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UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

Angular power spectrum and cosmological constrains using photometric redshifts

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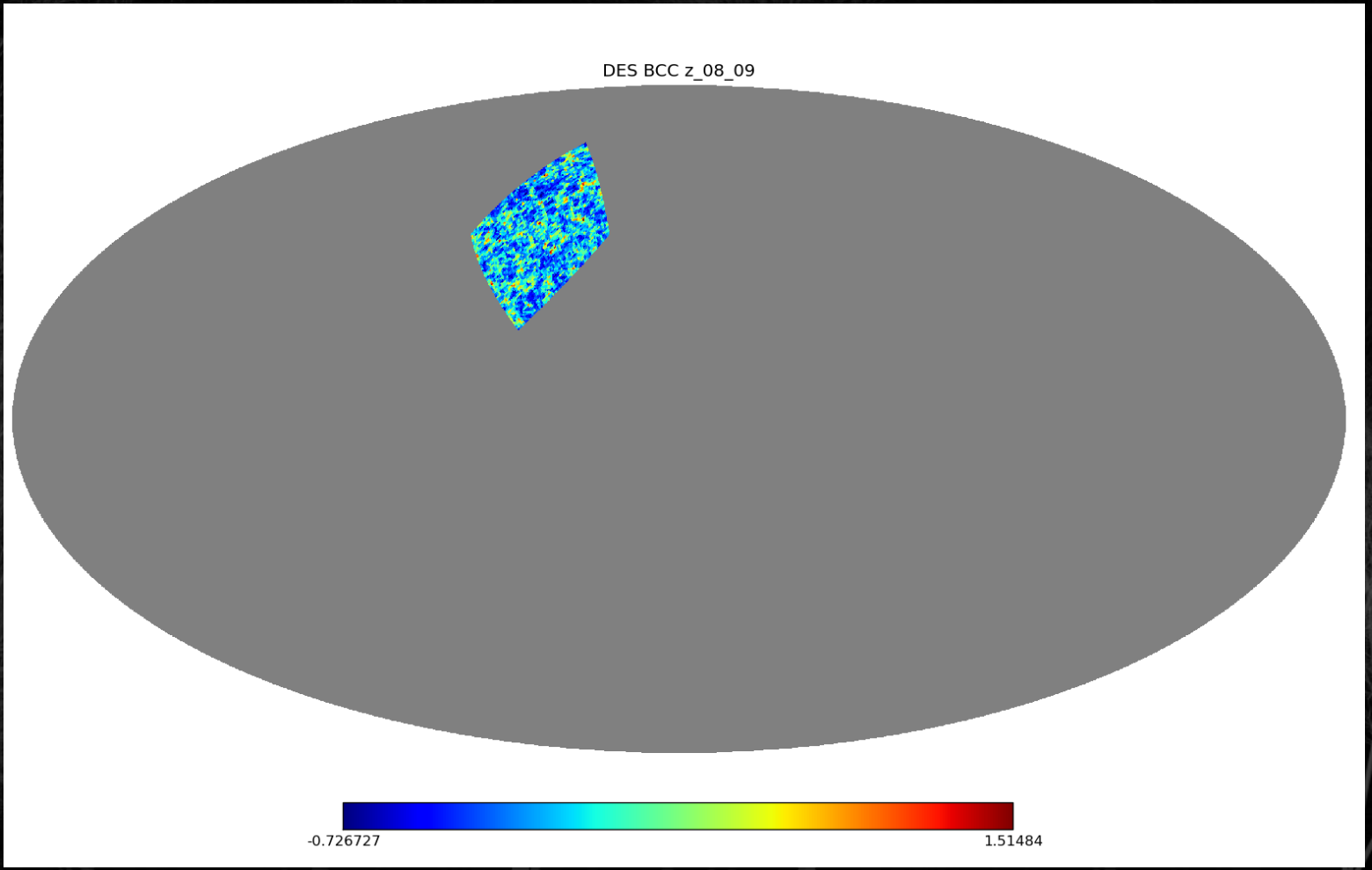
DES Ardvark v.05 data (BCC)

