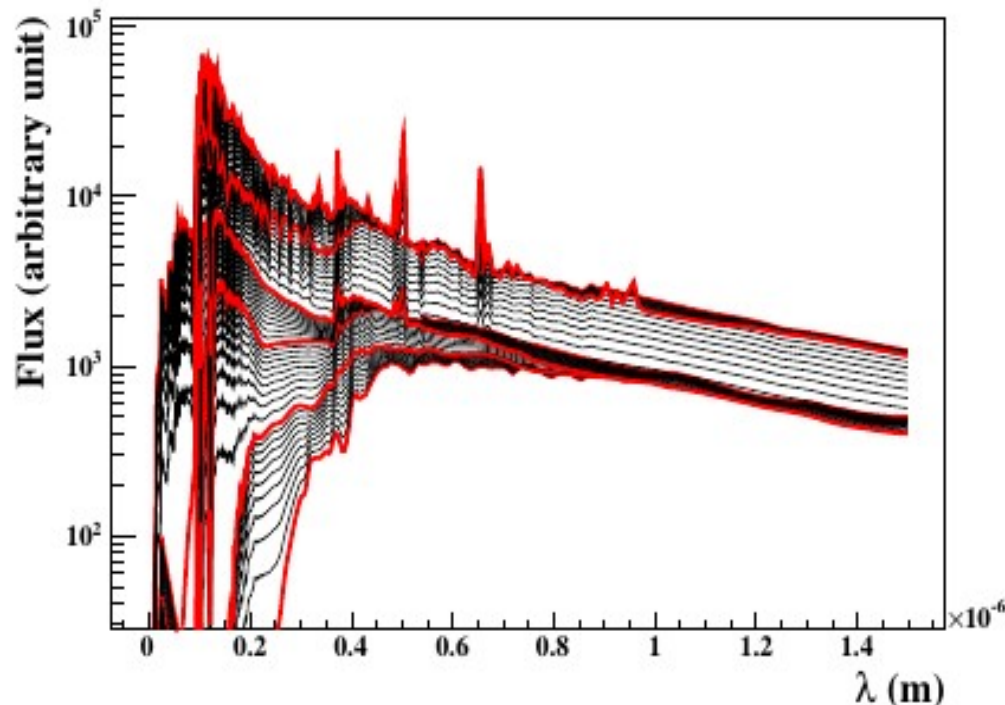


Comparing some SED library performances with Le Phare

Aim of our study :

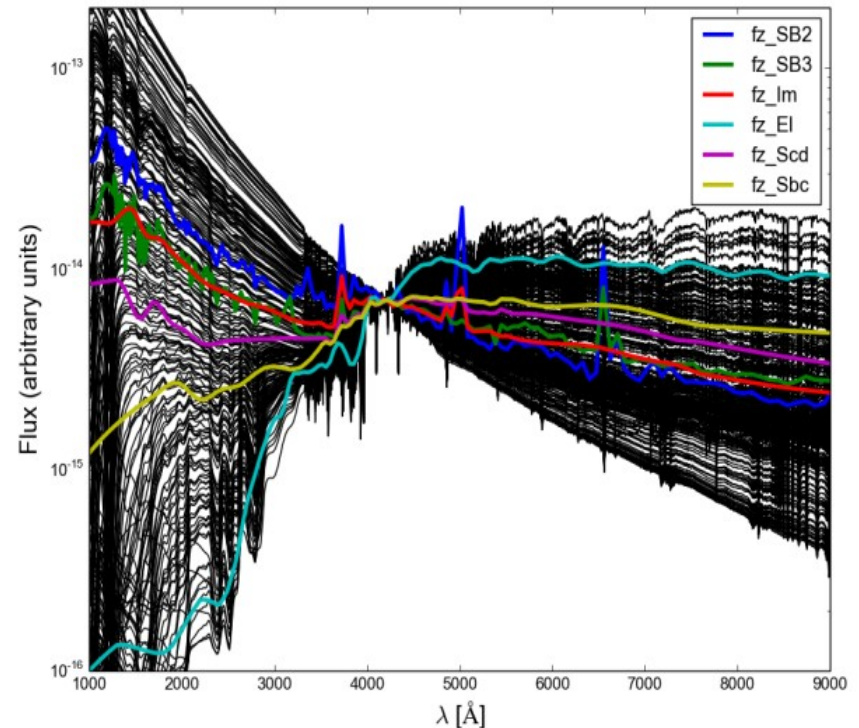
- 1/ Pedagogical !
- 2/ Building SED library using FORS2 spectra
- 3/ Brief description of the Brown et al database ($z < 0.05$) and check the completeness of the DirectSim and Brown templates as compared with FORS2 database ($0.275 < z < 1.05$)
- 4/ Comparison of SED performances with Le Phare

A.Gorecki et al., arXiv:1301.3010



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

/DirectSim-master/SEDs/Inst.*
(normalization from UGCA_219
between 415 and 425 nm)



Brown et al atlas, arXiv:1312.3029

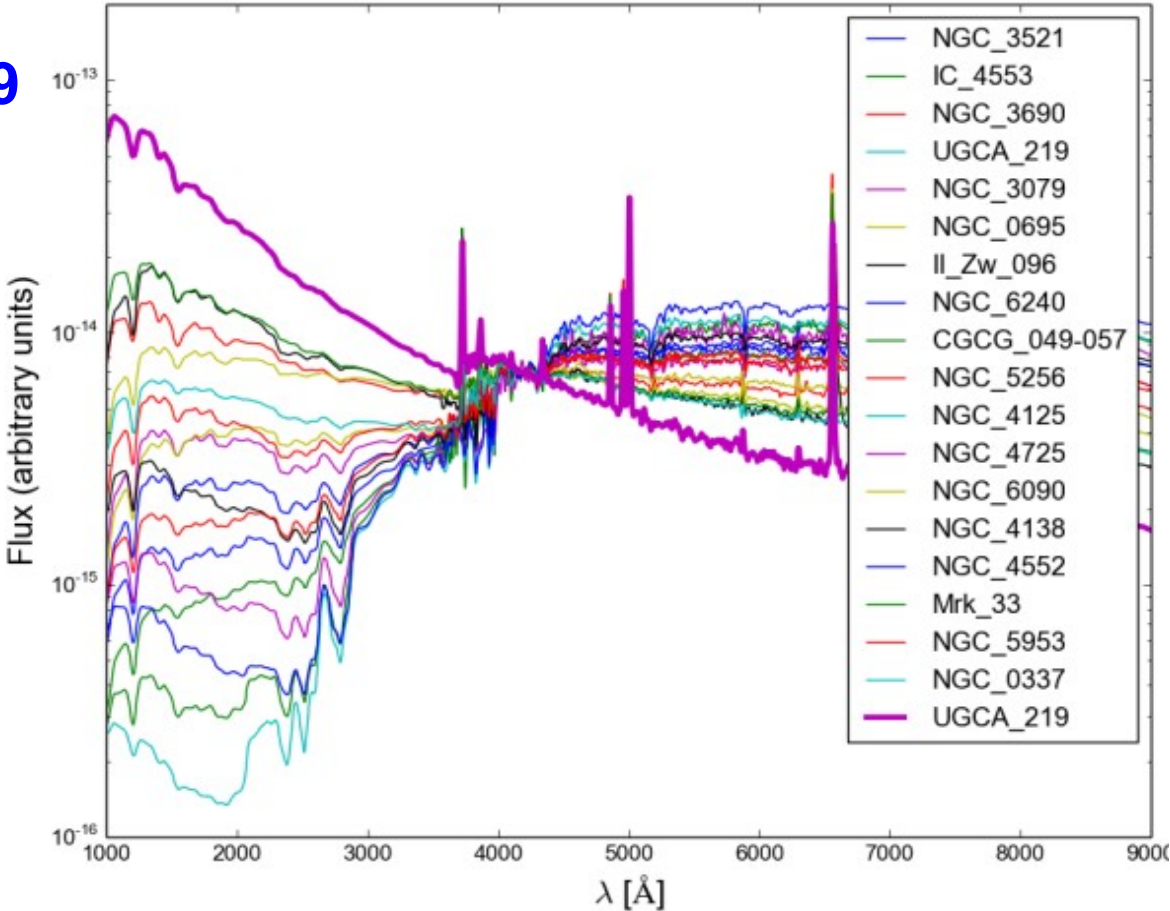
129 spectral energy distributions from the UV to mid-IR including : spirals, merging galaxies, blue compact dwarfs and luminous infrared galaxies

Absolute magnitude : $-14.4 > M_g > -22.3$

Colors : $0.1 < u-g < 1.9$

Redshift : $z < 0.05$

18 illustrative spectra that could be used as basic templates



Basic properties of the subsample

Name	Morphology	T-type	<i>g</i>	<i>M</i> _{NUV} − <i>M</i> _u	<i>M</i> _[8.0] − <i>M</i> _[24]	Notes
NGC 0337	SBd	7.0	12.36	0.96	0.79	Interacting galaxy
NGC 0695	S0	-2.0	13.90	1.17	0.72	
NGC 3079	SB(s)c	7.0	11.07	1.31	0.27	Seyfert 2
Mrk 33	Im pec	10.0	13.36	0.59	2.09	Wolf-Rayet Galaxy
UGCA 219	Sc	-	14.78	0.01	2.76	Blue Compact Dwarf
NGC 3521	SABbc	4.0	10.38	2.02	0.05	Galaxy merger and Wolf-Rayet Galaxy
NGC 3690	Pec	9.0	12.07	0.72	2.19	
NGC 4125	E6 pec	-5.0	10.89	3.44	-0.70	Elliptical galaxy without UV upturn
NGC 4138	SA(r)0	-1.0	11.86	1.83	0.04	
NGC 4552	E	-5.0	10.94	3.01	-0.74	Elliptical galaxy with UV upturn
NGC 4725	SABab pec	2.0	11.08	2.52	-0.20	
NGC 5256	Pec	99.0	13.82	1.35	2.14	Galaxy merger
CGCG 049-057	Irr	-	15.16	3.17	2.32	LIRG
NGC 5953	Sa	1.0	12.65	1.89	0.67	ULIRG Arp 220
IC 4553	Pec	-	13.85	2.35	3.27	
NGC 6090	Pec	-	14.20	0.82	1.76	Galaxy merger and LIRG
NGC 6240	Pec	90.0	13.45	1.69	2.34	
II Zw 096	Pec	-	14.30	0.49	2.91	Galaxy merger and starburst

18 illustrative spectra (and Blue Compact Dwarf)

Building FORS2 SED library

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 : $3000 \text{ \AA} < \lambda < 6000 \text{ \AA}$

Averaged spectra divided in 4 classes :
blue or red SED;
absorption or emission lines
and 5 redshift bins from $z=0.3$ to $z=1$

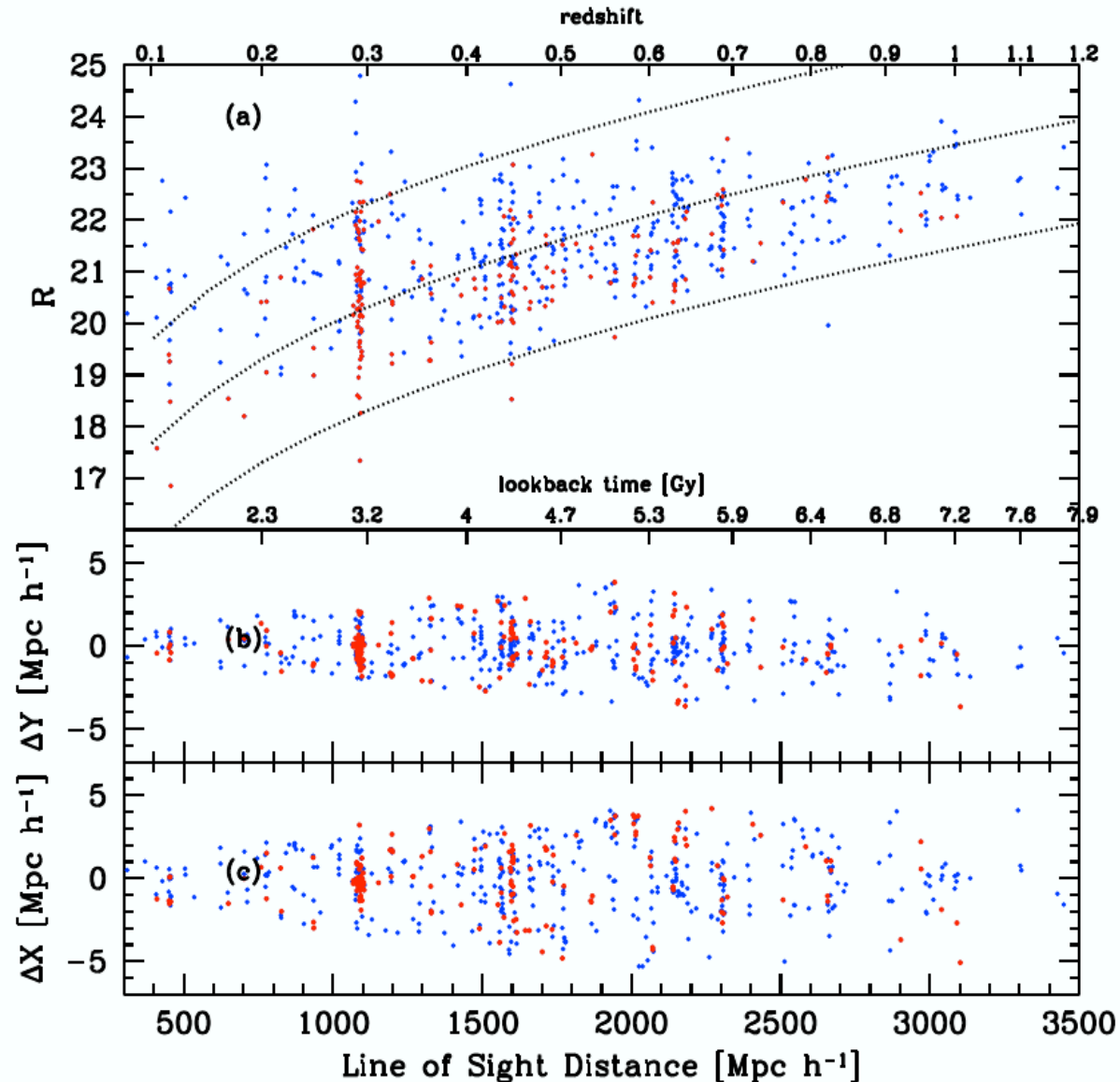
→ 67 averaged spectra

Building FORS2 SED library :

