DC1
Photoz with LePhare
Buzzard & Galacticus

Status on FORS2 SEDs

DC1 Dataset

- **NERSC : /project/projectdirs/lsst/PhotoZDC1/simulation_catalogs/**

  NB: Getting an account at NERSC:
  https://confluence.slac.stanford.edu/display/LSSTDESC/Getting+a+NERSC+Computing+Account

  Plans for Paper Writing:
  https://docs.google.com/document/d/15qEDUTTvjTwZRp9K-_xfulJ8939OpUBwNcQyYGtk98M/edit

  Near-term Tasks in the Science Roadmap:
  https://confluence.slac.stanford.edu/display/LSSTDESC/Nearterm+Tasks+in+the+Science+Roadmap

- **2 DC1 datasets : Buzzard (S.Schmidt) with 111173 objects,**
  Galacticus (A.Abate) with 317477 objects,
  - with corresponding set of filters (!)
  - training dataset + full DC1 dataset

- **Bug found and fixed in magnitude errors for Buzzard and Galacticus**
  → SCATERERRS directory

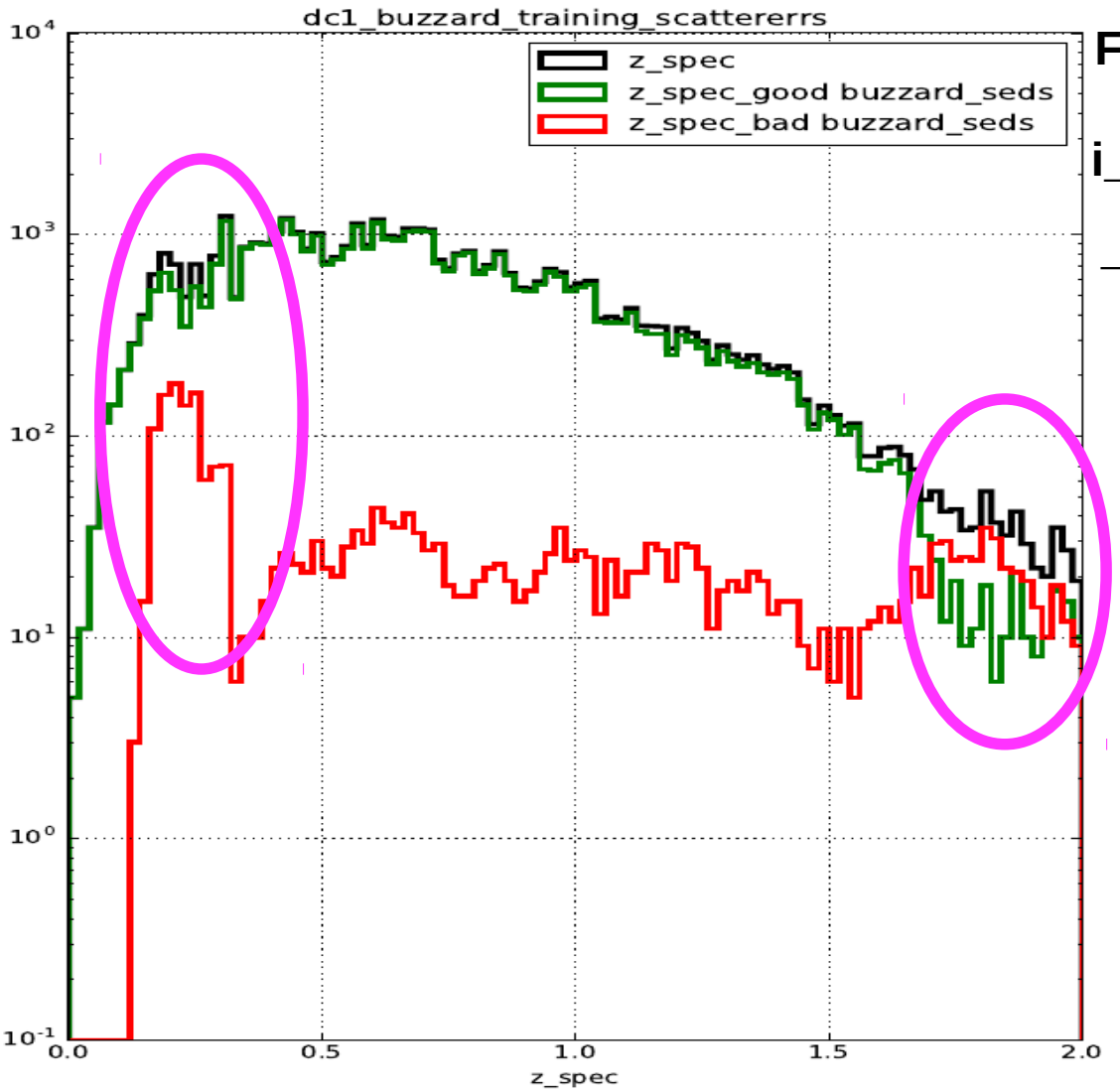
DC1-Buzzard
Photoz with LePhare

- **100 Buzzard SEDs**
- **Cut on lambda < 370 000 A needed (max ~ 8000 points for SEDs in LePhare)**
- **Le Phare, Arnouts S. & Ilbert O.**
  http://www.cfht.hawaii.edu/~arnouts/LEPHARE/lephare.html
- **NB: SkyNet NN run on Buzzard coming soon : stay tuned, and perhaps as a teaser showing either or both images in cc, from Sanchez et al 2014 1406.4407**

Buzzard training

DC1 – Buzzard training : z-spec & z_phot distributions

LePhare on Golden sample



Final_Buzzard_training_file.out

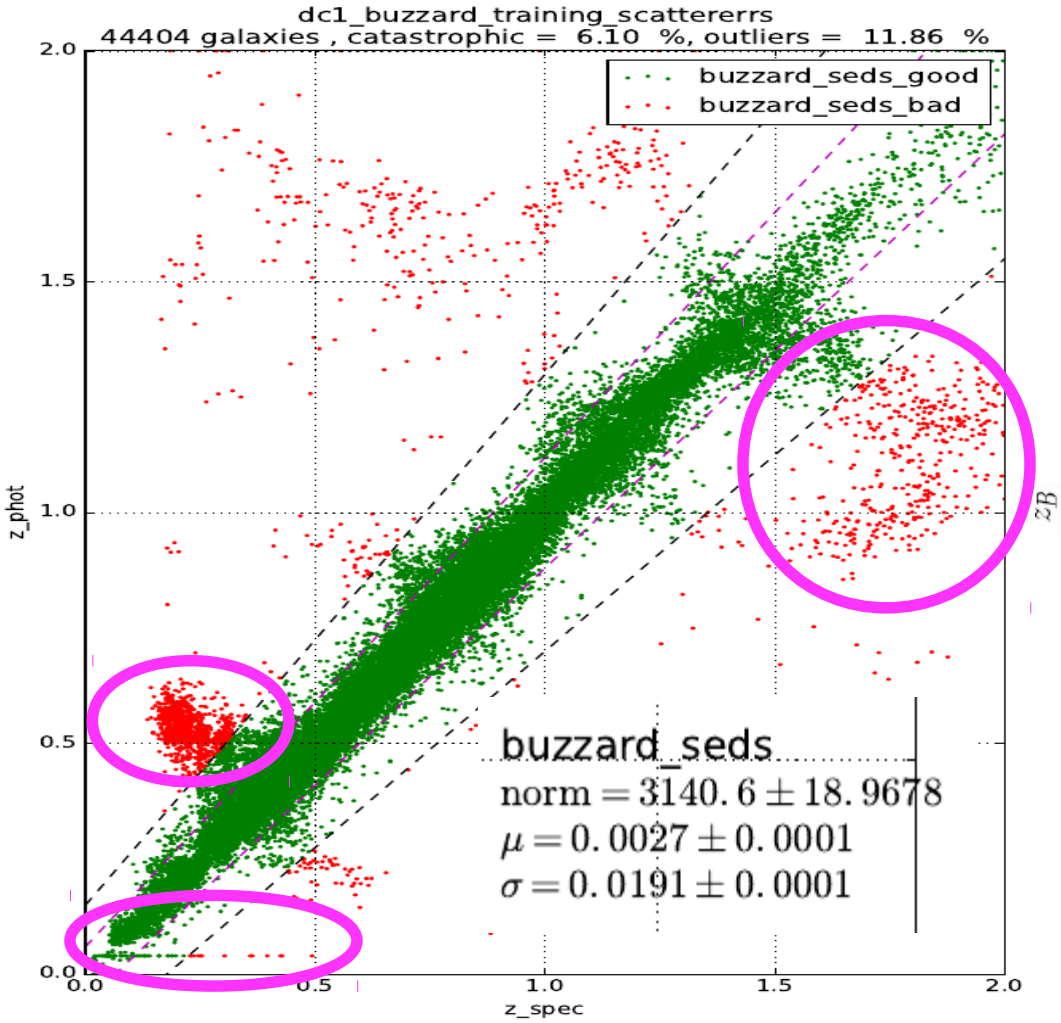
i_mag<25.3 cut applied
111171 objects
→ 43491 objects after
i_mag cut (2.5 ratio)

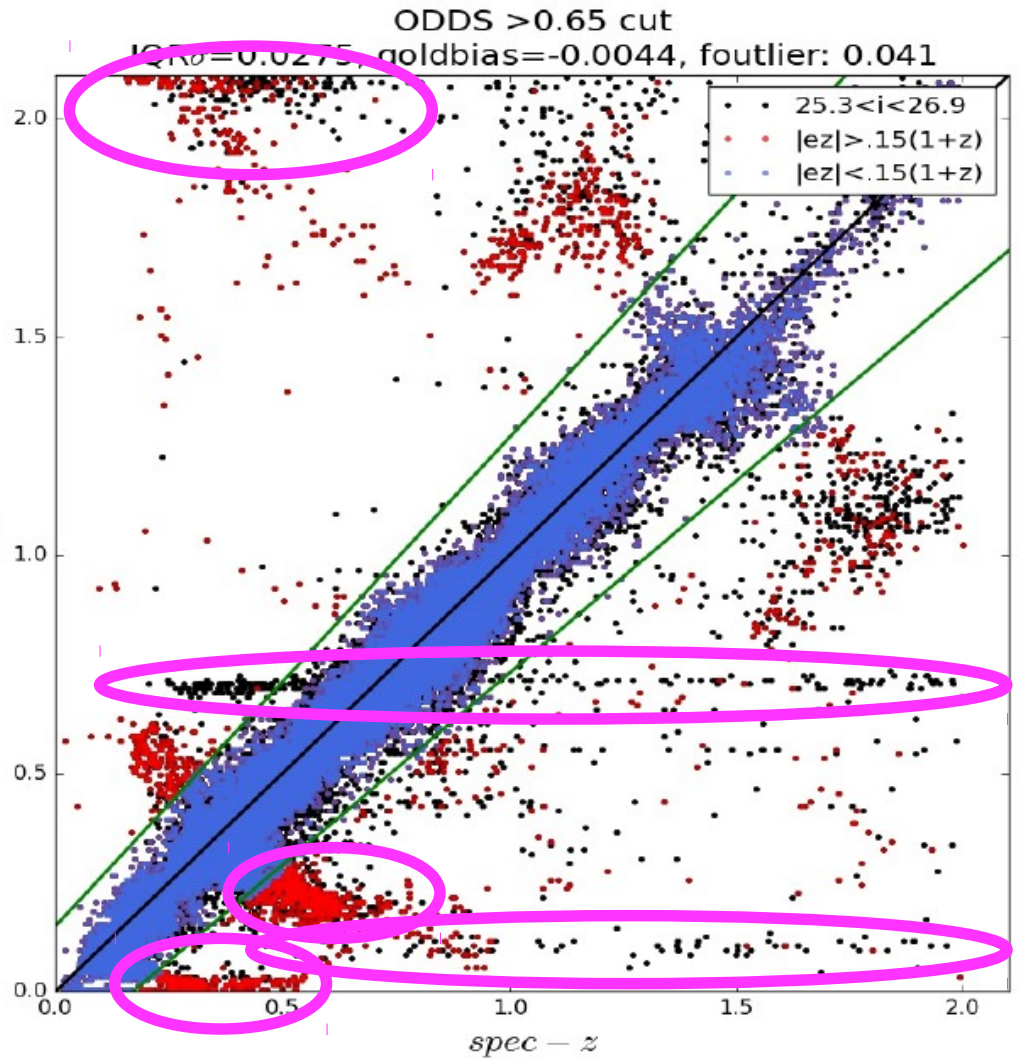
|(z_spec-z_phot)/(1+z_spec)| <0.15

Catastrophics:
|(z_spec-z_phot)/(1+z_spec)| >0.15

DC1 – Buzzard training : z-spec/z_phot

LePhare versus BPZ on Golden sample





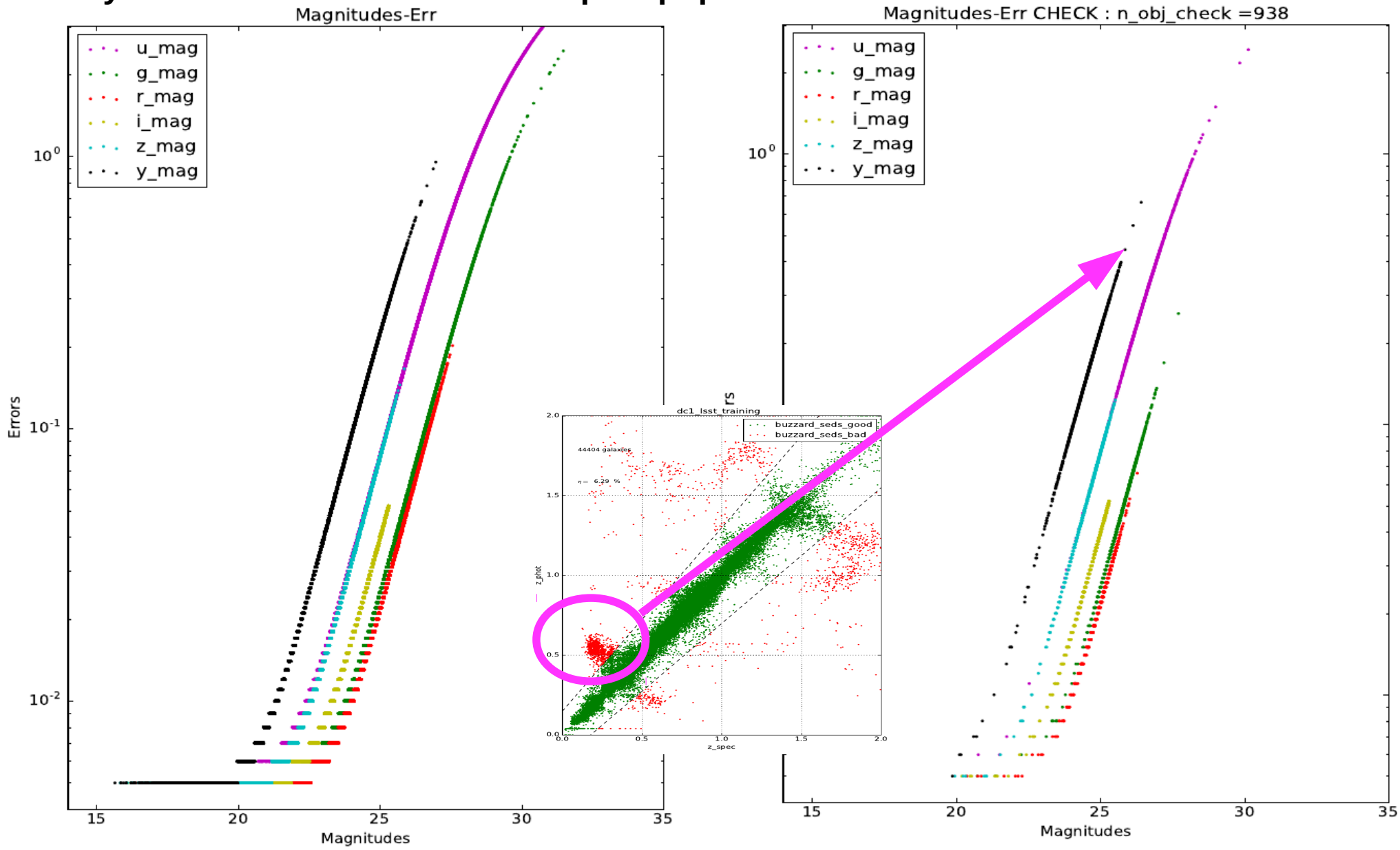
LePhare i_mag < 25.3

BPZ (S.Schmidt 16/11)

Seems many checks might be performed to compare both codes ...

DC1 – Buzzard training :
Try to understand z-spec/z_phot catastrophics

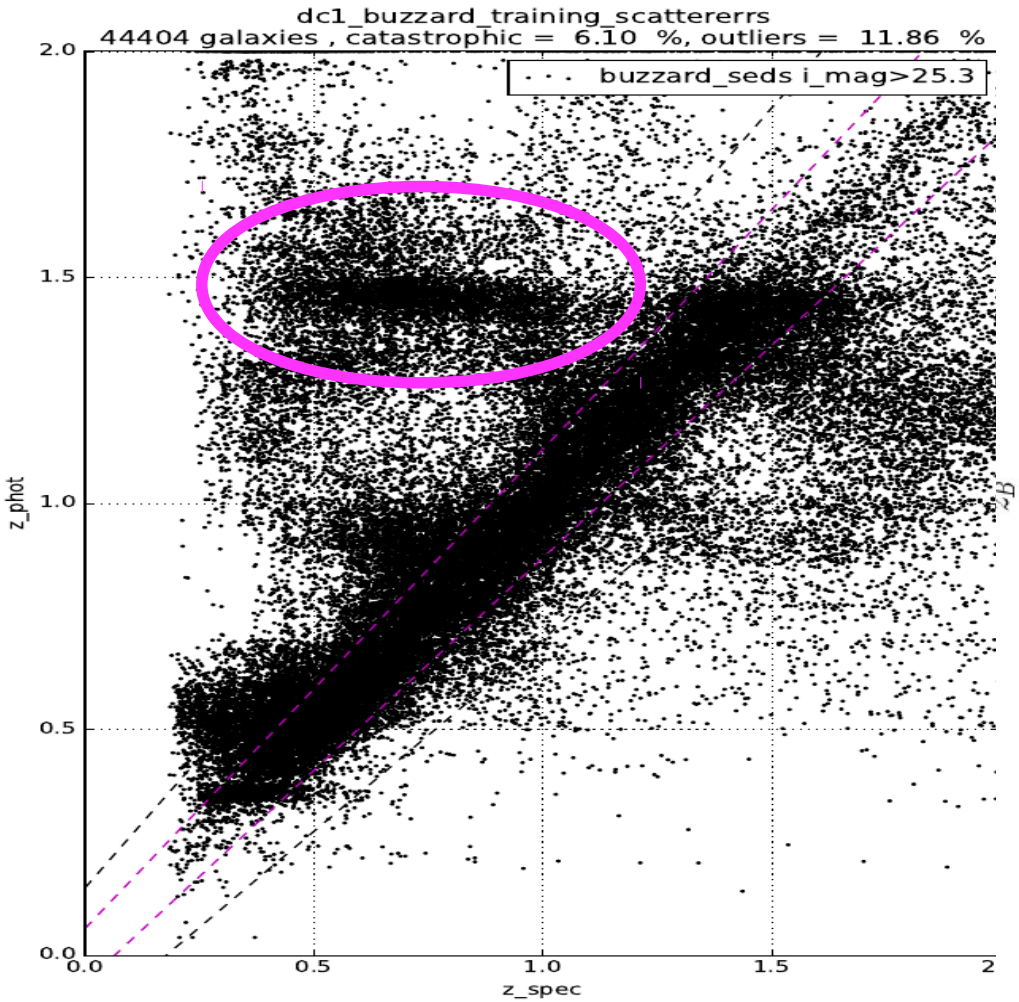
Does it comes from larger errors on U band ?
Try to isolate one of the catastrophic population:

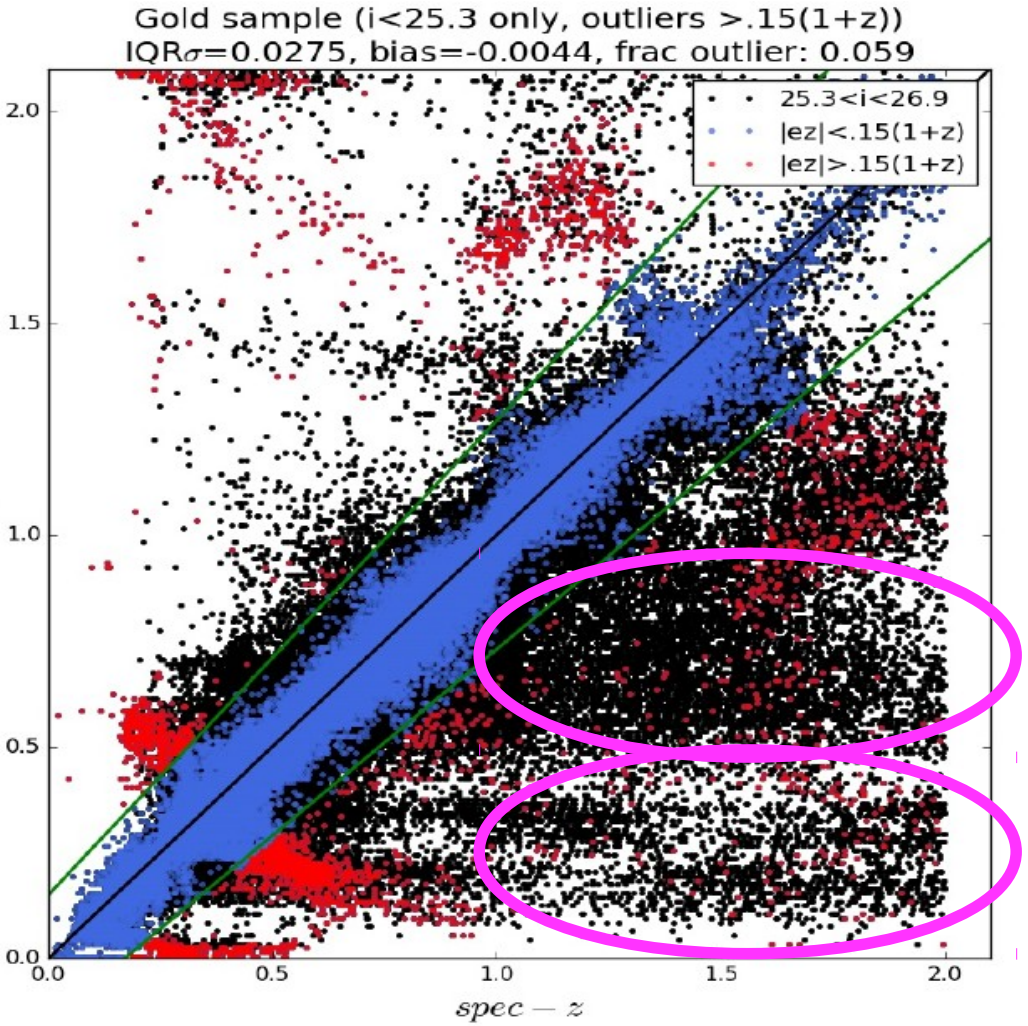


Not very conclusive … ongoing work.

DC1 – Buzzard training : z-spec / z_phot

LePhare versus BPZ at high magnitude



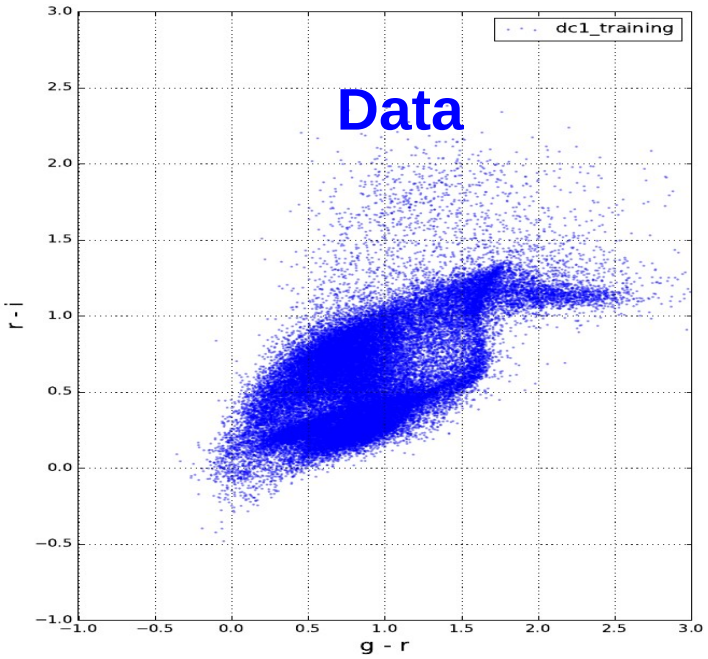


LePhare **i_mag > 25.3**

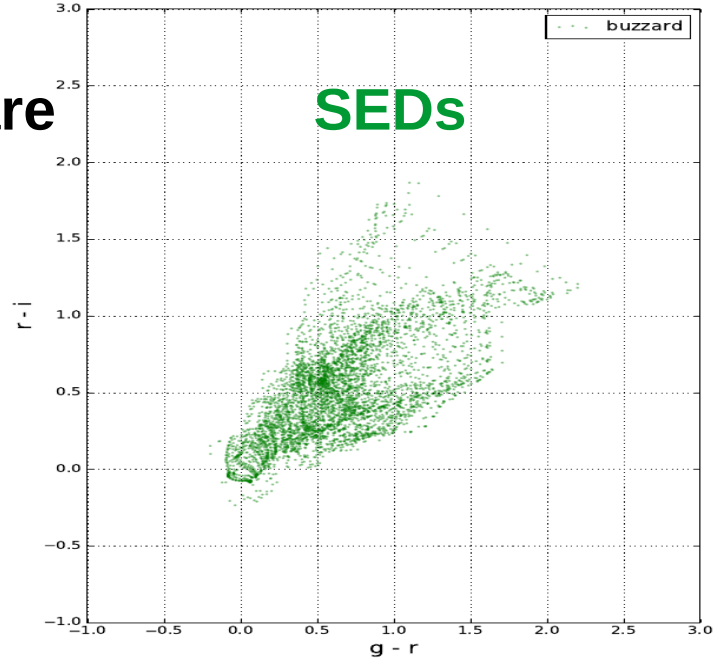
BPZ (S.Schmidt 16/11)

Even at high magnitudes ...