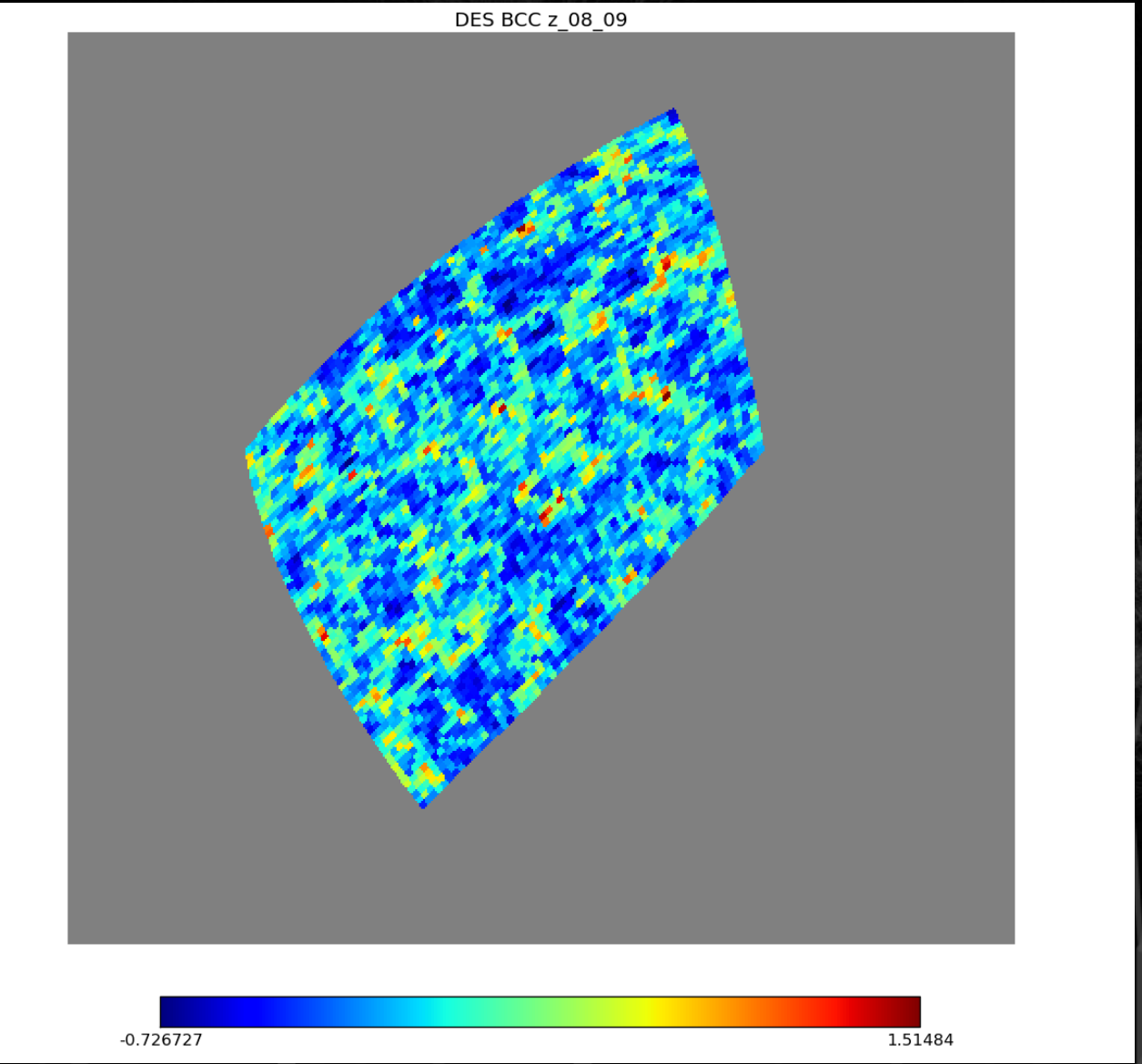
Latest BCC catalog

Overdensity maps



DES Ardvark v.05 data (BCC)

- $\sim$ 43 million galaxies with z between 0 and 1.5
- 4096 Healpix "pixels" (nside=128)
- rotated frame from DES footprint to matches healpix scheme
- $\sim$ 830 sq degrees
- ... so far



Photometric redshift PDFs using TPZ

We use TPZ (Carrasco Kind & Brunner, 2013a) to generate photo-z for all galaxies.