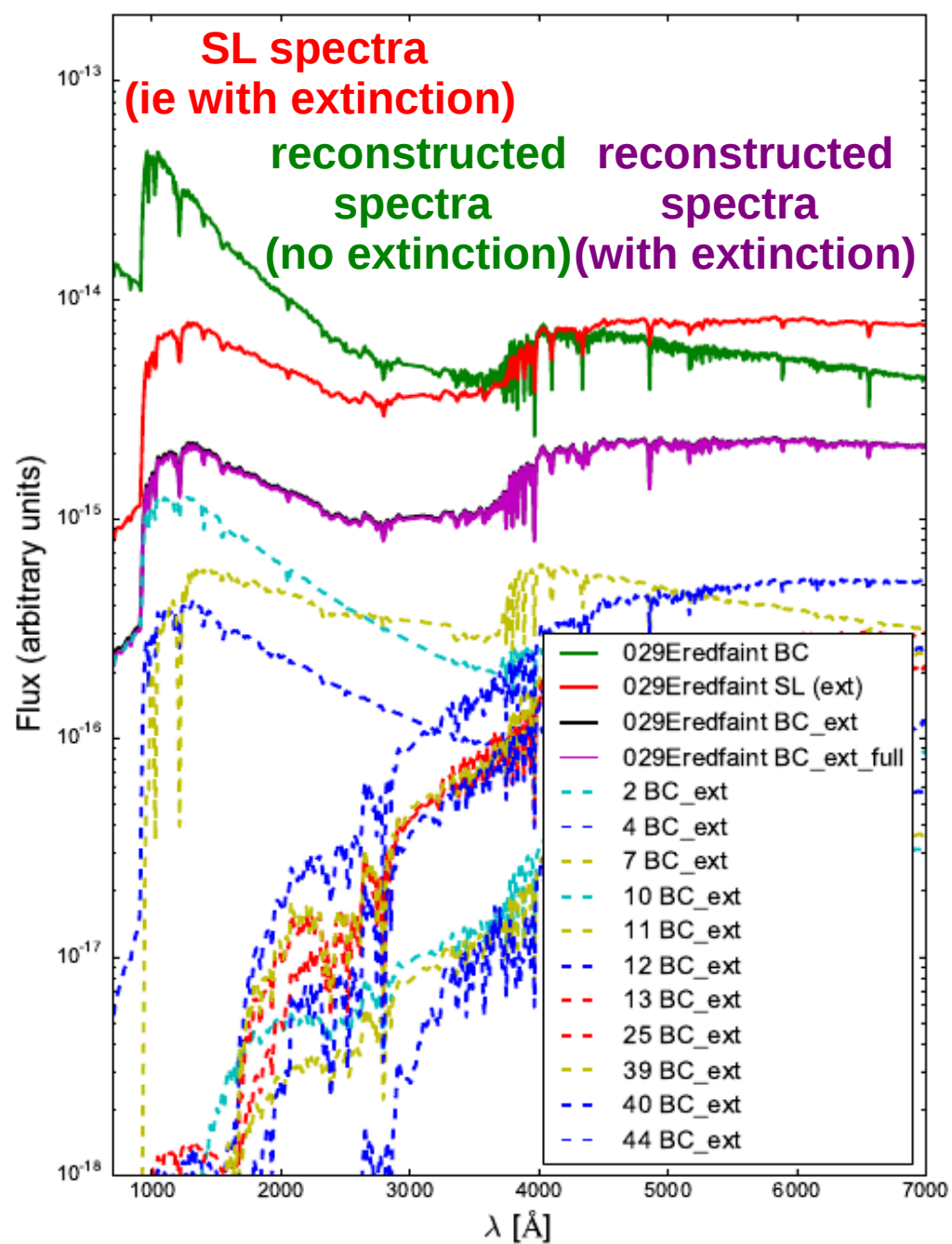
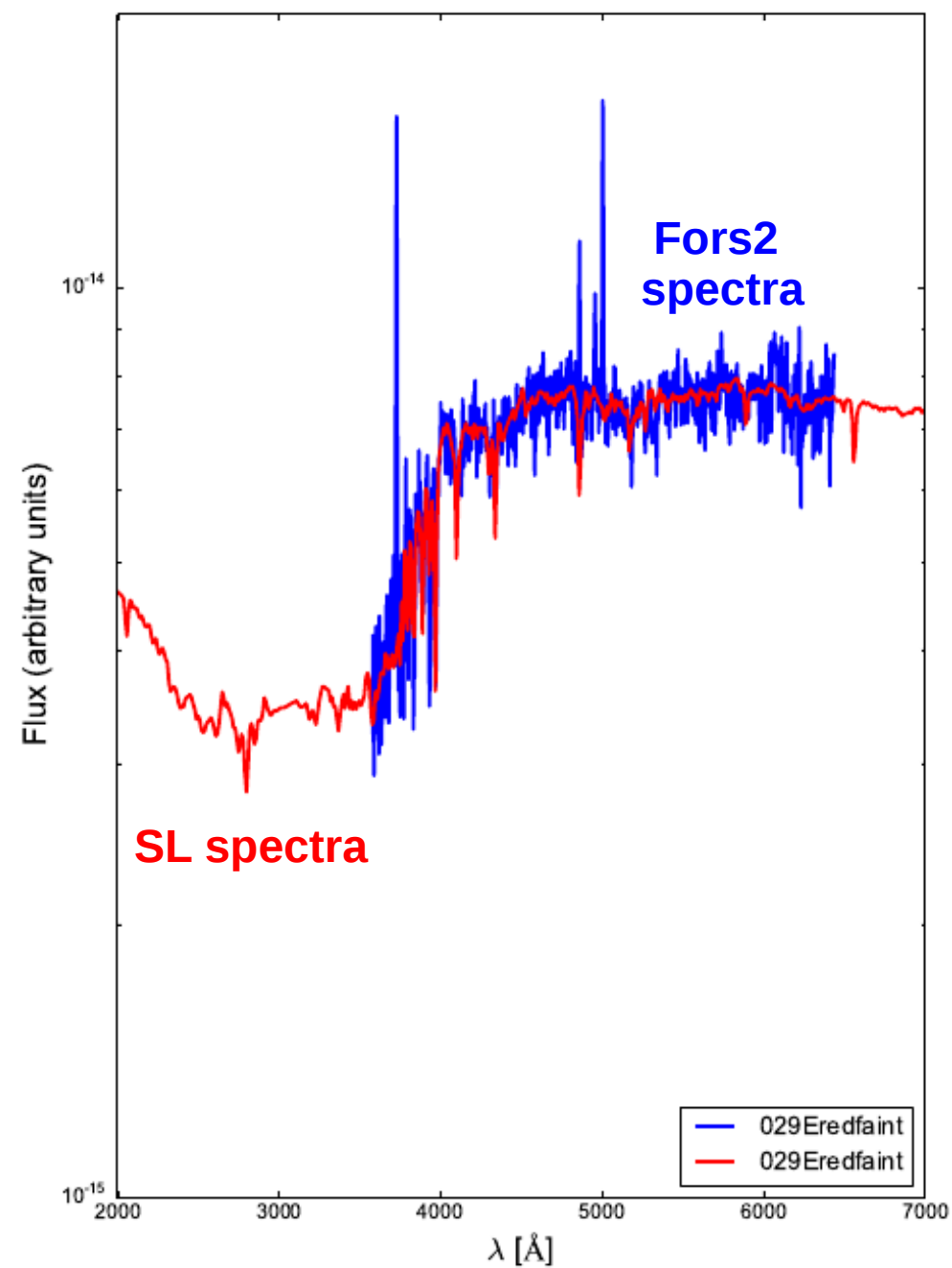
Stellar mixing and synthetic spectra
derived from SED using STARLIGHTV04

Based on 45 evolutionary stellar
population models from Bruzual&Charlot
(2003)

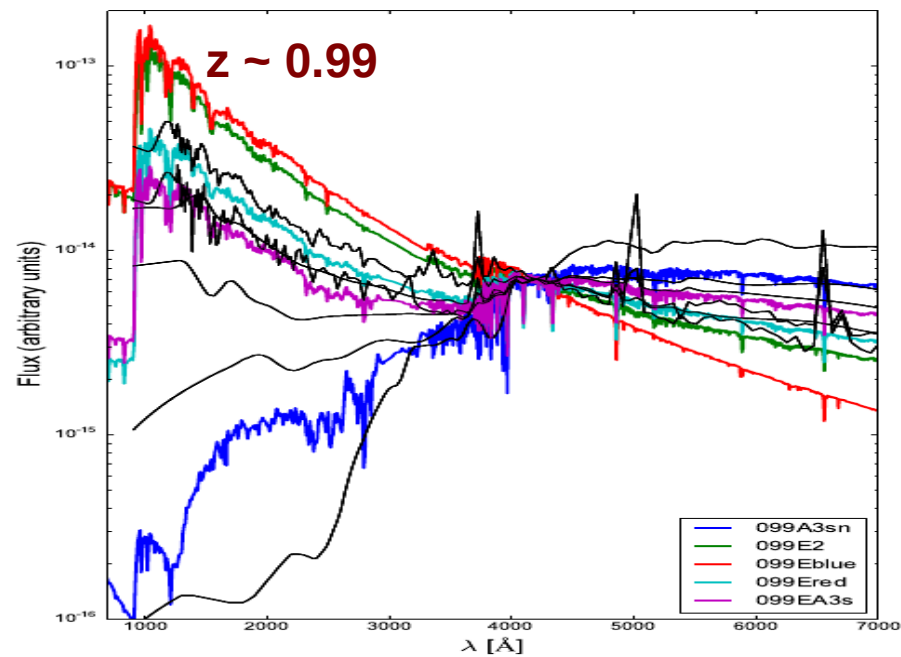
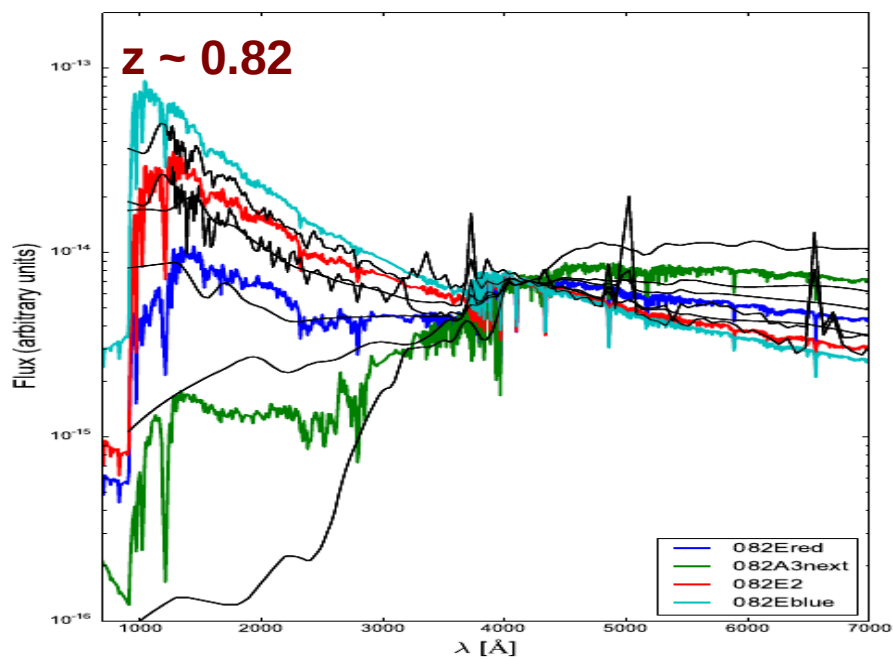
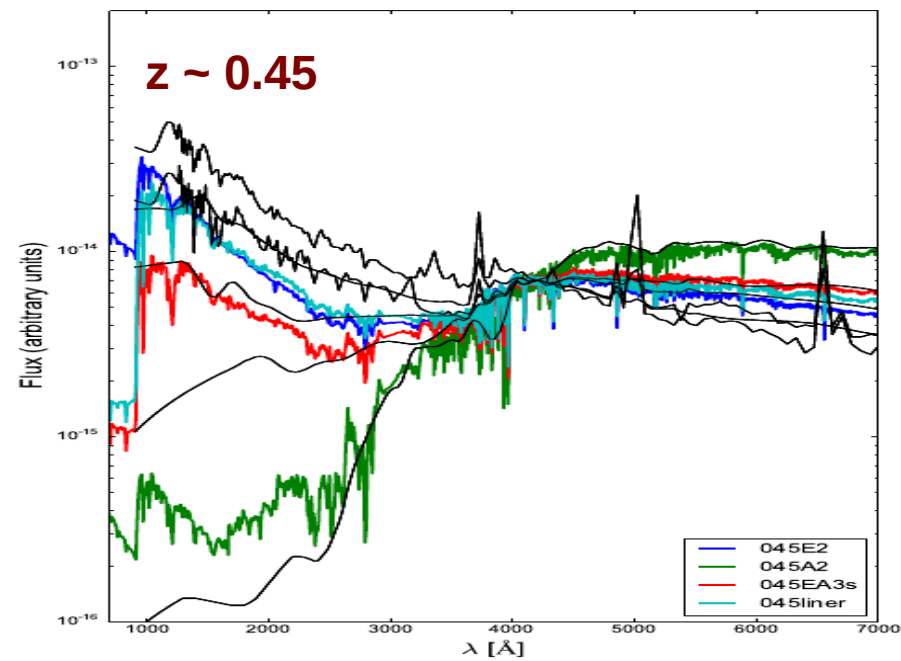
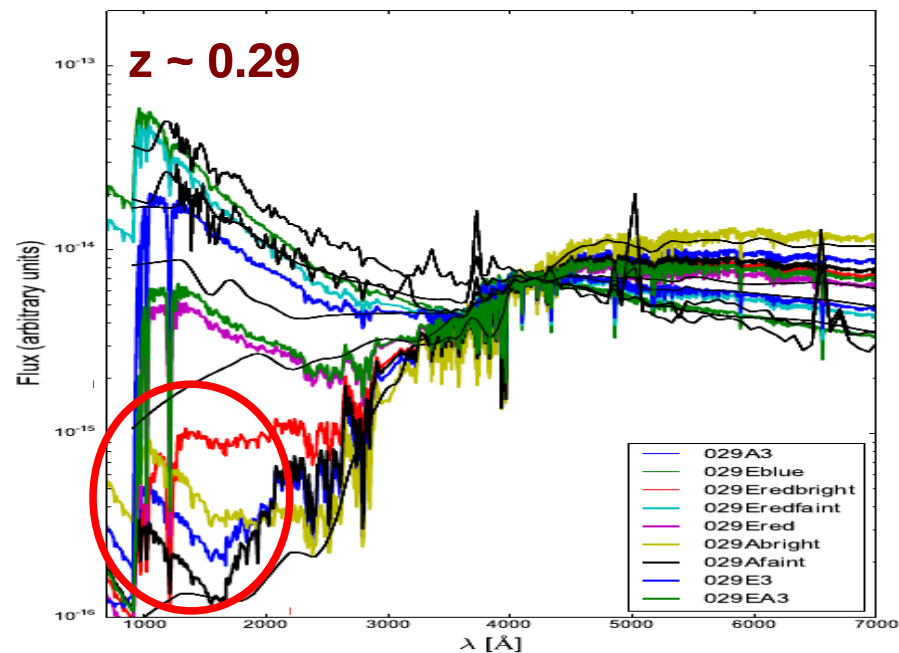
→ model continuum spectra extended
to $700 \text{ \AA} < \lambda < 100000 \text{ \AA}$



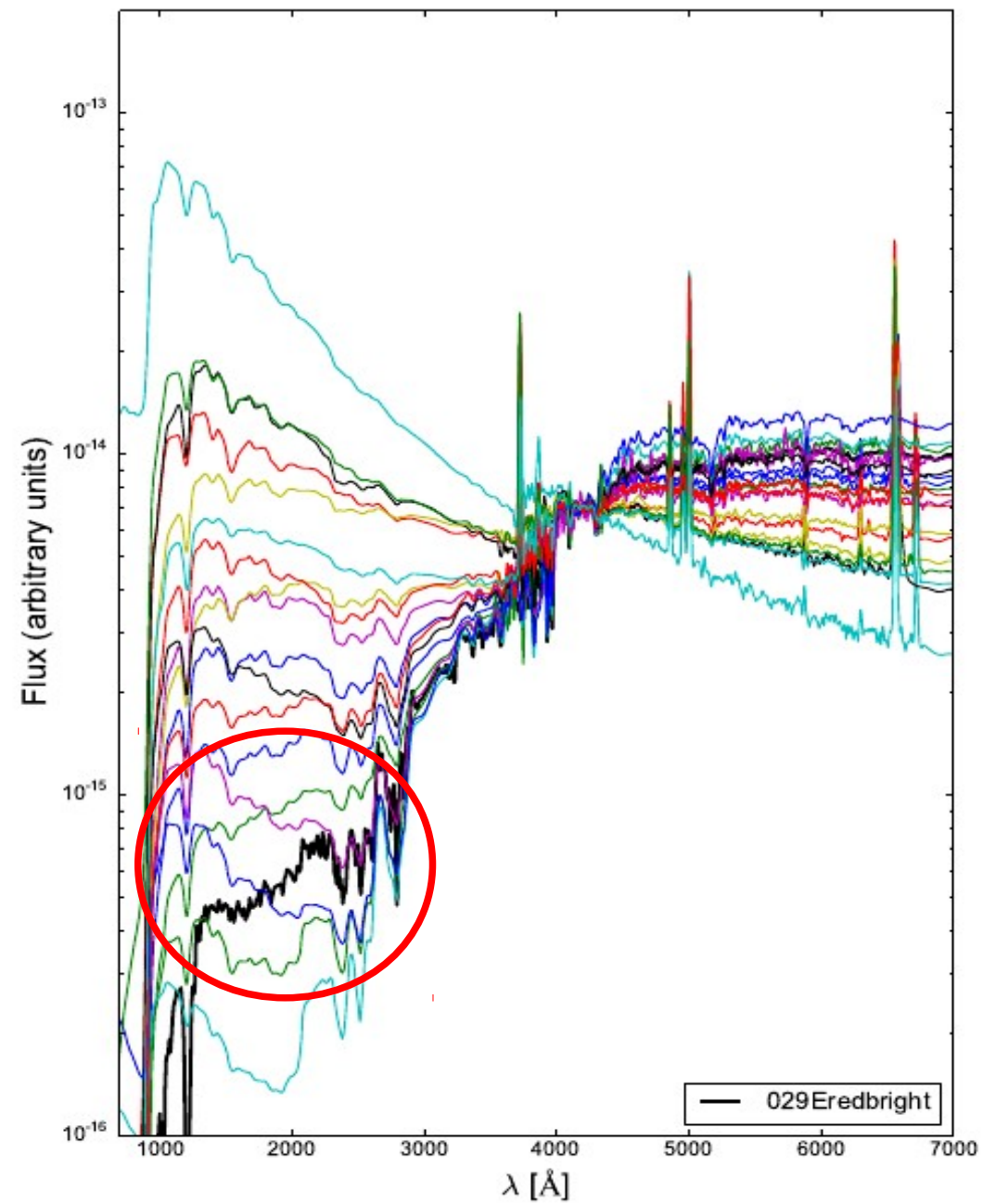
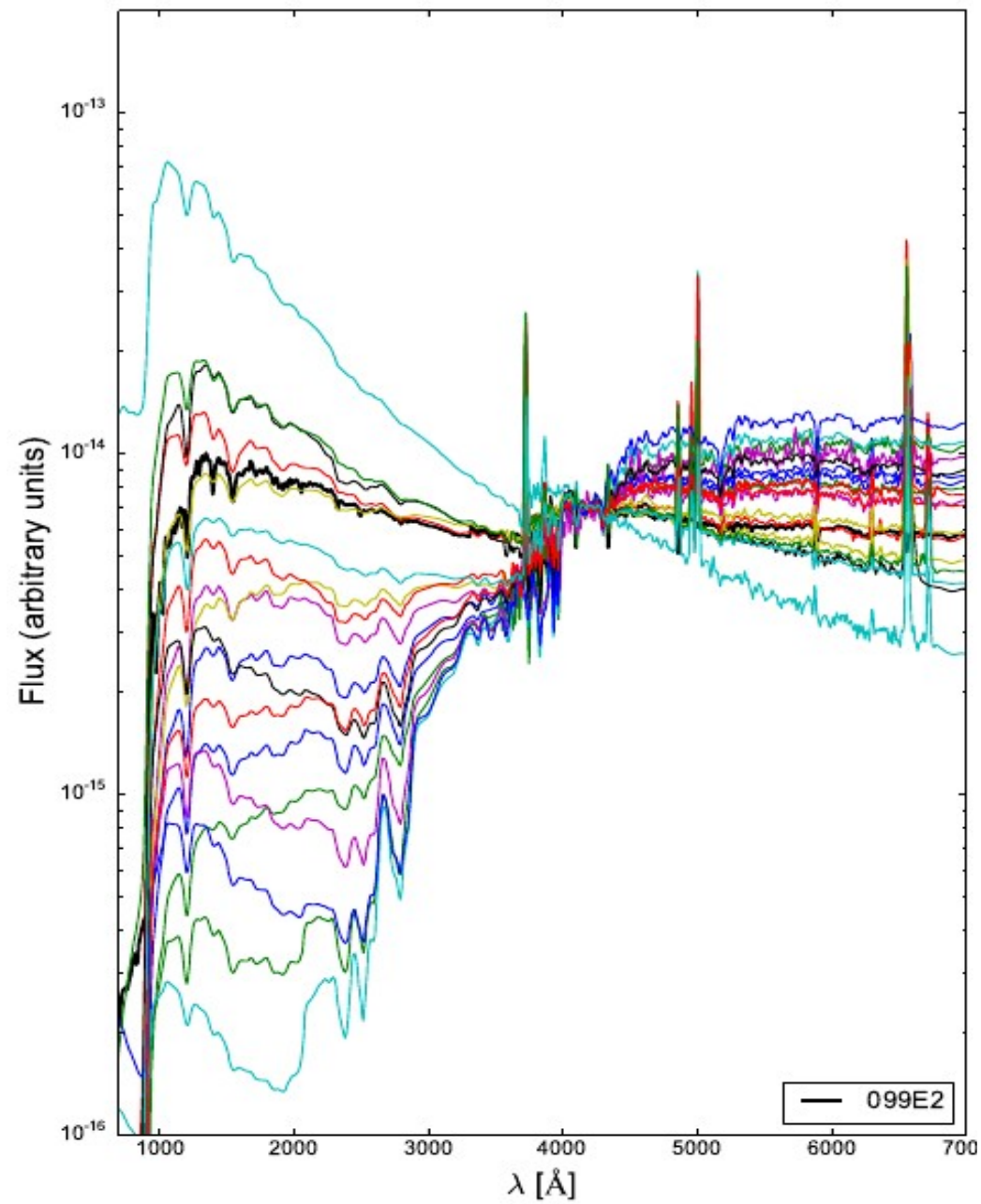
Examples of reconstructed spectra