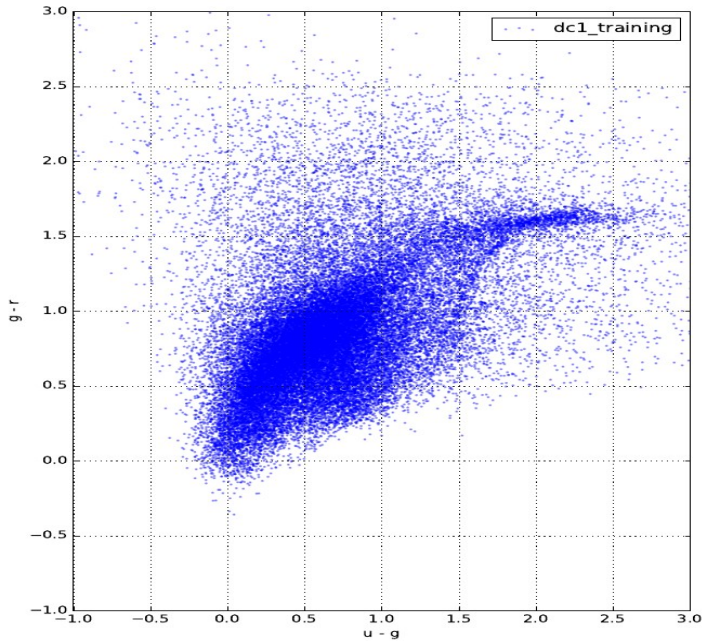
DC1 – Buzzard – training : r-i / g-r color plots

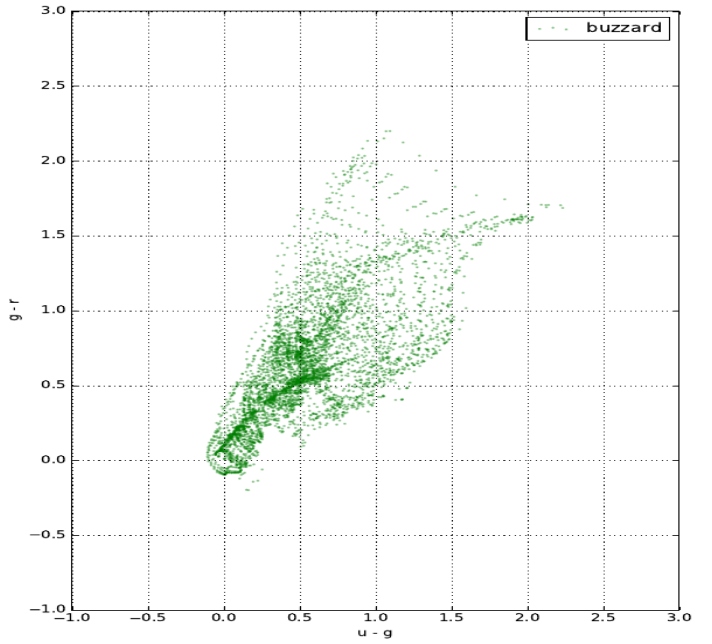


LePhare

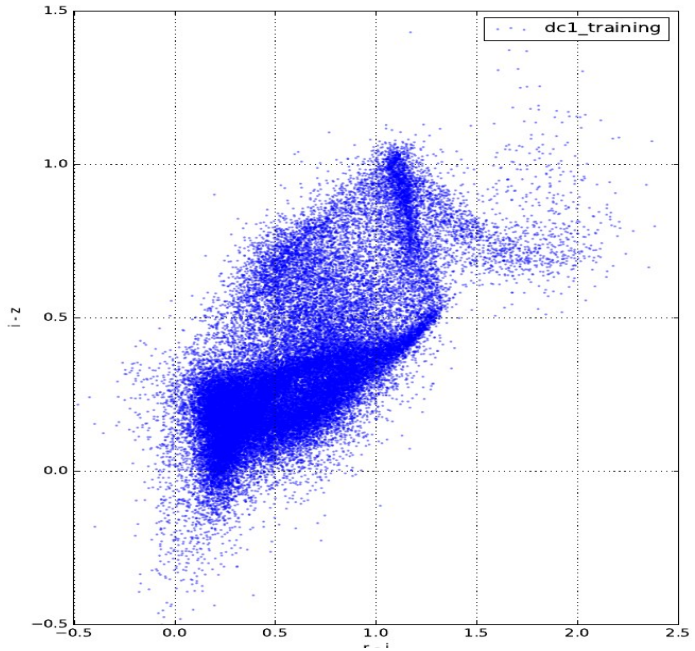


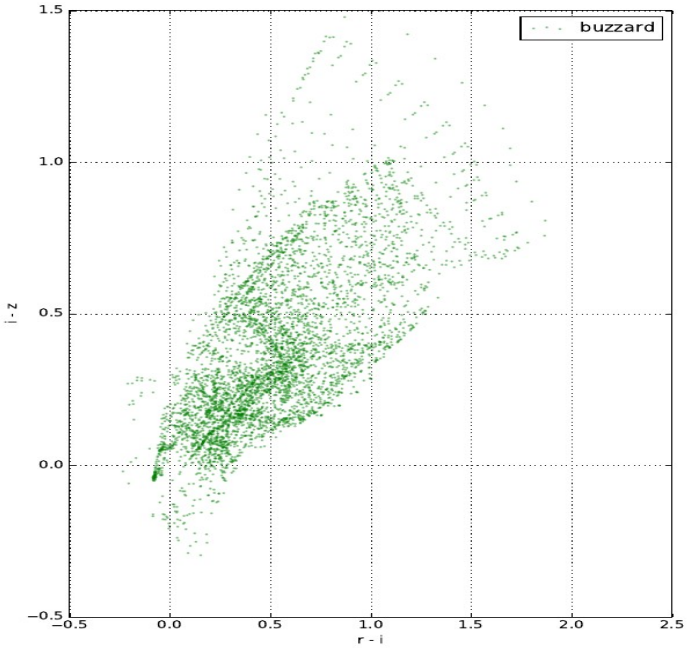
DC1 – Buzzard – training : g-r / u-g color plots





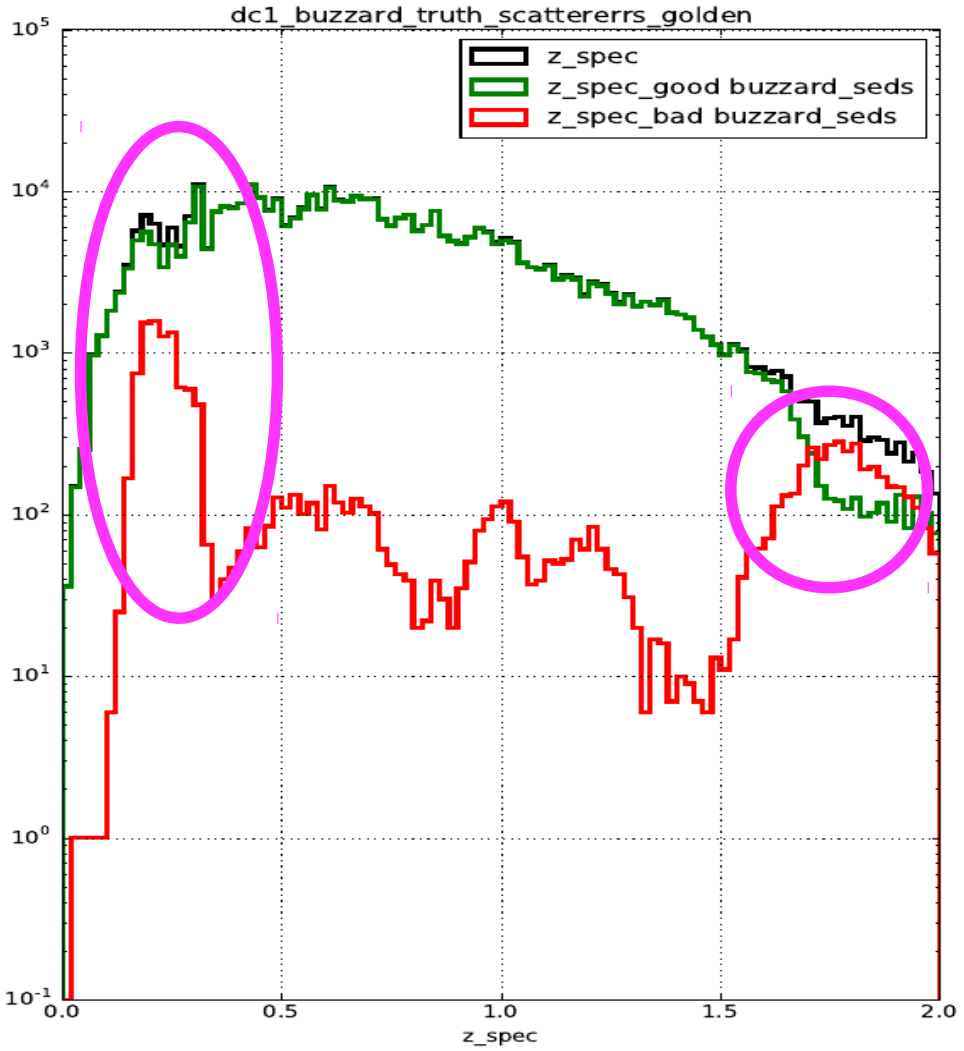
DC1 – Buzzard – training : i-z / r-i color plots

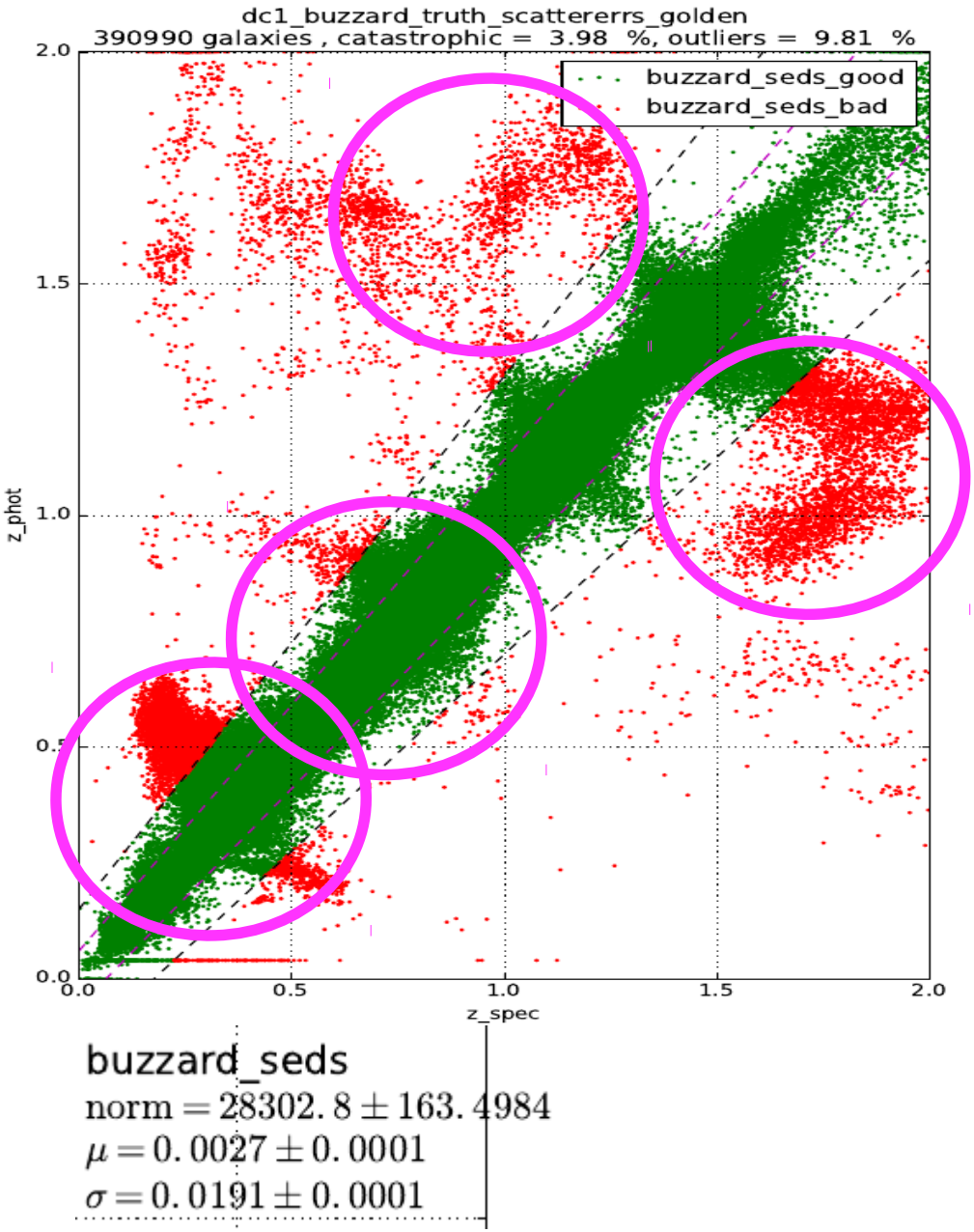




Full Buzzard (golden) 391106 objects

DC1 – Buzzard : z_phot distribution

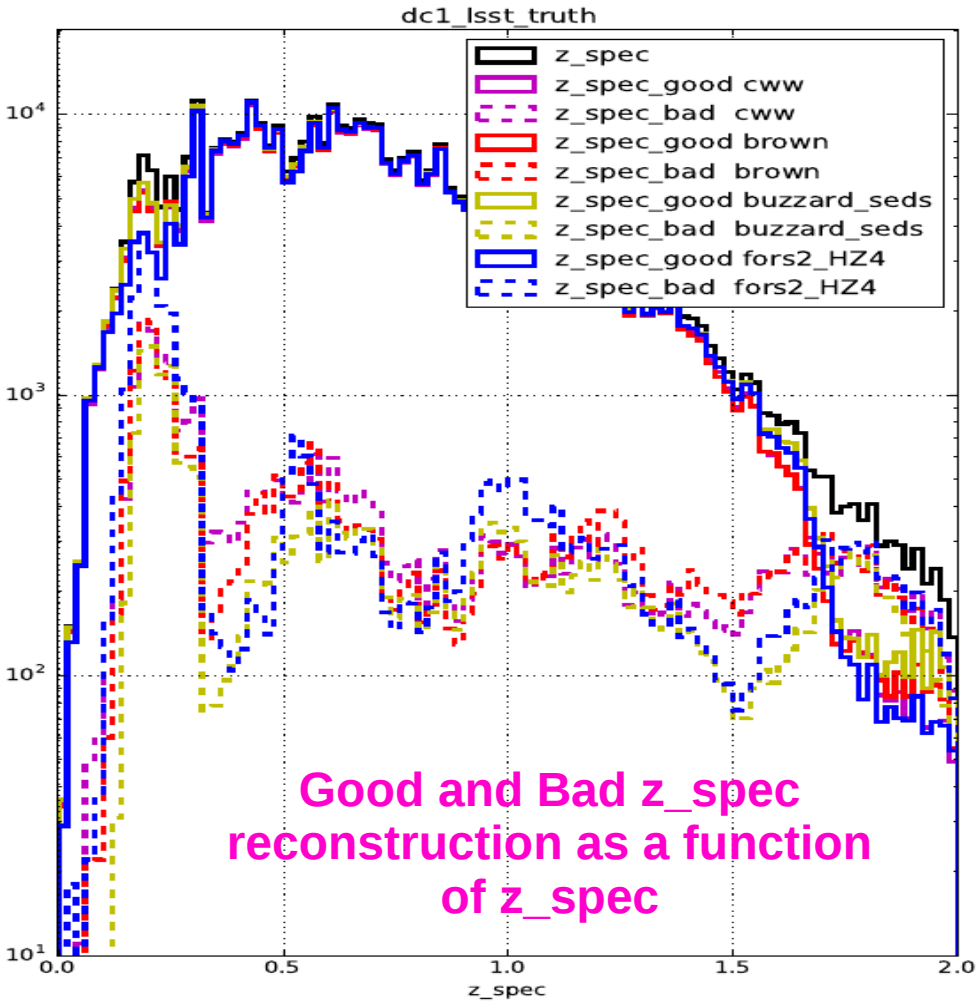


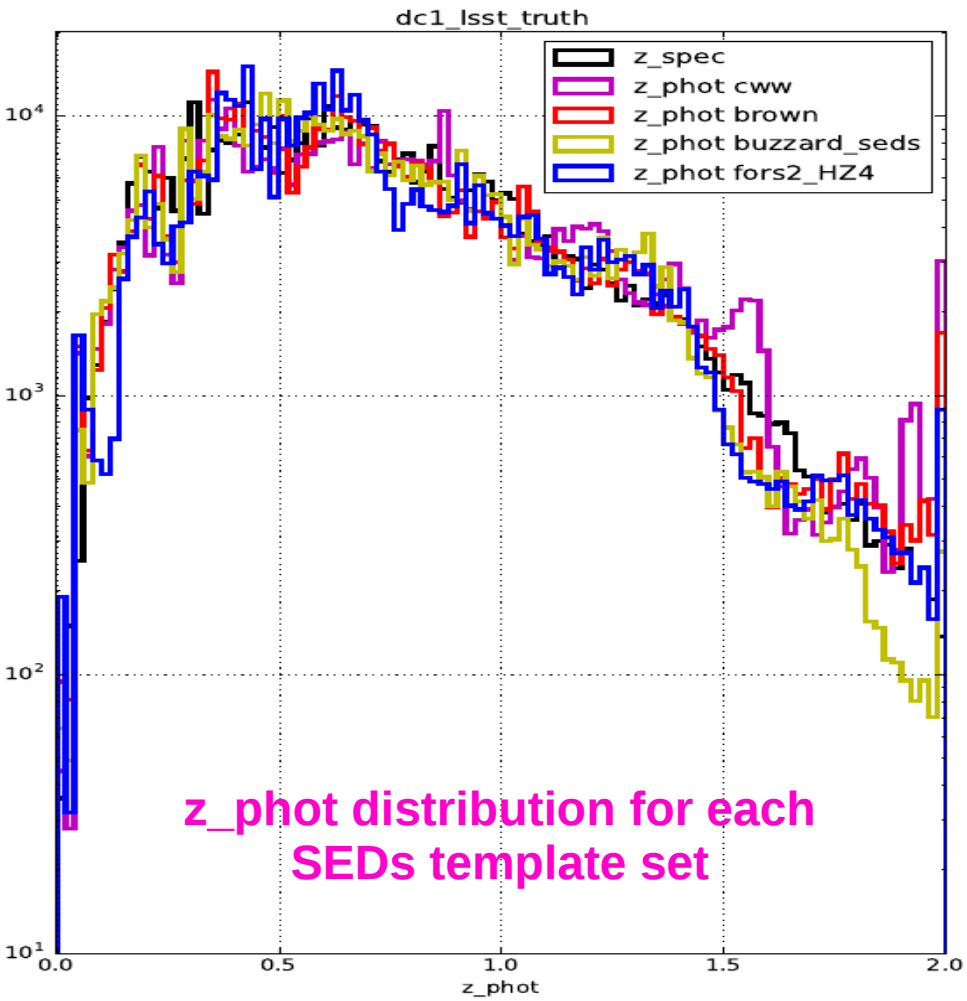


DC1 training results confirmed

DC1 – Buzzard : Comparison with other SEDs templates

LePhare





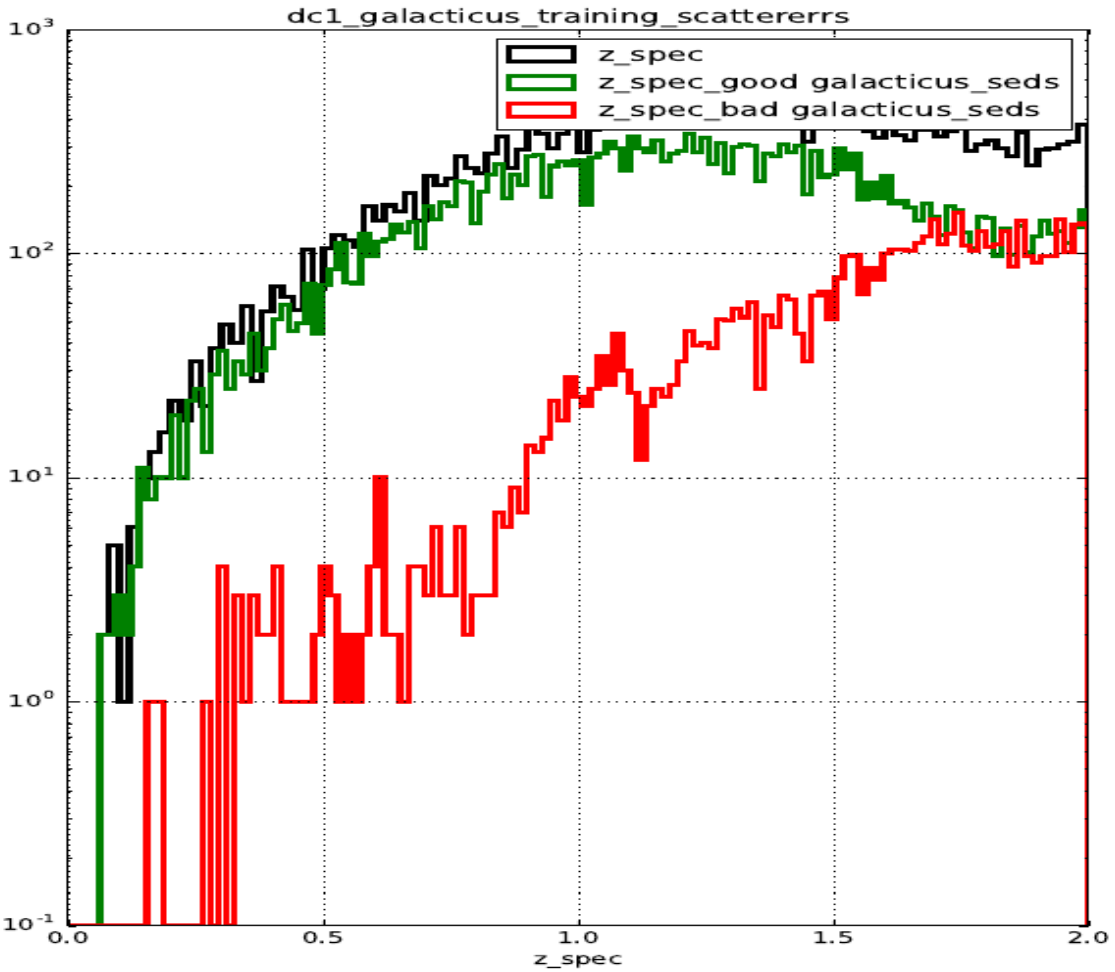
Change of SEDs template set leads to almost the same results

Galacticus training

NB: I did not find any other analysis on this dataset

DC1 – Galacticus training : z-spec & z_phot distributions

LePhare on Golden sample



i_mag<25.3 cut applied
317477 objects
→ 155119 objects after i_mag cut (2.5 ratio)