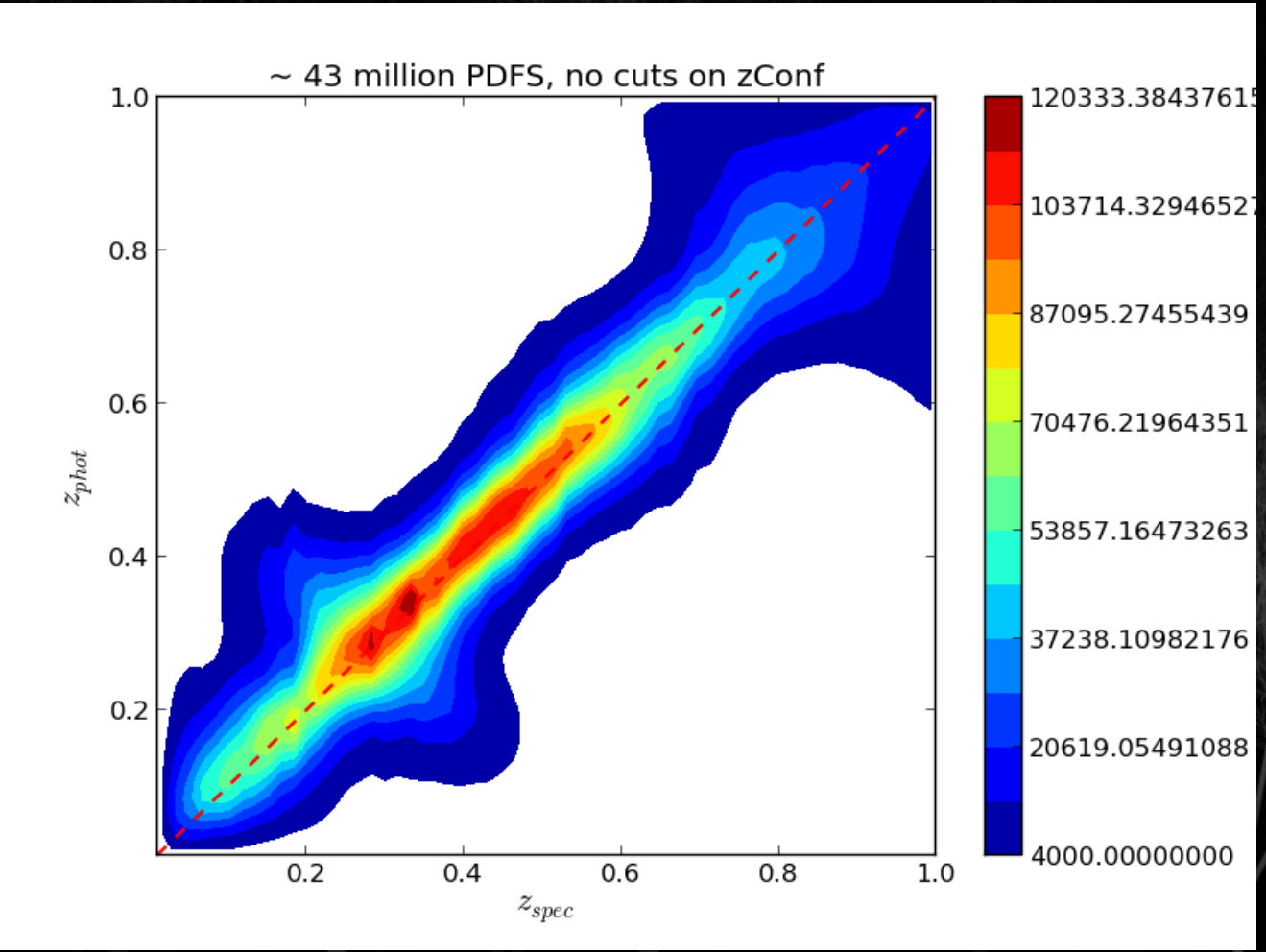
100,00 for training

5 magnitudes only

$\sim$ 0.17 sec per PDF

Store 43 million PDFs for analysis

No outlier removal



Photometric redshift PDFs using TPZ

Metrics

$(\Delta z = z_{phot} - z_{spec})$

$< \Delta z >= 0.0088$

$< |\Delta z| >= 0.089$

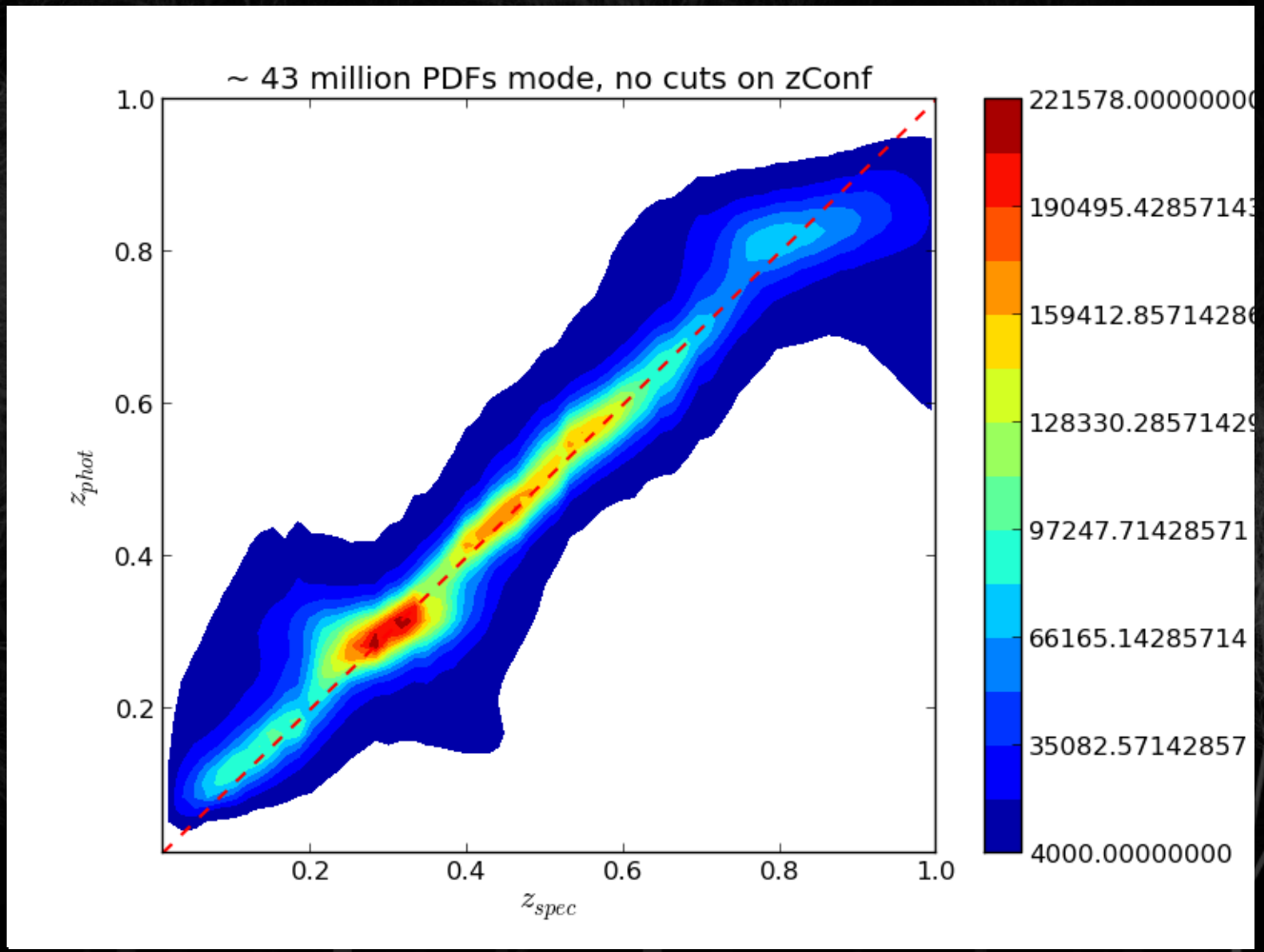
