Clustering redshift for Euclid

Using Euclid MICE2 simulation

Vivien Scottez (IAP)

Seldner & Peebles (1979)

Phillips & Shanks (1987), Landy, Szalay & Koo (1996)

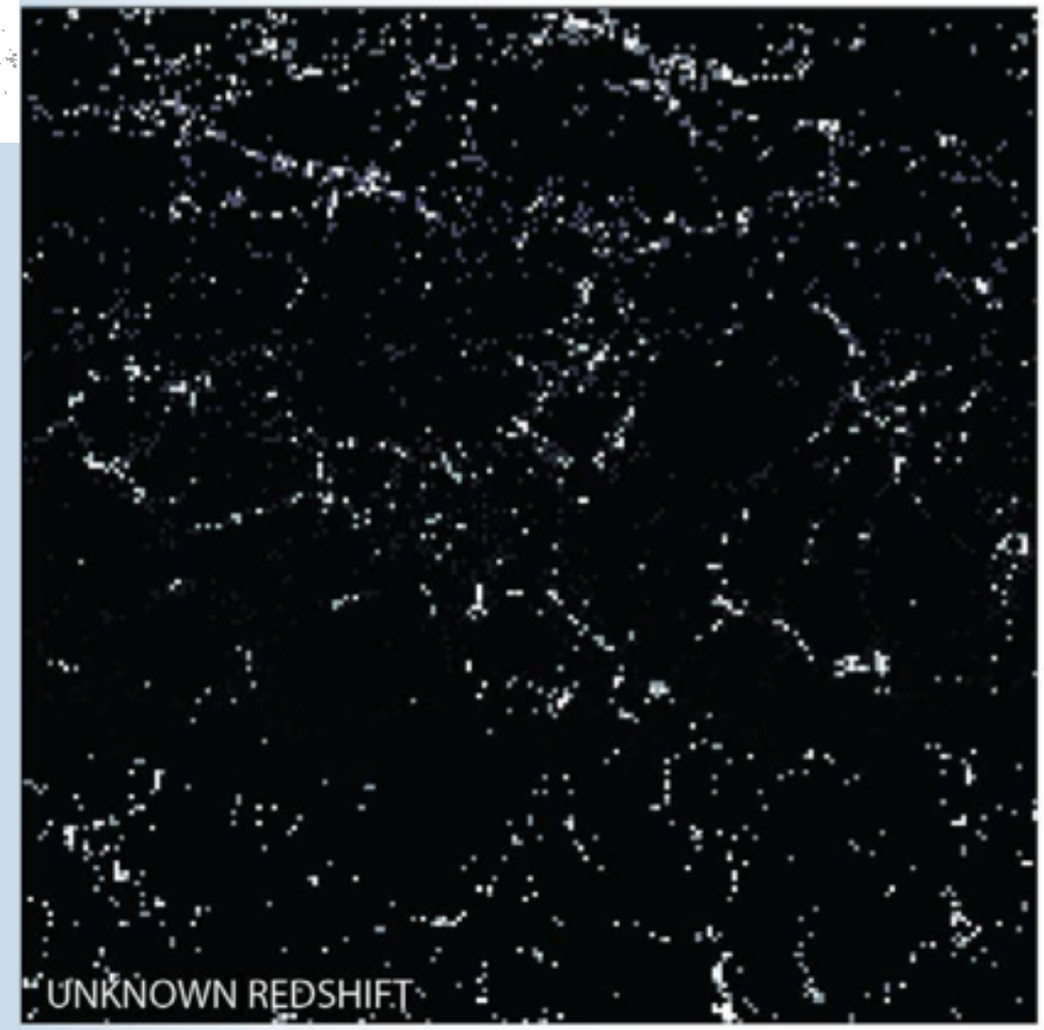
Newman (2008), Matthews & Newman (2010, 2012)
McQuinn & White (2013)

Schmidt et al. (2012), Ménard et al. (2013), Rahman et al. (2015/2016), Hildebrandt et al. (2016)