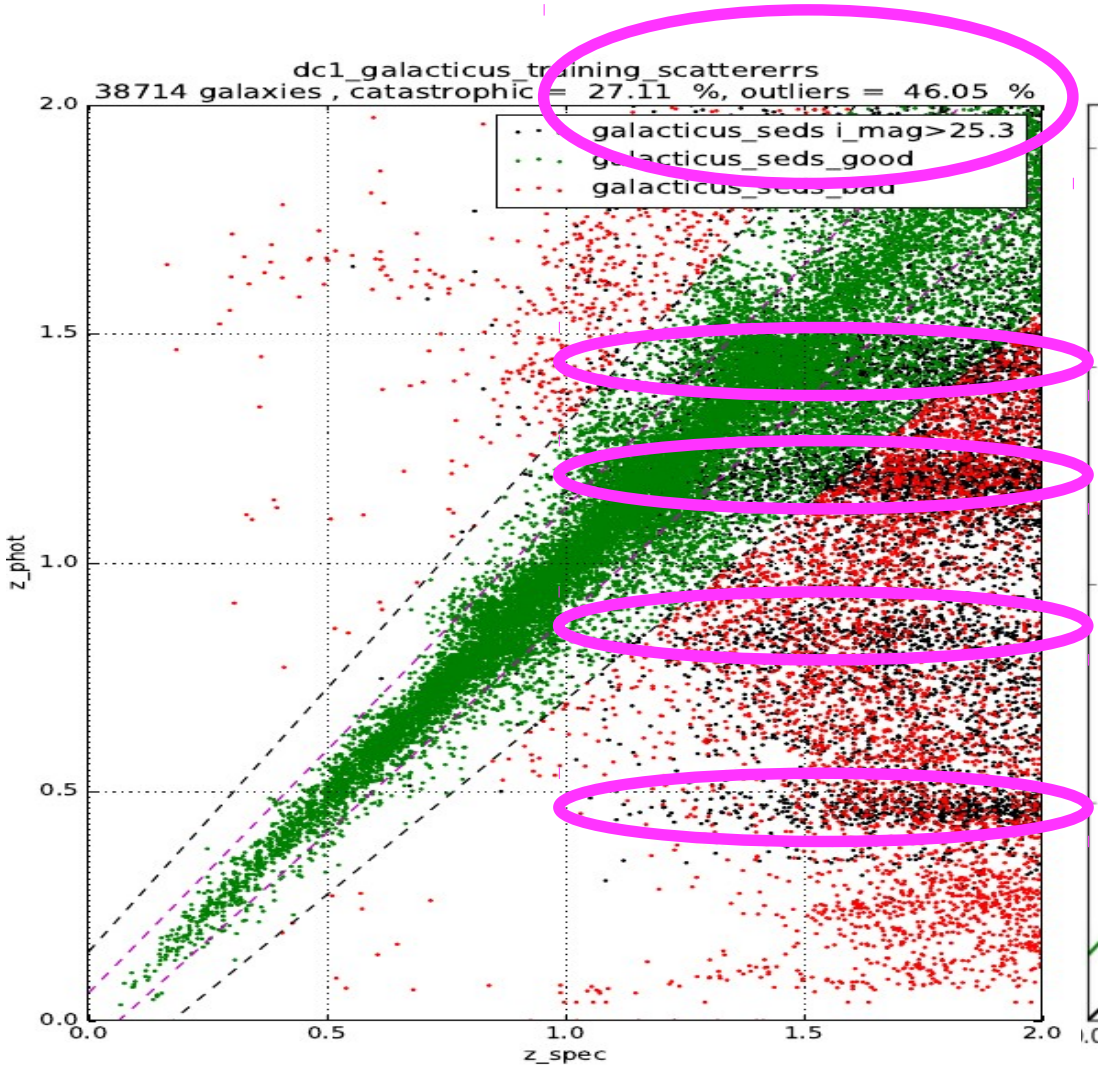
|(z_spec-z_phot)/(1+z_spec)| <0.15

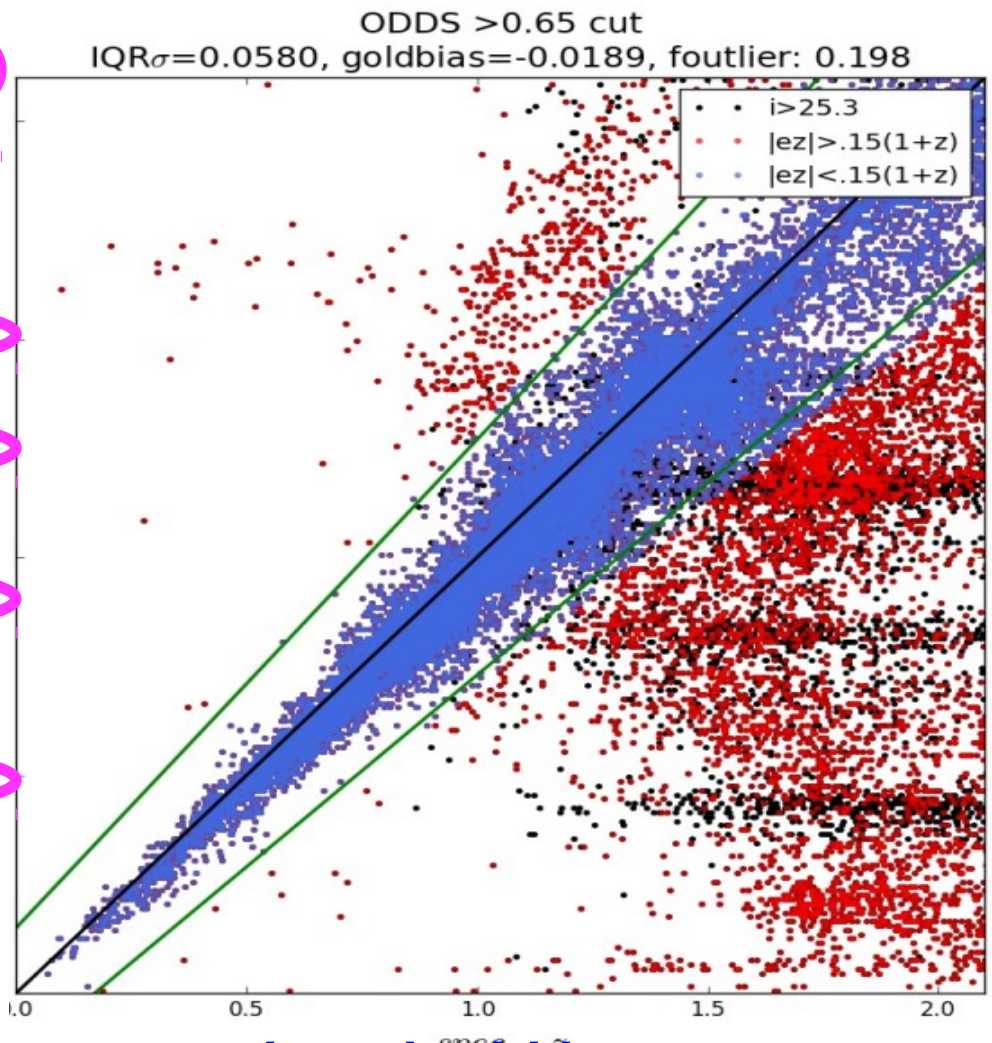
Catastrophics:
|(z_spec-z_phot)/(1+z_spec)| >0.15

Fraction of Catastrophics clearly increase with redshift

DC1 – Galacticus training : z-spec/z_phot

LePhare versus BPZ on Golden sample (i_mag<25.3)





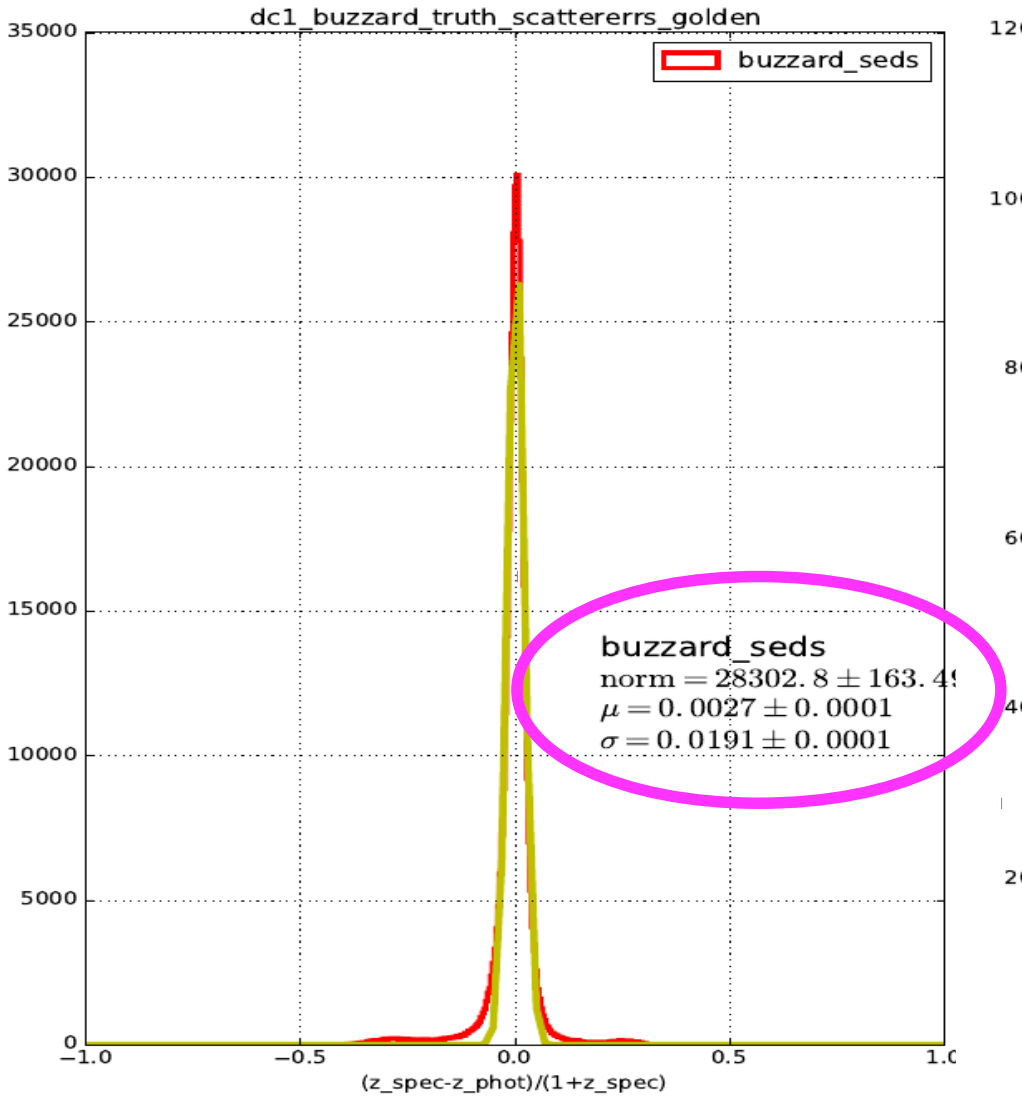
LePhare

BPZ (S.Schmidt)
Preliminary results !

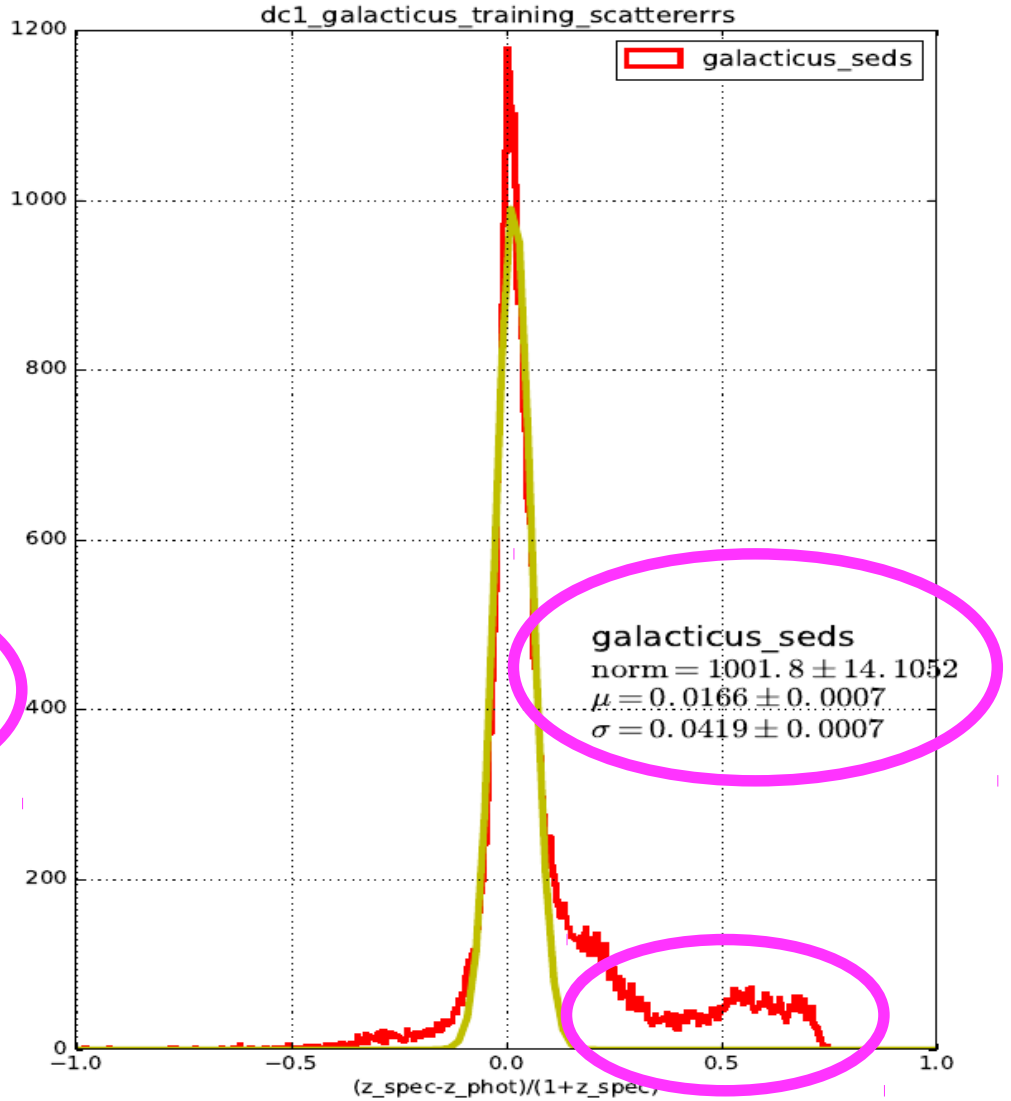
Similar results for Lephare and BPZ ...

z_spec-z_phot distribution comparison

Buzzard



Galacticus



Status on FORS2 SEDs

FORS2 data

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

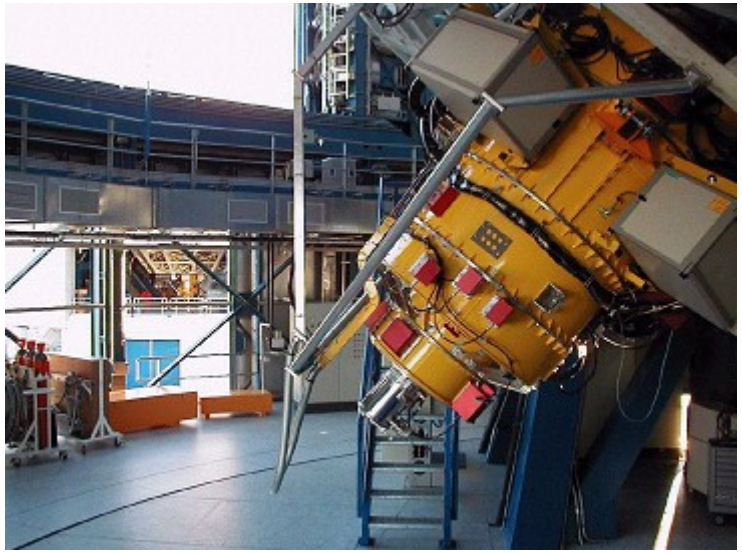
Redshifts : 0.275 < z < 1.05 down to R=23

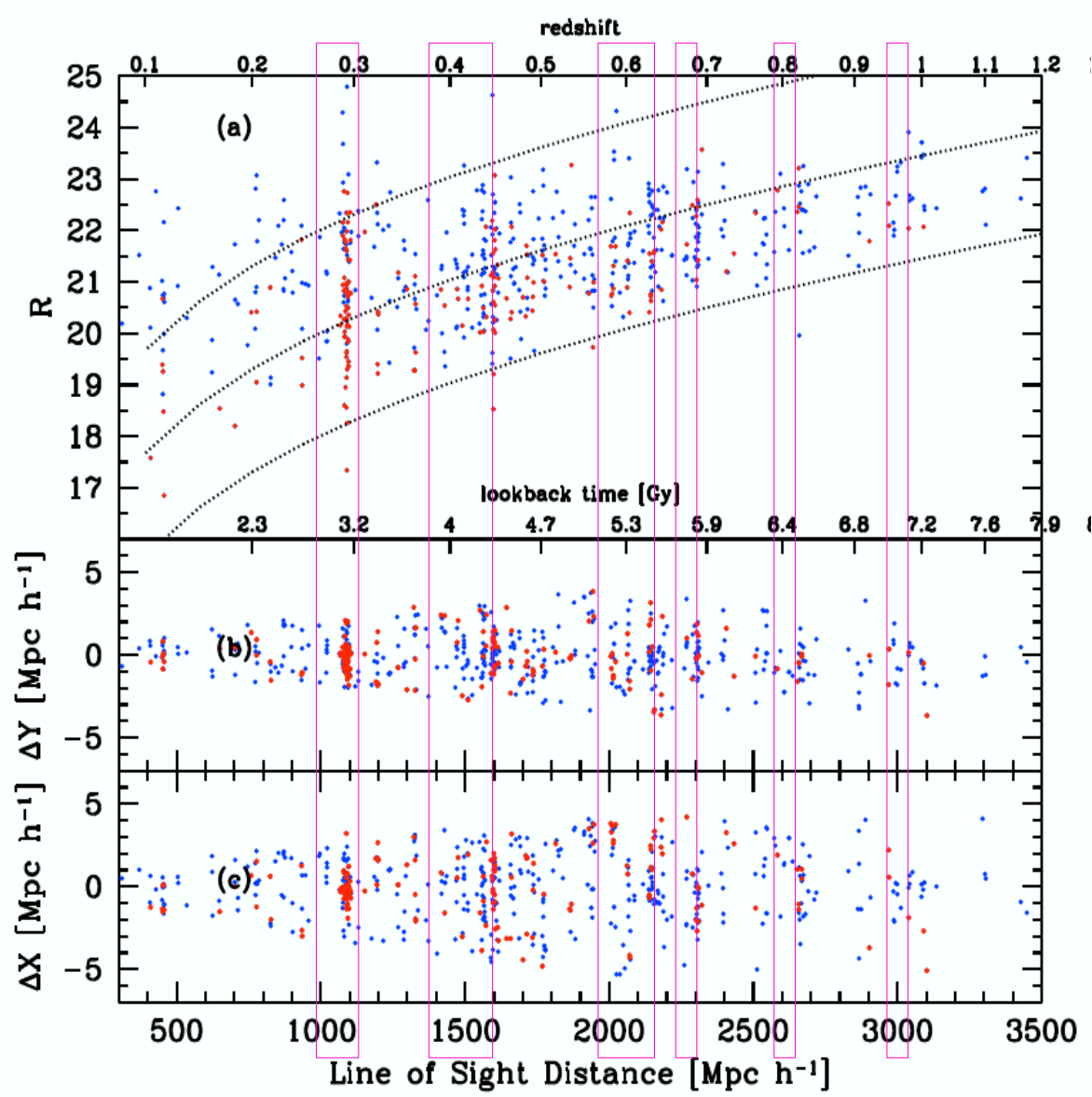
Rest frame window : 3000 Å < λ < 6000 Å

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)

→ **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 redshift interval, does SED templates derived from physical spectra lead to better photo-z results than extrapolated SED templates ?
  Brown (z<0.05) SEDs versus FORS2 (0.275 < z < 1.05)

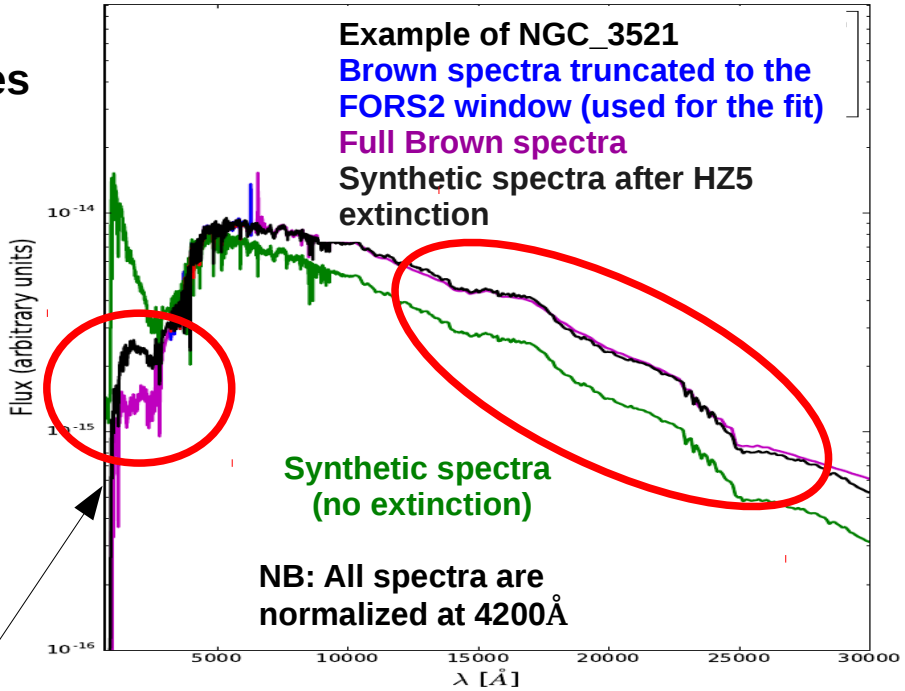
- **Building a general procedure to create SED library from physical spectra :**

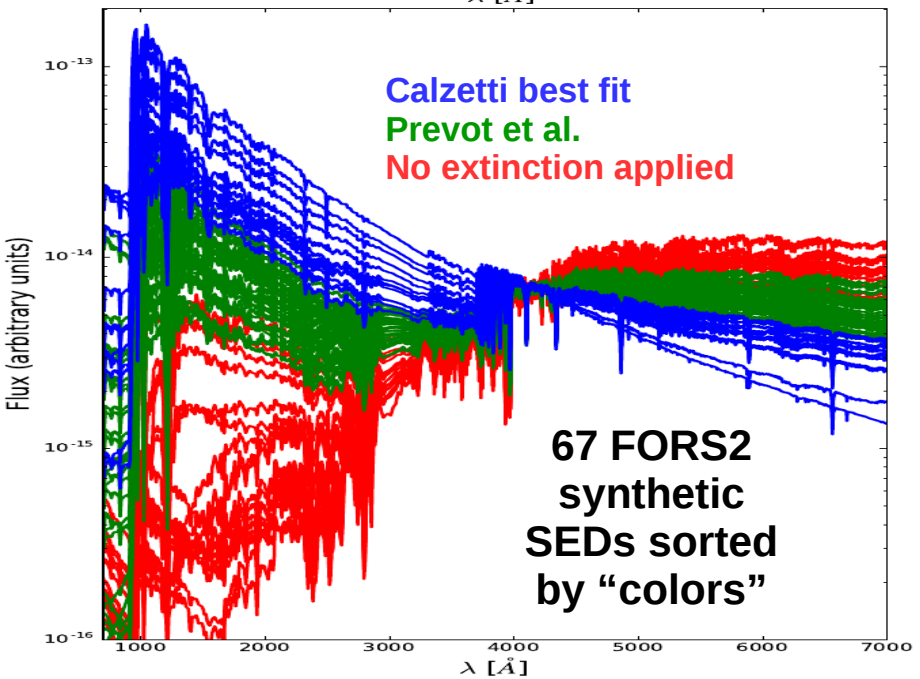
1/ Methodology :
Stellar mixing and synthetic spectra derived from fit on physical spectra using evolutionary stellar population models