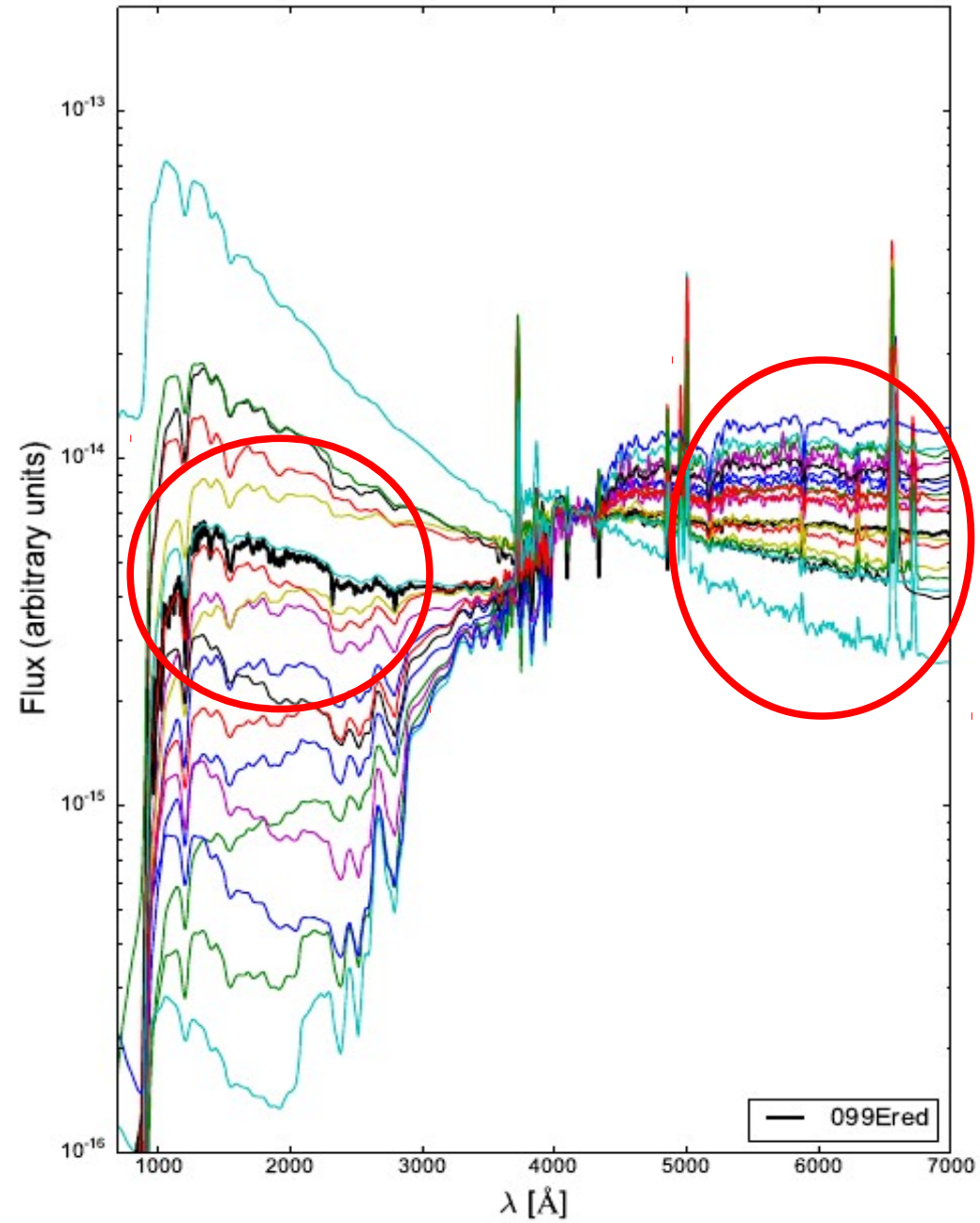
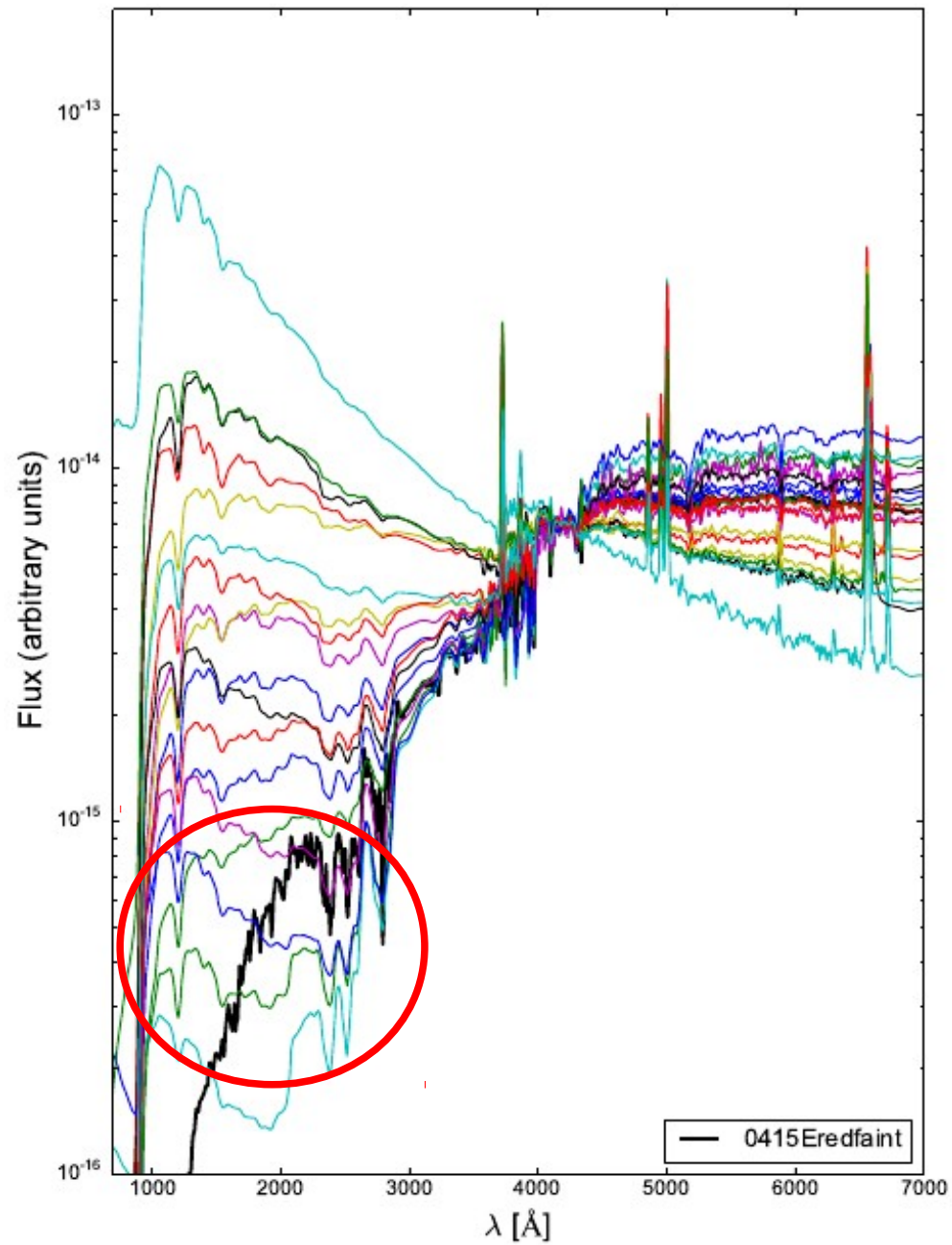
FORS2 atlas as a function of the redshift (versus 6 FZ templates)



Comparison with Brown spectra



Comparison with Brown spectra



SED library performance comparison

PRELIMINARY !

Catalog :

CFHTLS – D1

U, G, R, I, Z

DEEP + Ultra DEEP field
 $17.5 < \text{Magnitude } I_{AB} < 24.5$

$0 < z < 6$

VVDS spectro data
($3 < \text{redshift quality flag} < 4$)

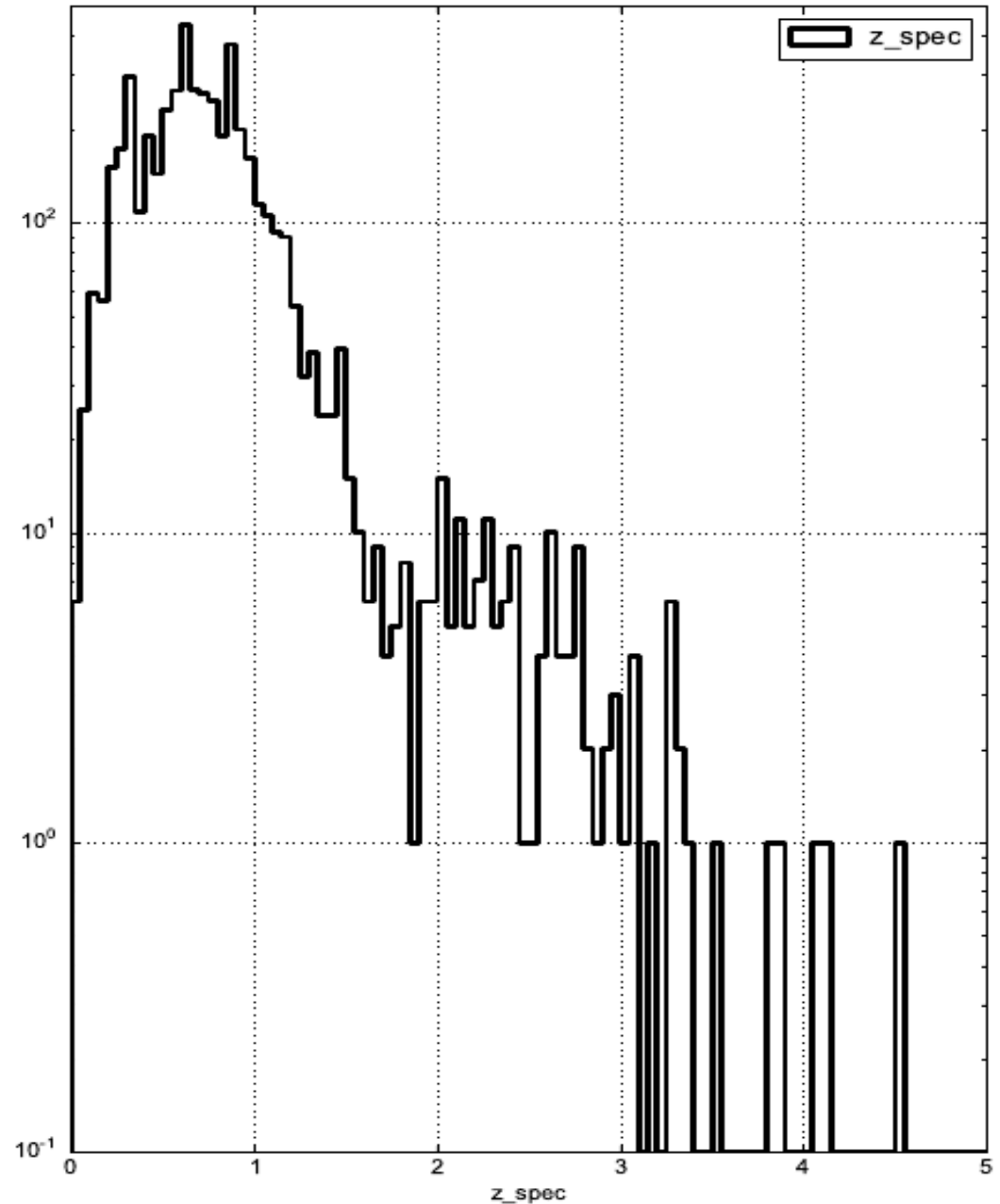
4663 objects

Photo-z code :

Le Phare (Arnouts S. & Ilbert O.)
with extinction (Calzetti et al.)

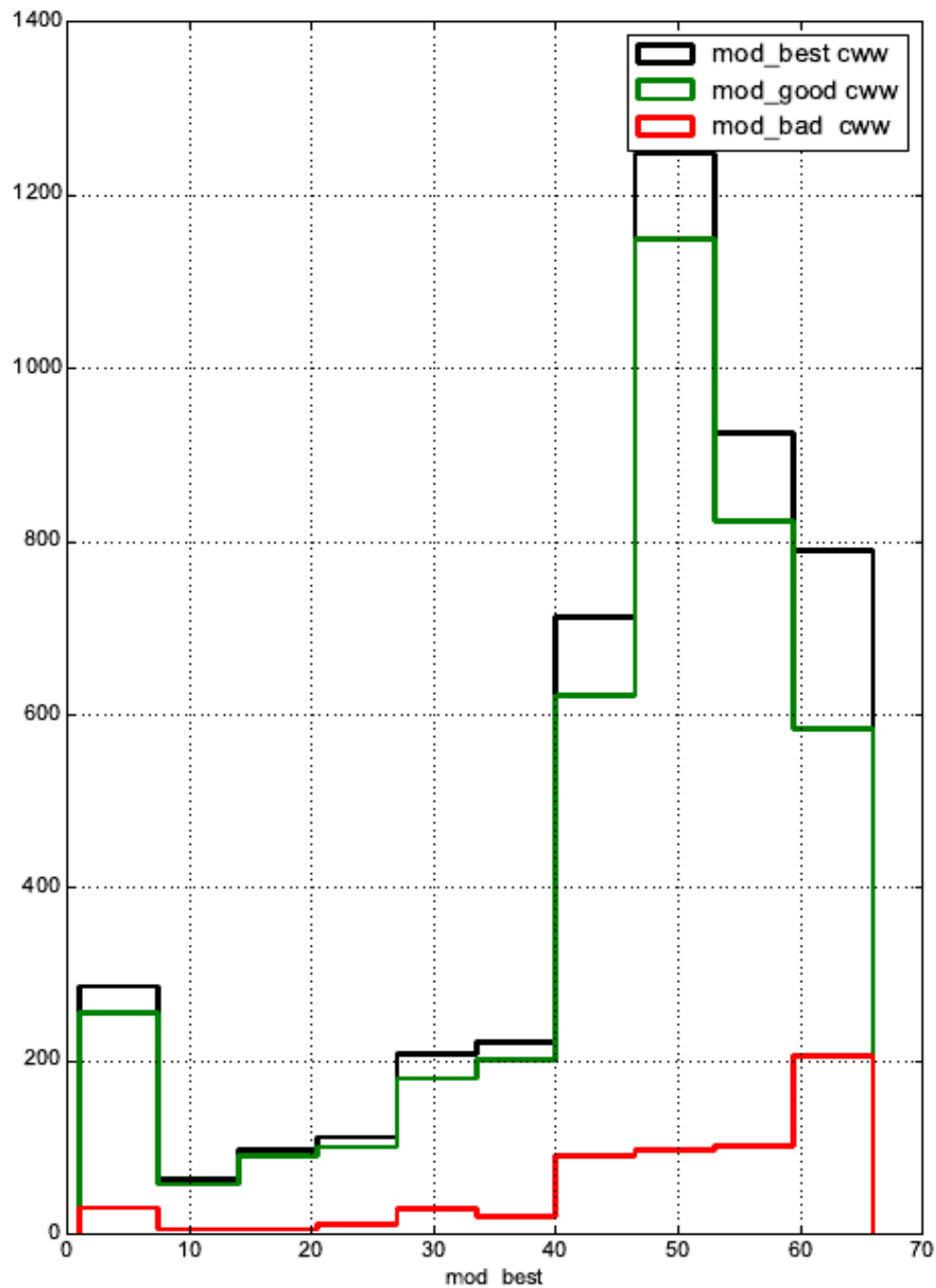
SED libraries :