Scottez et al. (2016) MNRAS, 462, 1683-1696

Clustering Redshifts

Spatial correlation with reference set

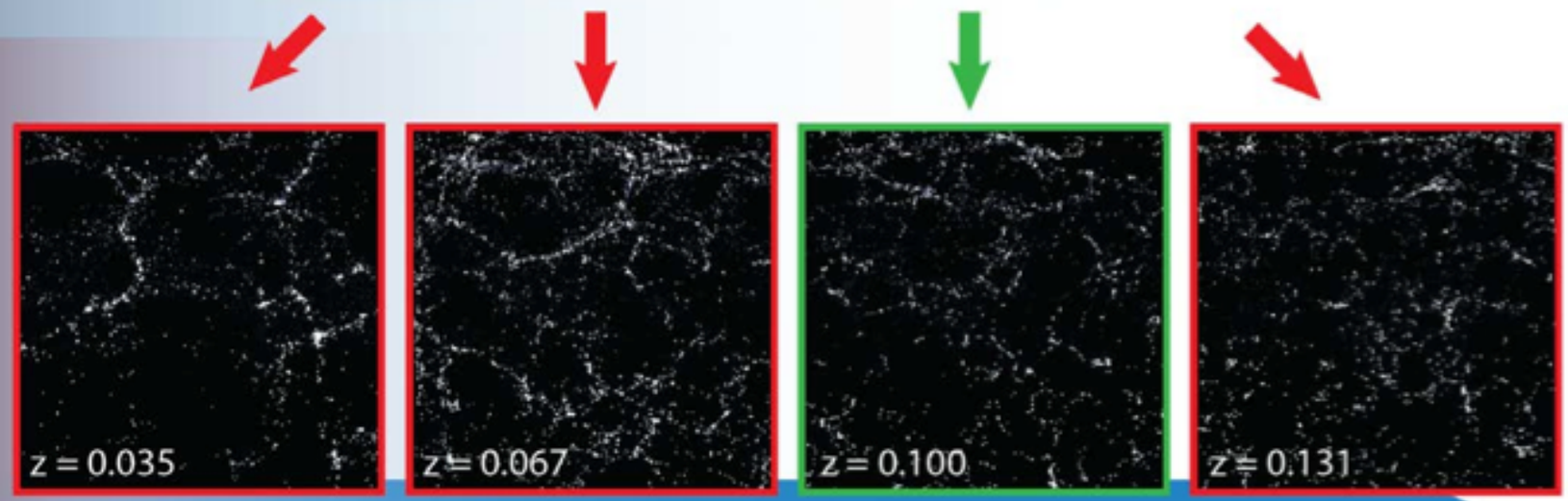


SELECTED SAMPLE

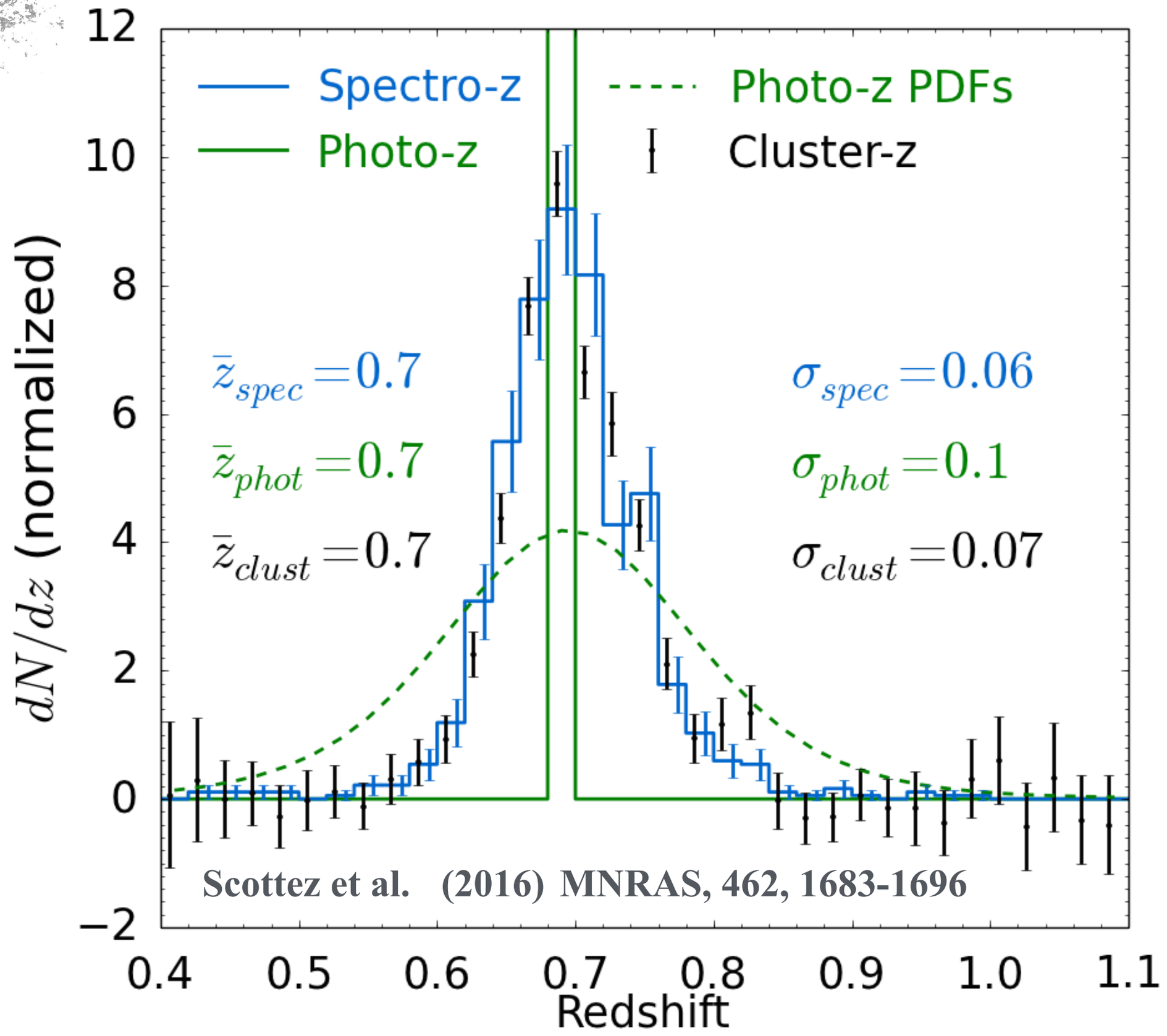
Matching on-sky structure in reference redshift slice with selected (unknown) sample