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

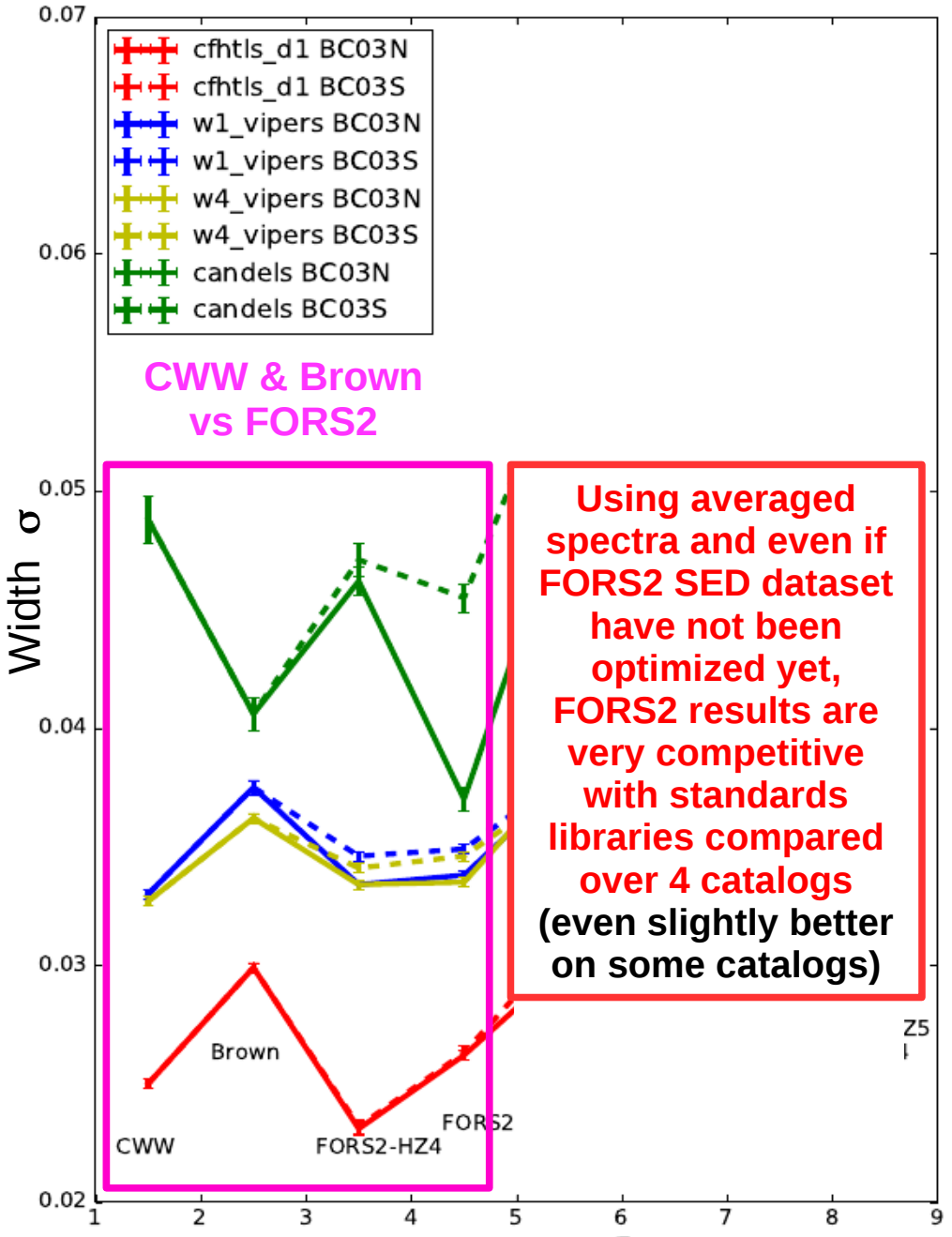
3/ Same procedure applied to FOR2 dataset (averaged spectra, no AGNs) :
→ 67 spectra used as new SED templates



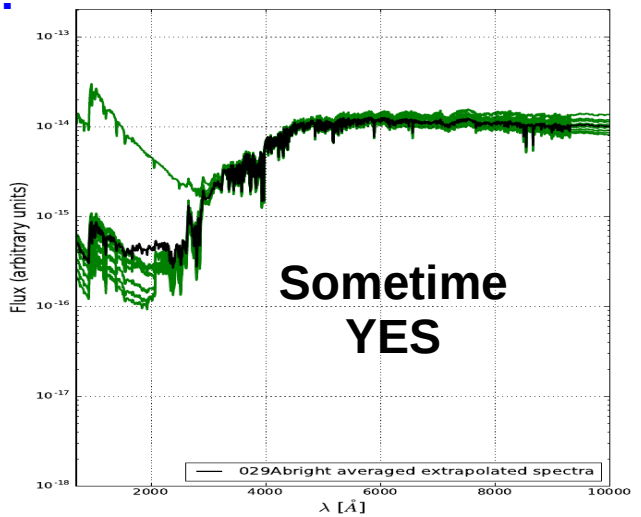


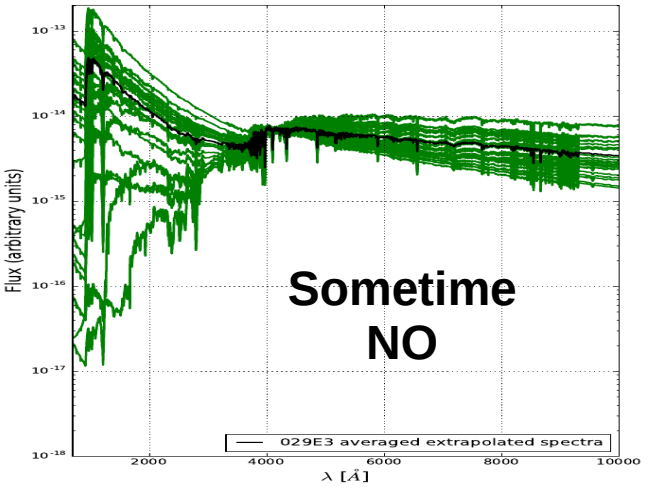
SED library performance comparison. Gaussian fit

Width versus SEDs for various catalogs



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

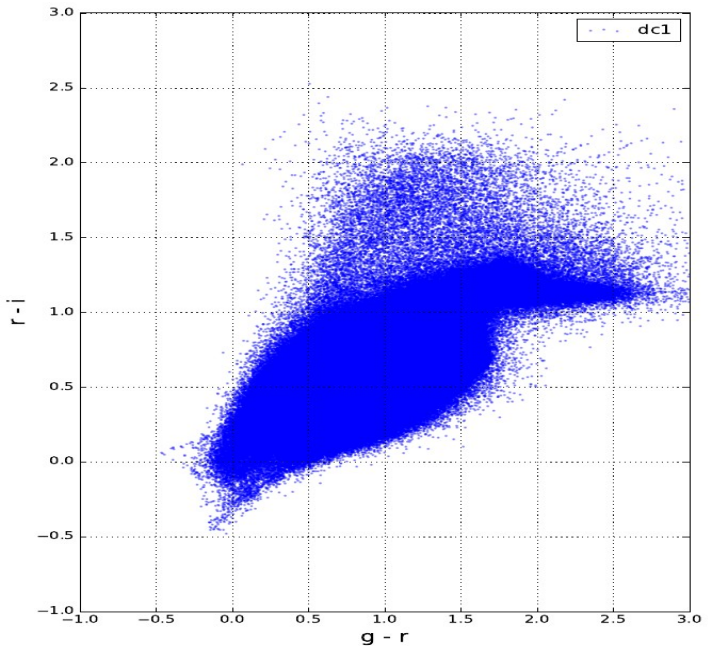




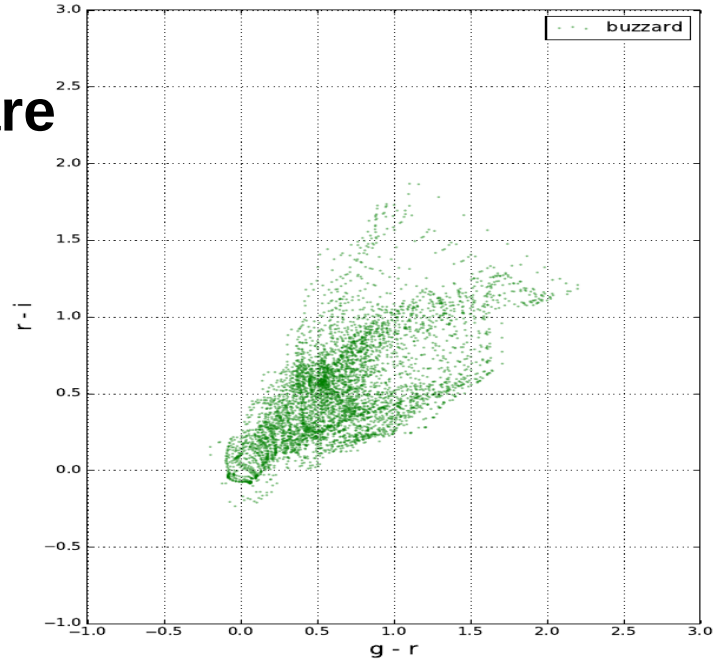
Ongoing work : We decided to work on the full FORS2 dataset instead on averaged spectra → 654 potential SEDs instead of 64