- 66 “CWW” SED spectra (Ilbert et al 2006)
- 67 FORS2 SEDs
- 129 Brown SEDs

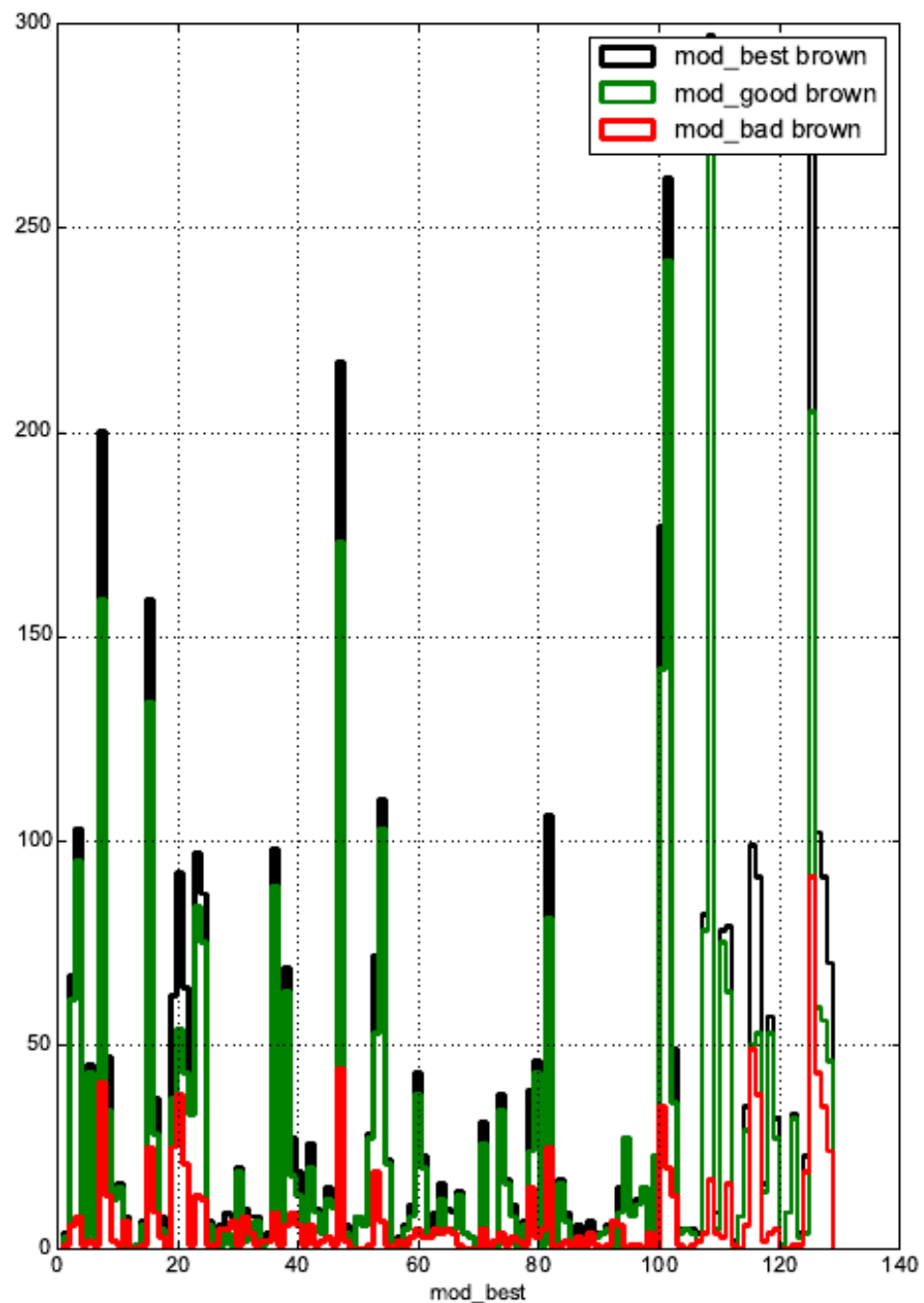


Best models distribution

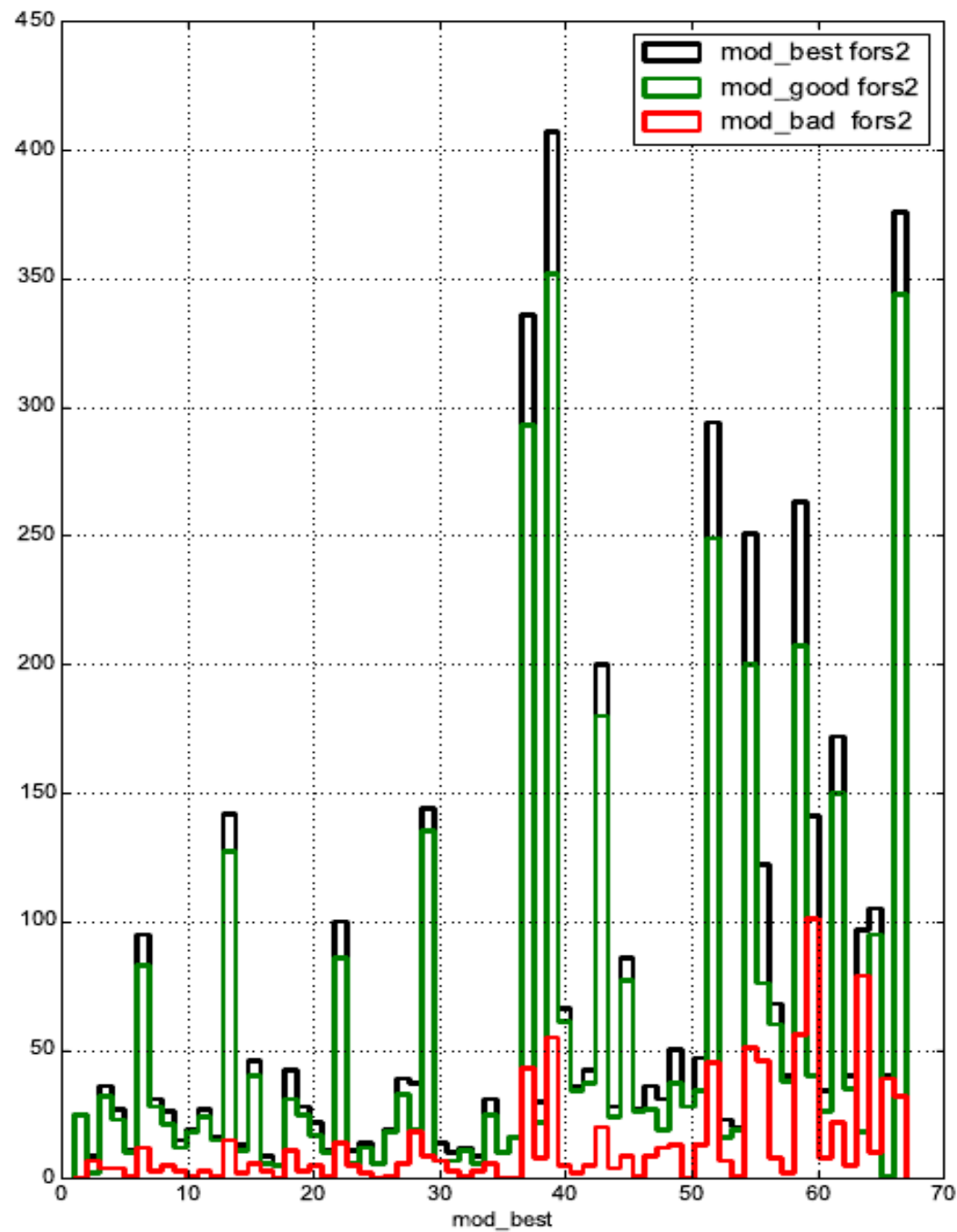
Good = $|(z_{\text{spec}} - z_{\text{phot}})/z_{\text{spec}}| < 0.2$



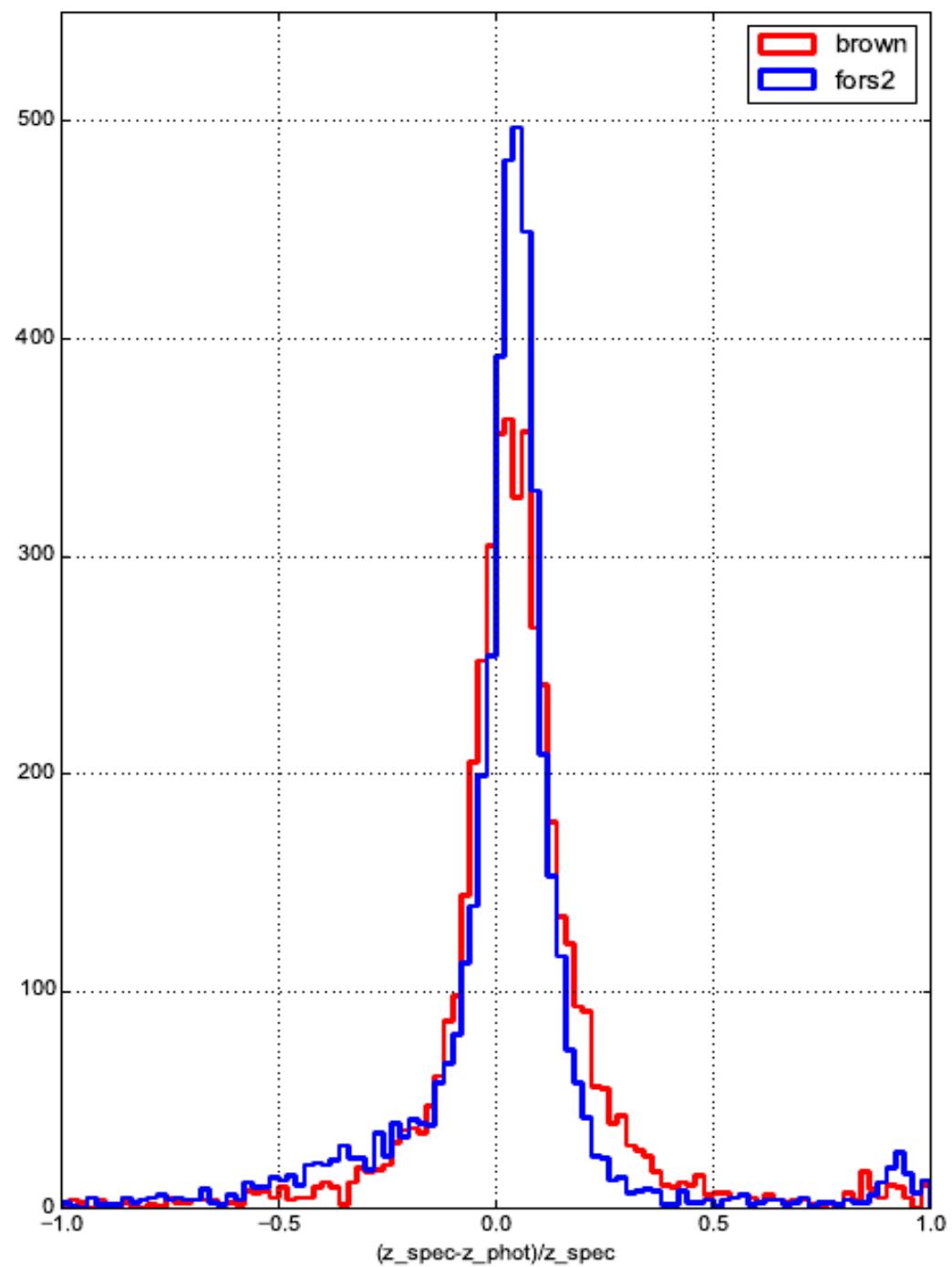
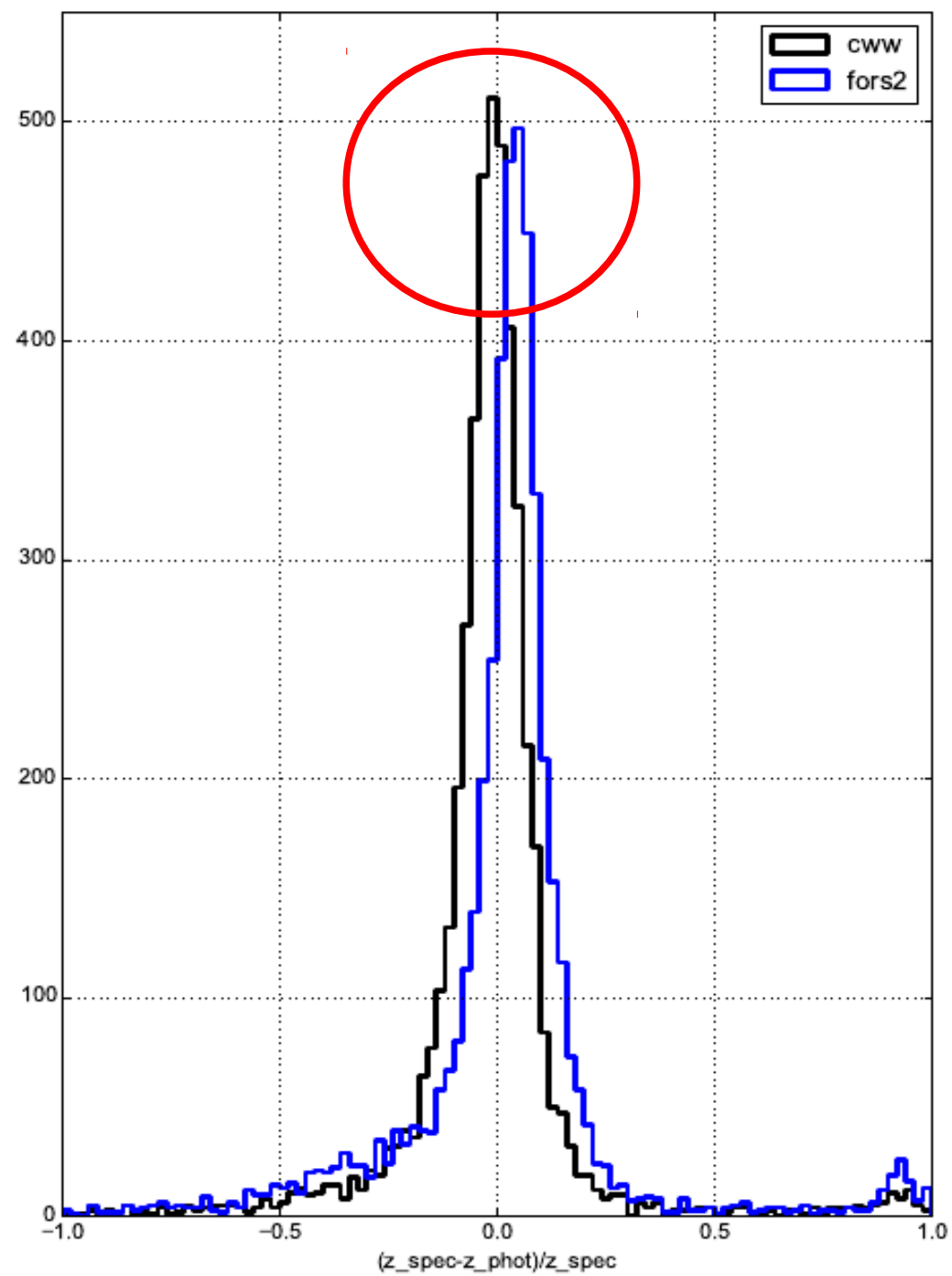
Bad = $|(z_{\text{spec}} - z_{\text{phot}})/z_{\text{spec}}| > 0.2$