$\sigma_{\Delta z} = 0.1421$

$\sigma_{|\Delta z|} = 0.1109$

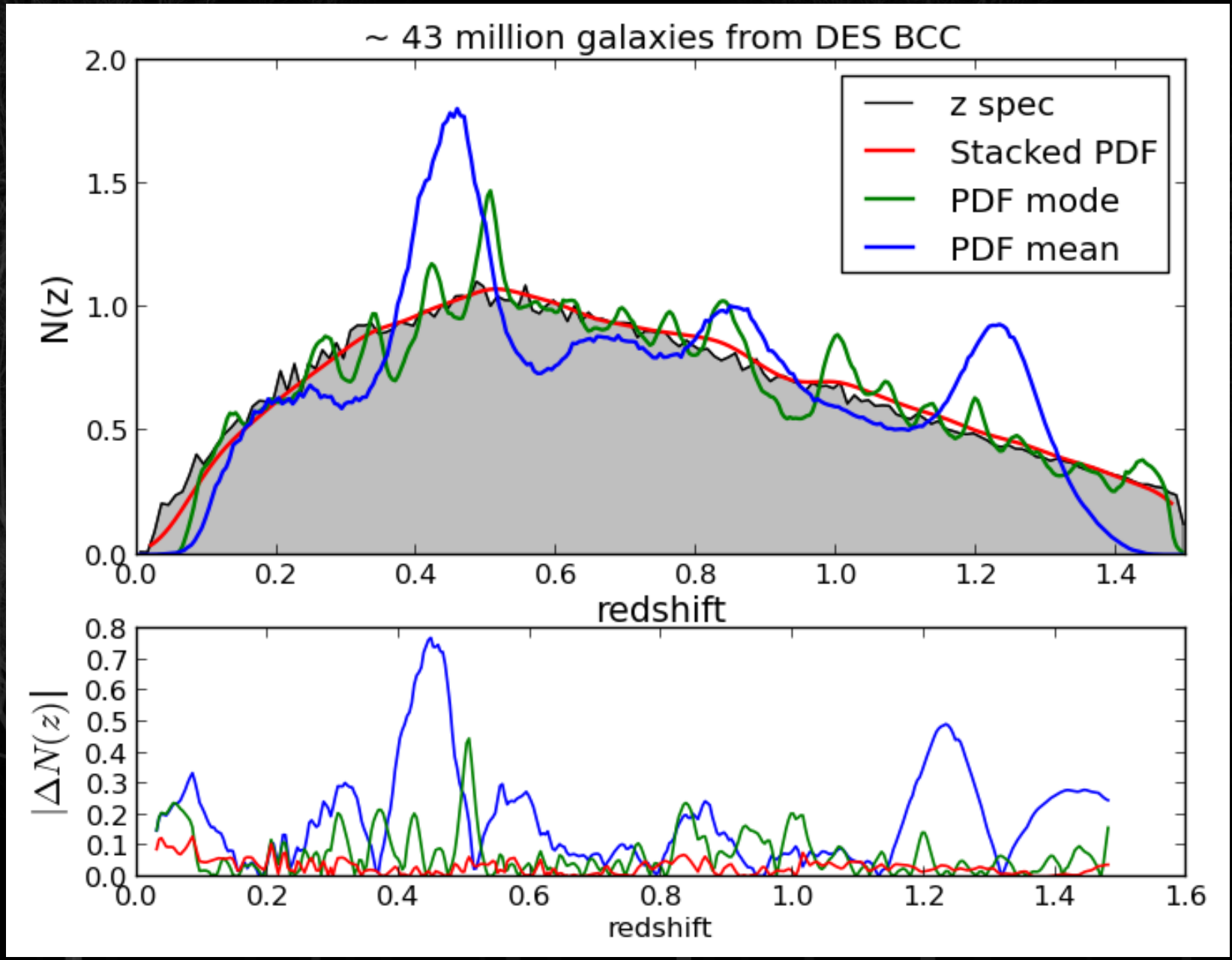
$\sigma_{68} = 0.0885$

$frac > 2\sigma = 0.0531$

$frac > 3\sigma = 0.0207$



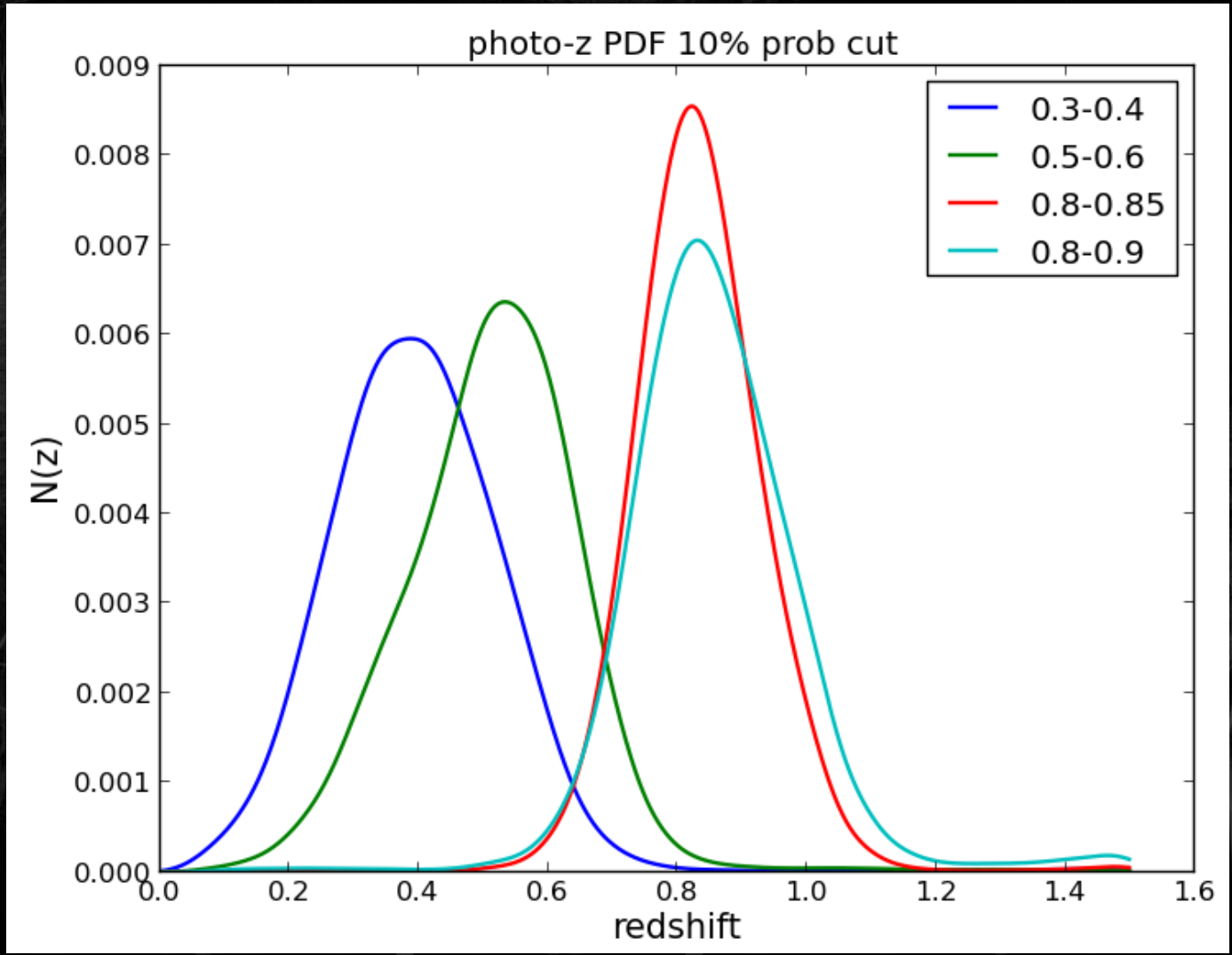
N(z) using PDFs computed by TPZ



Also in redshift shells

We consider only PDF with at least 10% of its area inside redshift shell

