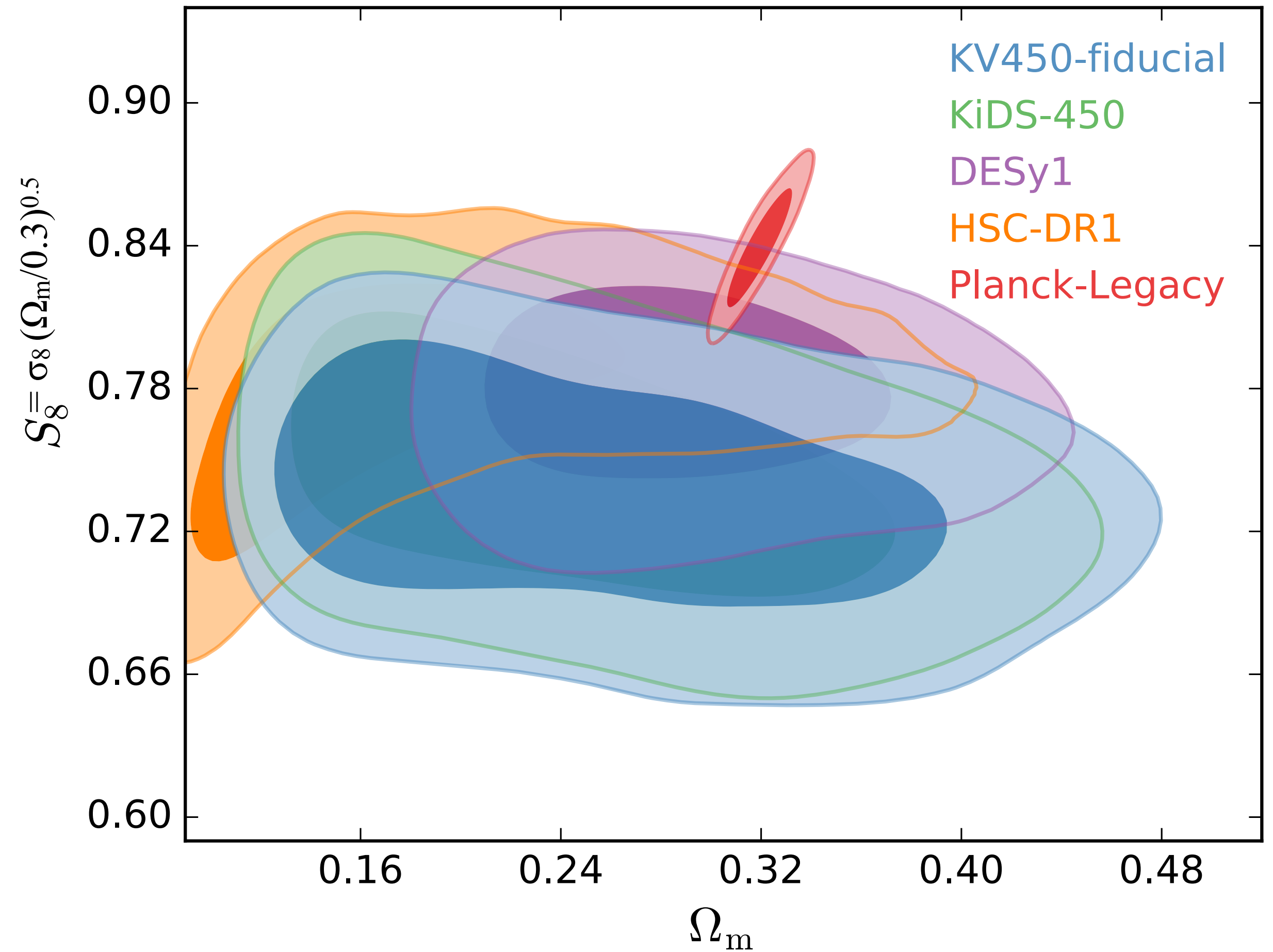
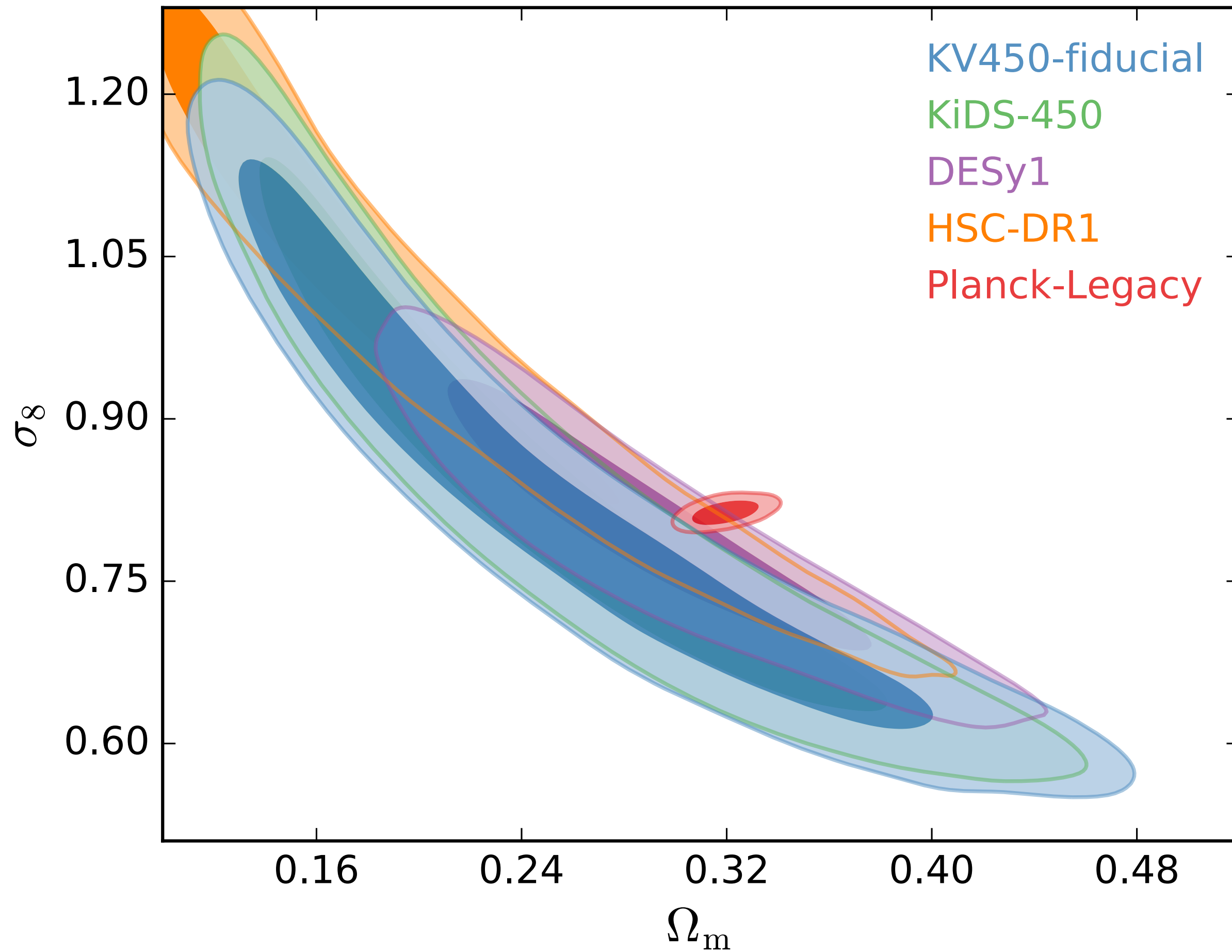


KIDS+VIKING: Cosmic shear tomography with optical+IR data

Hendrik Hildebrandt - Ruhr-University Bochum
German Centre for Cosmological Lensing (GCCL)



KiDS-VIKING-450



Wrong or new physics?