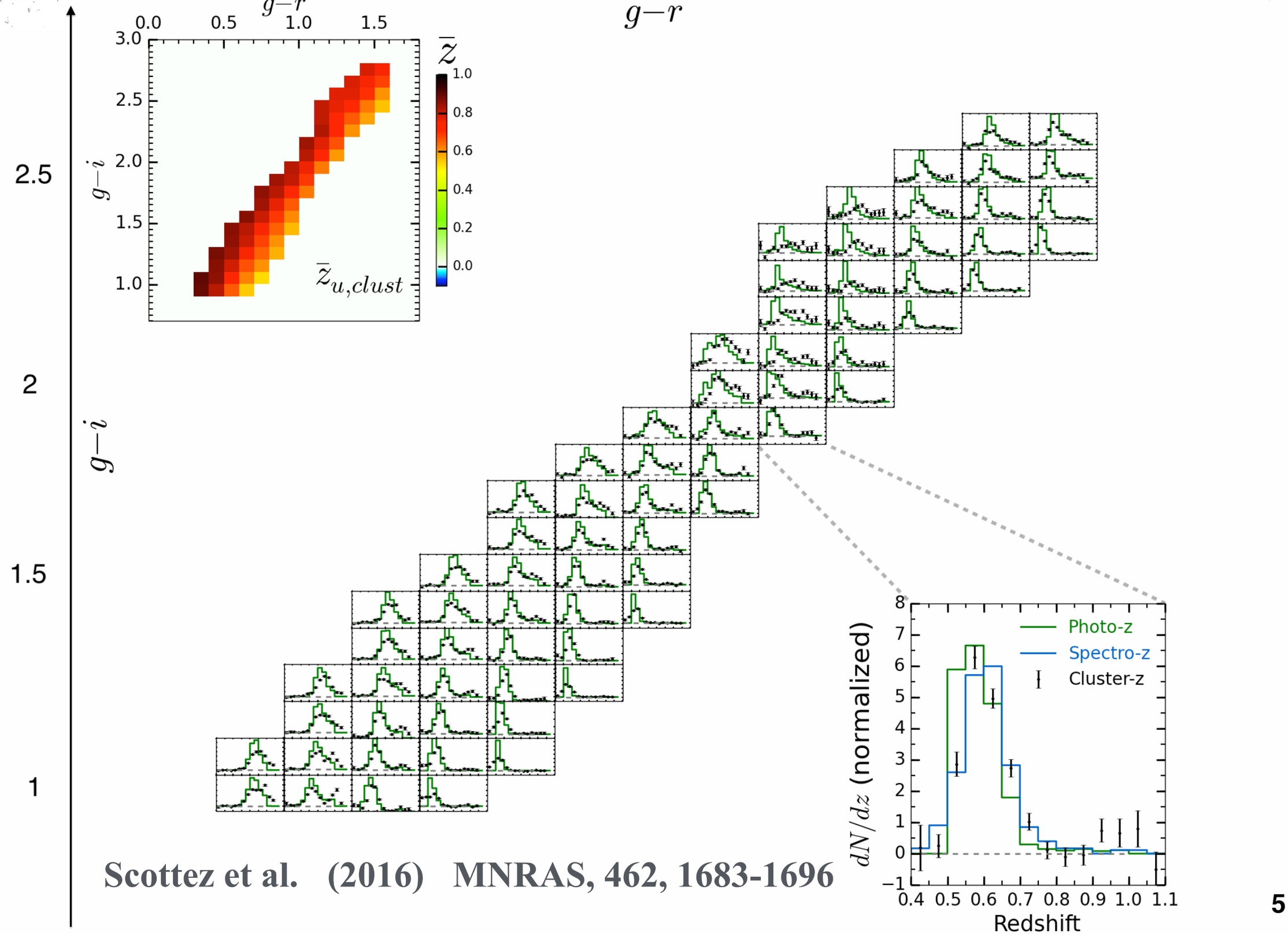
$$\langle \delta_{\mathrm{ref}} \cdot \delta_{\mathrm{unknown}} \rangle$$

Metric: 2-point correlation function



REFERENCE SLICES


Spectro-z
Photo-z
Photo-z PDFs
Cluster-z
$\bar{z}_{spec} = 0.7$
$\bar{z}_{phot} = 0.7$
$\bar{z}_{clust} = 0.7$
$\sigma_{spec} = 0.06$
$\sigma_{phot} = 0.1$
$\sigma_{clust} = 0.07$
Scottez et al. (2016) MNRAS, 462, 1683-1696
dN/dz (normalized)
Redshift
12
10
8
6
4
2
0
−2
0.4
0.5
0.6
0.7
0.8
0.9
1.0
1.1



Scottez et al. (2016) MNRAS, 462, 1683-1696

Euclid MICE2 simulation

- Hibrid HOD and HAM simulation

- ~ 500M galaxies from $0.07 < z < 1.4$ over 5 000 deg^2

- We choose to focus on 100 deg^2

  → ~ 8M objects

  Perfect photometry !