N(z) and overdensities from stacked PDFs



Computing C_ℓ

- Quadratic estimation with Karhunen - Loève compression on the overdensity maps(Hayes, Brunner & Ross, 2013)
- Bandwidth $\Delta\ell \sim \frac{180}{\phi}$
- Computational expensive, $t \sim (n_p)^3$ and $m \sim (n_p)^2$
- Usually $\ell_{max} \sim 3 \times N_{side}$
- We use $\Delta\ell = 11$ and $\ell_{max} \sim 350$

Modeling C_ℓ

Limber approximation with no redshift-space distortions and scale-independent bias b:

$$C_\ell = \frac{\ell(\ell+1)}{2\pi} b^2 \int dz \phi^2(z) \frac{H(z)}{r^2(z)} P\left(\frac{\ell+1/2}{r(z)}, z\right)$$

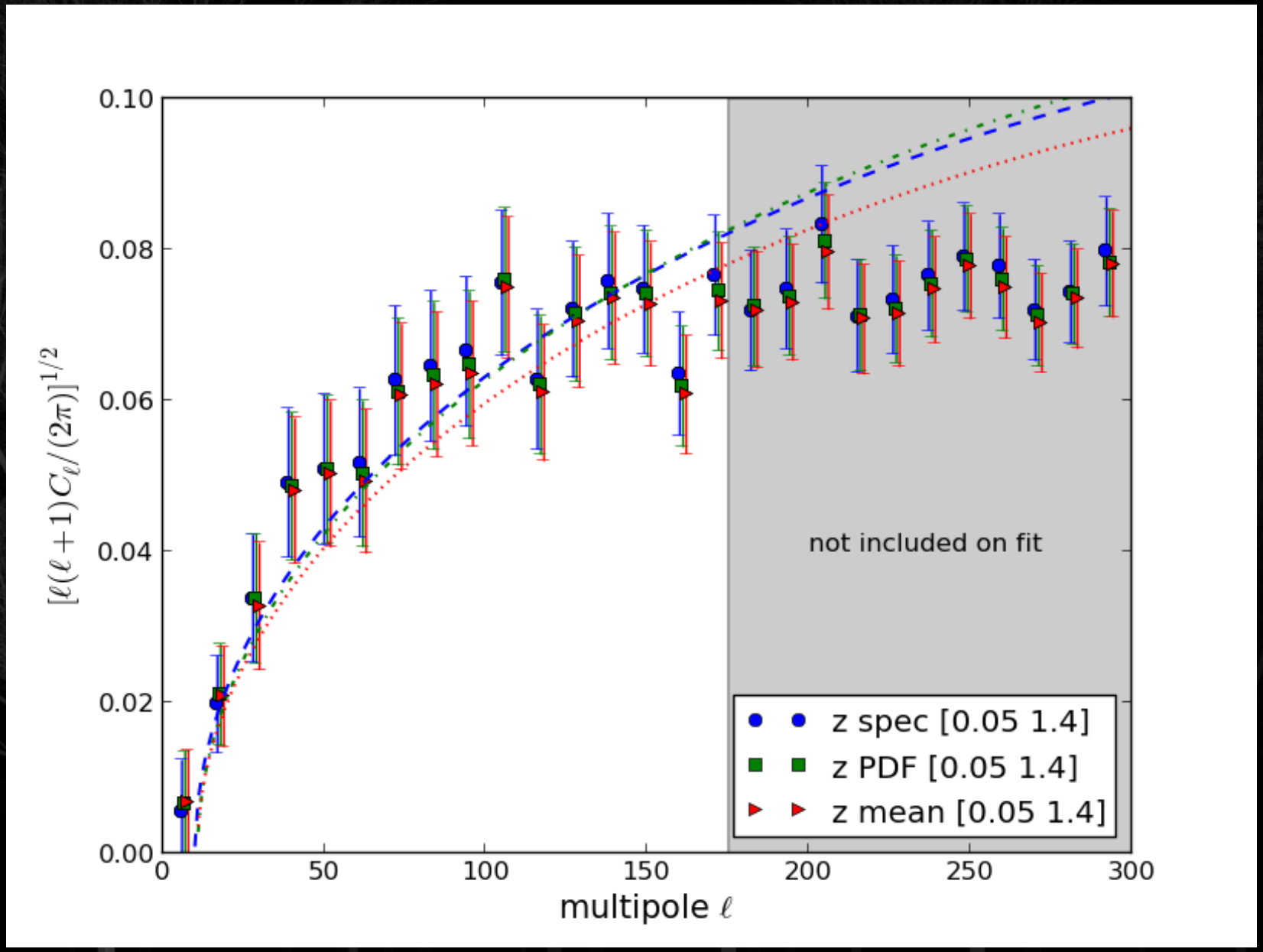
CAMB and HALOFIT for non linear $P(k,z)$