BACKUP

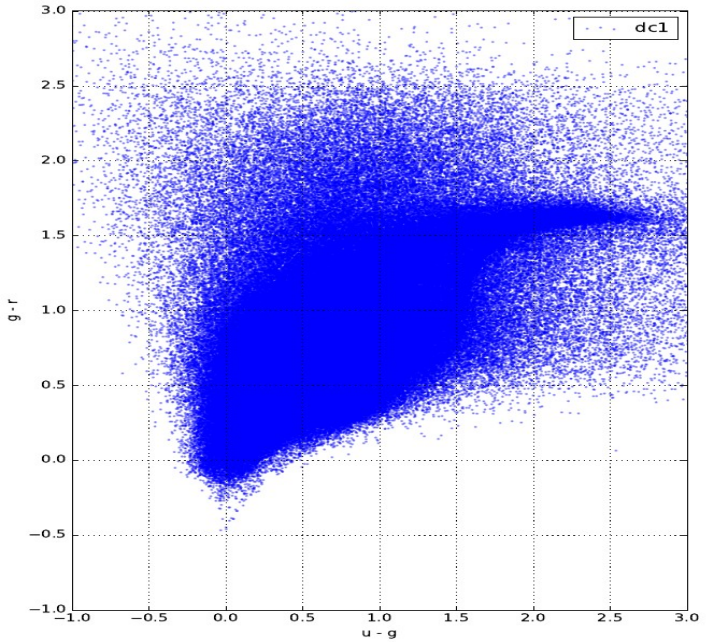
DC1 – Buzzard : r-i / g-r color plots

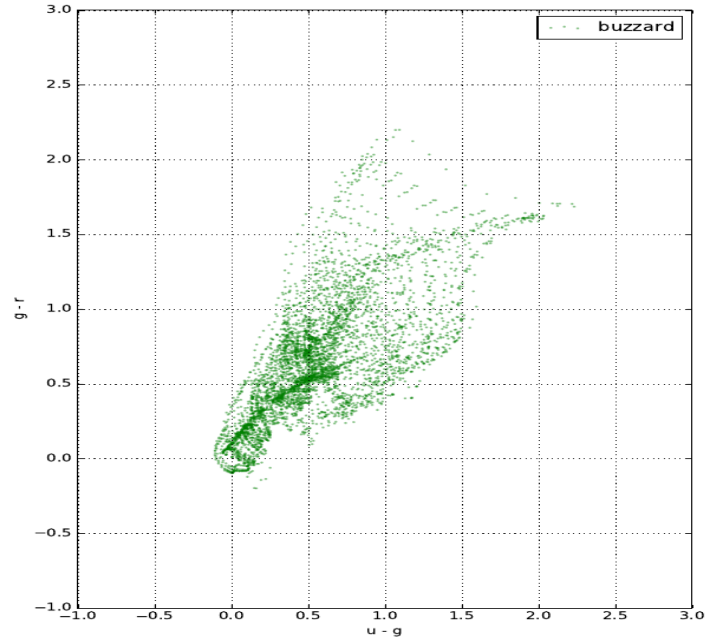


LePhare

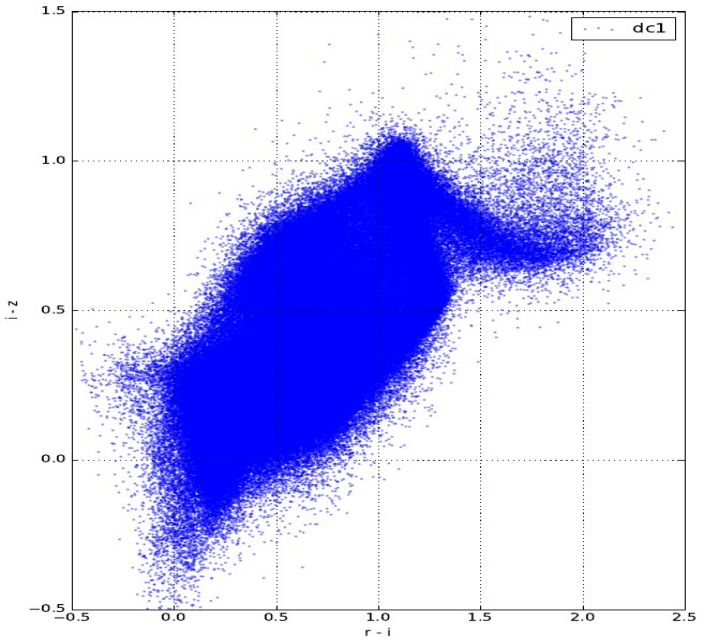


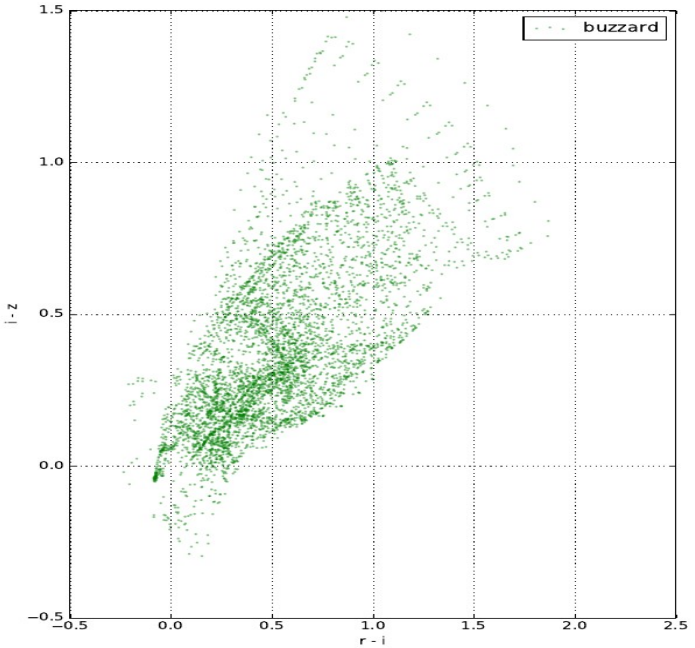
DC1 – Buzzard : g-r / u-g color plots





DC1 – Buzzard : I-z / r-i color plots



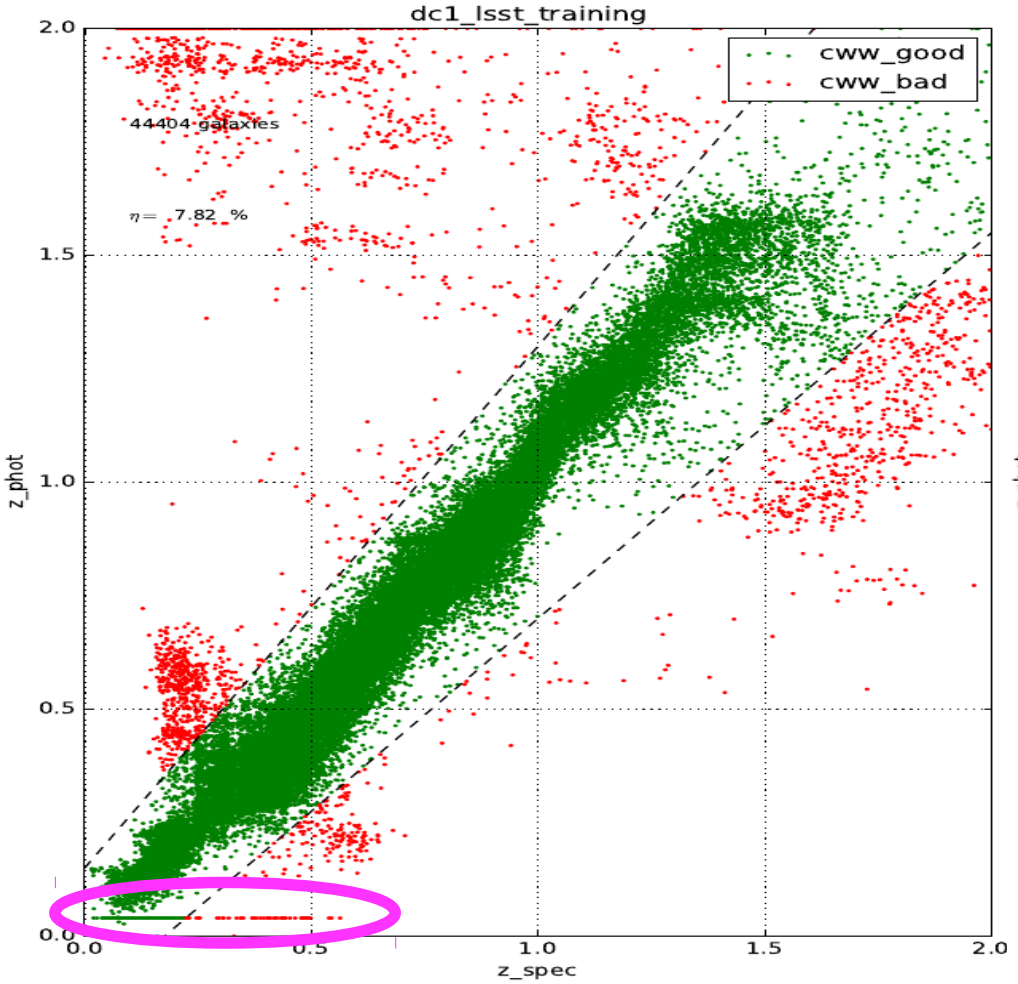


DC1
Buzzard
training

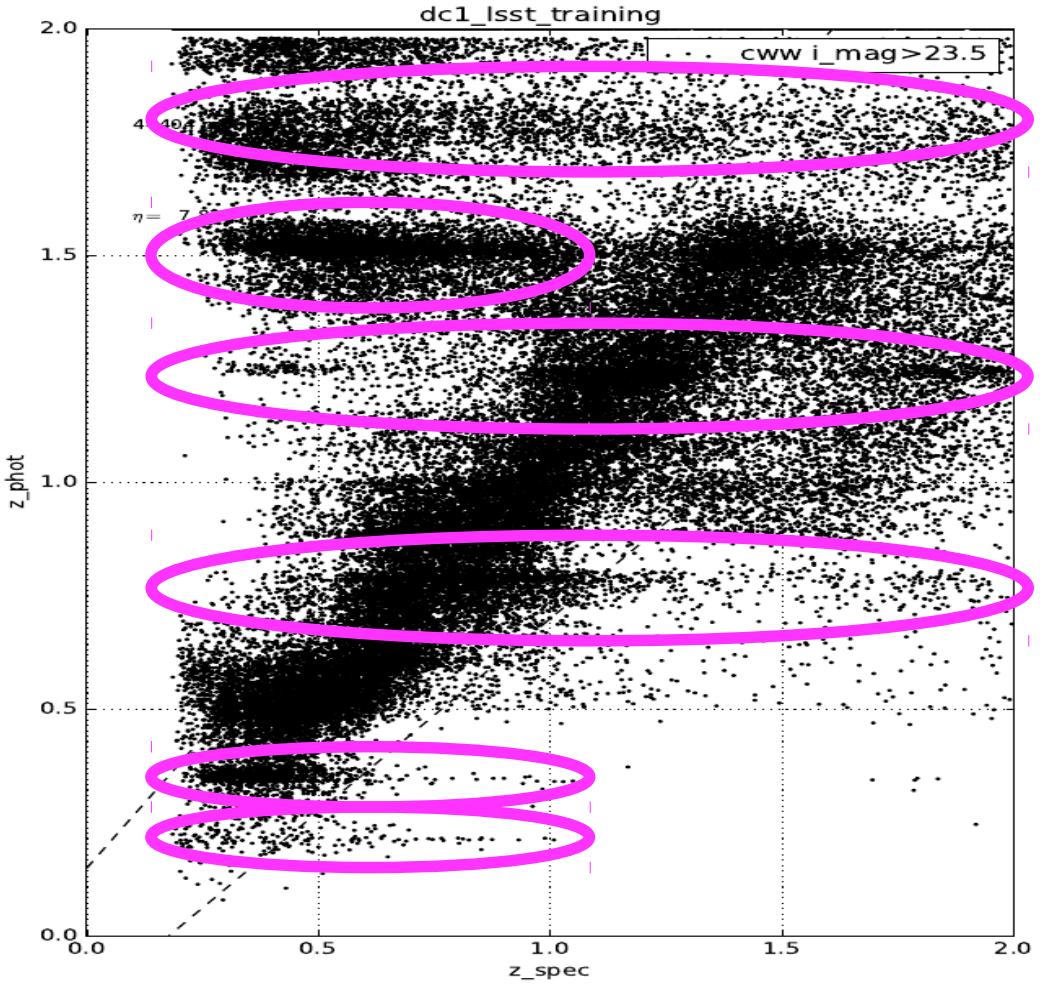
Comparison with other SEDs templates

DC1 – Buzzard – training Lephare : z-spec /z_phot

LePhare - CWW



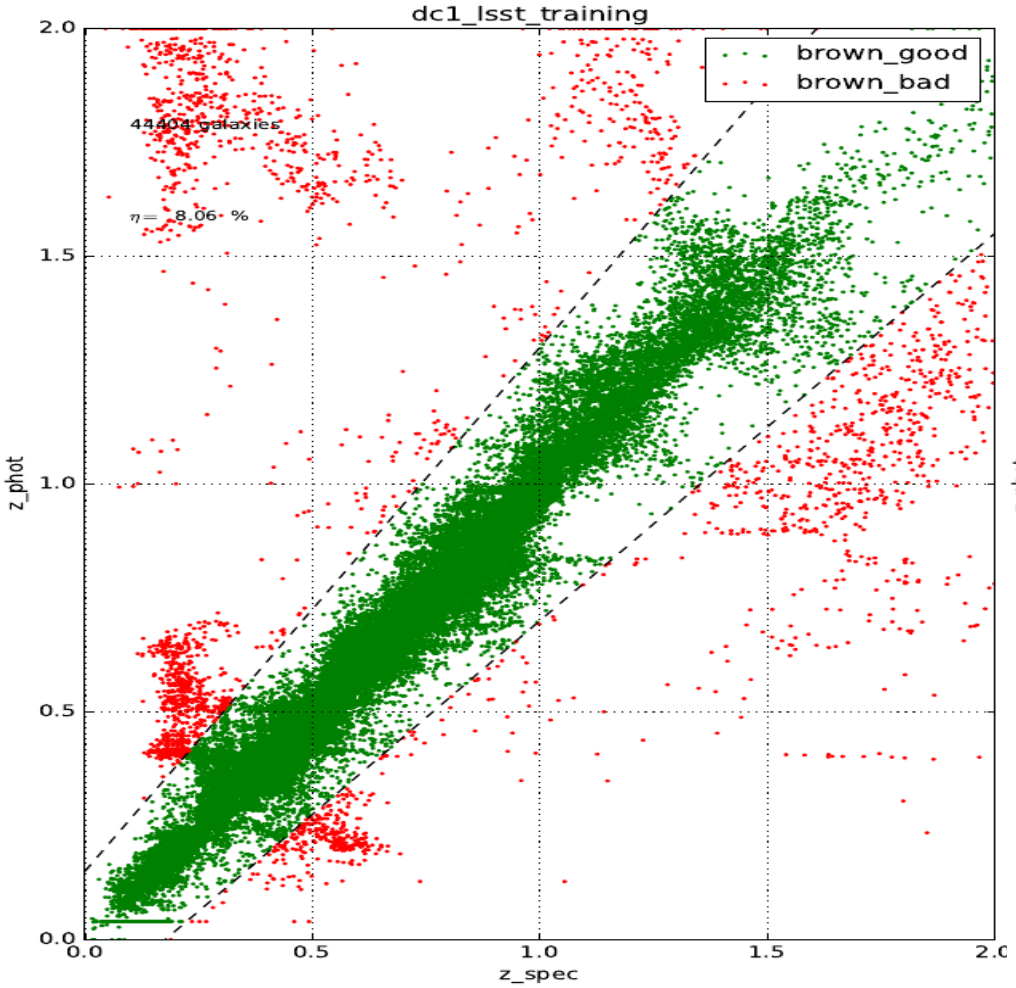
i_mag<25.3



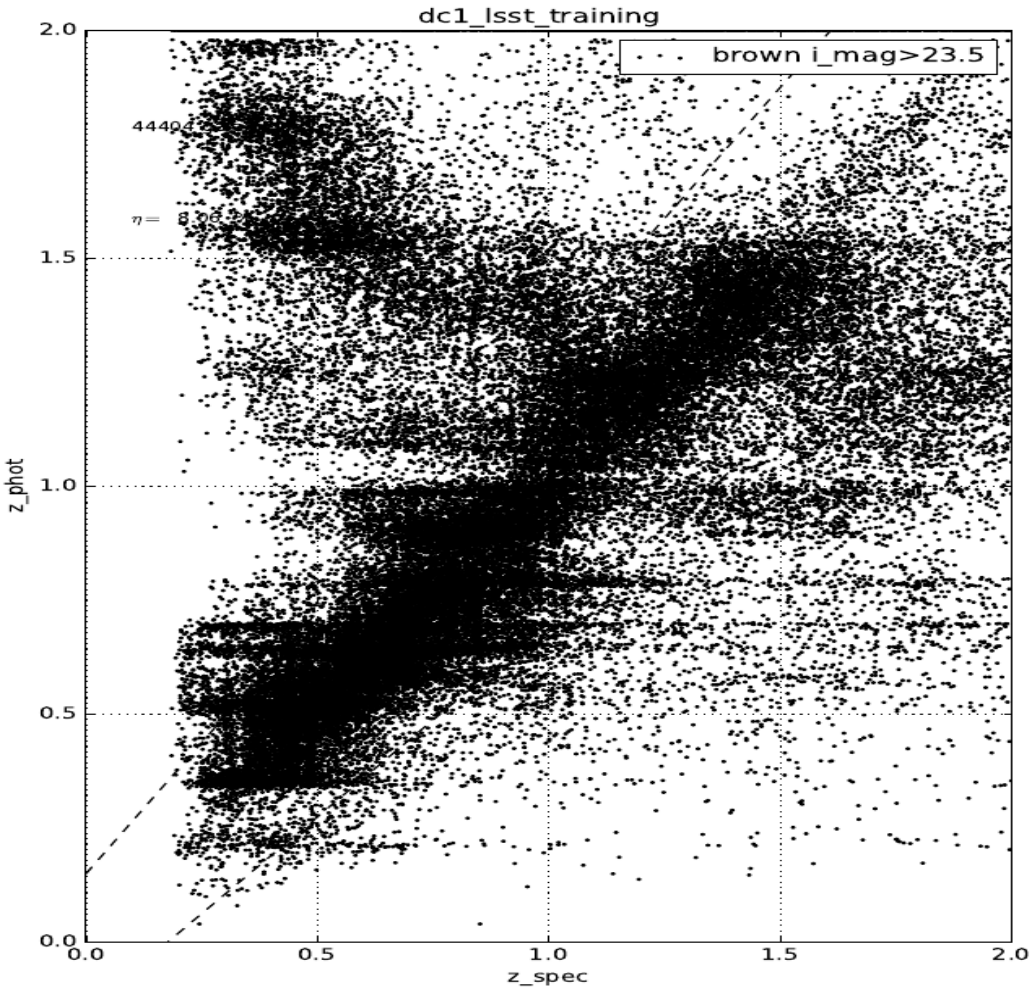
i_mag>25.3

DC1 – Buzzard – training Lephare : z-spec /z_phot

LePhare - Brown



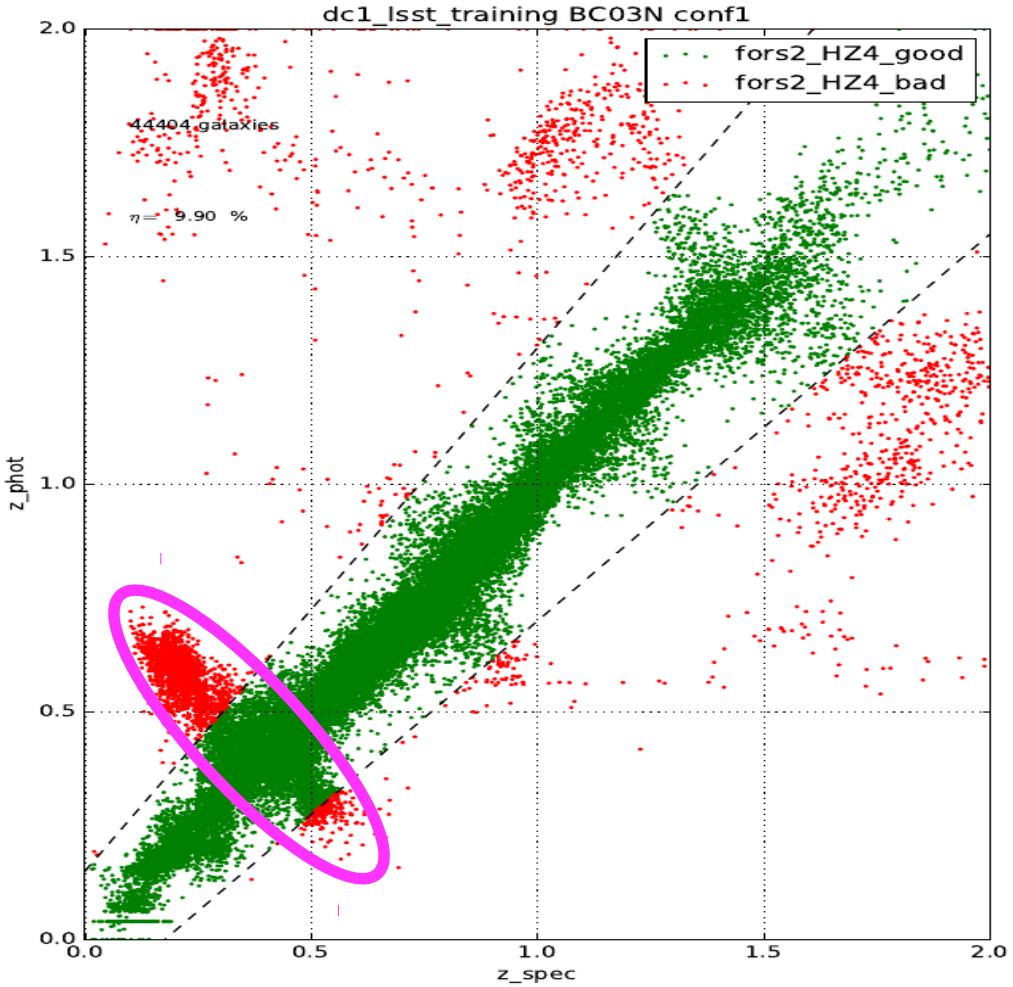
i_mag<25.3



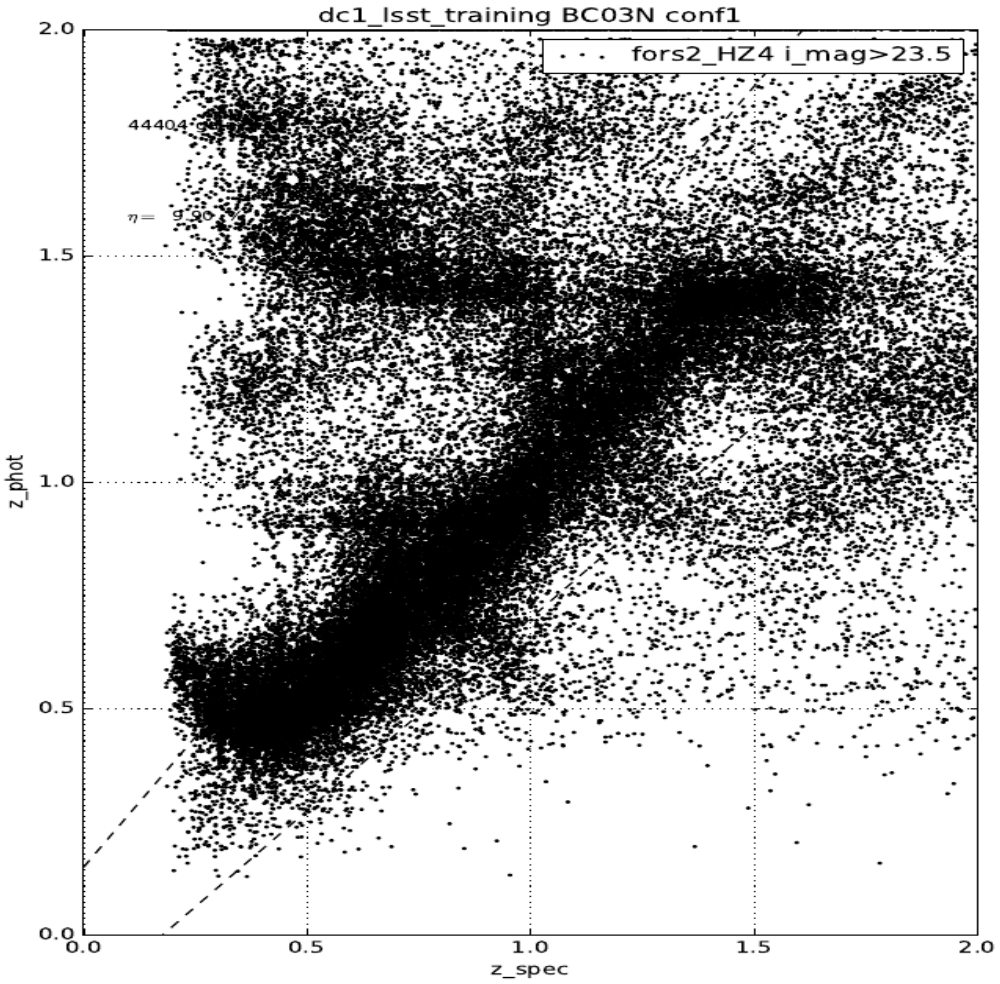
i_mag>25.3

DC1 – Buzzard – training Lephare : z-spec /z_phot

LePhare - Fors2



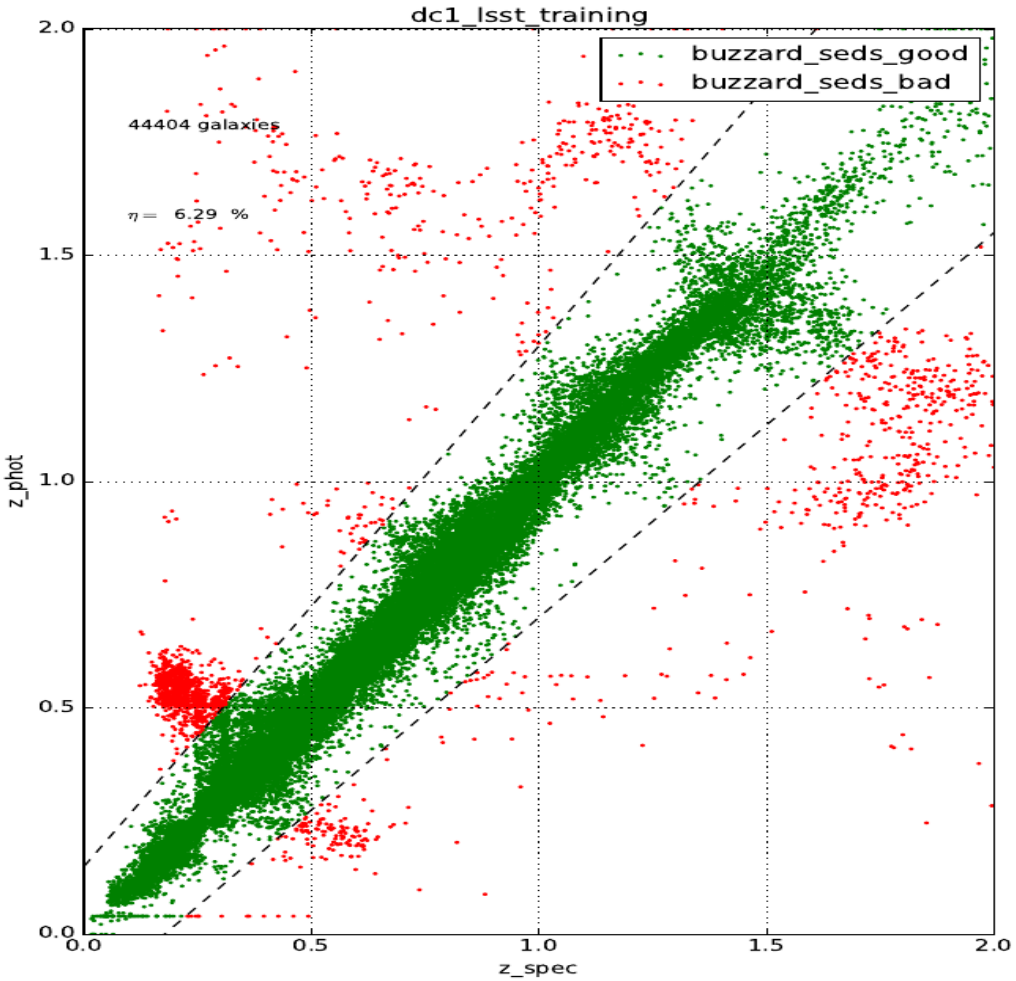
i_mag<25.3



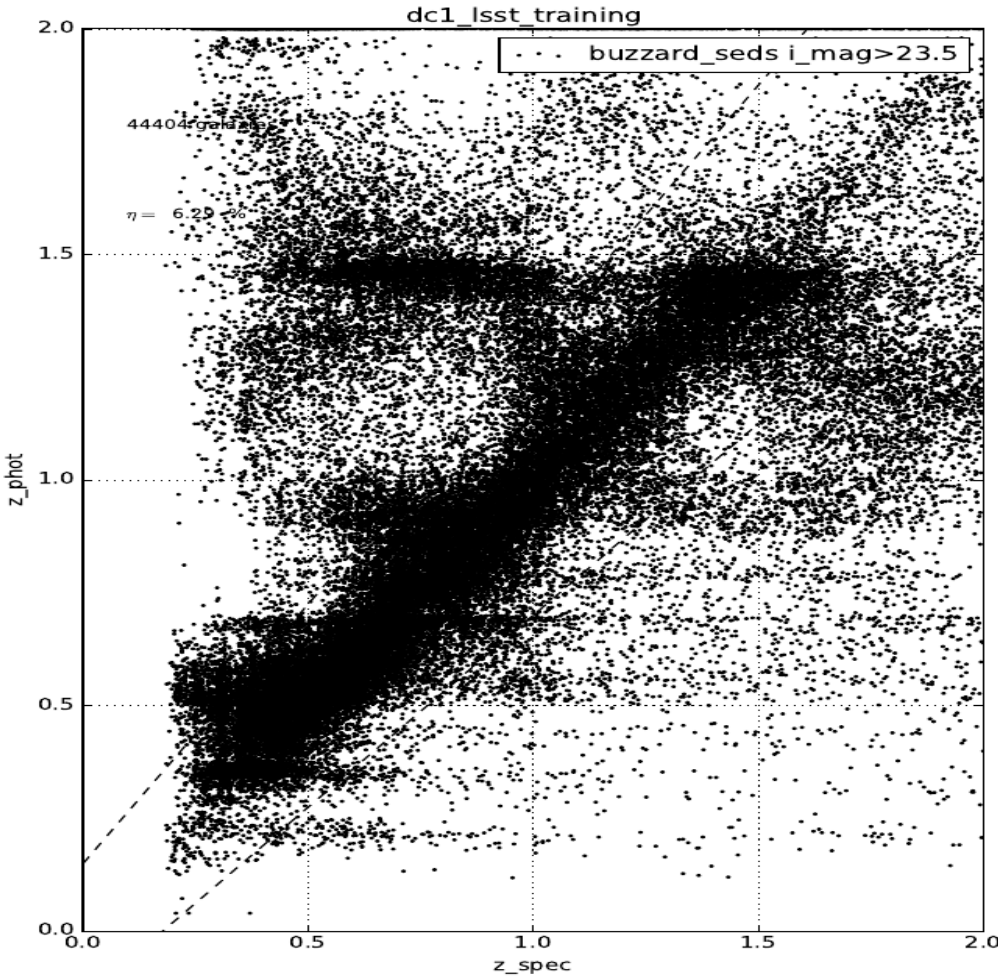
i_mag>25.3

DC1 – Buzzard – training Lephare : z-spec /z_phot

LePhare – 100 Buzzard SEDs

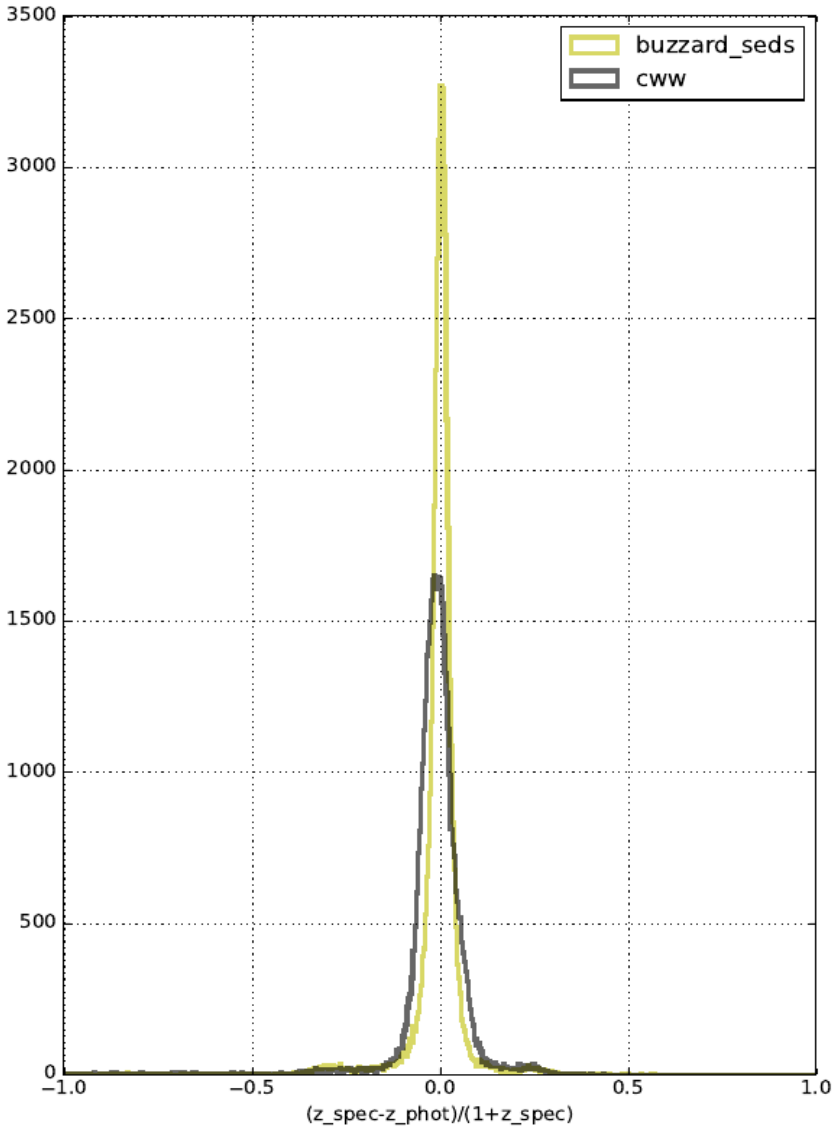


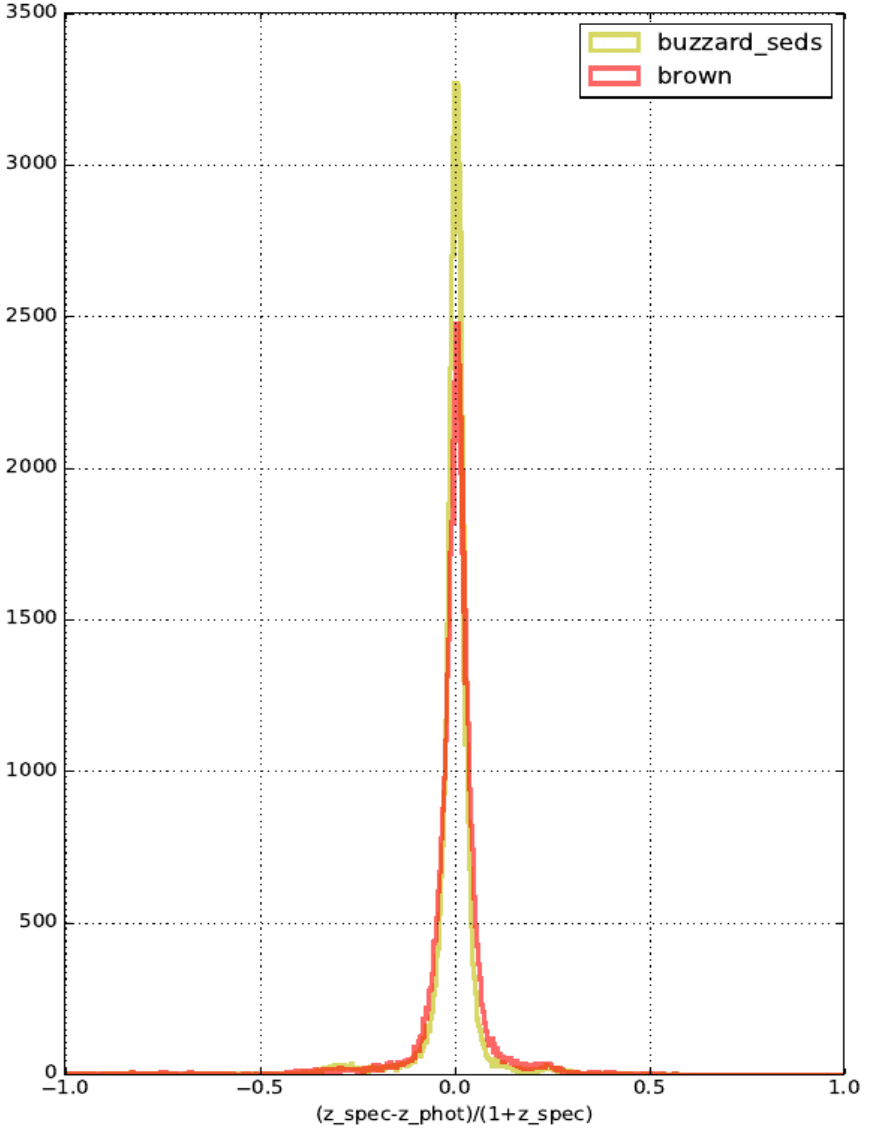
i_mag<25.3



i_mag>25.3

DC1 – Buzzard – training Lephare : z-spec /z_phot





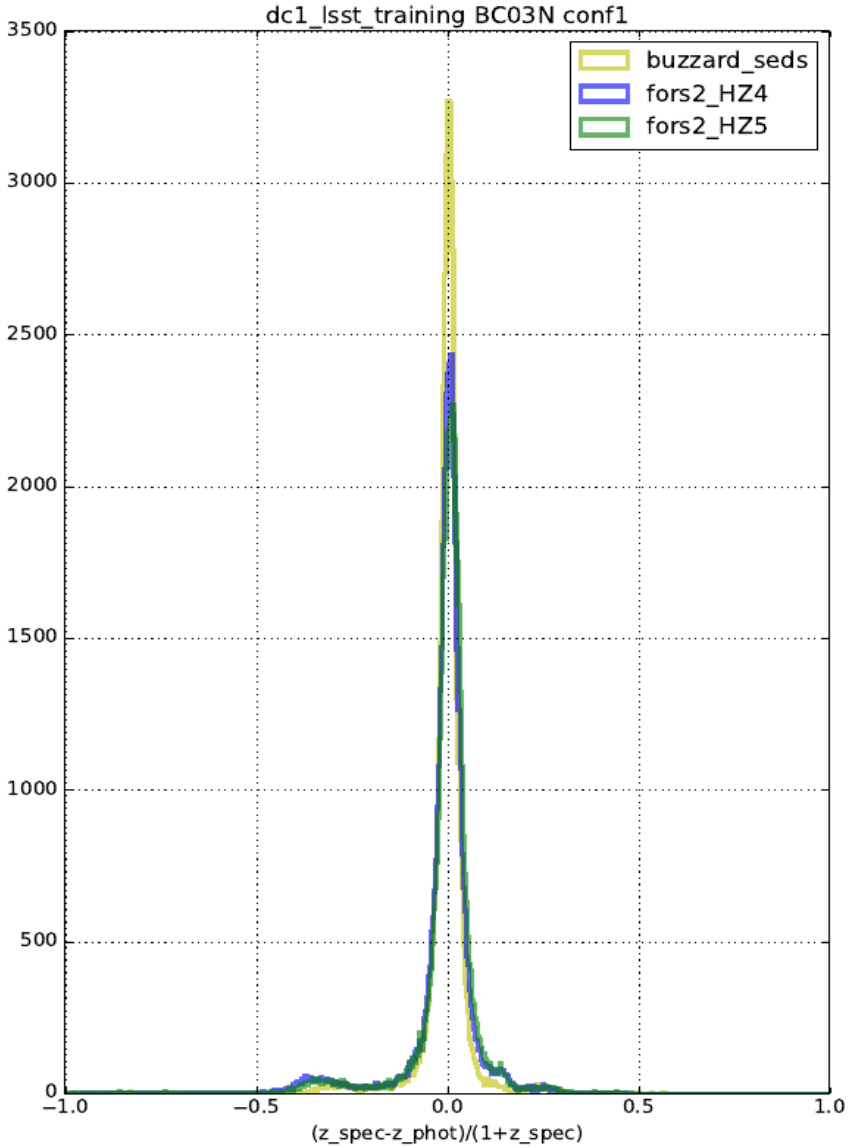
cww
$\text{norm} = 1628.1 \pm 7.2454$
$\mu = -0.0089 \pm 0.0002$
$\sigma = 0.0388 \pm 0.0002$

brown
$\text{norm} = 2122.4 \pm 15.5955$
$\mu = 0.0058 \pm 0.0002$
$\sigma = 0.0280 \pm 0.0002$