Data selection 1

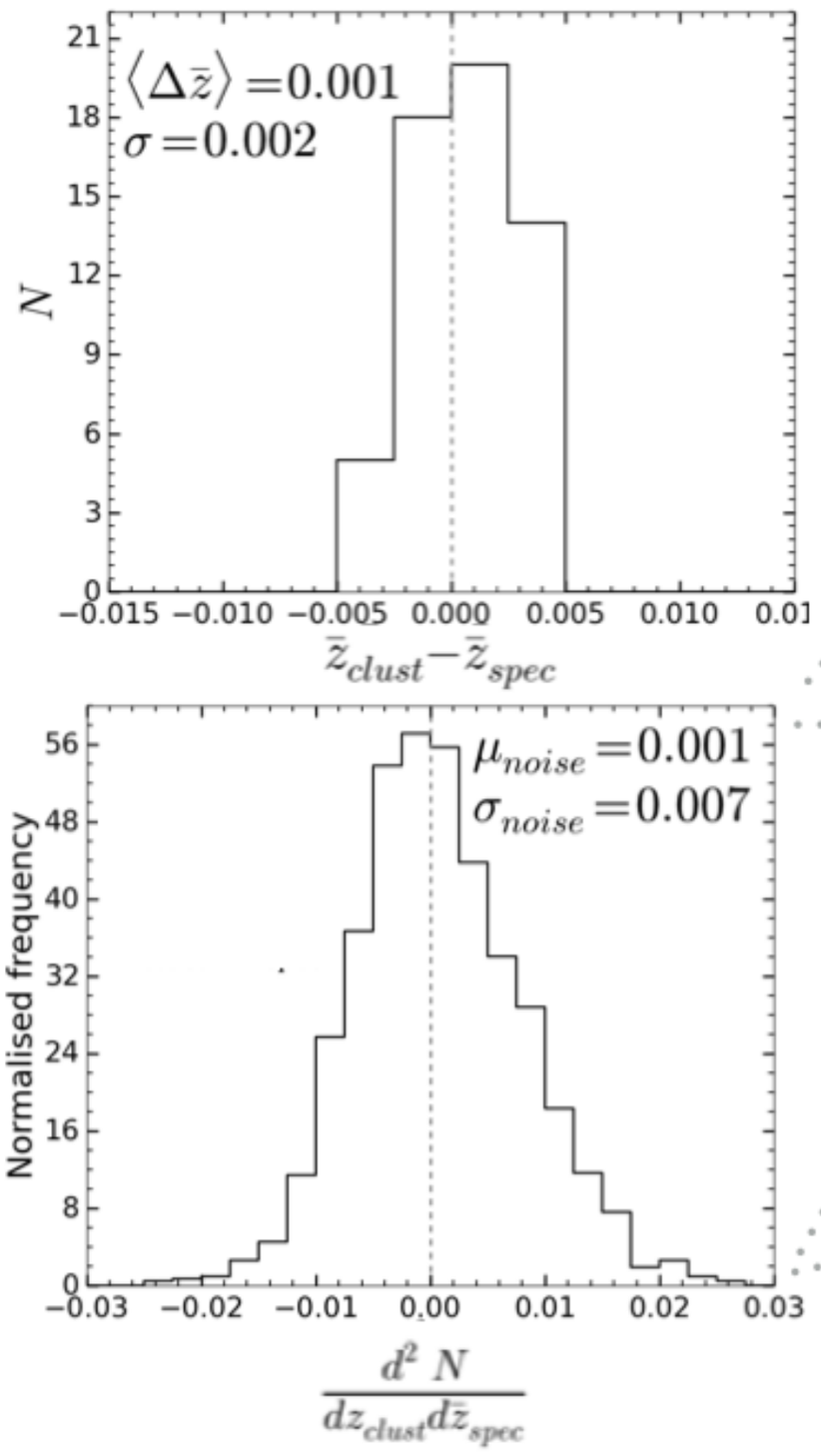
Reference sample

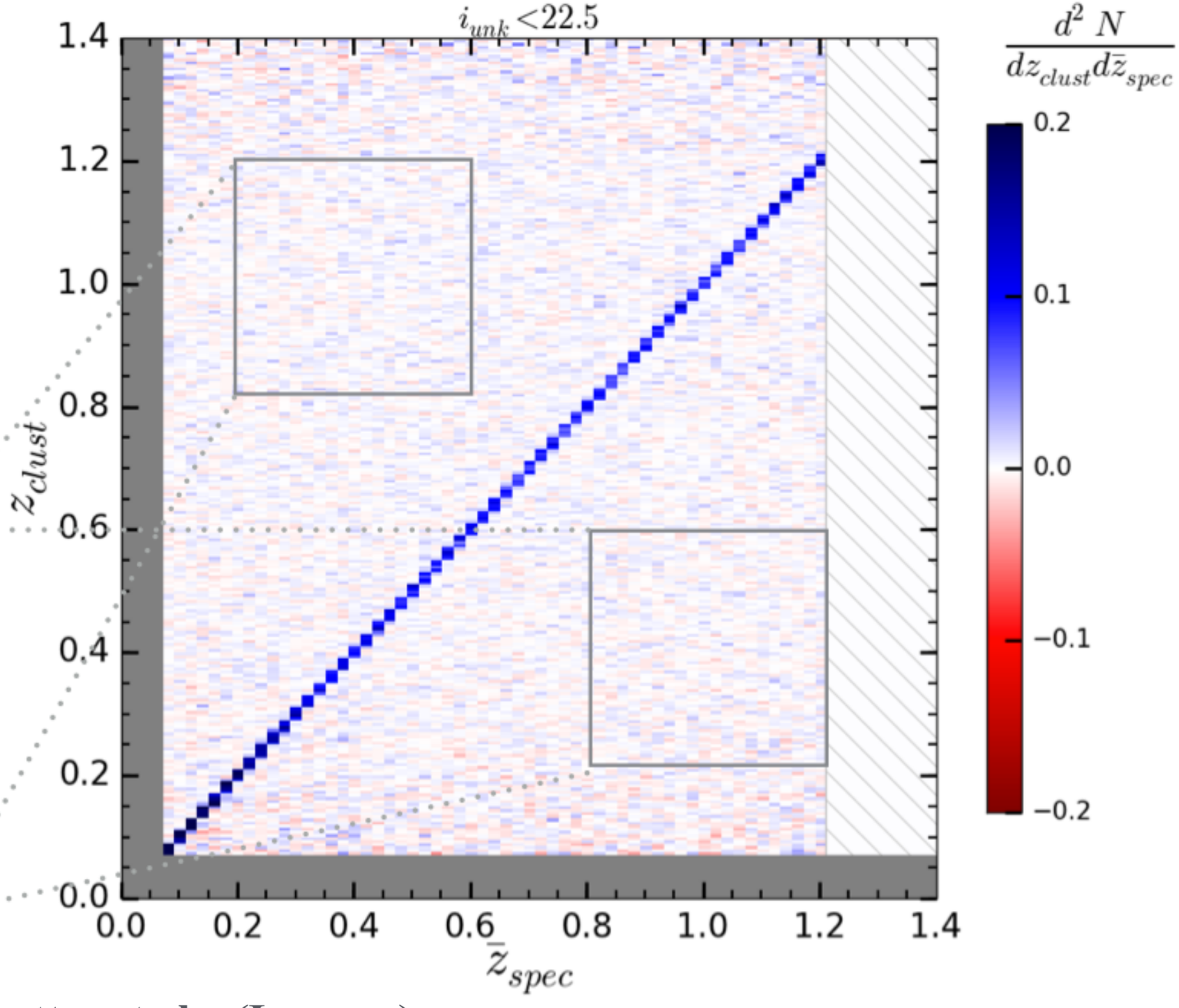
- 200k sources
  i < 22.5

Unknown sample

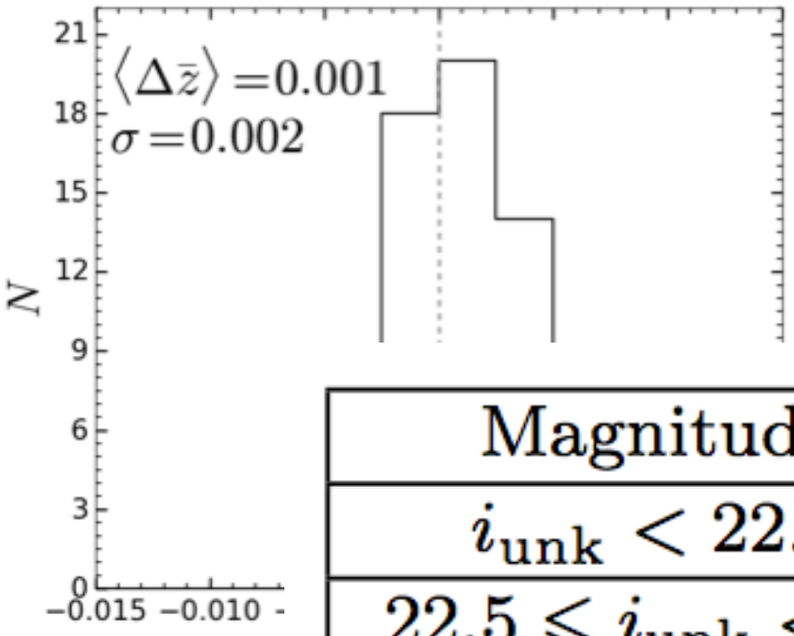
- ~ 114k galaxies
  i<22.5

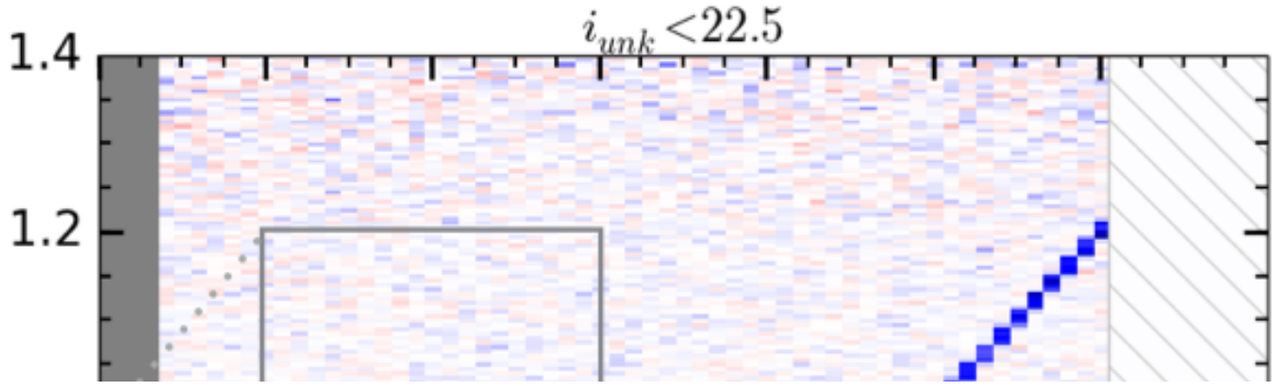