$\phi(z)$ calculated using z_{spec}, full PDF and its mean

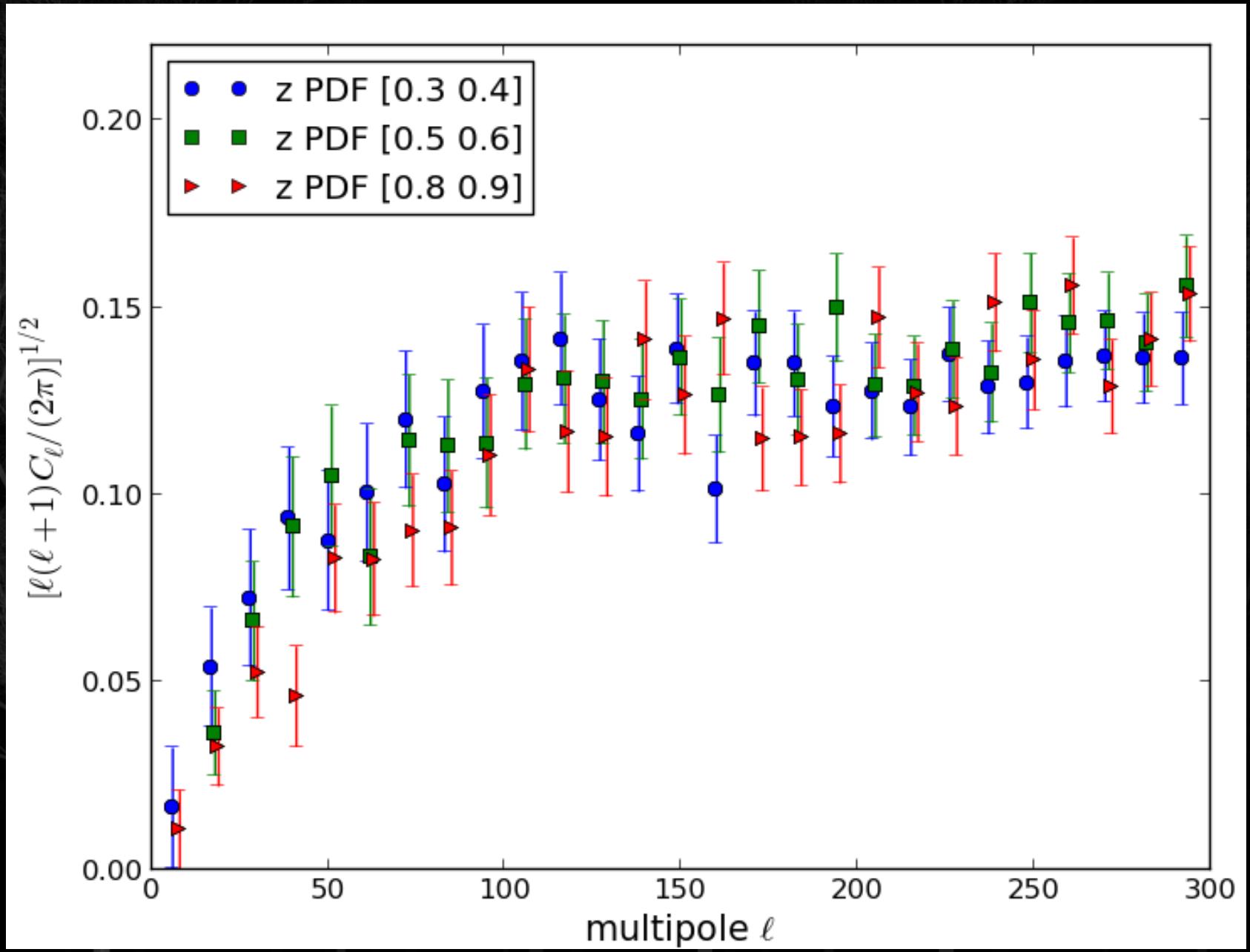
Fitting with MCMC. Fit on Ω_m, Ω_b, n_s , H_o and the bias. We fix $\omega = -1$ and $\Omega_k = 0$