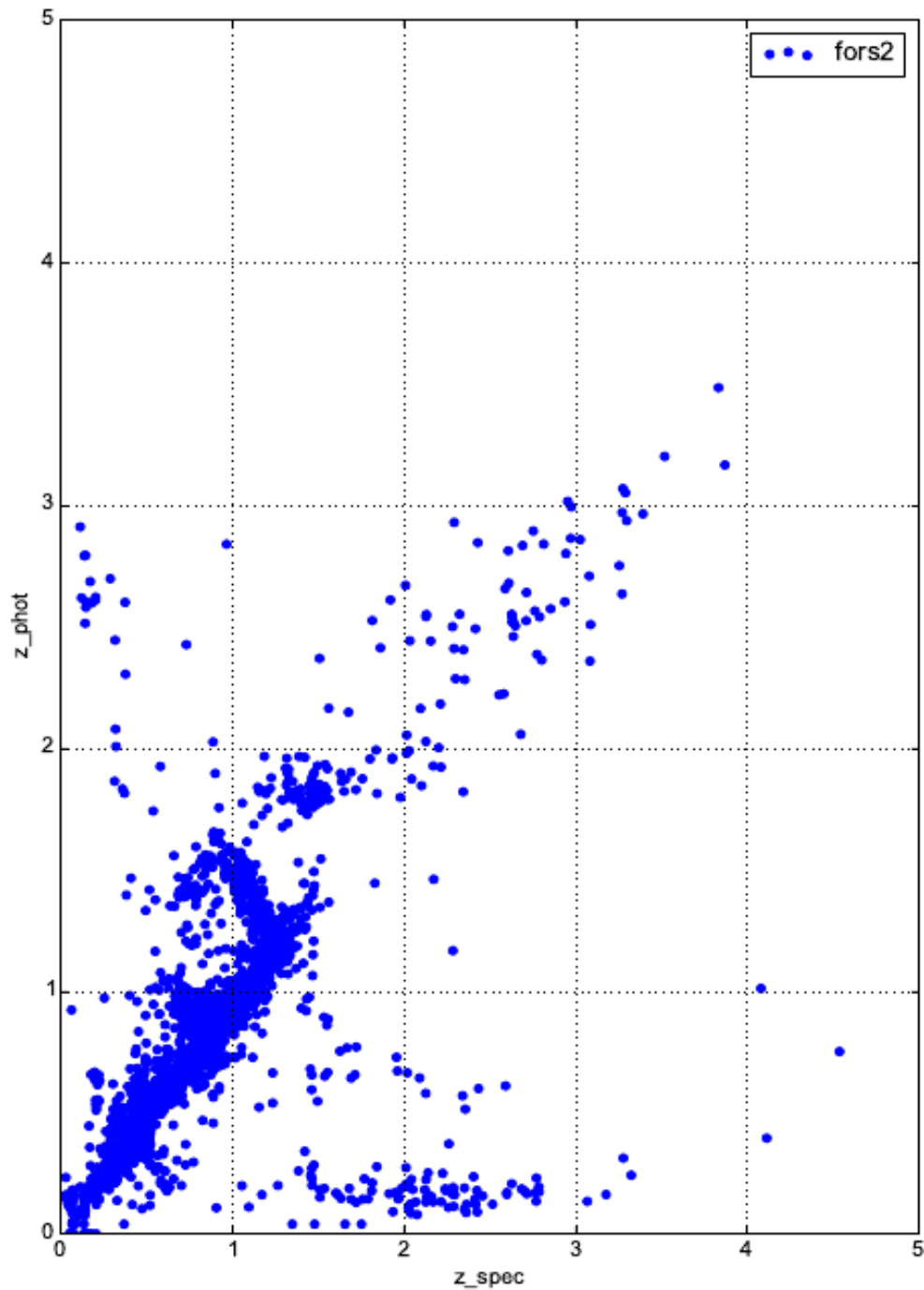
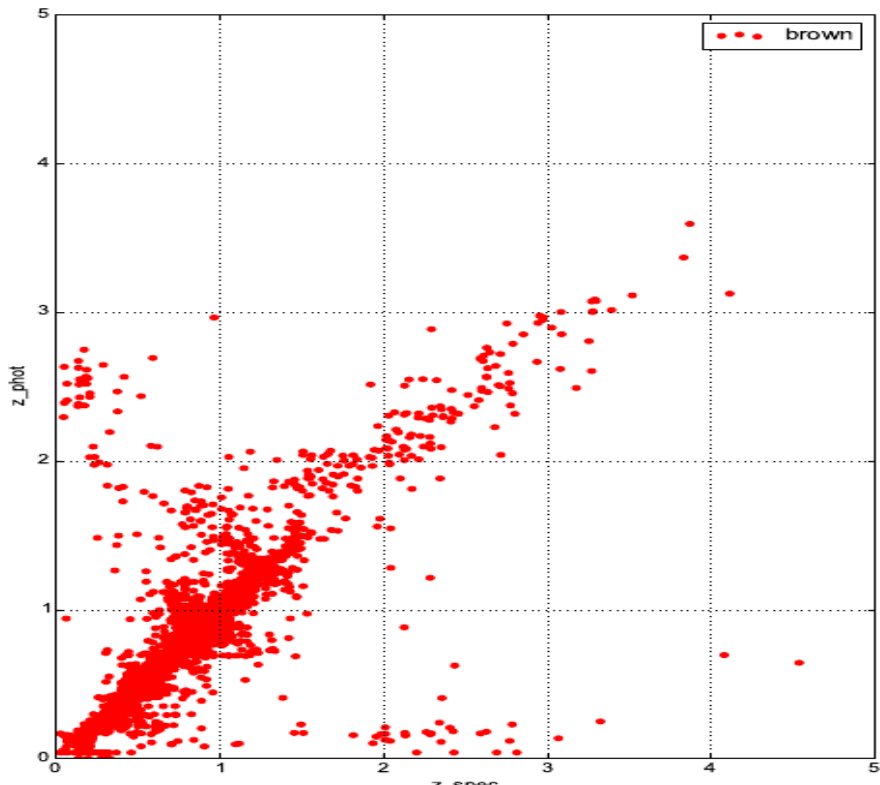
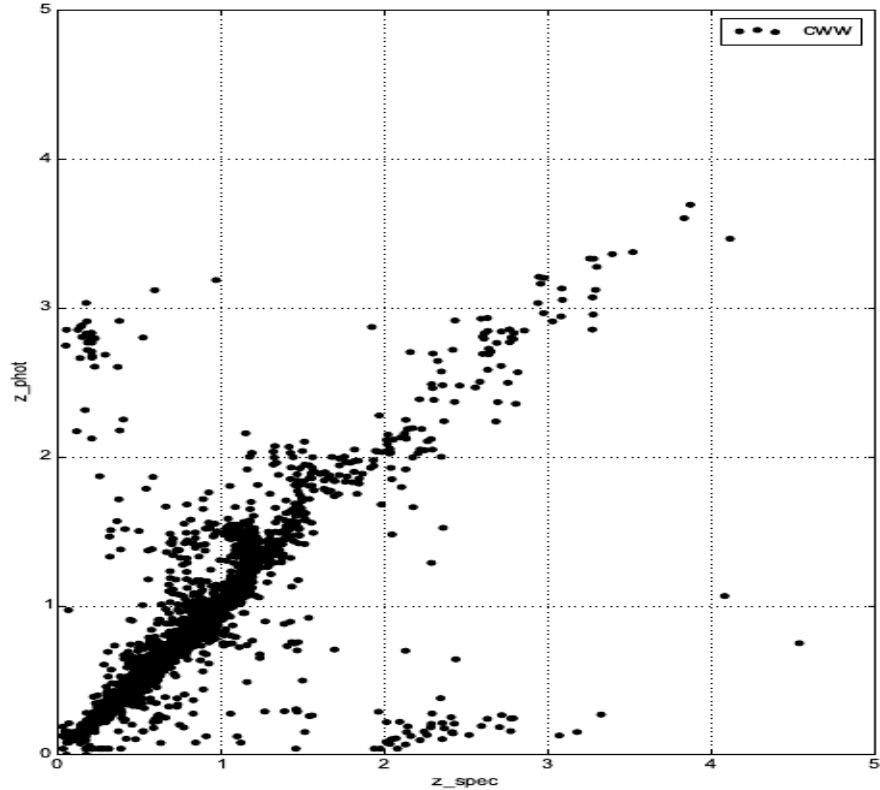
Best models distribution



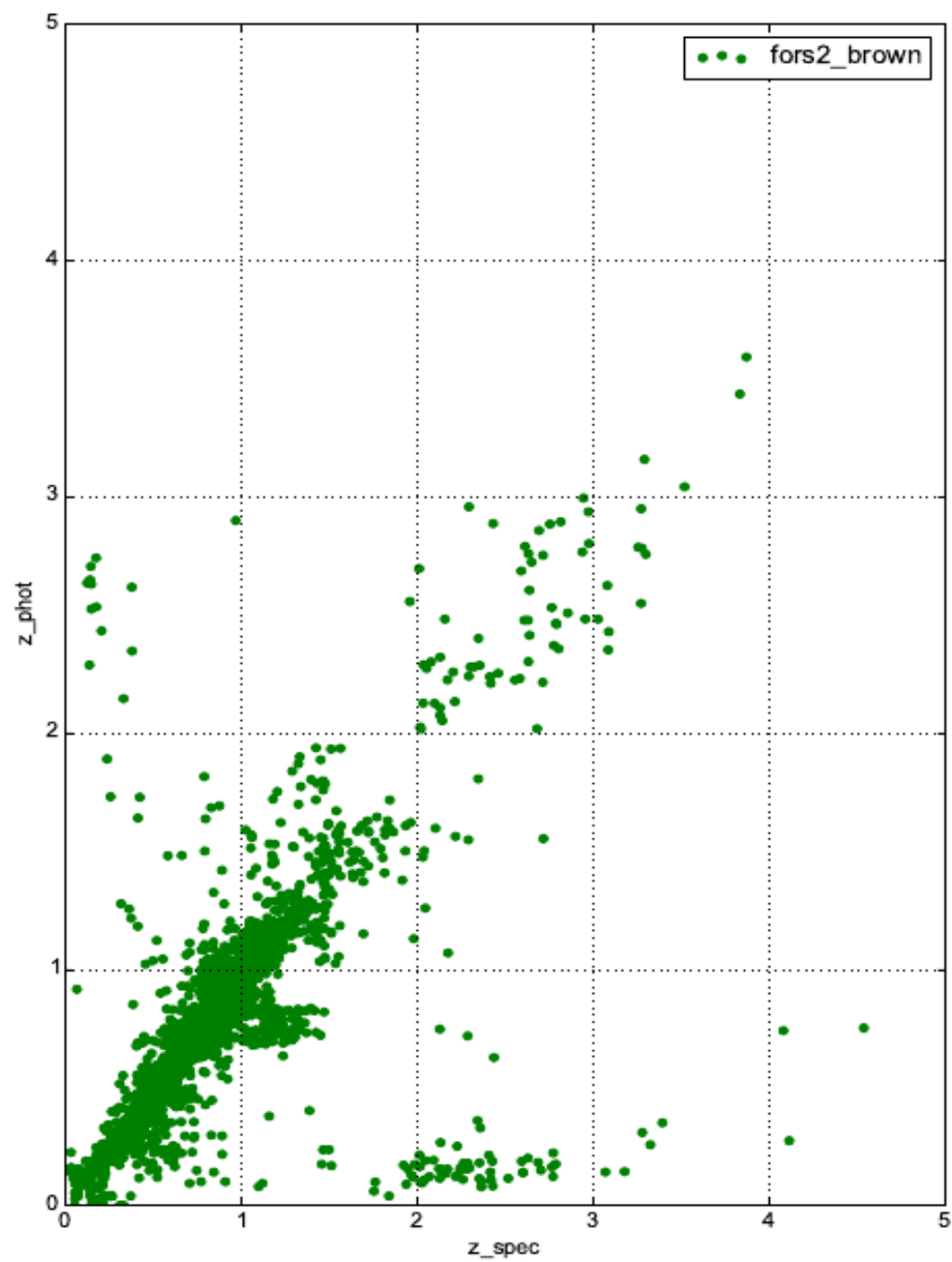
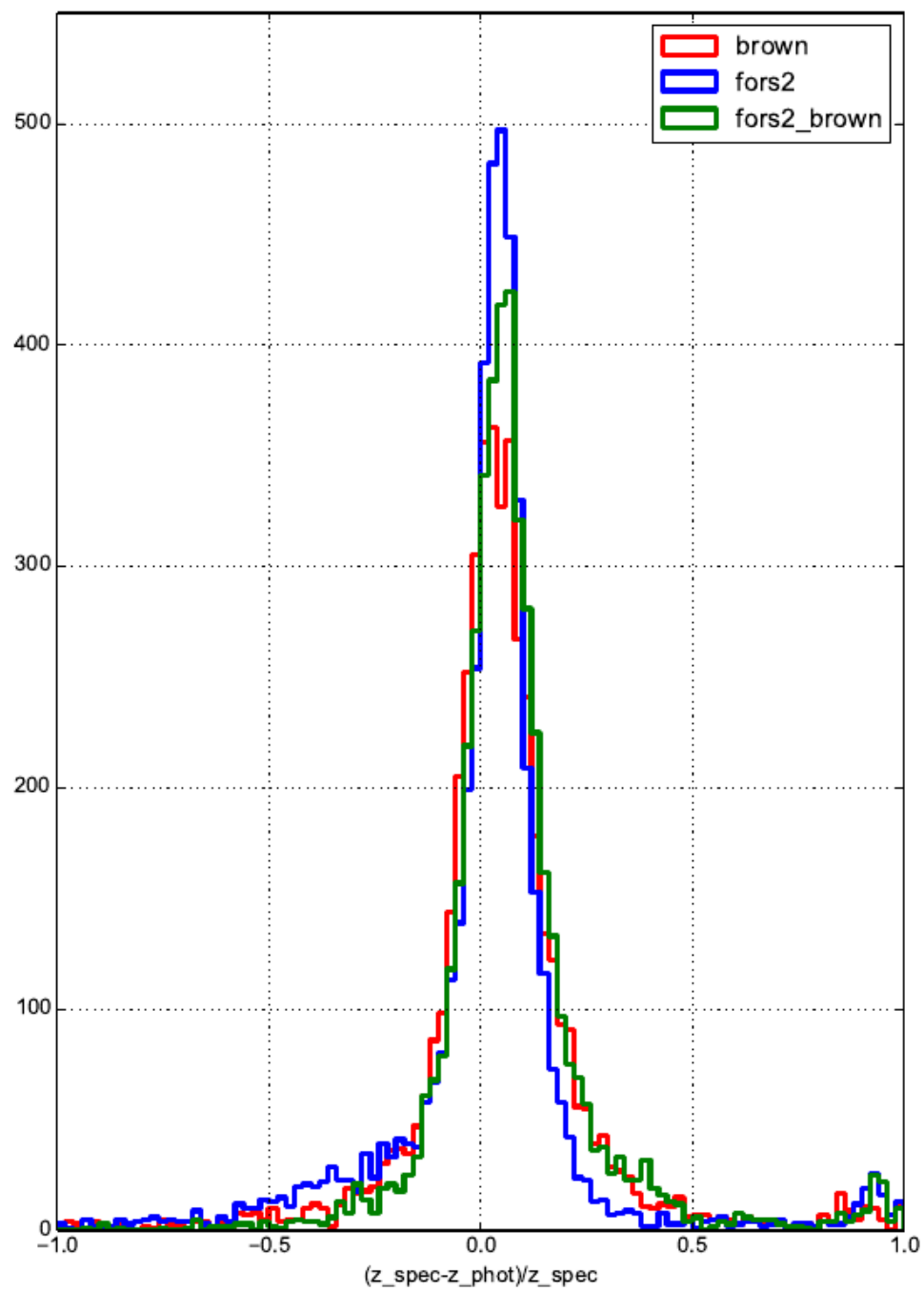
Delta_z distribution



z_phot versus z_spec



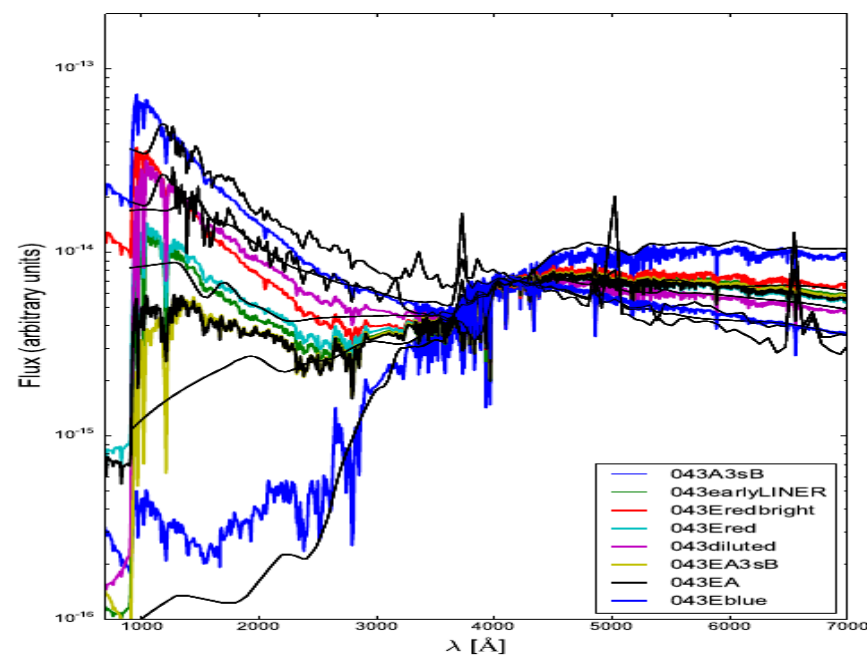
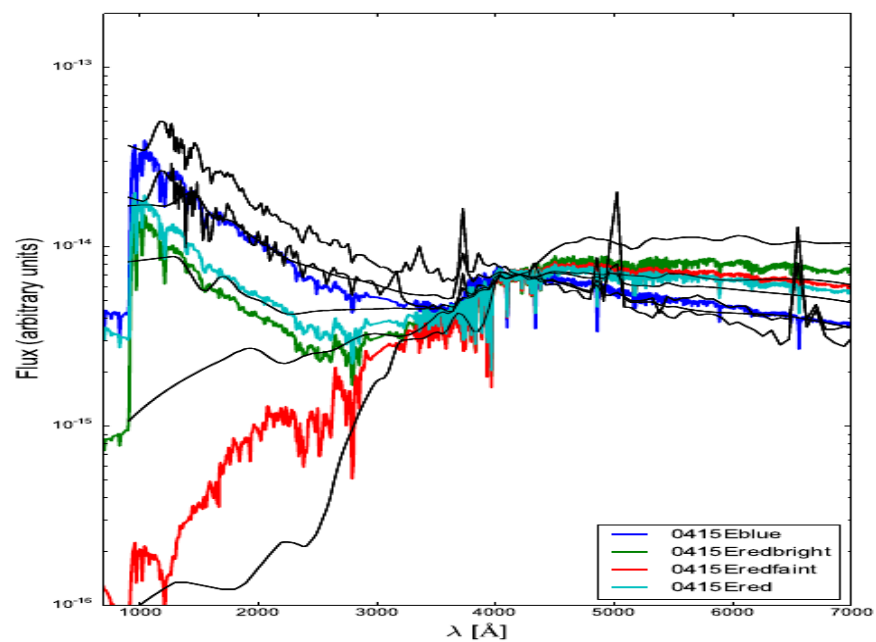
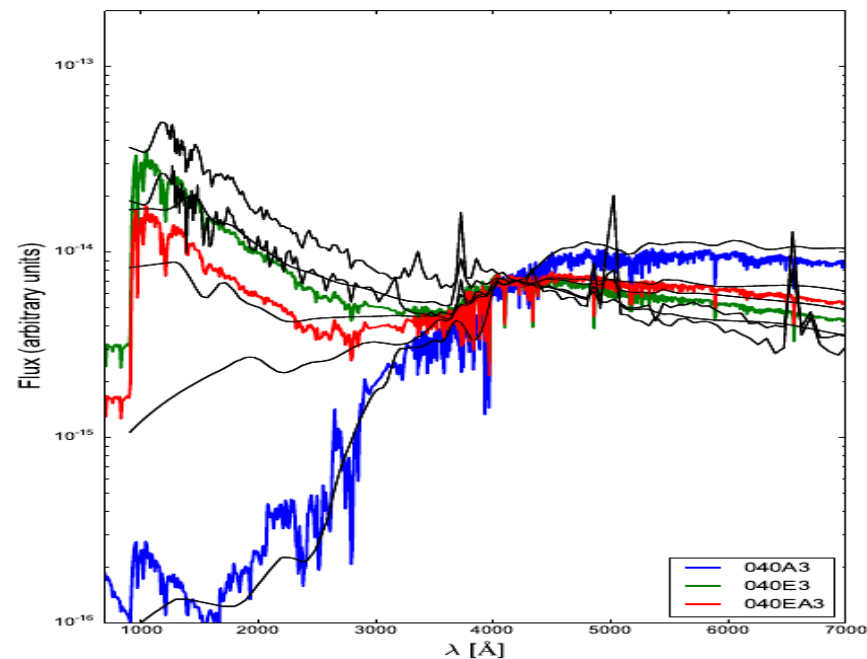
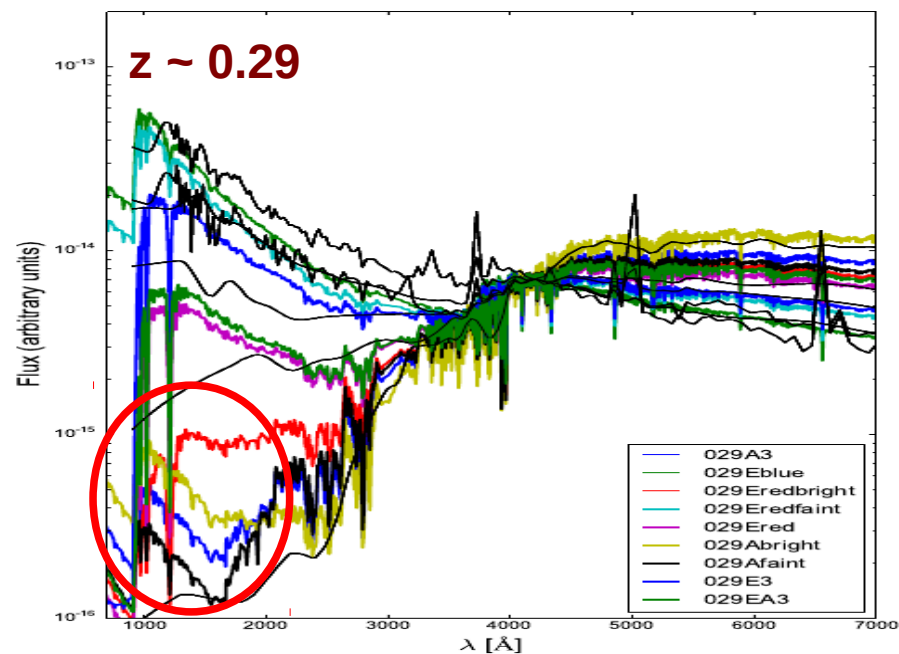
Brown+FORs2