→ Samples are selected on their spec-z

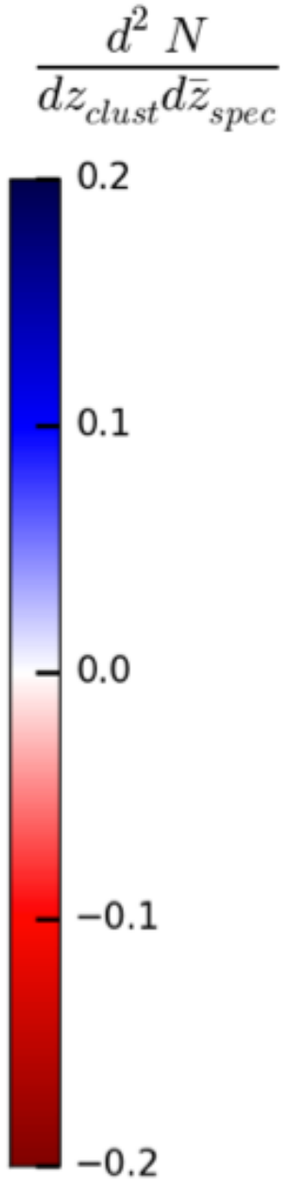




Scottez et al. (In prep.)







Magnitude	$\langle \Delta\bar{z} \rangle$	σ	$\mu_{\rm noise}$	$\sigma_{\rm noise}$
$i_{\rm unk} < 22.5$	0.001	0.002	0.001	0.007
$22.5 \leqslant i_{\rm unk} < 23$	0.001	0.002	0.001	0.007
$23 \leqslant i_{\rm unk} < 23.5$	0.001	0.002	0.001	0.007
$23.5 \leqslant i_{\rm unk} < 24$	0.001	0.002	0.001	0.007
$24 \leqslant i_{\rm unk} < 24.5$	0.001	0.002	0.001	0.008
$24.5 \leqslant i_{\rm unk} < 25$	0.001	0.002	0.001	0.007

Scottez et al. (In prep.)