"red leak" and pixel window function limitations

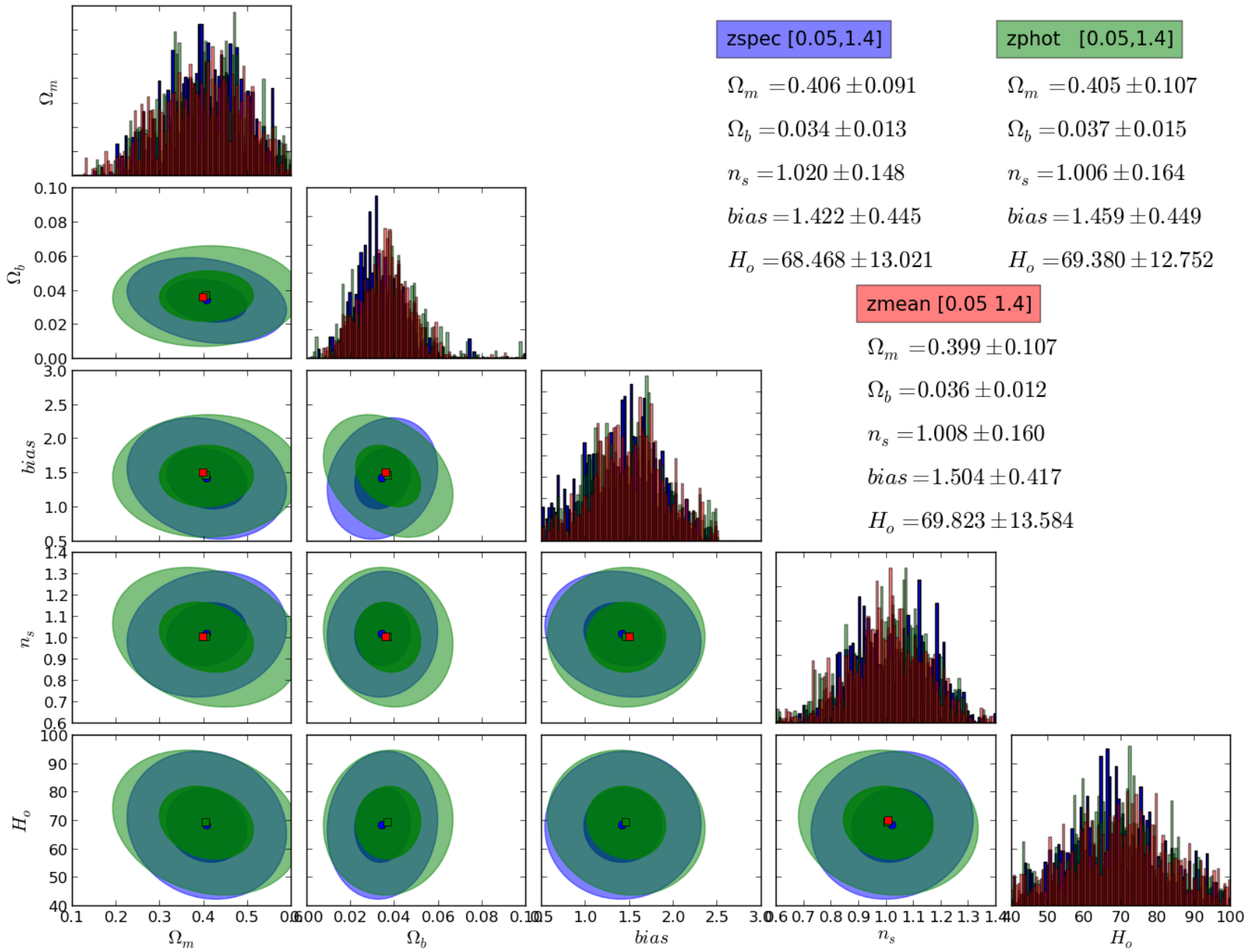
Preliminary Results



Preliminary Results



Fitting Cosmological parameters



zspec [0.05,1.4]

$\Omega_m = 0.406 \pm 0.091$

$\Omega_b = 0.034 \pm 0.013$

$n_s = 1.020 \pm 0.148$

$bias = 1.422 \pm 0.445$

$H_o = 68.468 \pm 13.021$

zphot [0.05,1.4]

$\Omega_m = 0.405 \pm 0.107$

$\Omega_b = 0.037 \pm 0.015$

$n_s = 1.006 \pm 0.164$

$bias = 1.459 \pm 0.449$

$H_o = 69.380 \pm 12.752$

zmean [0.05 1.4]

$\Omega_m = 0.399 \pm 0.107$

$\Omega_b = 0.036 \pm 0.012$

$n_s = 1.008 \pm 0.160$

$bias = 1.504 \pm 0.417$

$H_o = 69.823 \pm 13.584$

Current and future work

* Lots to be done!
* Use larger areas to decrease $\Delta\ell$. Possible BAO signal
* Increase resolution to go to small and non linear scales
* Review current code and modify it accordingly.
* Compute C_ℓ at several redshift shells to constrain d_A
* Real data; Masking observations, calibrate photo-z
* Cross-correlation between redshift shells

Thanks!

Questions?

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