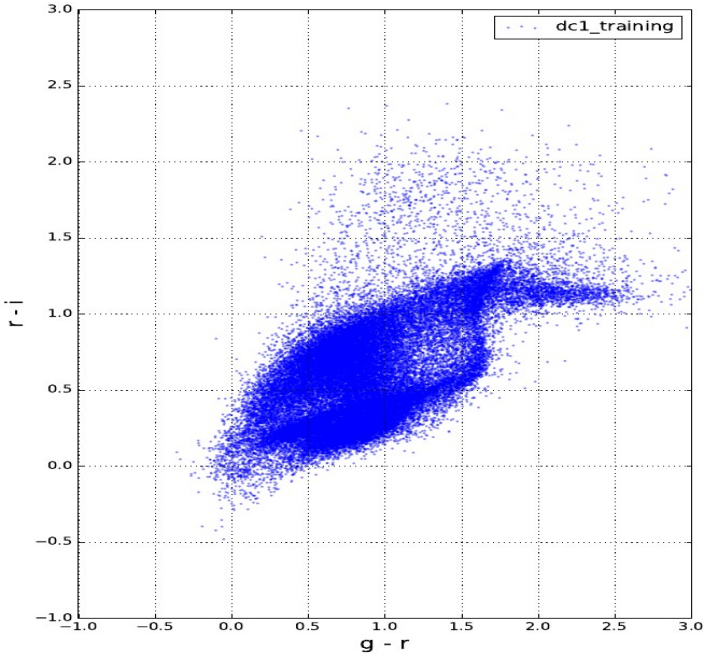
fors2
$\text{norm} = 2281.3 \pm 16.5302$
$\mu = 0.0053 \pm 0.0002$
$\sigma = 0.0248 \pm 0.0002$

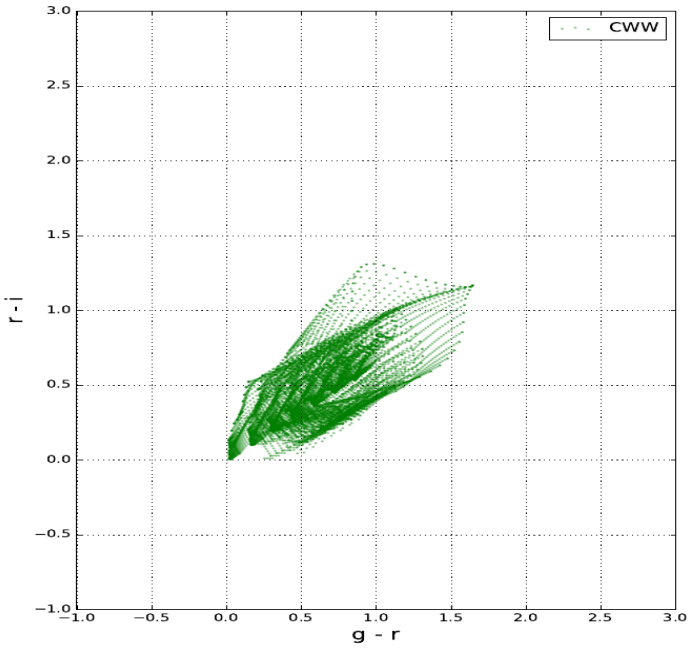
buzzard_seds
$\text{norm} = 3104.1 \pm 19.0248$
$\mu = 0.0033 \pm 0.0001$
$\sigma = 0.0192 \pm 0.0001$

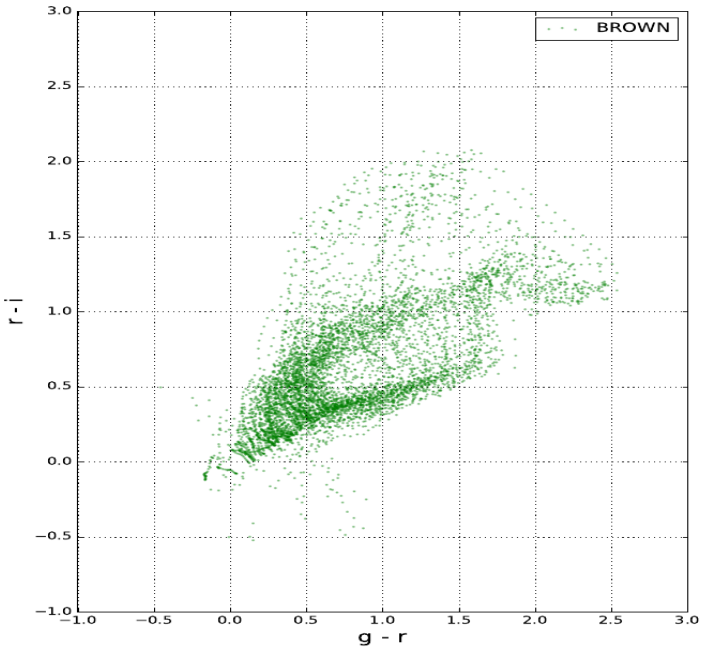
DC1 – Buzzard – training Lephare : z-spec /z_phot

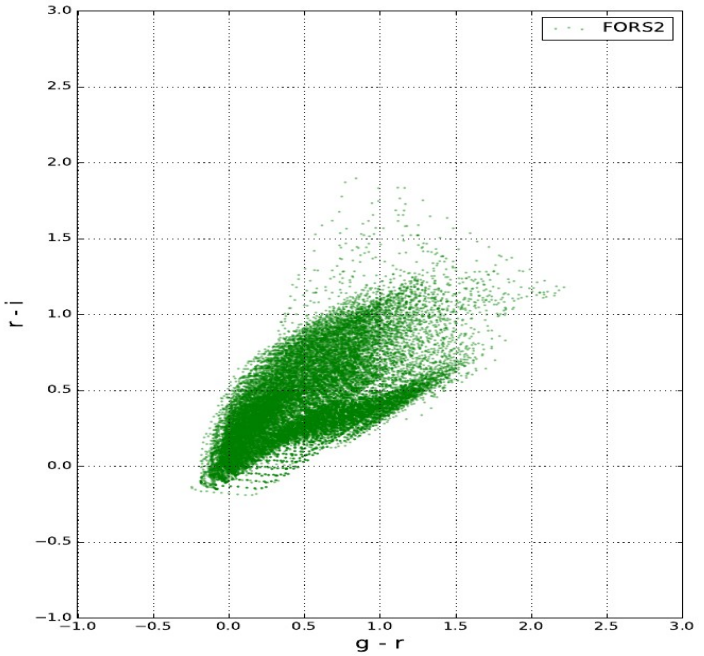


DC1 – Buzzard – training : r-i / g-r color plots

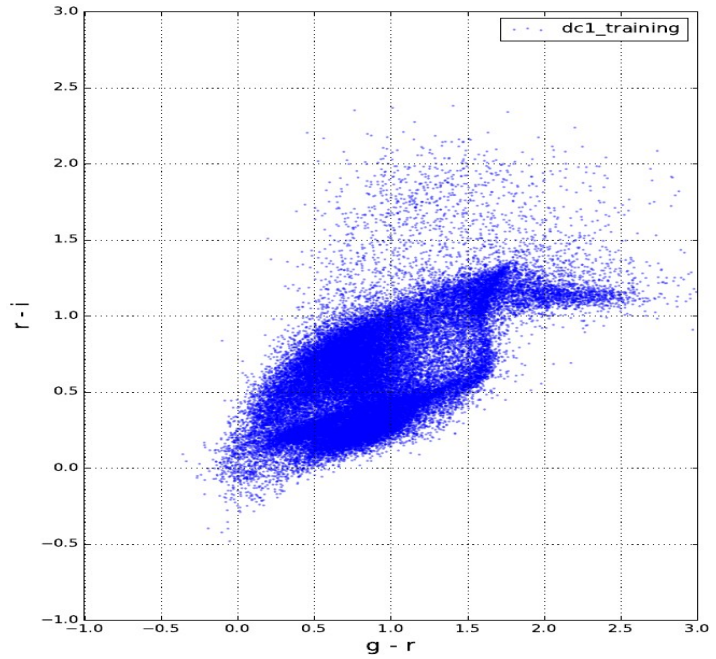


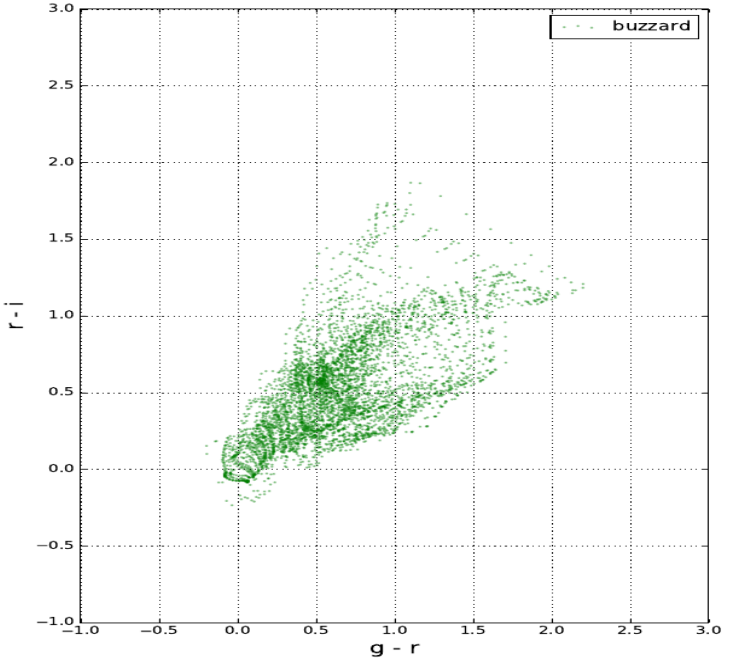




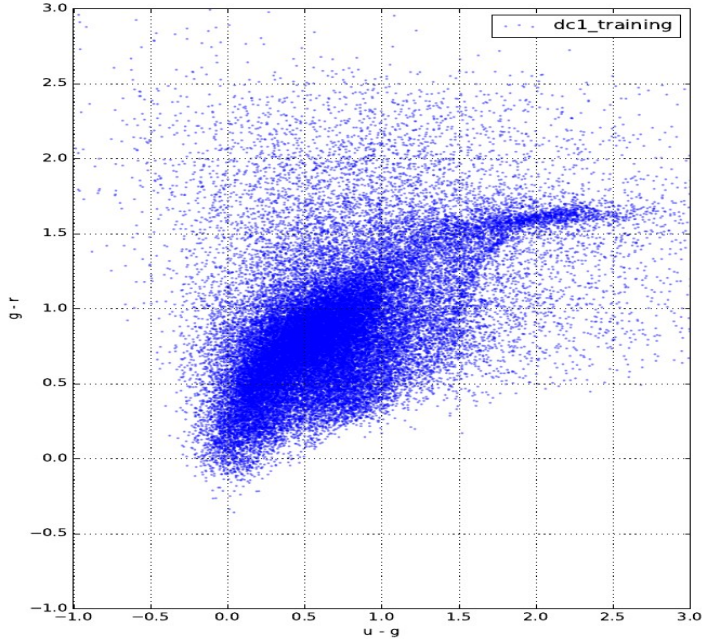


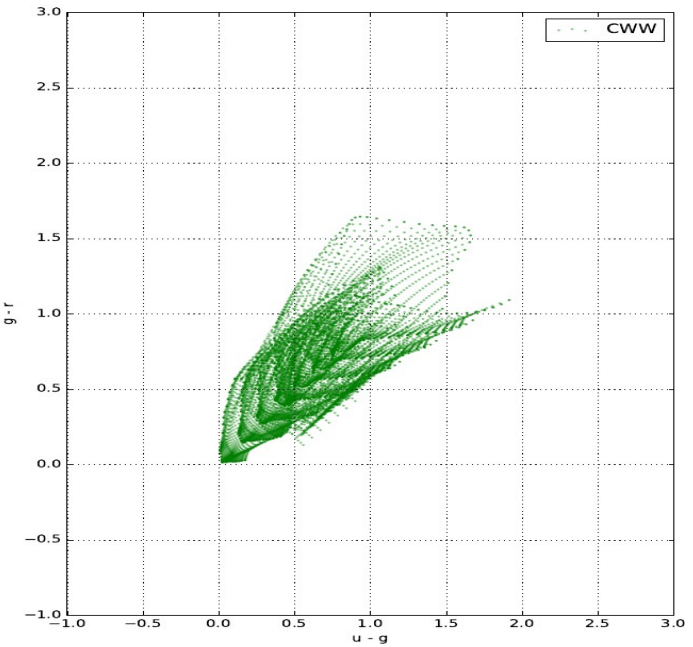
DC1 – Buzzard – training : r-i / g-r color plots

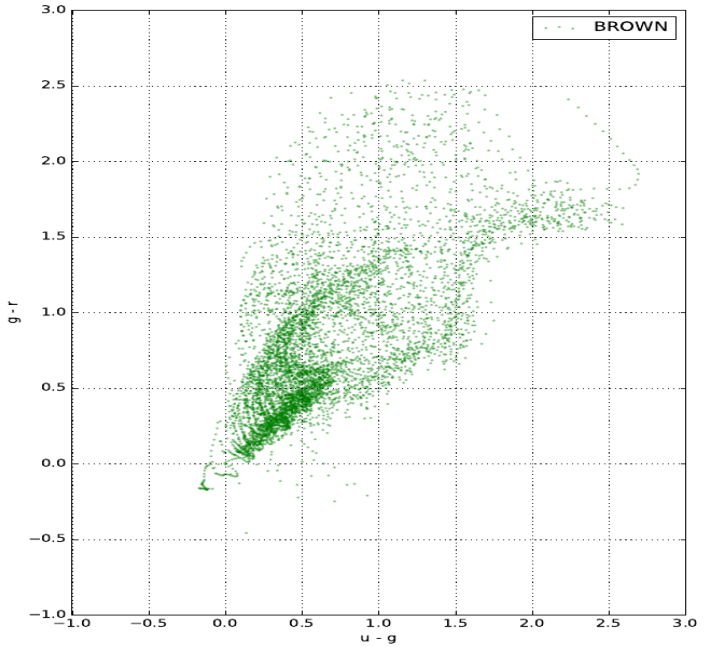


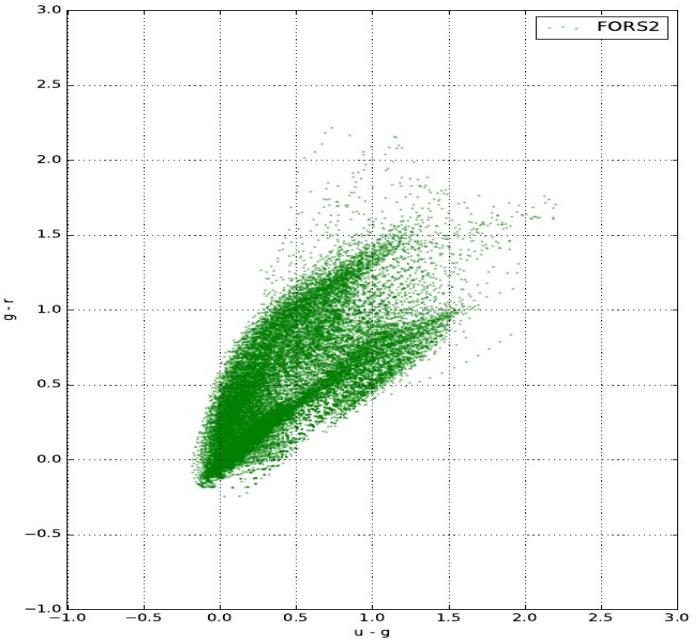


DC1 – Buzzard – training : g-r / u-g color plots

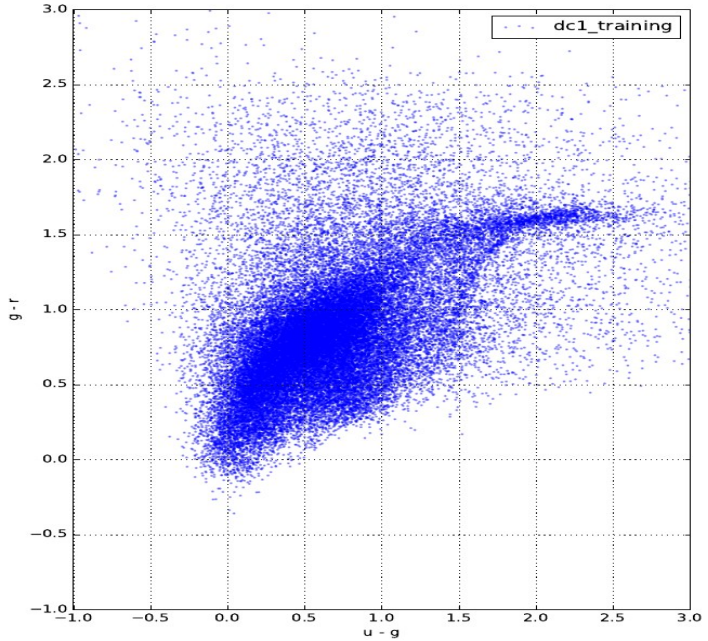


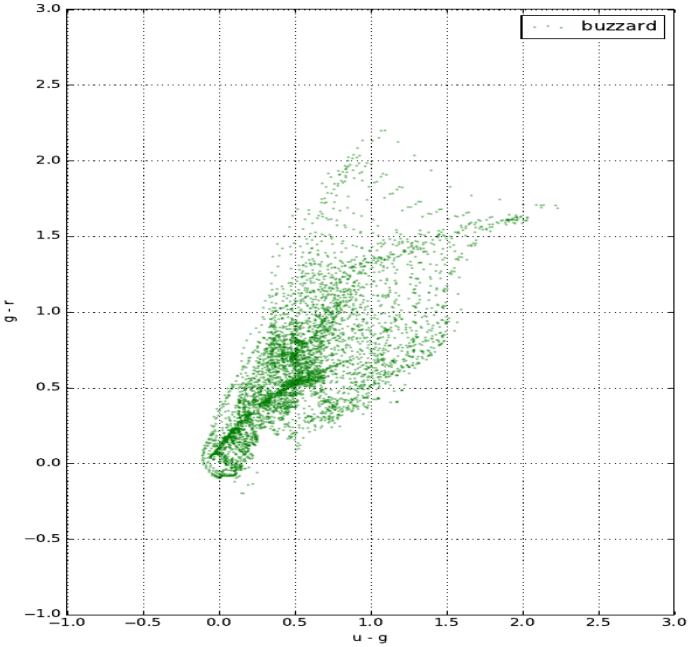




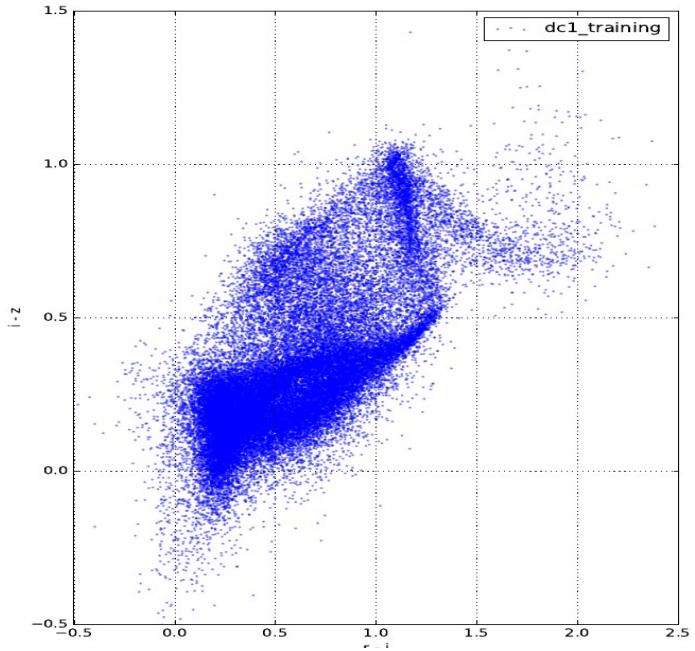


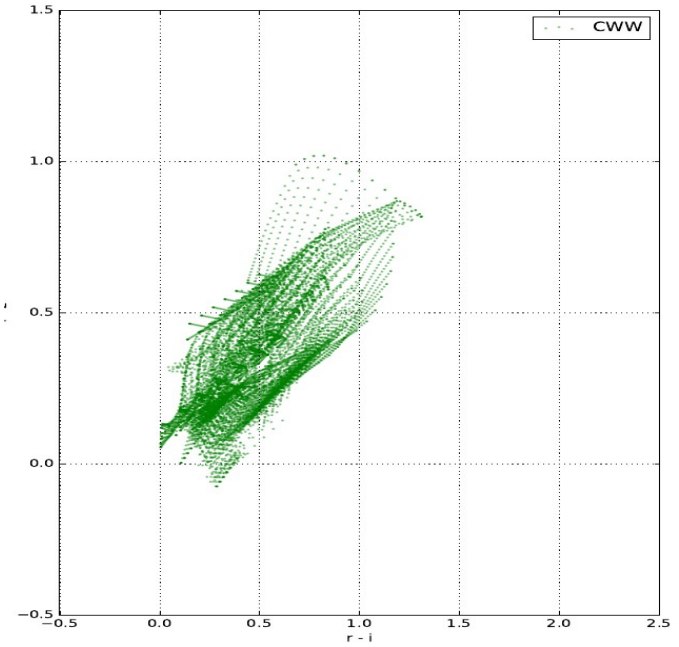
DC1 – Buzzard – training : g-r / u-g color plots