Data selection 2

Reference sample

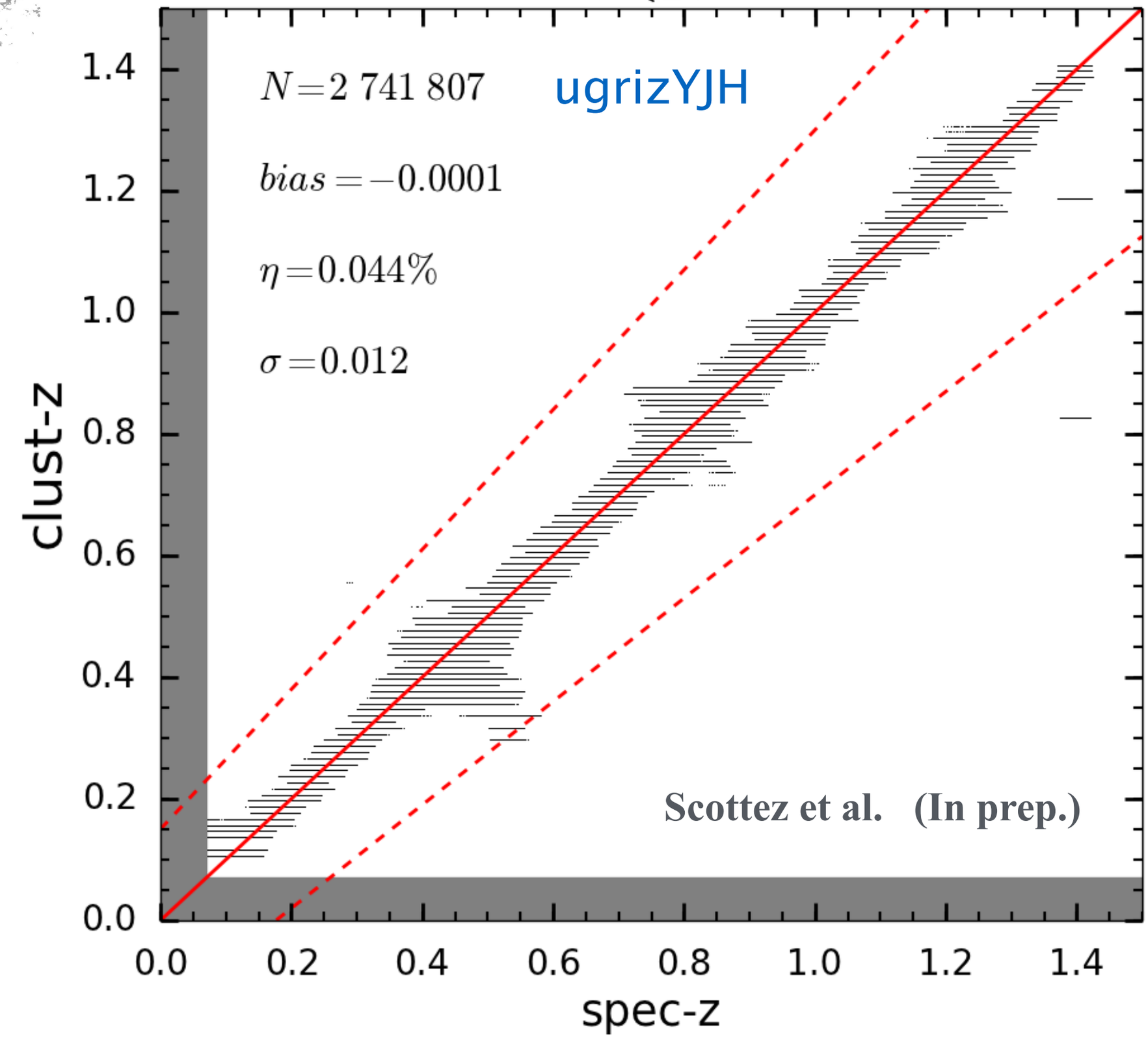
- 200k sources
  i < 22.5

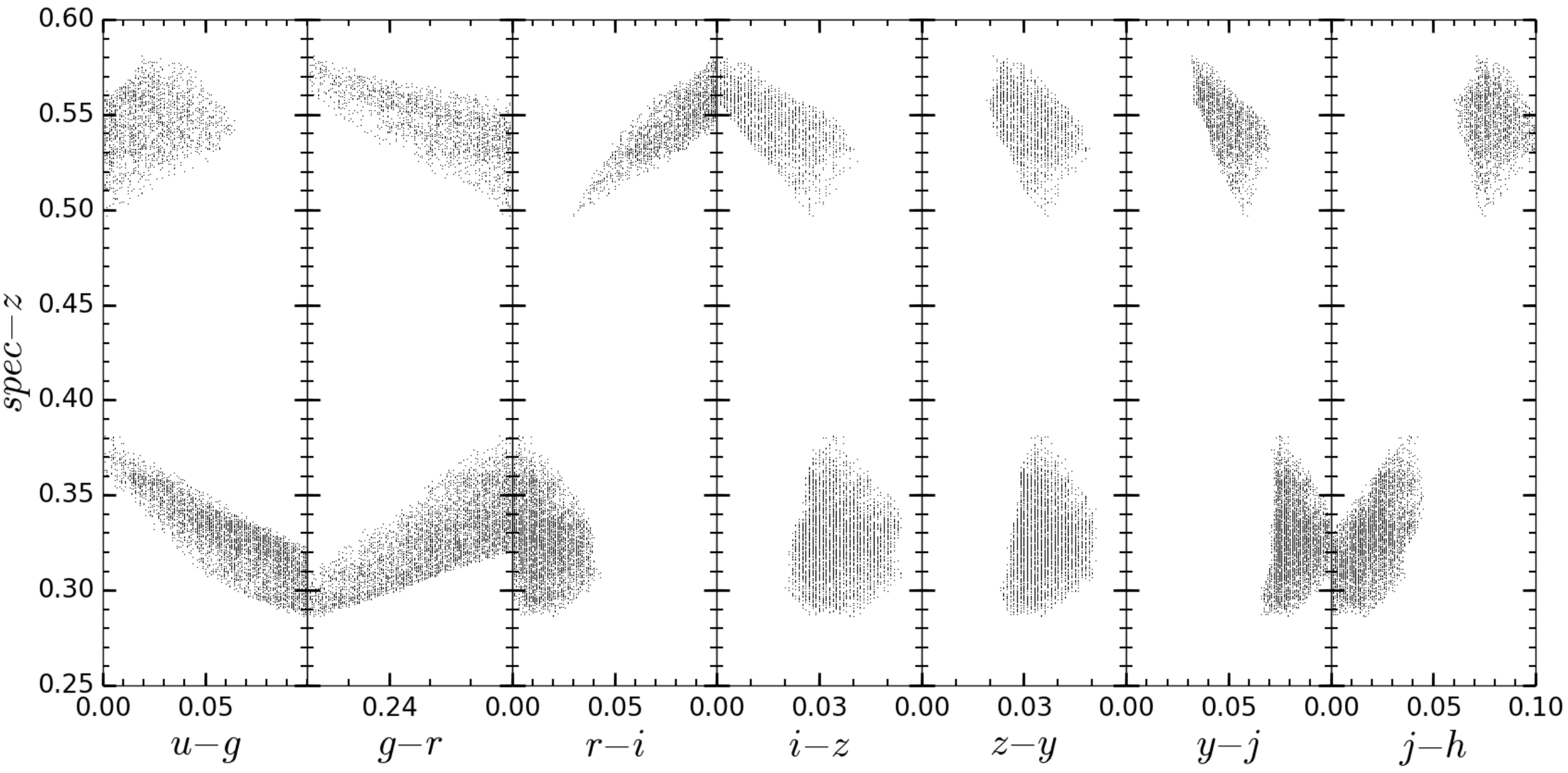
Unknown sample

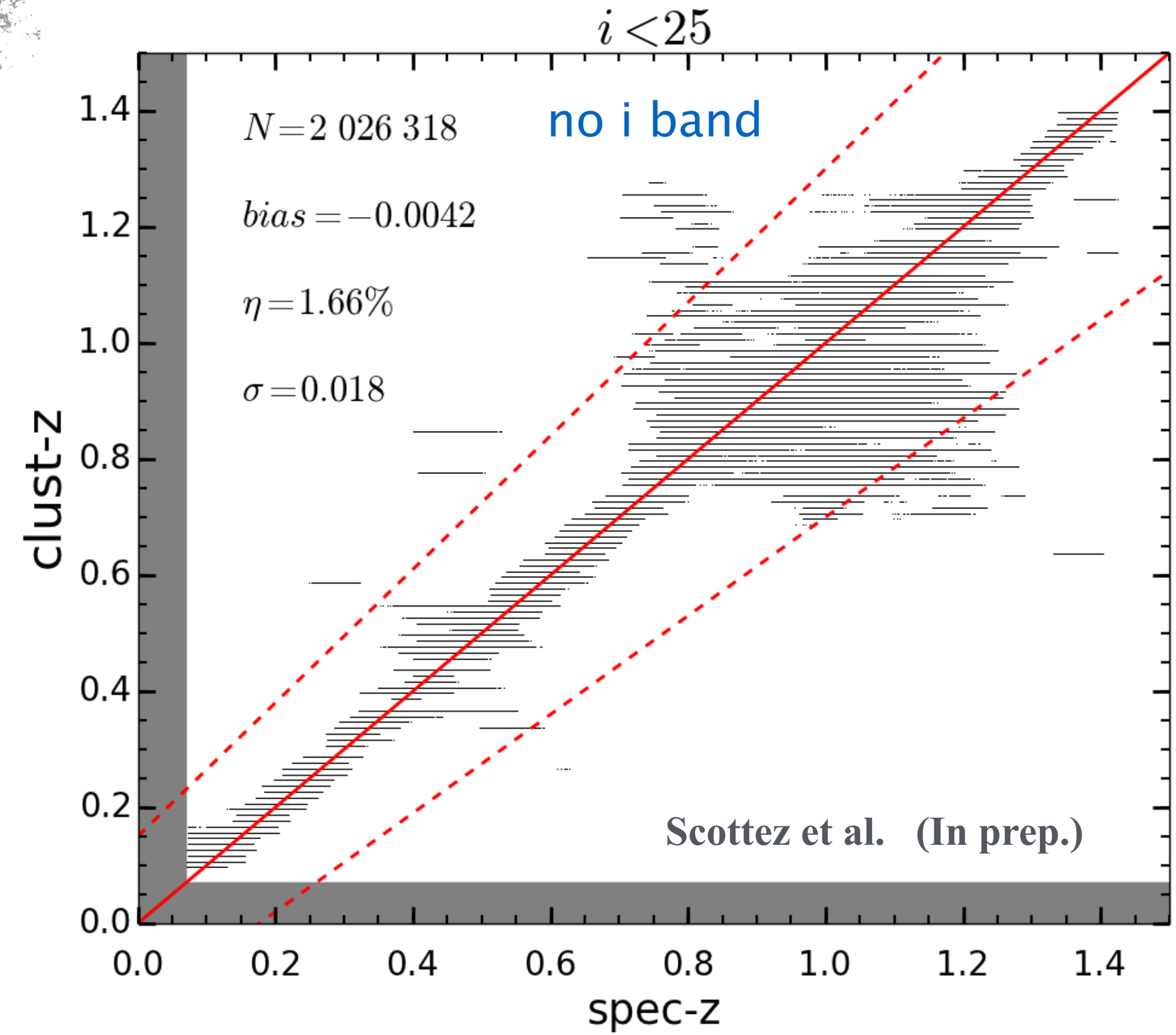
- ~ 3.4M Spr
  i < 25

- Both samples have:
  u, g, r, i, z, Y, J, H + morphologie (bulge/disk)

→ We split the unknown sample in:
u–g, g–r, r–i, i–z, z–Y, Y–J, J–H With $\triangle_{col}$=0.1
+ Ell/Spr separation


$i<25$
$N=2\ 741\ 807$
ugrizYJH
$bias=-0.0001$
$\eta=0.044\%$
$\sigma=0.012$
Scottez et al. (In prep.)
clust-z
spec-z
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4


0.60
0.55
0.50
0.45
0.40
0.35
0.30
0.25
$spec-z$
0.00
0.05
0.24
0.00
0.05
0.00
0.03
0.00
0.03
0.00
0.05
0.00
0.05
0.10
$u-g$
$g-r$
$r-i$
$i-z$
$z-y$
$y-j$
$j-h$


$i<25$
$N=2\ 026\ 318$
$bias=-0.0042$
$\eta=1.66\%$
$\sigma=0.018$
no i band
Scottez et al. (In prep.)
clust-z
spec-z
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4

Summary

- Cluster-z do not depend on magnitude
- The method do not have huge intrinsic bias

Limitations:

- Perfect photometry
- Z range to 1.4

What's next ?

- Add realistic error on magnitudes
- Application to Ell