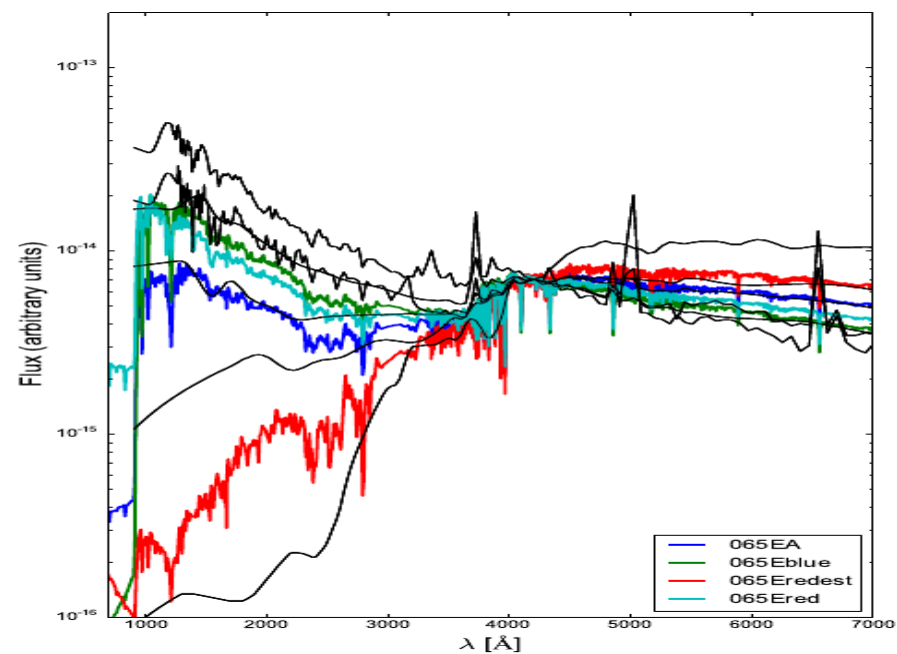
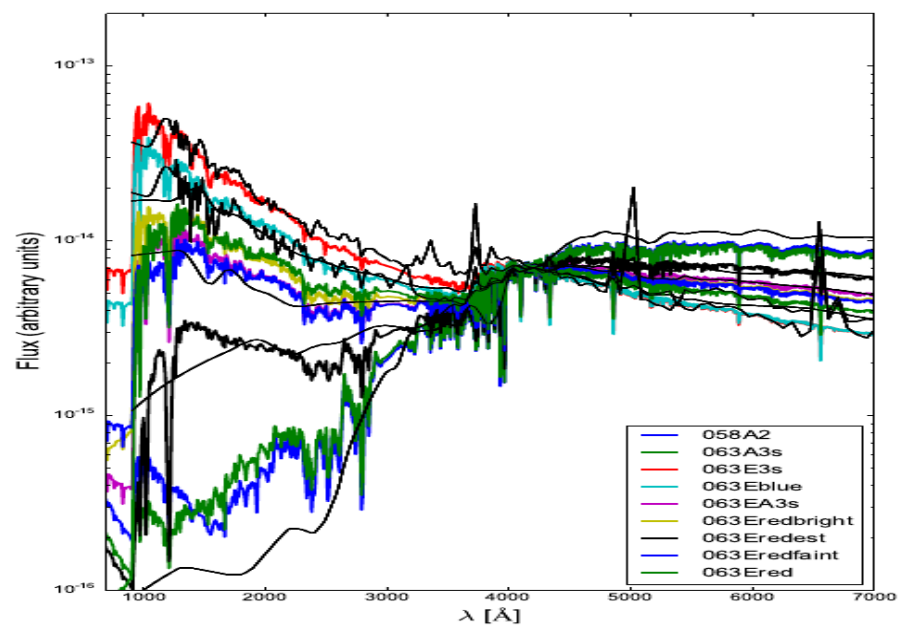
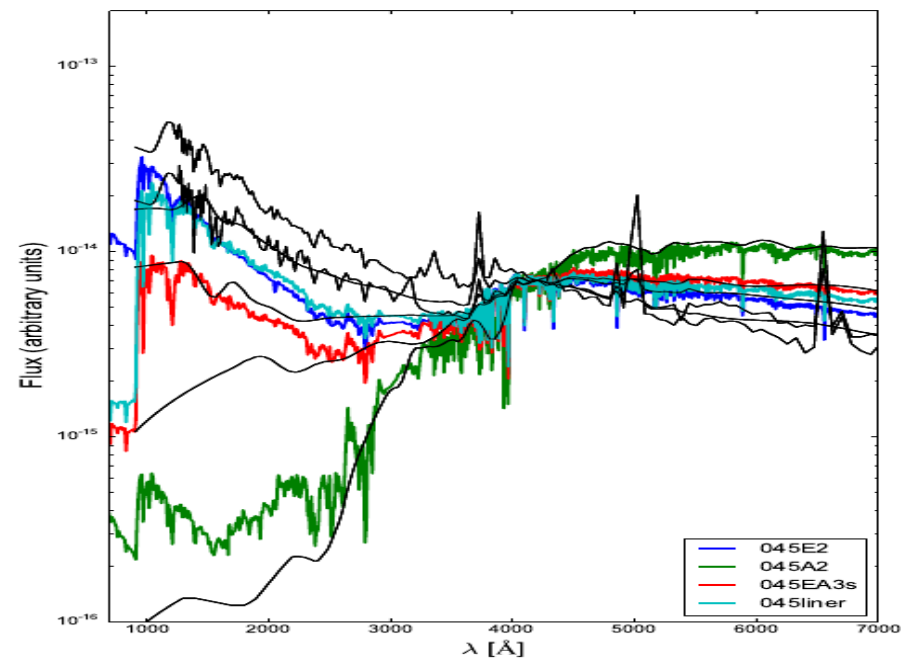
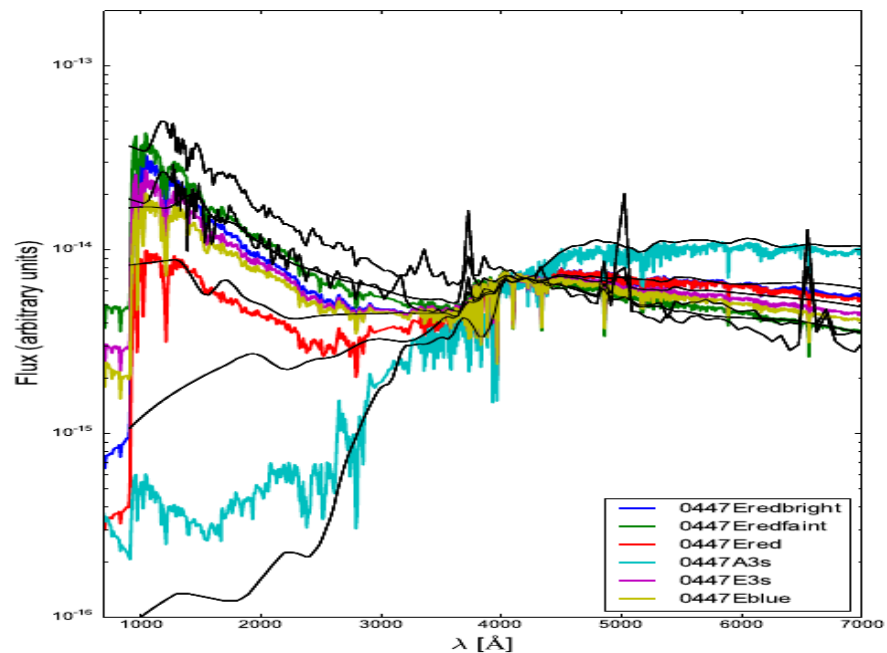
Conclusions

- **Key issues have been solved regarding the building of the FORS2 library with Starlight**
- **We should now be able to derive template fitting spectra from measured spectra**
- **First comparisons of Fors2 library with standard libraries used for template fitting have been performed.
First results are encouraging but still need checks and improvements**
- **C++ version of Le Phare code should be available soon**

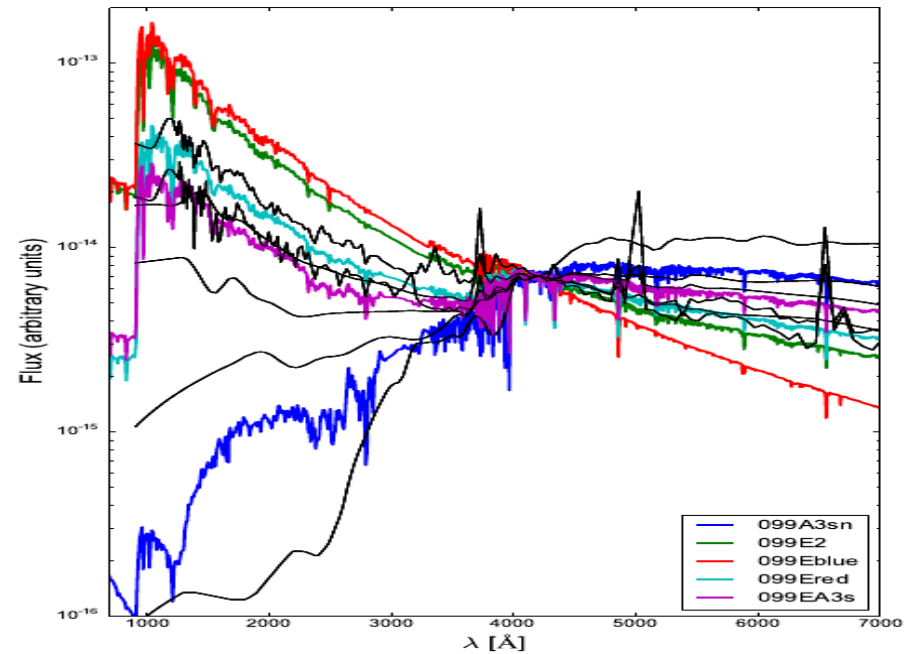
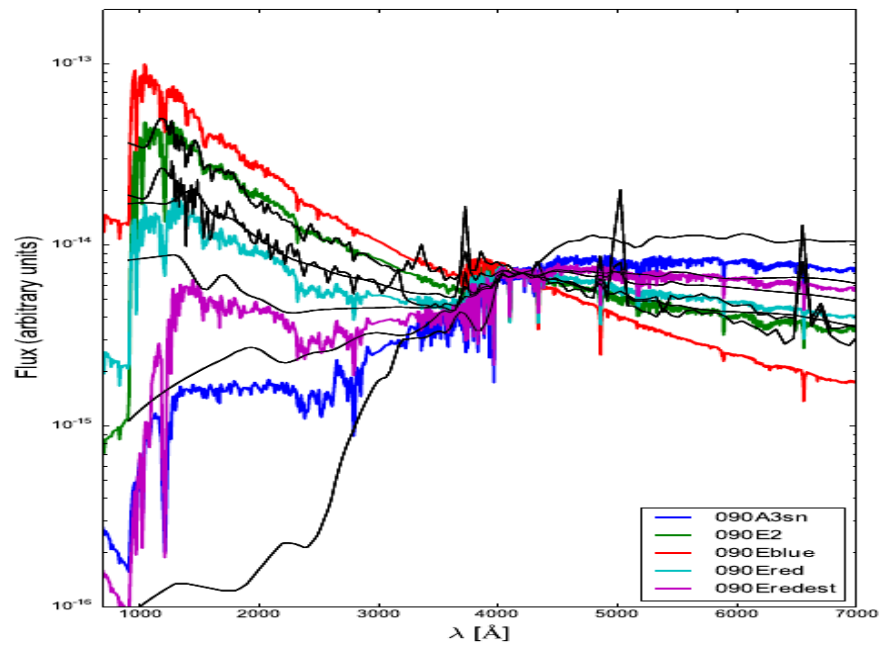
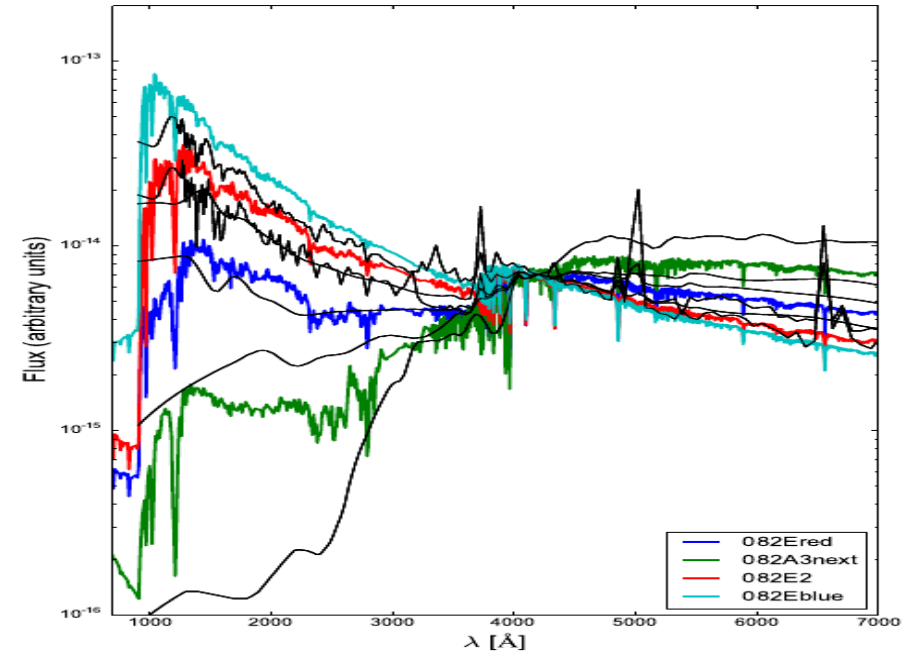
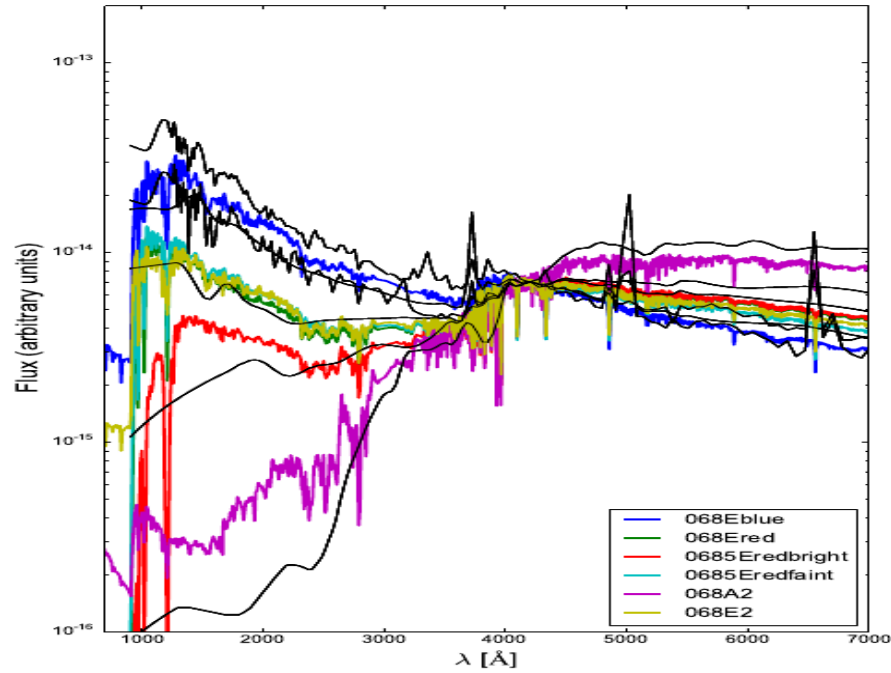
FORS2 atlas as a function of the redshift (versus 6 FZ templates)



FORS2 atlas as a function of the redshift (versus 6 FZ templates)