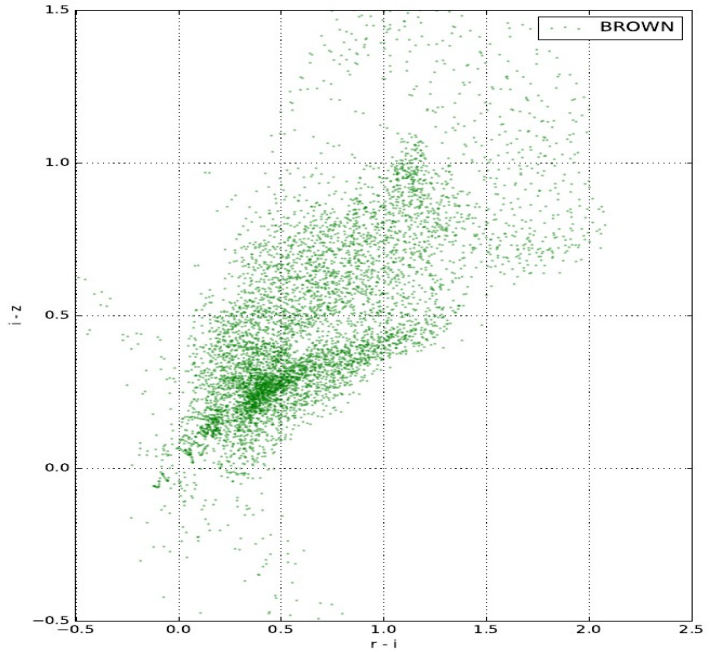


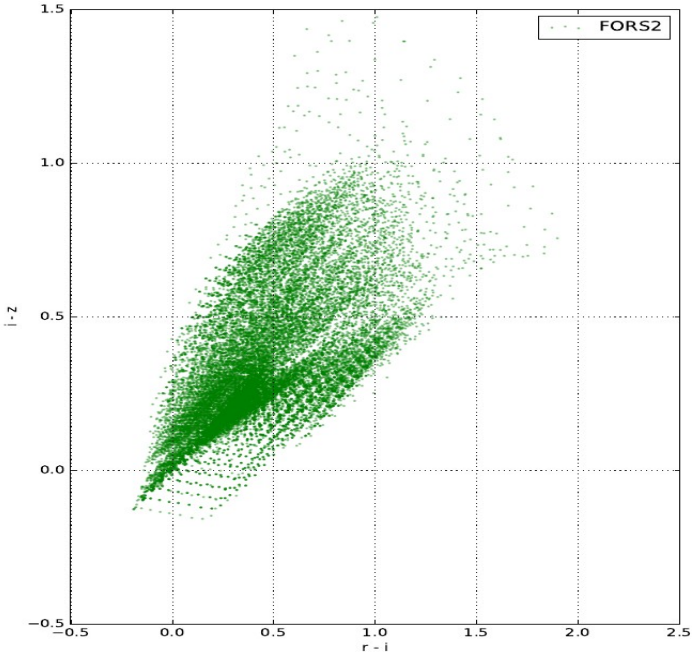


DC1 – Buzzard – training : I-z / r-i color plots

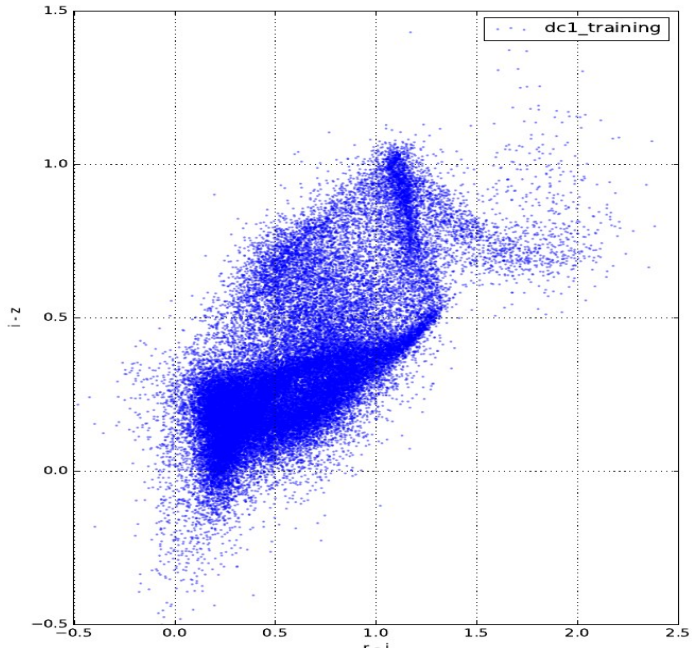


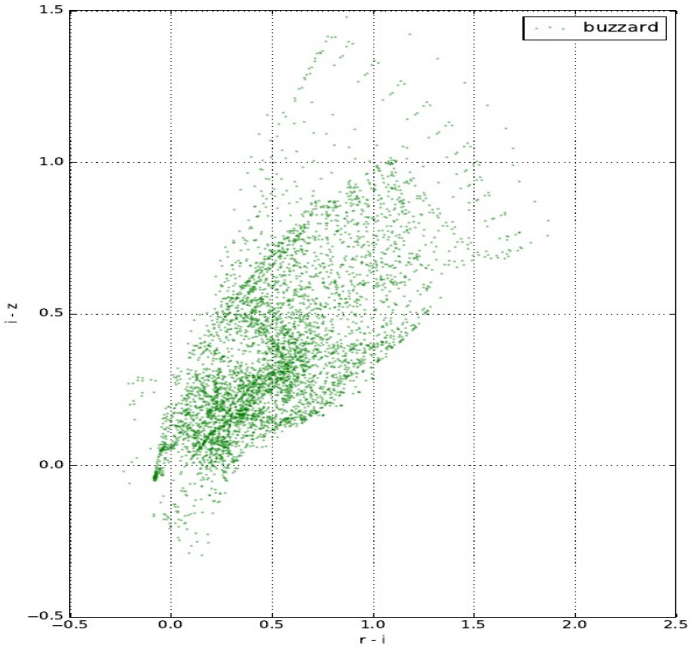






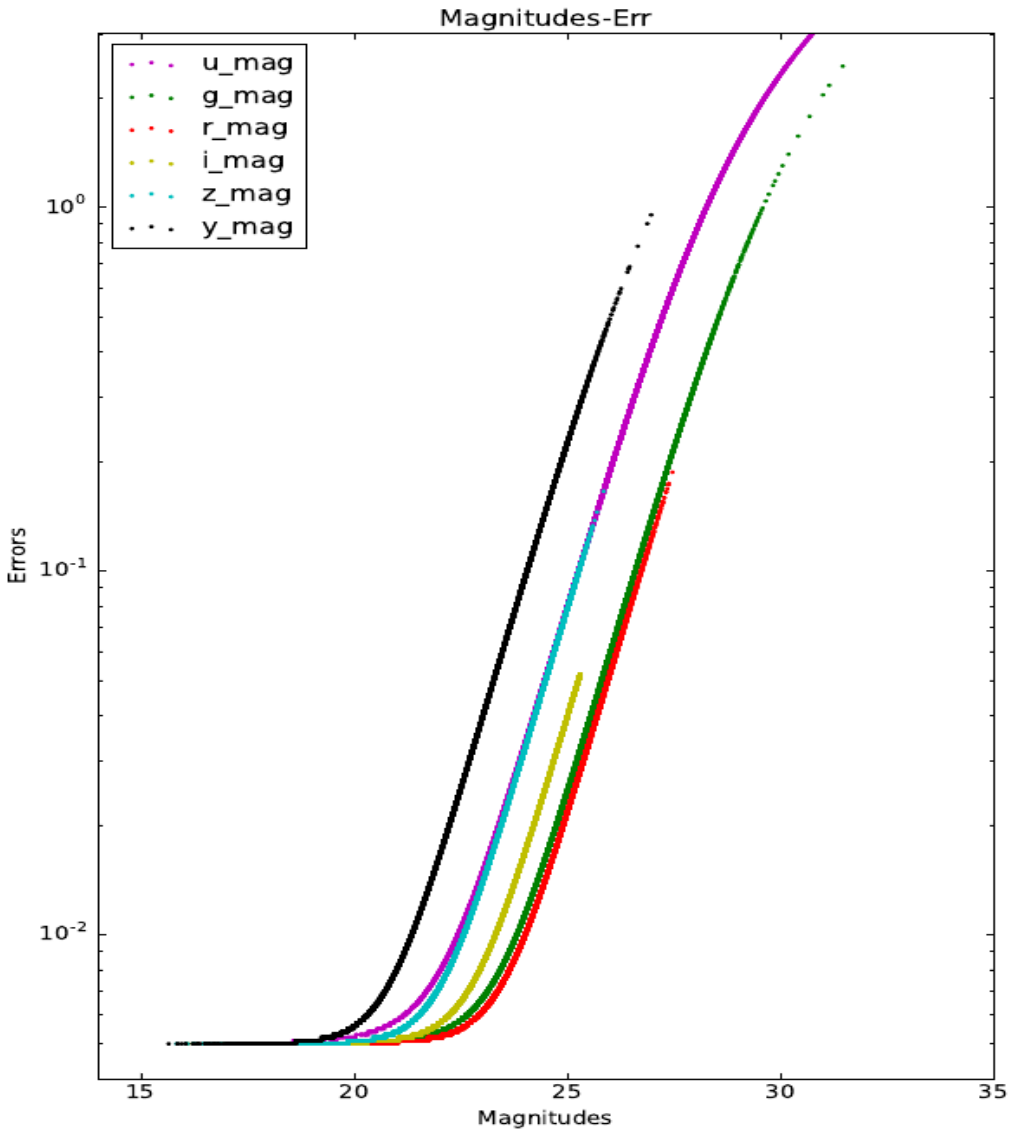
DC1 – Buzzard – training : I-z / r-i color plots

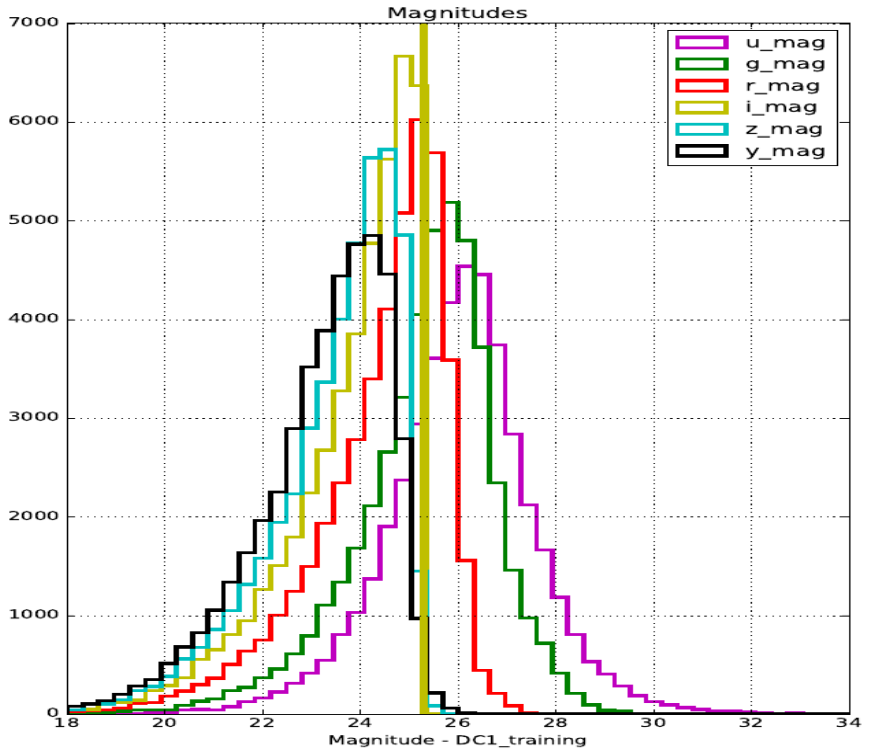


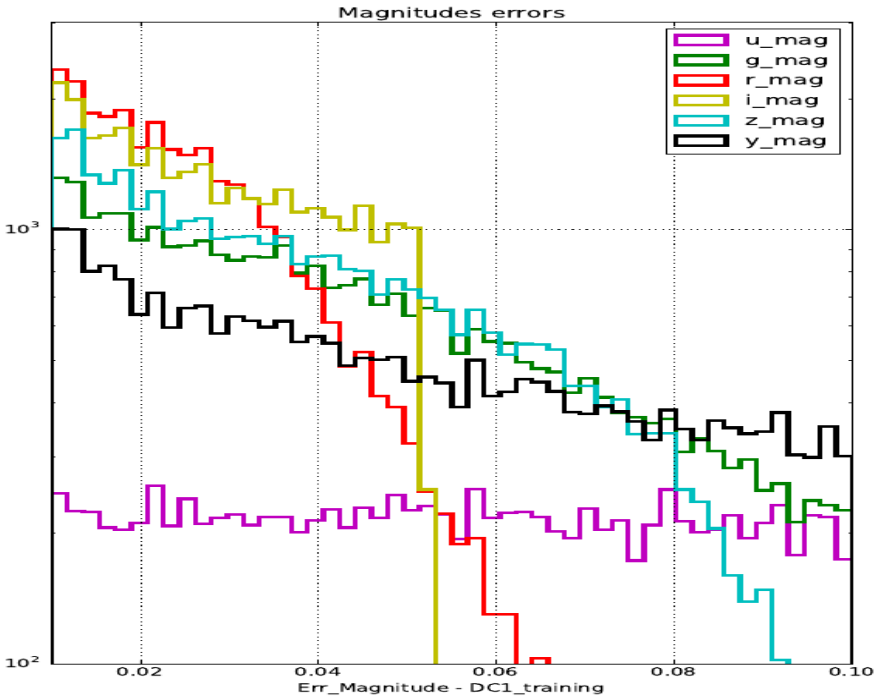


DC1
Buzzard
training

DC1 – Buzzard training : Magnitudes and Errors

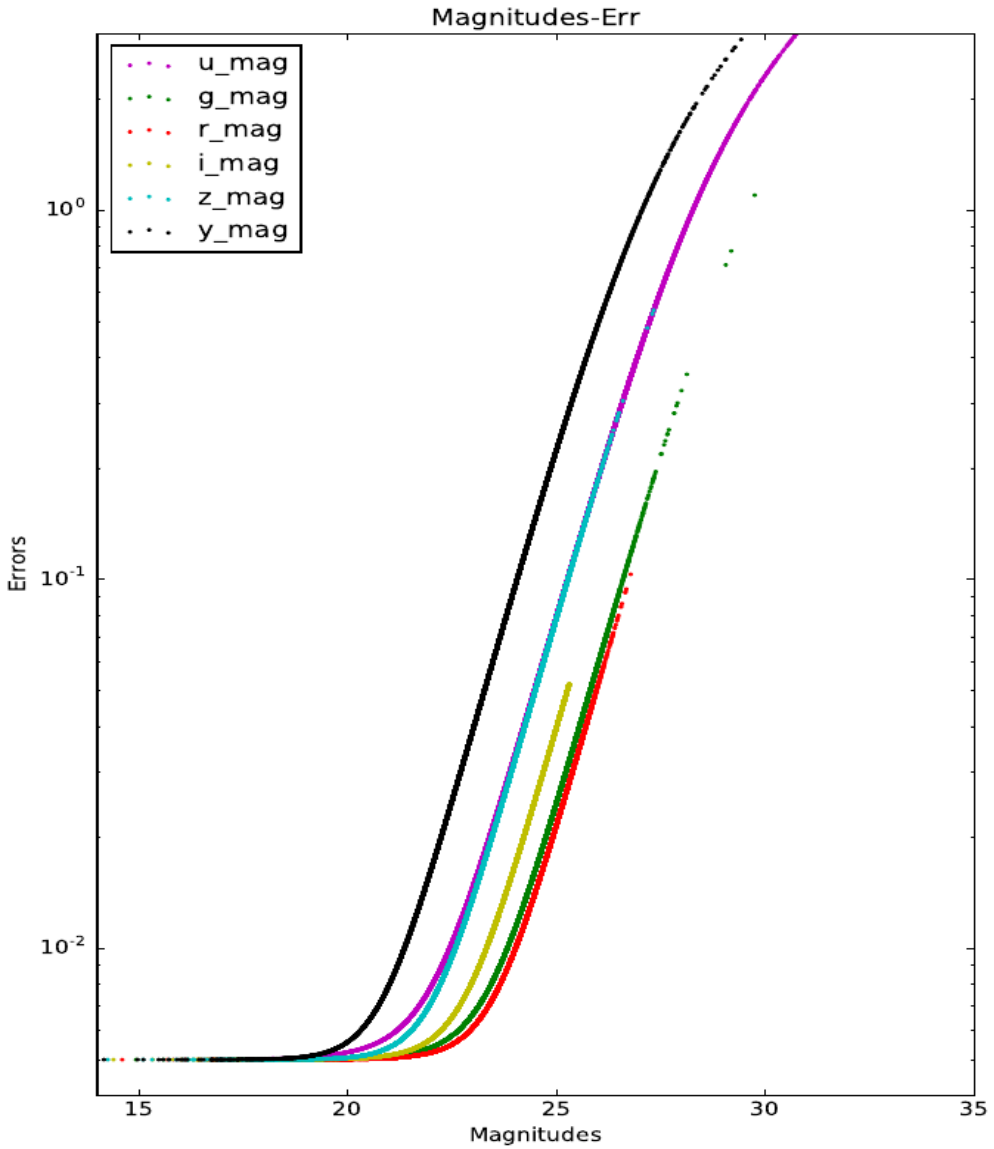


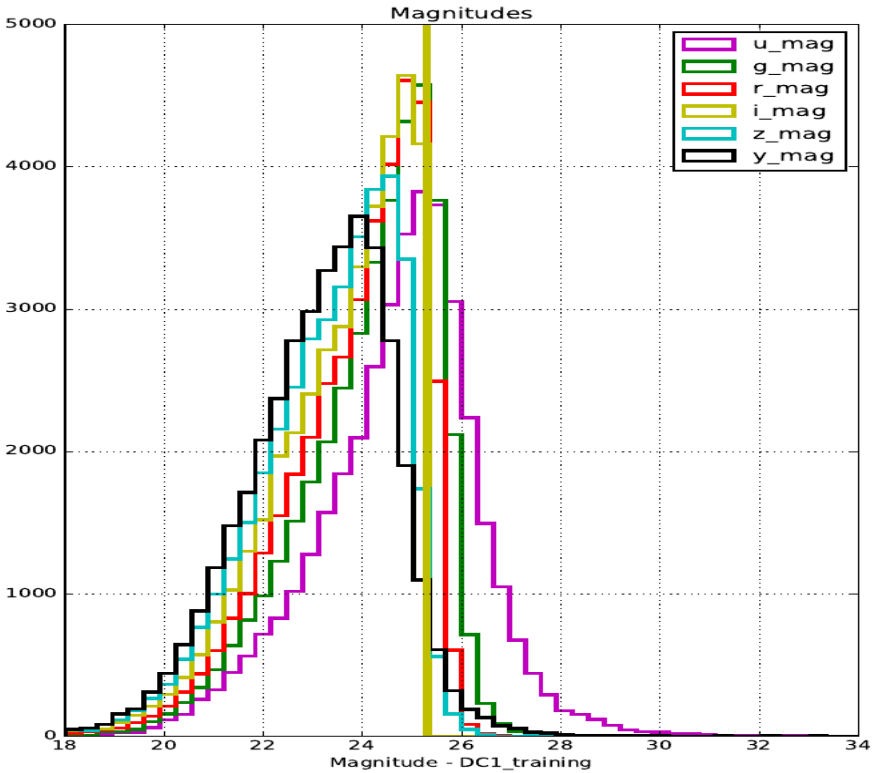


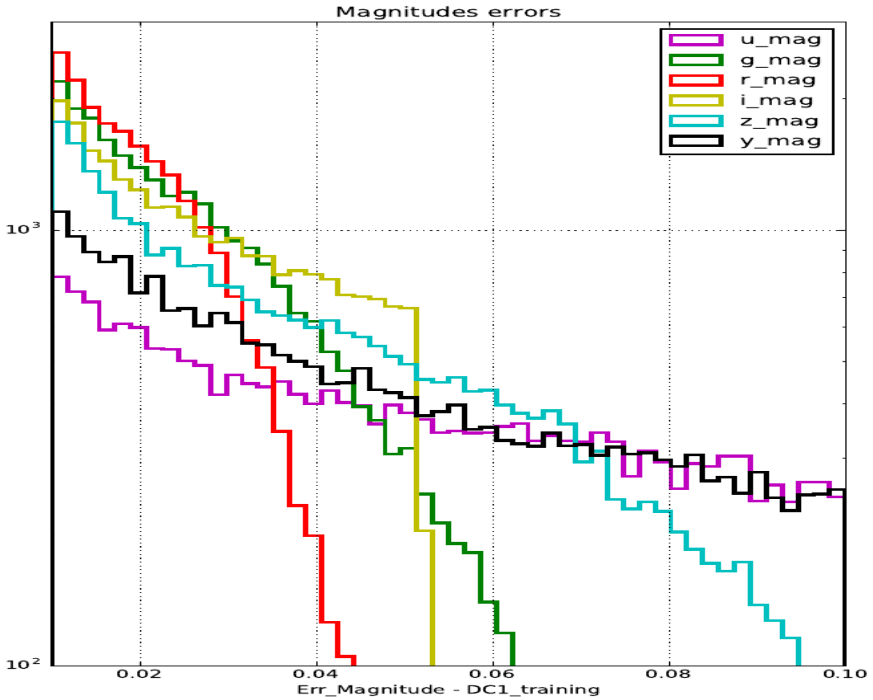


i_mag<25.3 cut applied
111173 objects → 44411 objects after i_mag cut (2.5 ratio)
Final_Buzzard_training_file.out

DC1 – Galacticus training : Magnitudes and Errors

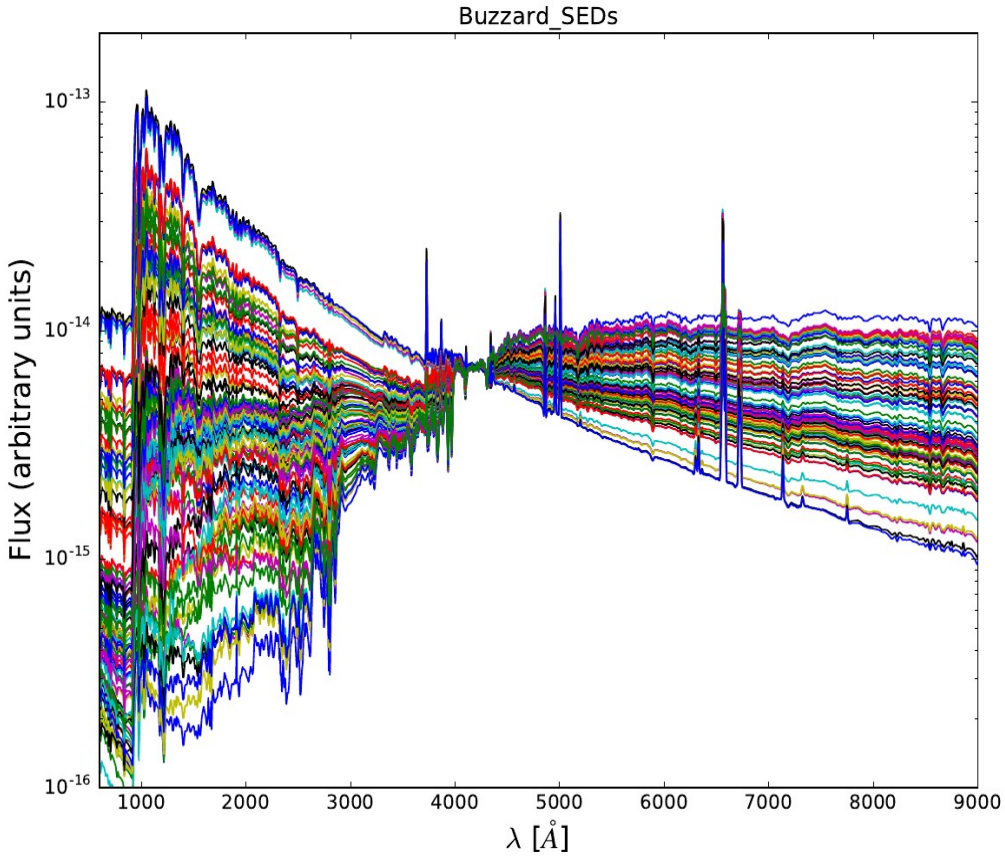


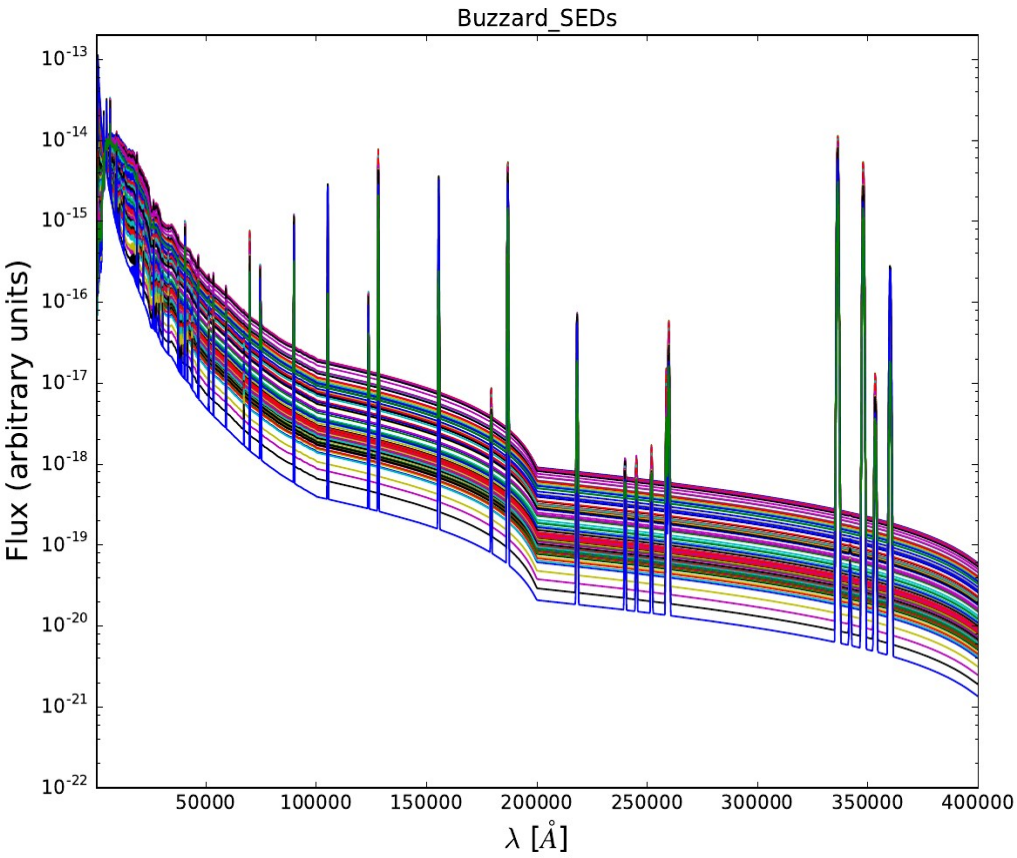




i_mag<25.3 cut applied
317477 objects → 155119 objects after i_mag cut (2.0 ratio)