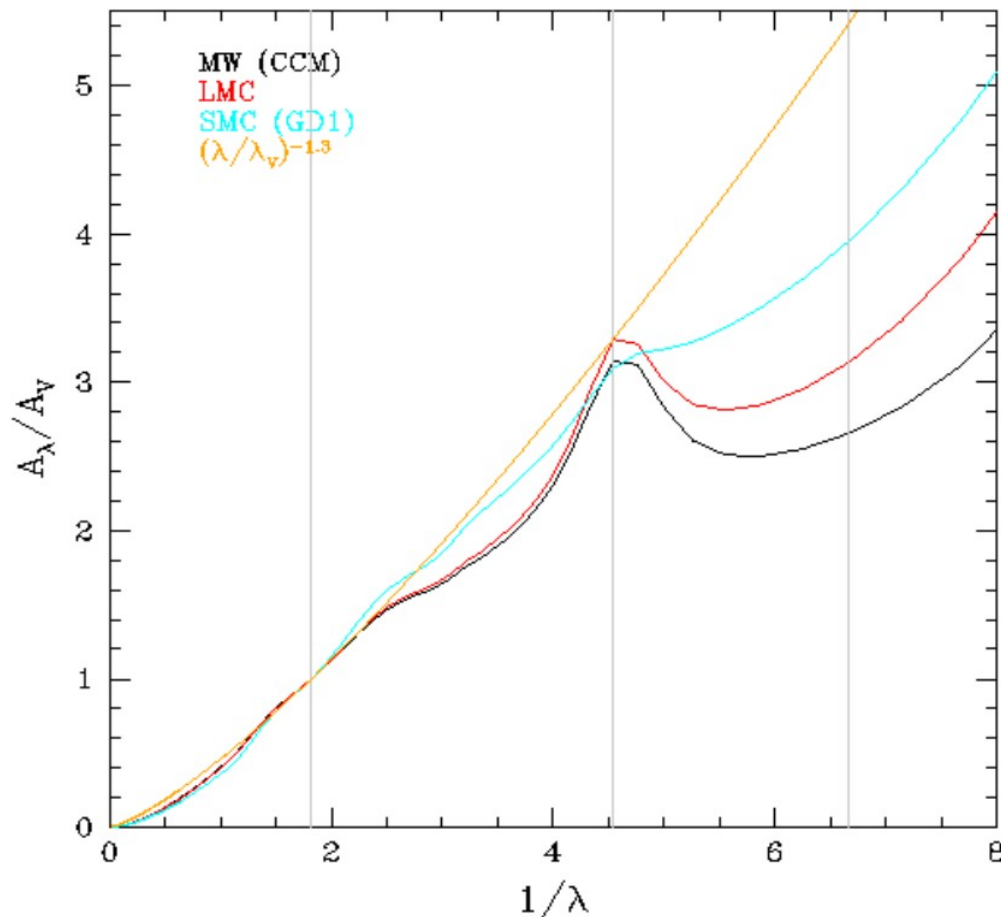


FORS2 atlas as a function of the redshift (versus 6 FZ templates)



The question of the extinction models in the UV

The UV band extrapolation strongly depends on the extinction modeling ... and there are lots of models :



STARLIGHTV04 :

CCM - Cardelli, Clayton & Mathis (1989)

GD1 - Gordon et al. (2003) SMC Bar

GD2 - Gordon et al. (2003) LMC2 Super-Shell

GD3 - Gordon et al. (2003) LMC Average

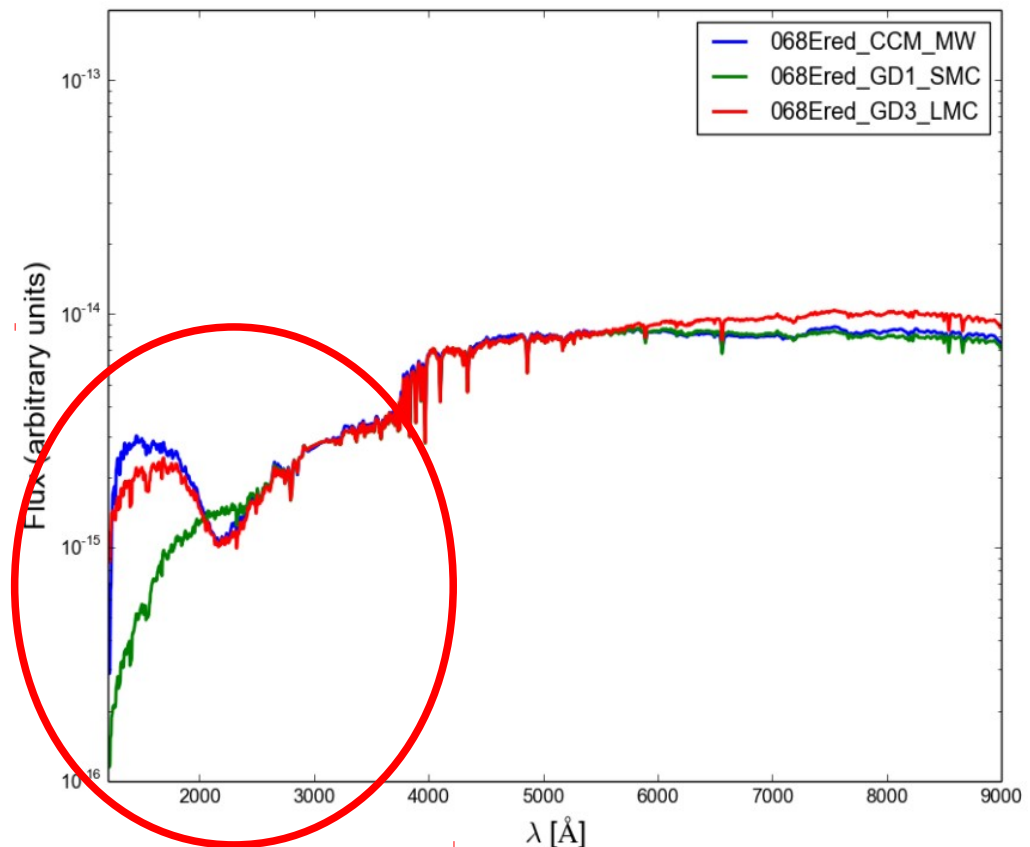
HZ1 - HYPERZ = Allen (1976), from HyperZ

HZ2 - HYPERZ = Seaton (1979), from HyperZ

HZ3 - HYPERZ = Fitzpatrick (1986) LMC, from HyperZ

HZ4 - HYPERZ = for Prevot et al. (1984) and Bouchet et al. (1985) SMC, from HyperZ

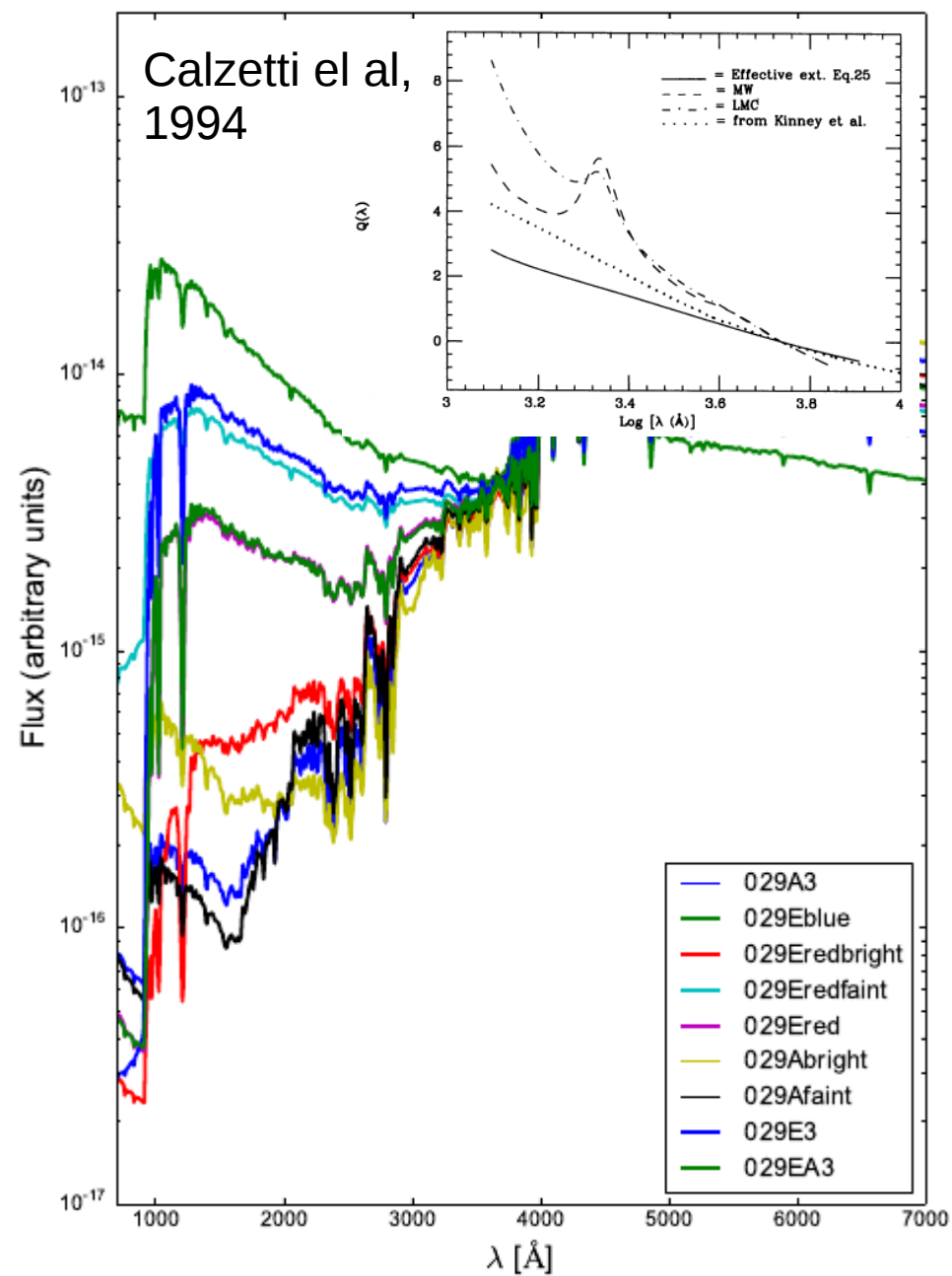
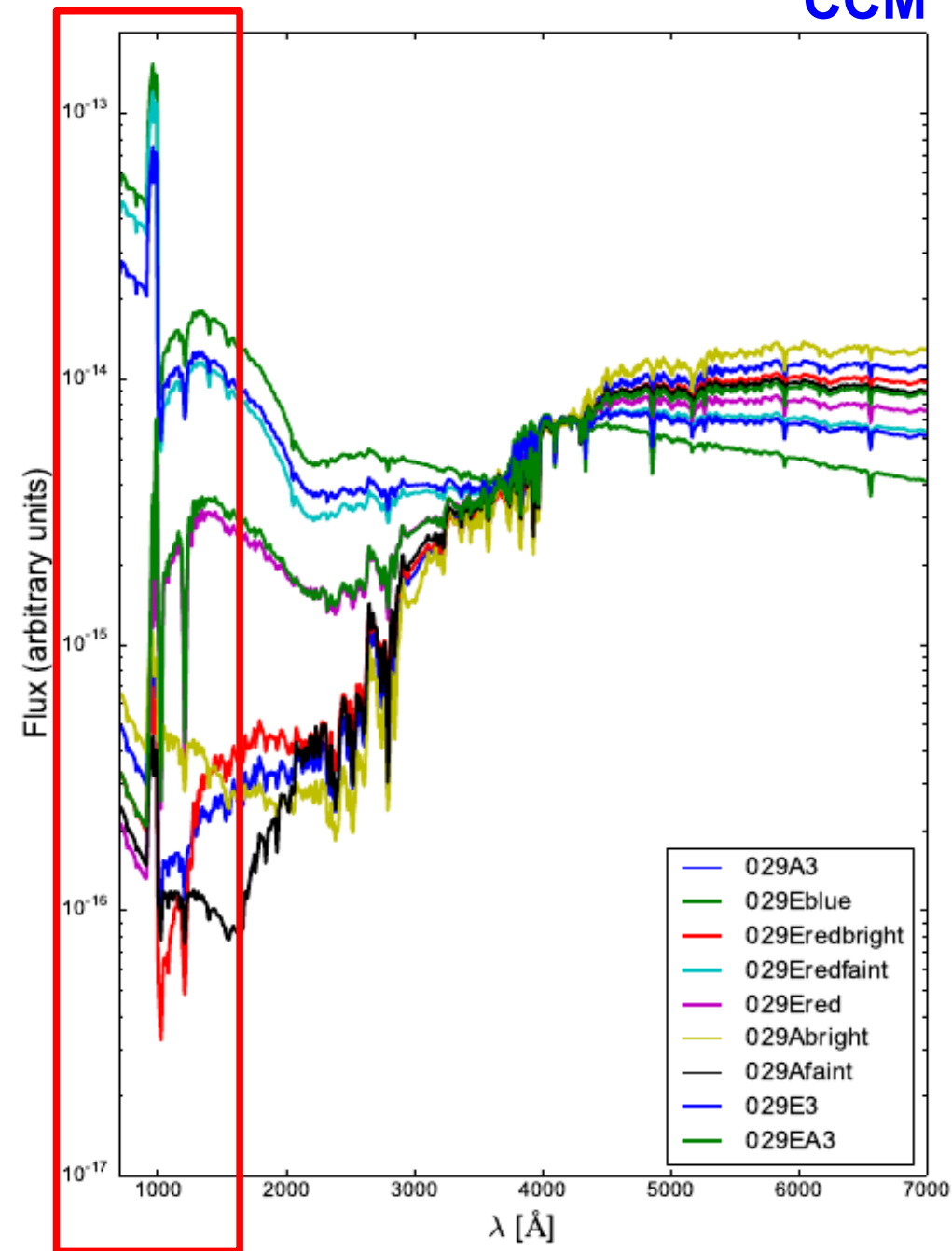
HZ5 - HYPERZ = Calzetti (astro-ph/9911459), from HyperZ



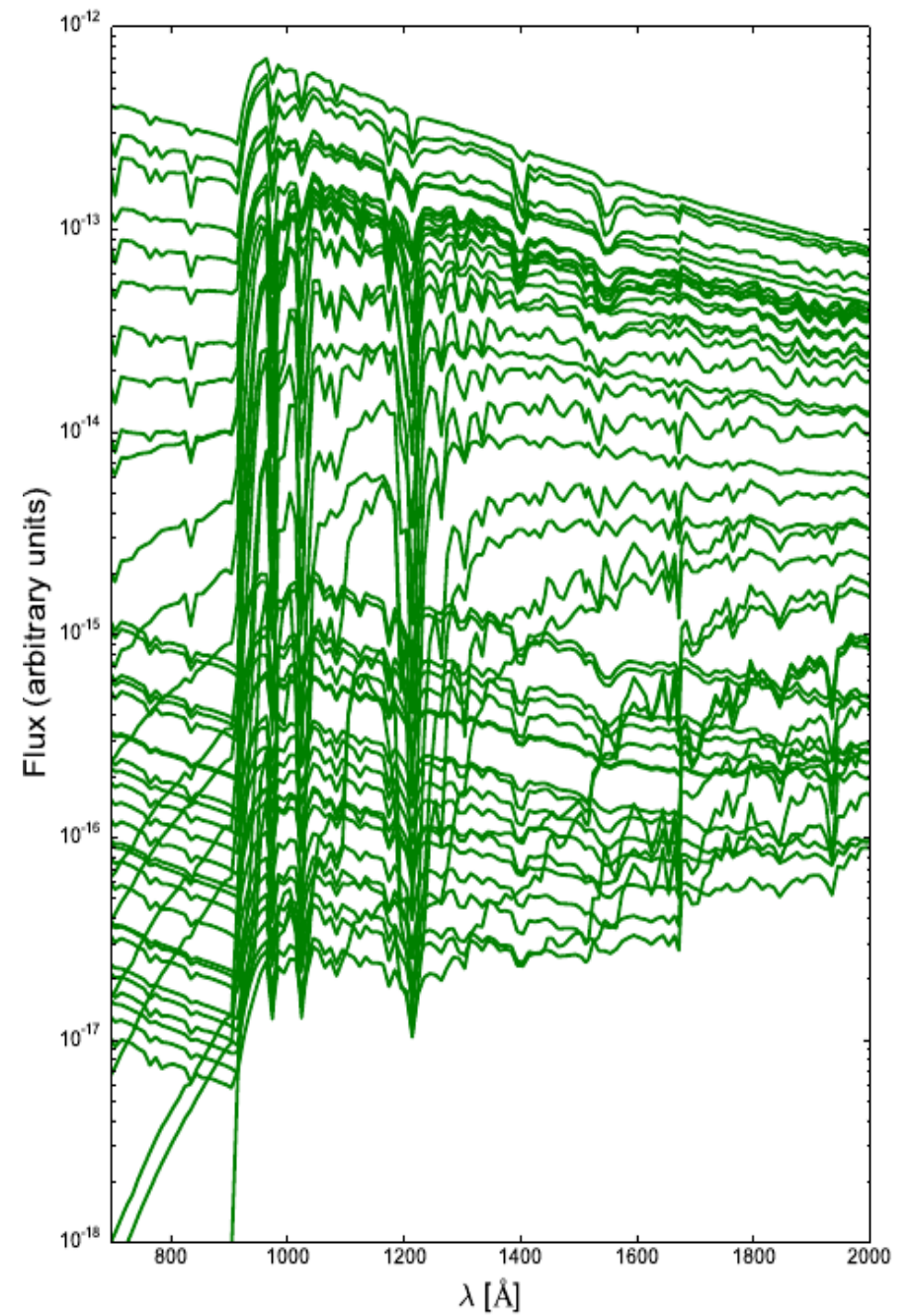
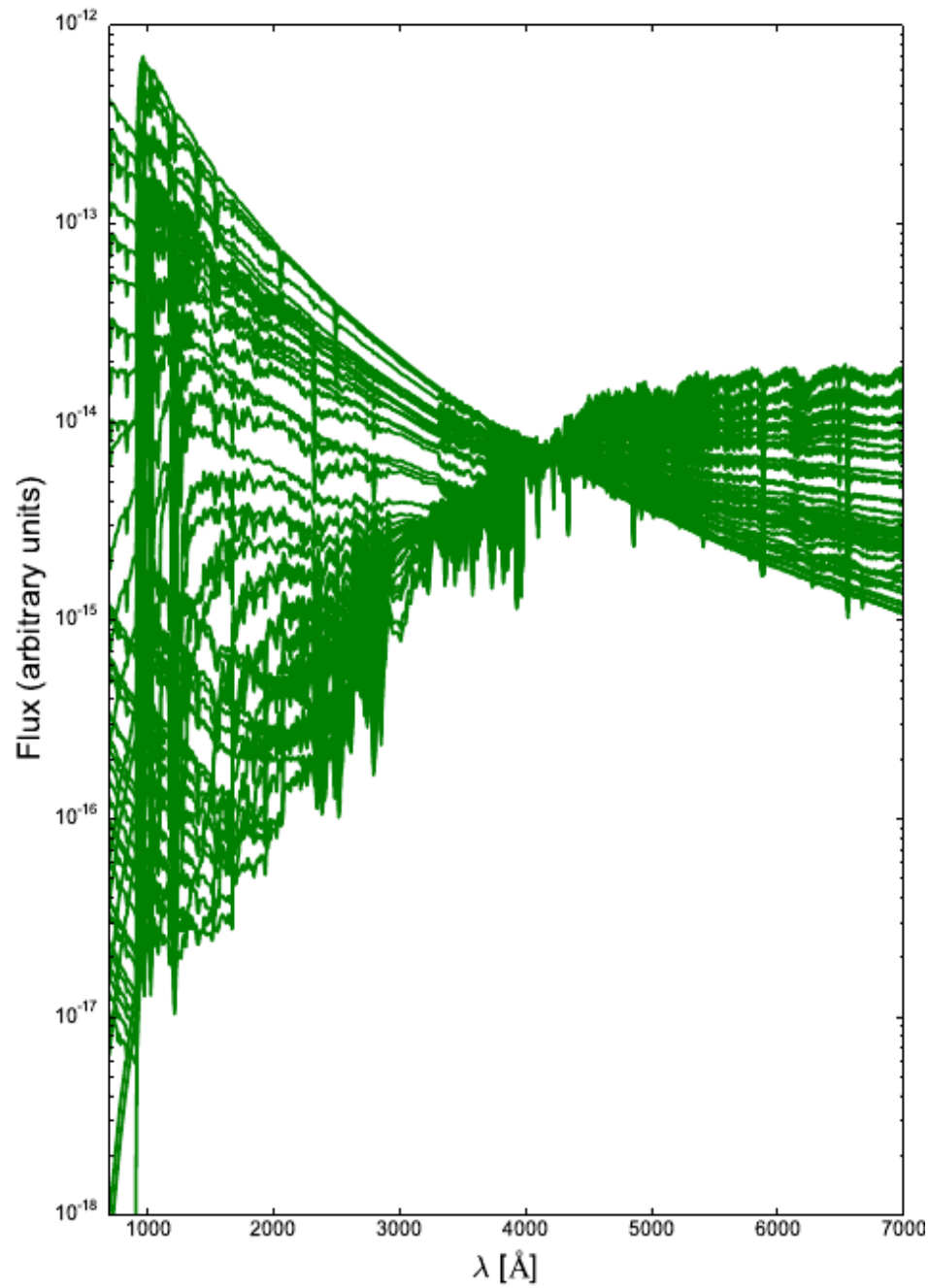
Extrapolation with extinction might be problematic down to $\sim 1000 \text{ \AA}$