100 Buzzard SEDs

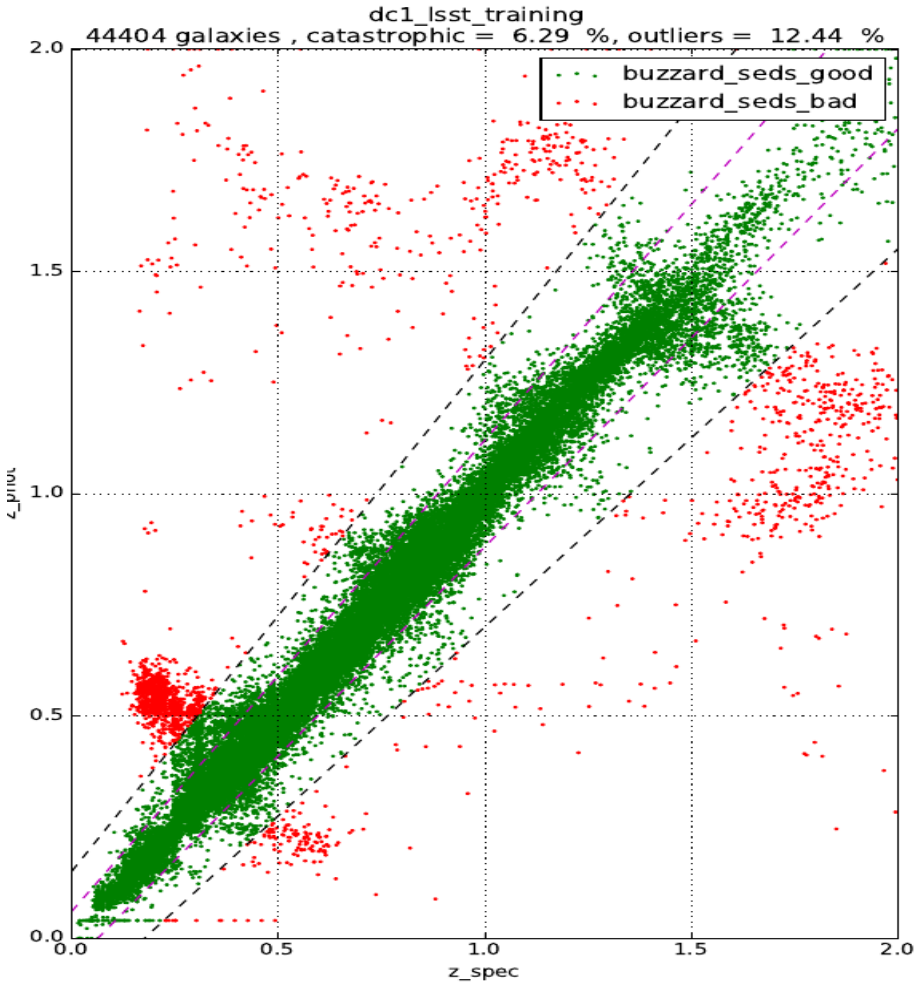


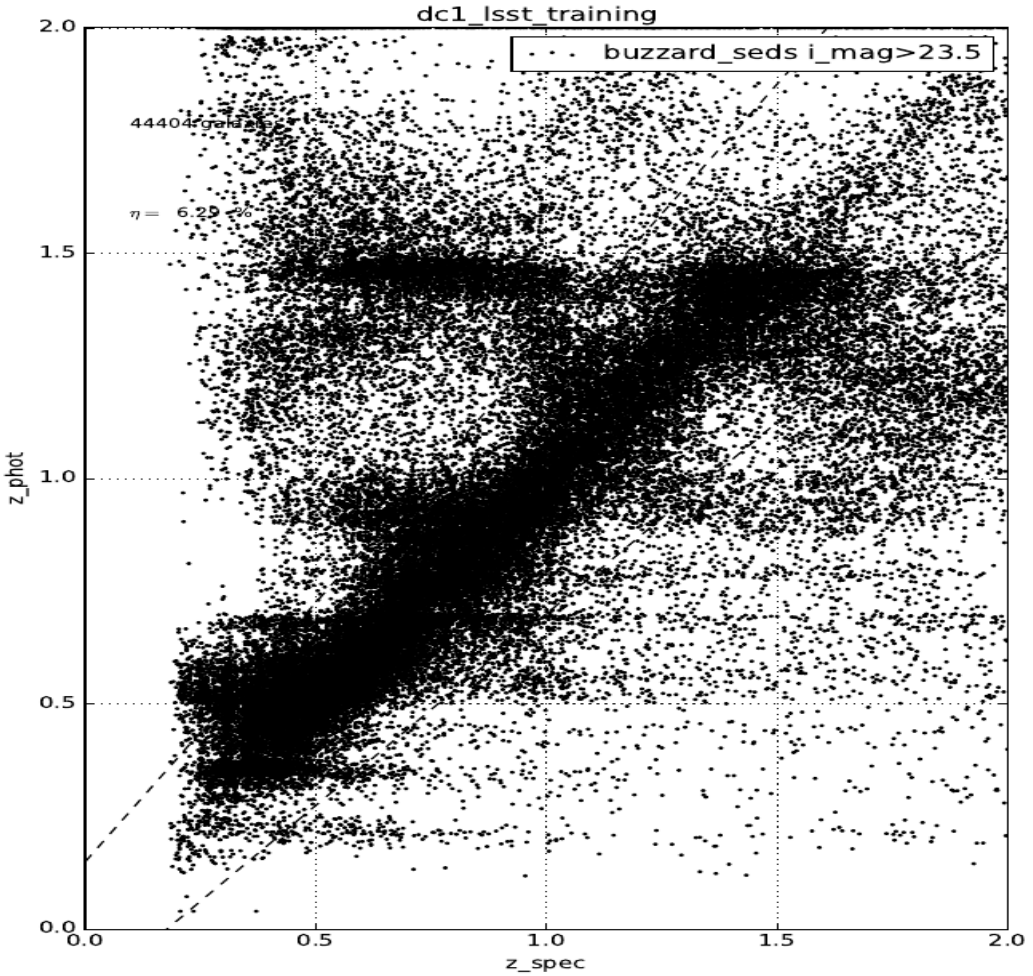


Cut on lambda < 370 000 A needed (max ~ 8000 points for SEDs in LePhare)

DC1 – Buzzard training : z-spec / z_phot
100 Buzzard SEDs

LePhare





i_mag < 25.3

buzzard_seds

$\mathrm{norm} = 3104.1 \pm 19.0248$

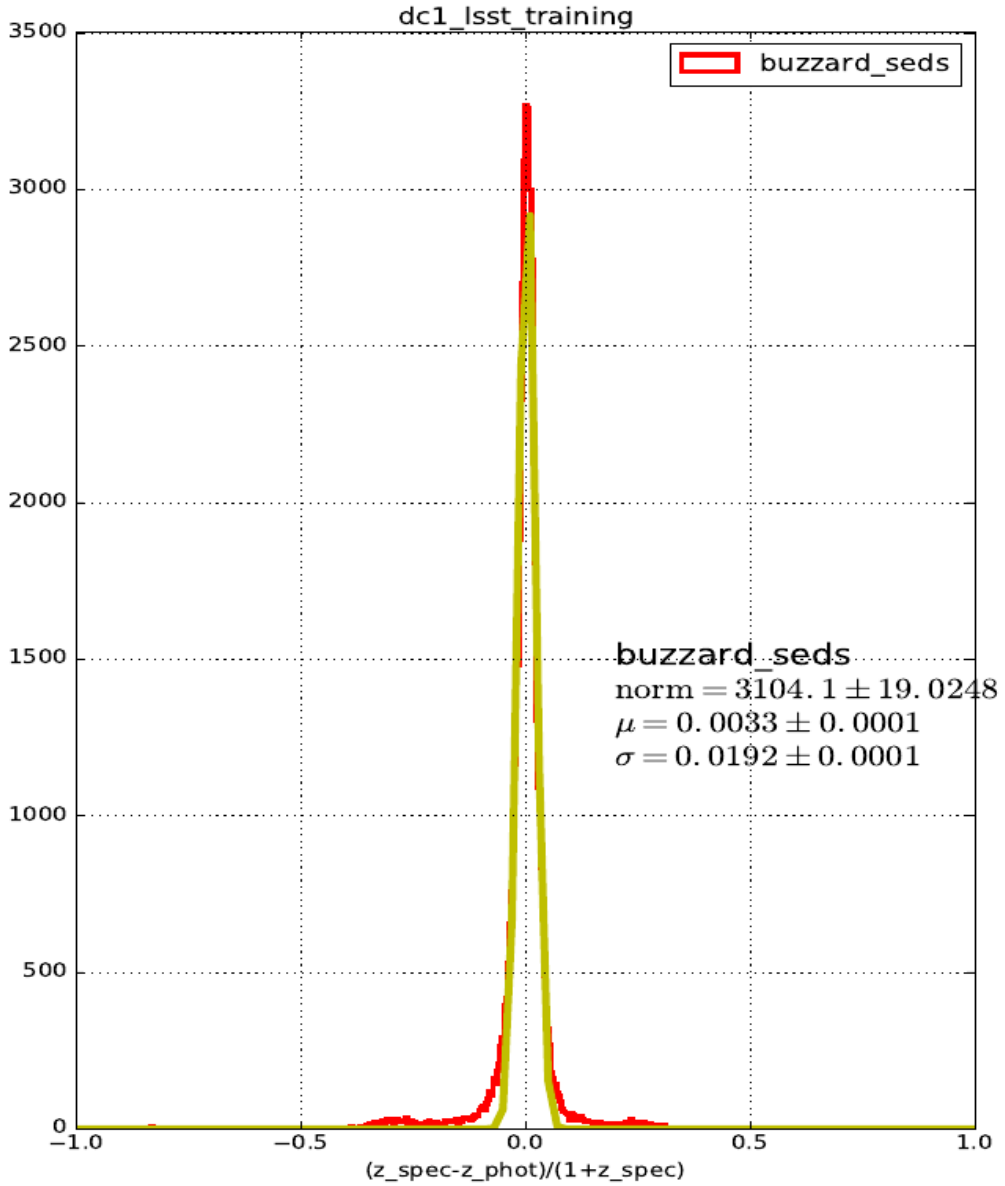
$\mu = 0.0033 \pm 0.0001$

$\sigma = 0.0192 \pm 0.0001$

i_mag > 25.3

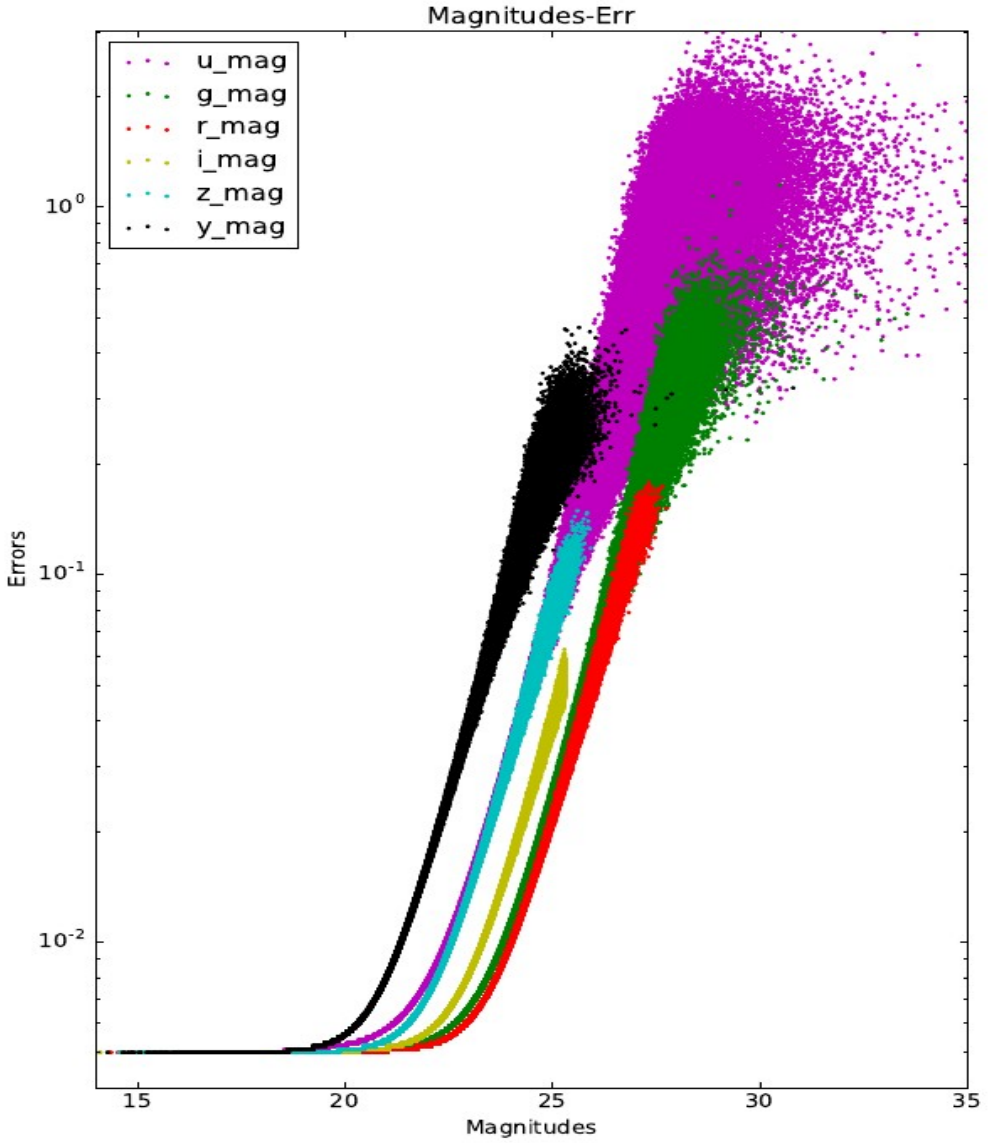
DC1 – Buzzard training : z-spec / z_phot
100 Buzzard SEDs

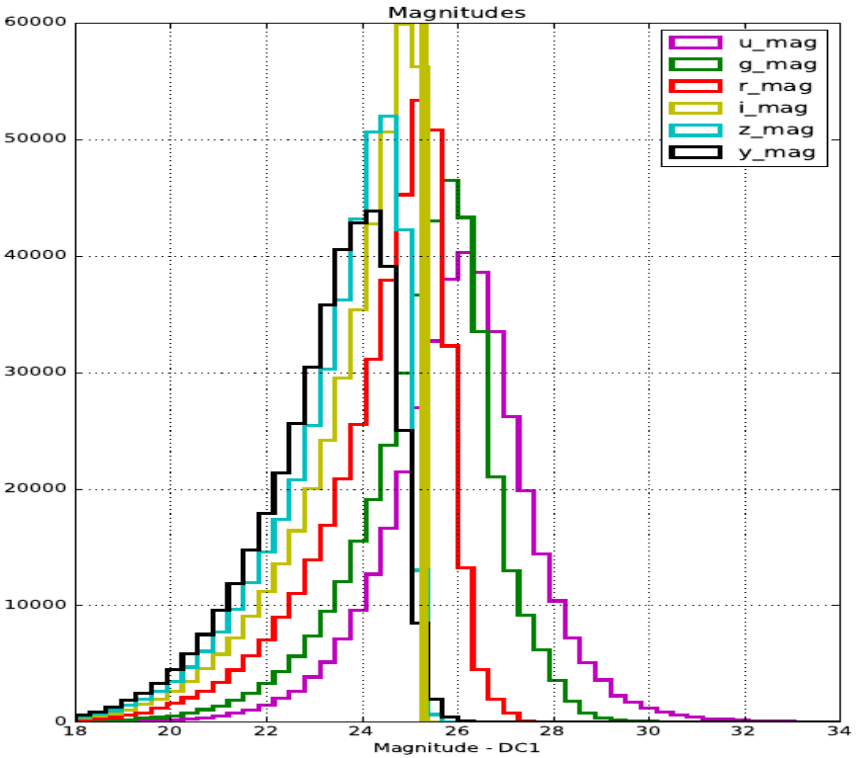
LePhare

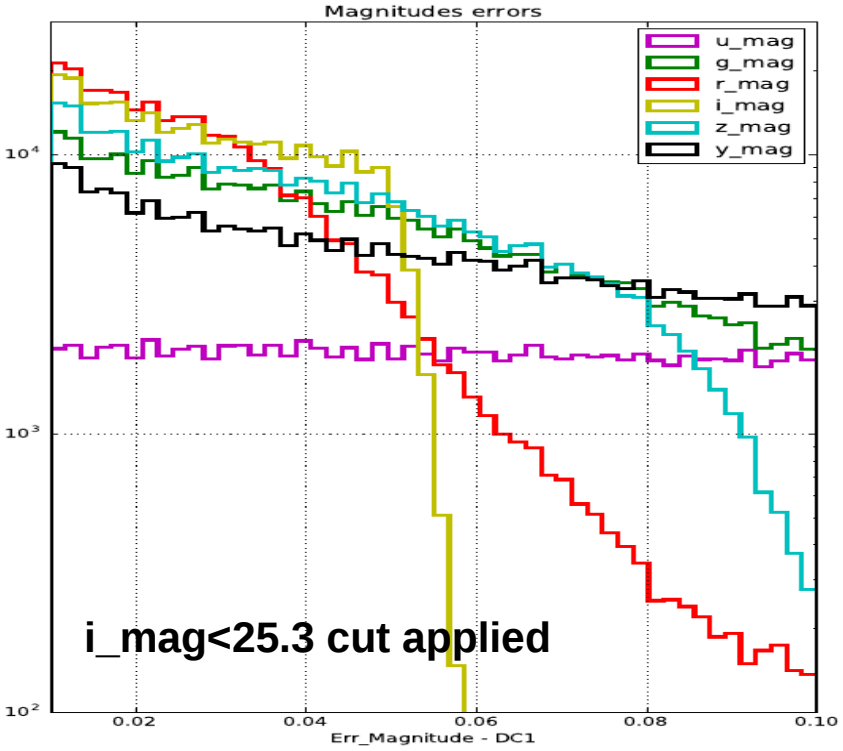


DC1
Buzzard

DC1 – Buzzard : Magnitudes and Errors

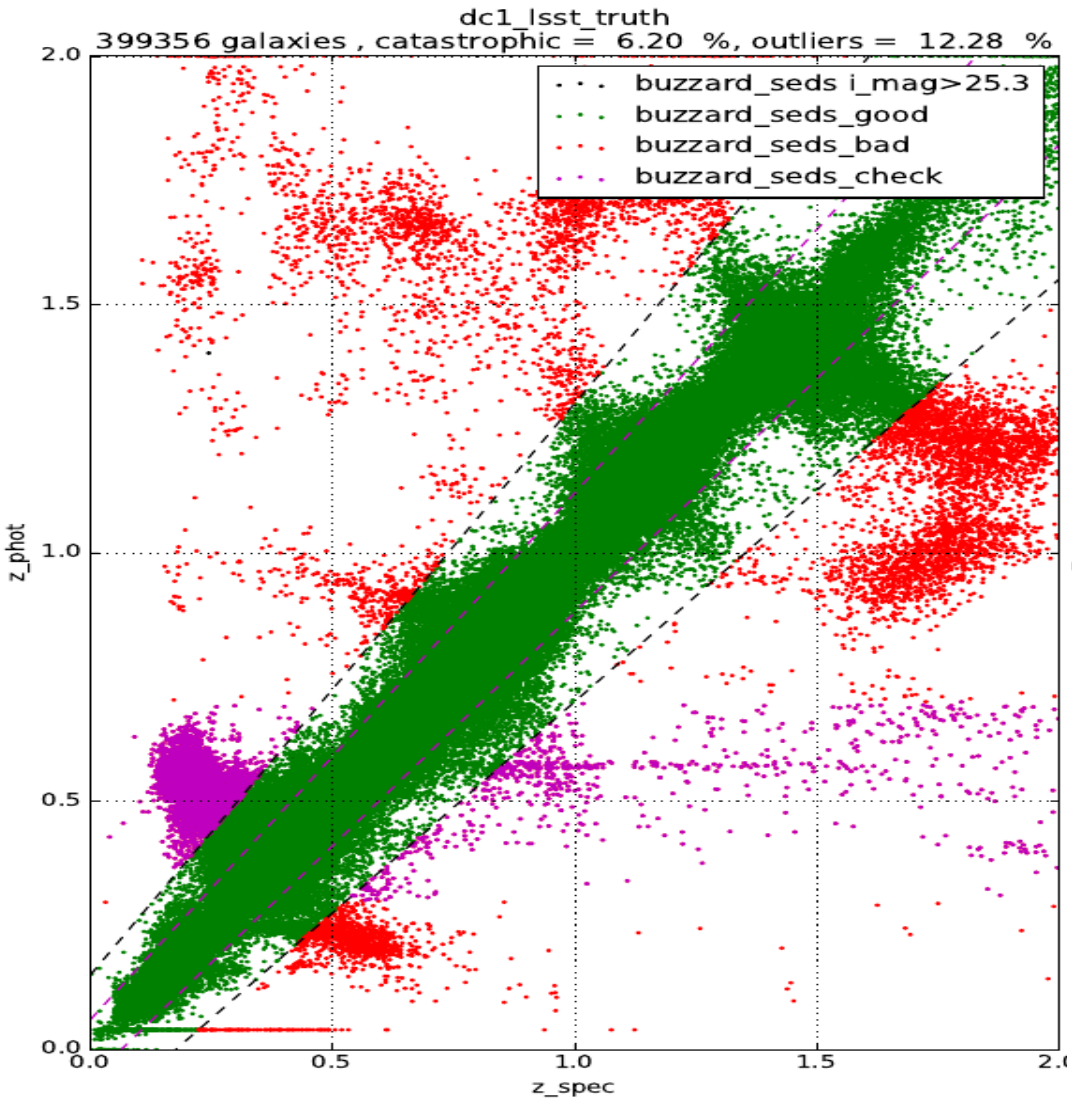


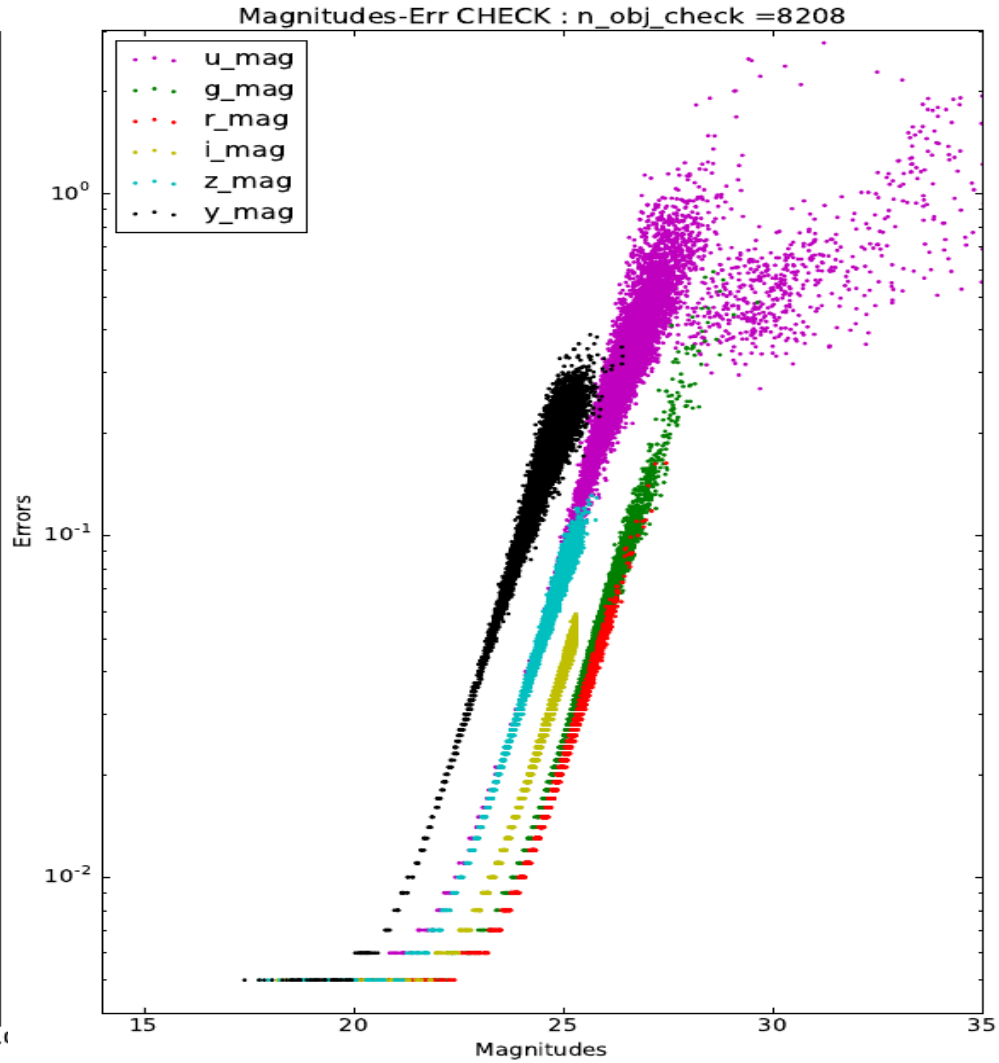




Final_Buzzard_test_file.out
1000885 objects → 399442 after i_mag cut (2.5 ratio)

i_mag<25.3 cut applied


dc1_lsst_truth
399356 galaxies , catastrophic = 6.20 %, outliers = 12.28 %
buzzard_seds i_mag>25.3
buzzard_seds_good
buzzard_seds_bad
buzzard_seds_check
z_phot
z_spec
0.0
0.5
1.0
1.5
2.0


Magnitudes-Err CHECK : n_obj_check =8208
u_mag
g_mag
r_mag
i_mag
z_mag
y_mag
Errors
Magnitudes
10^{0}
10^{-1}
10^{-2}
15
20
25
30
35