CCM

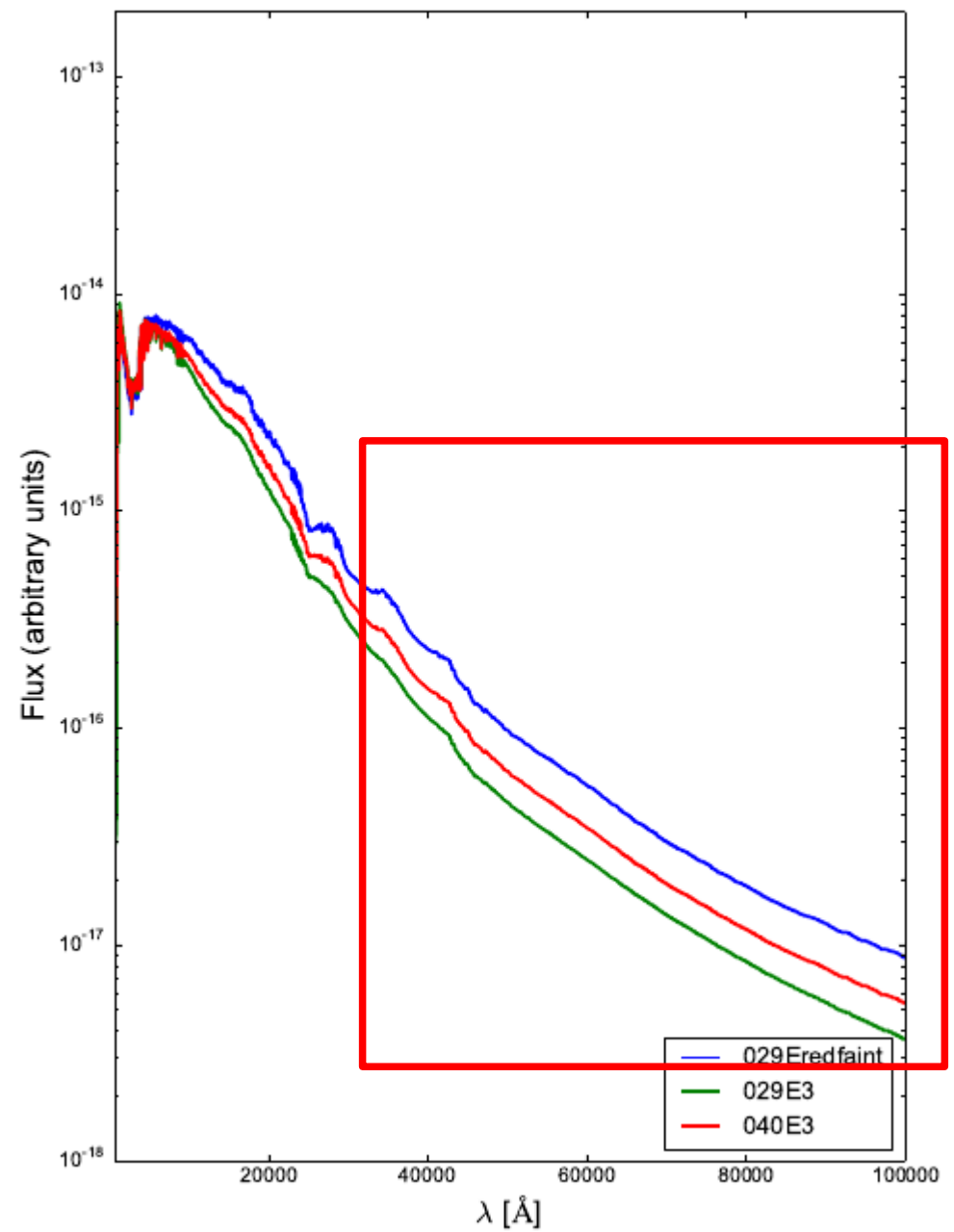
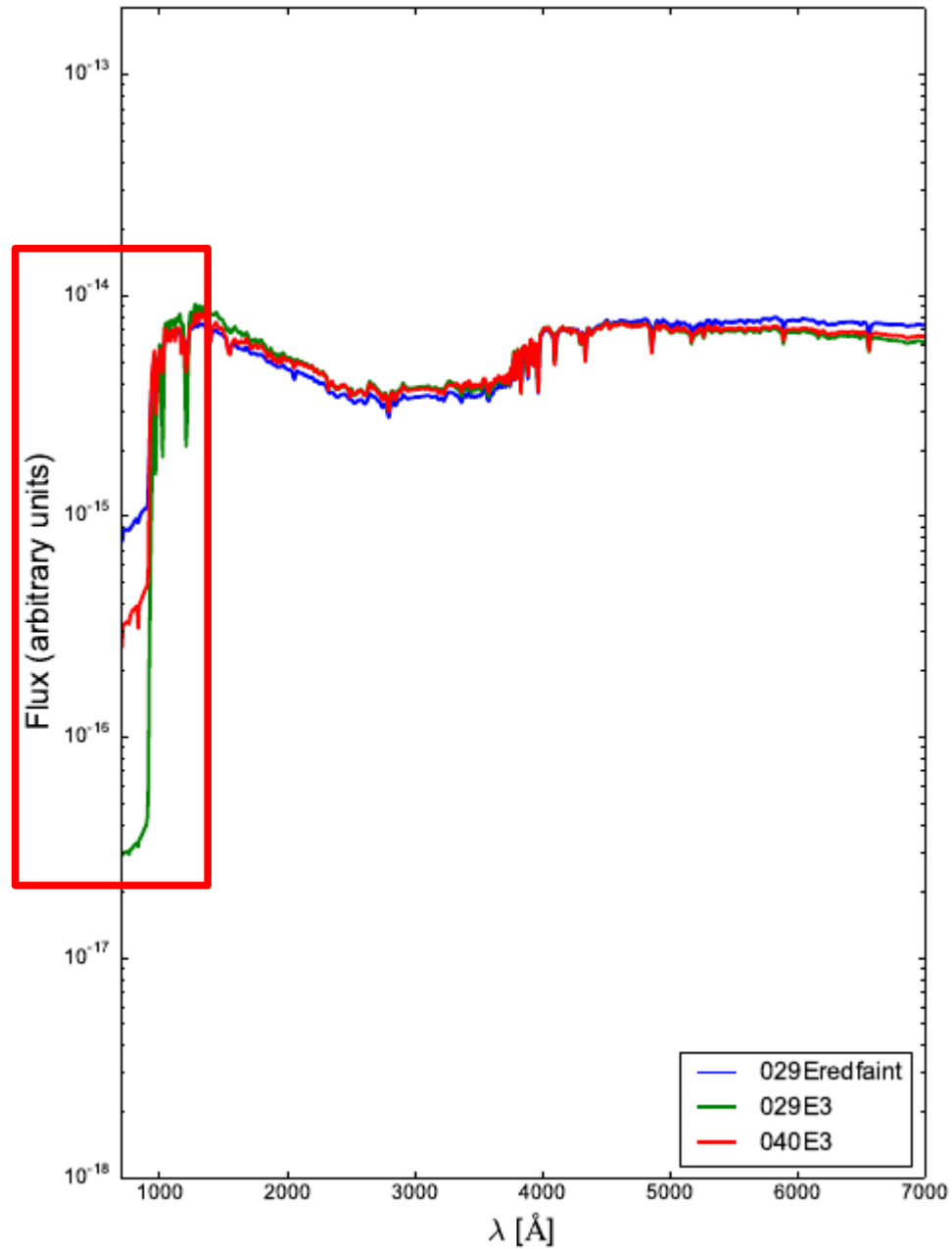
HZ5



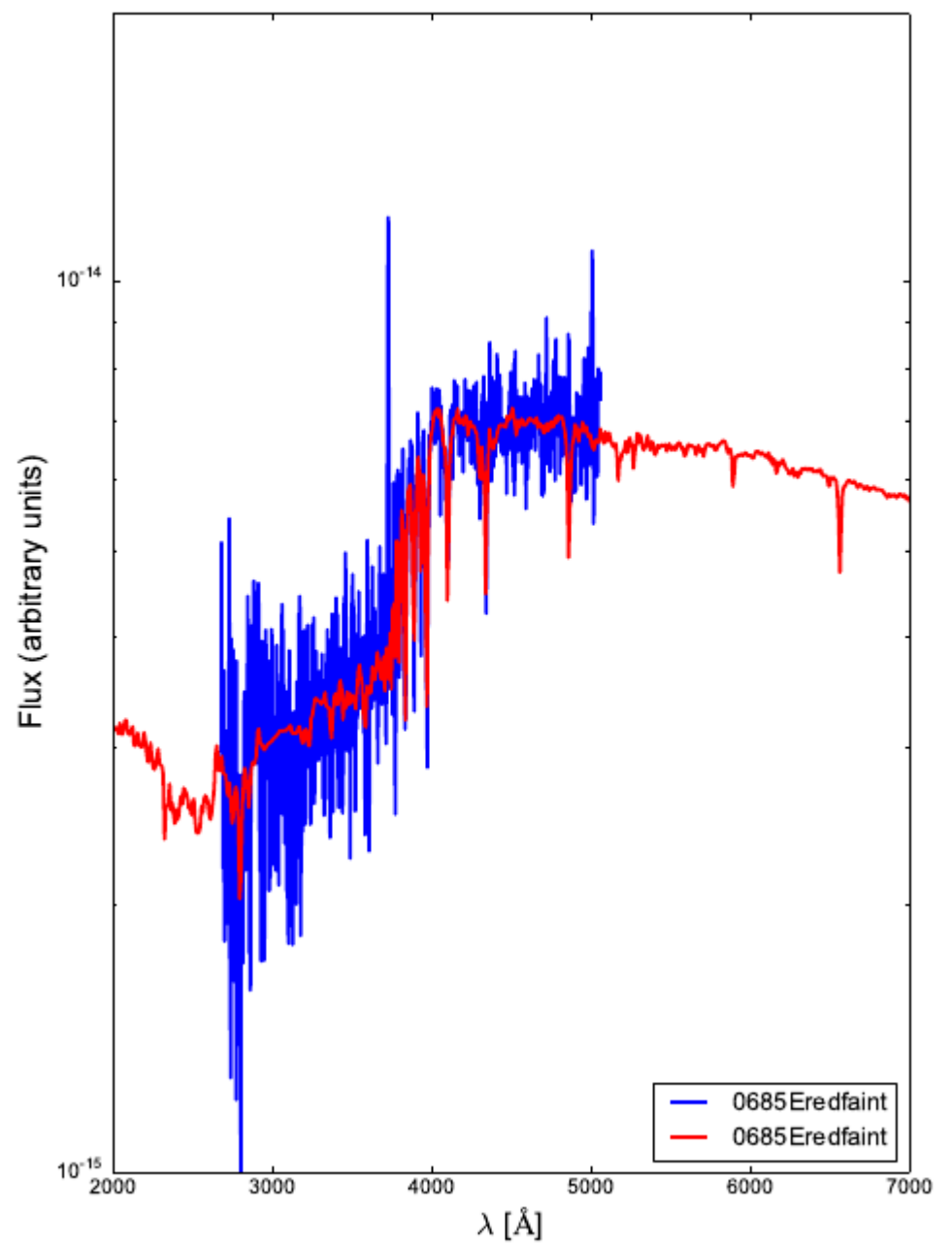
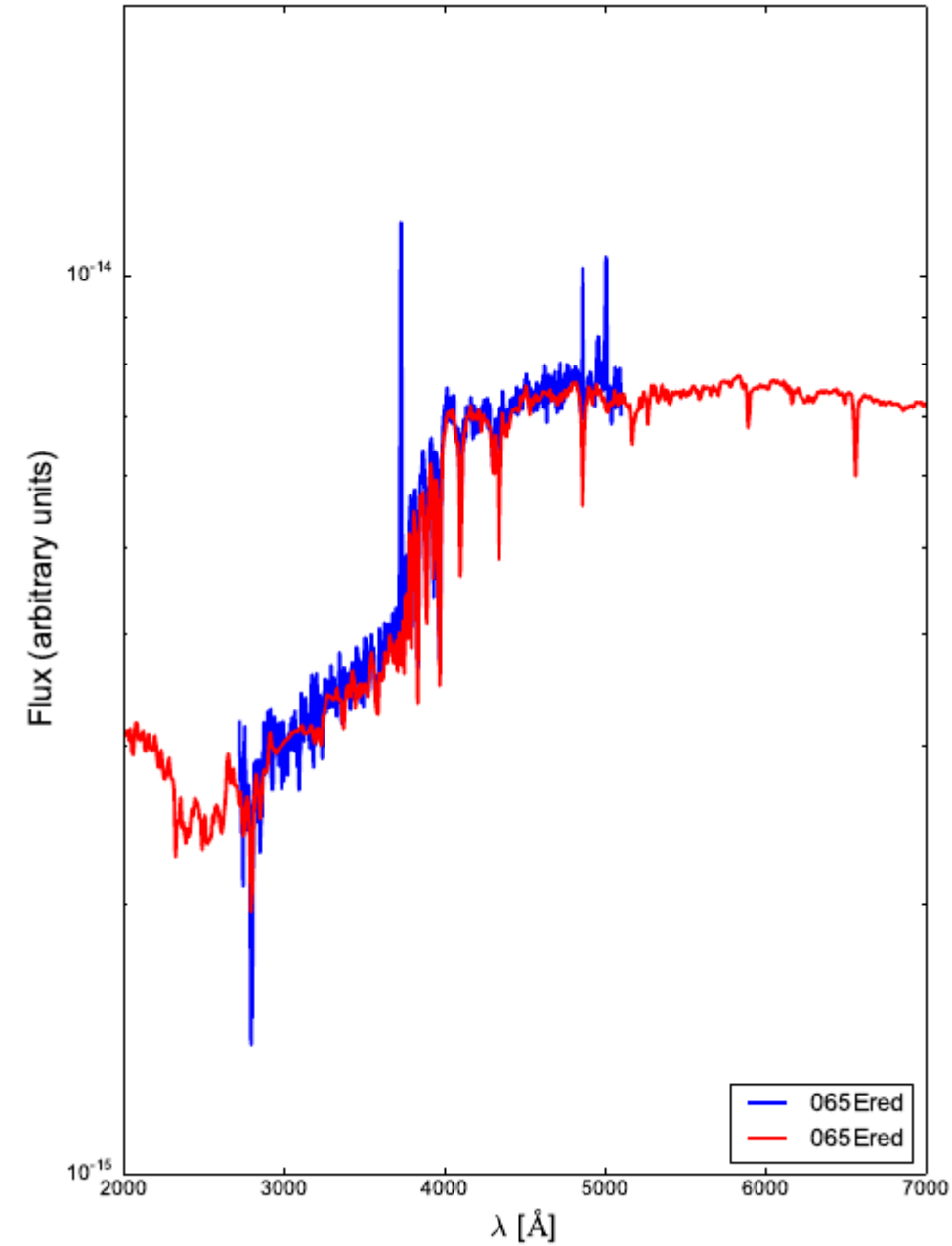
45 stellar population models from Bruzual&Charlot (2003)



Search for similar spectra : spectral shape



Search for similar spectra : Fors2 spectra



Brown illustrative spectra as compared with DirecSim sample