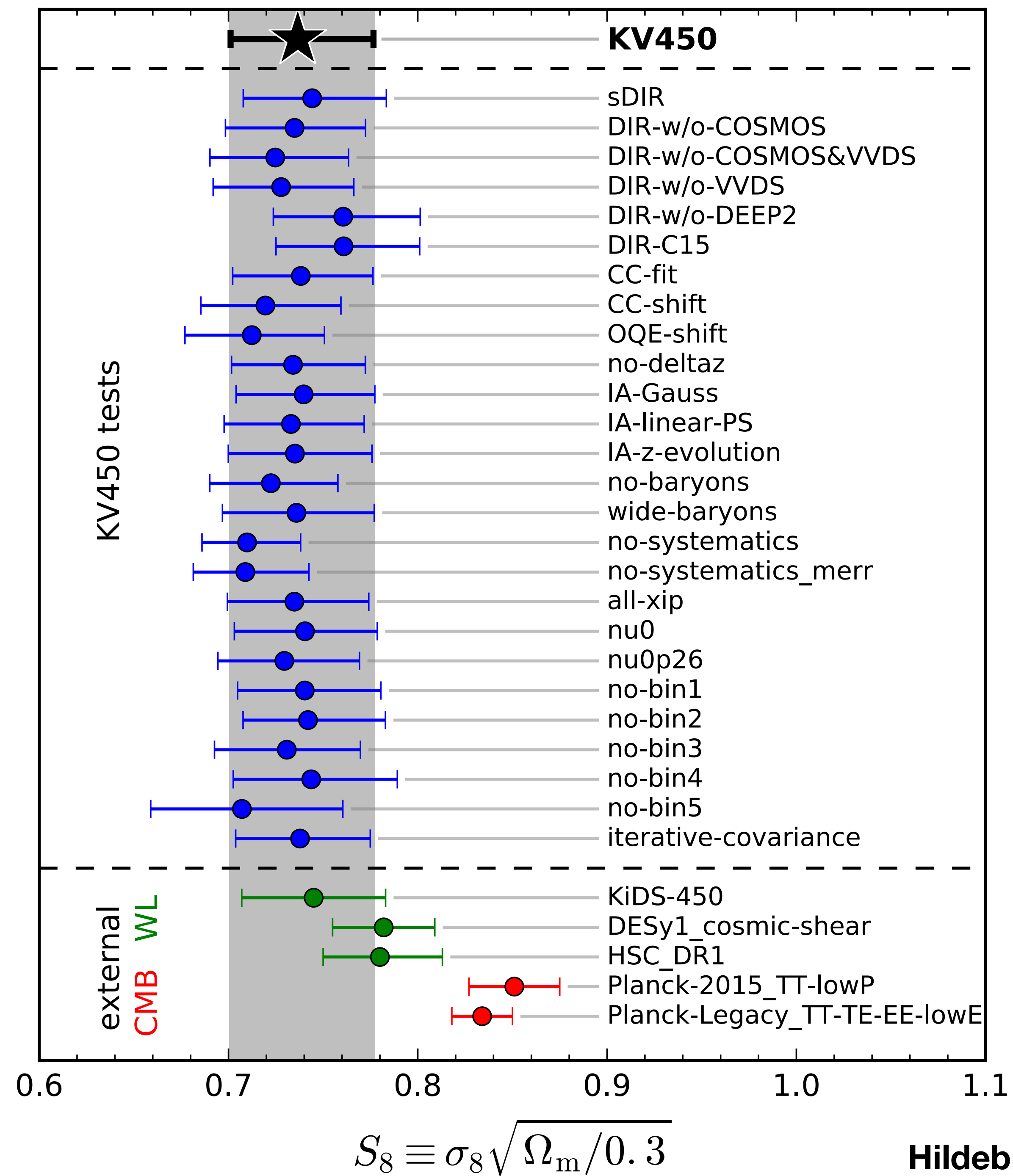
Observation -> theory

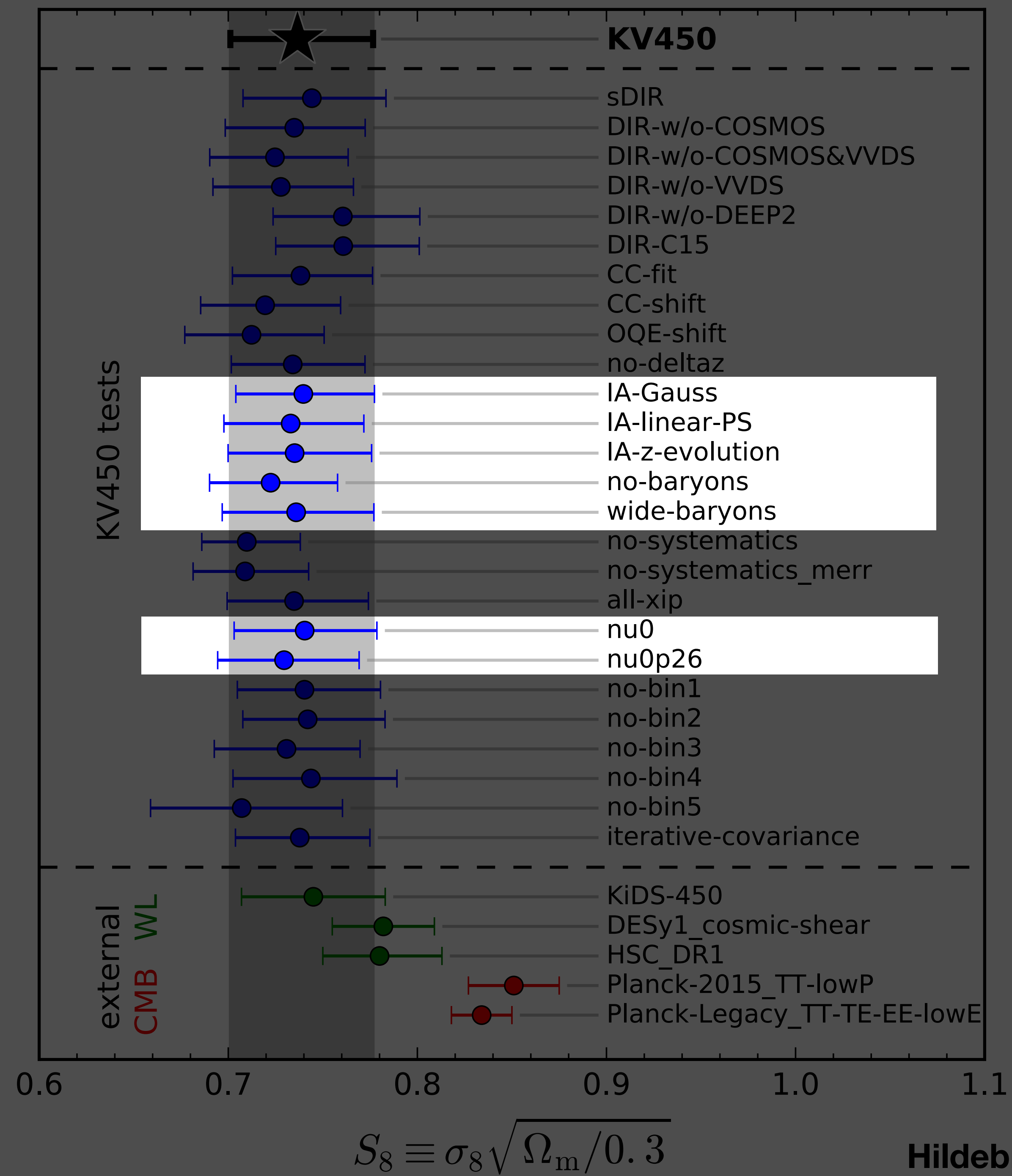
$$\xi_{\pm}(\theta) = \langle \gamma_t \gamma_t \rangle (\theta) \pm \langle \gamma_{\times} \gamma_{\times} \rangle (\theta)$$

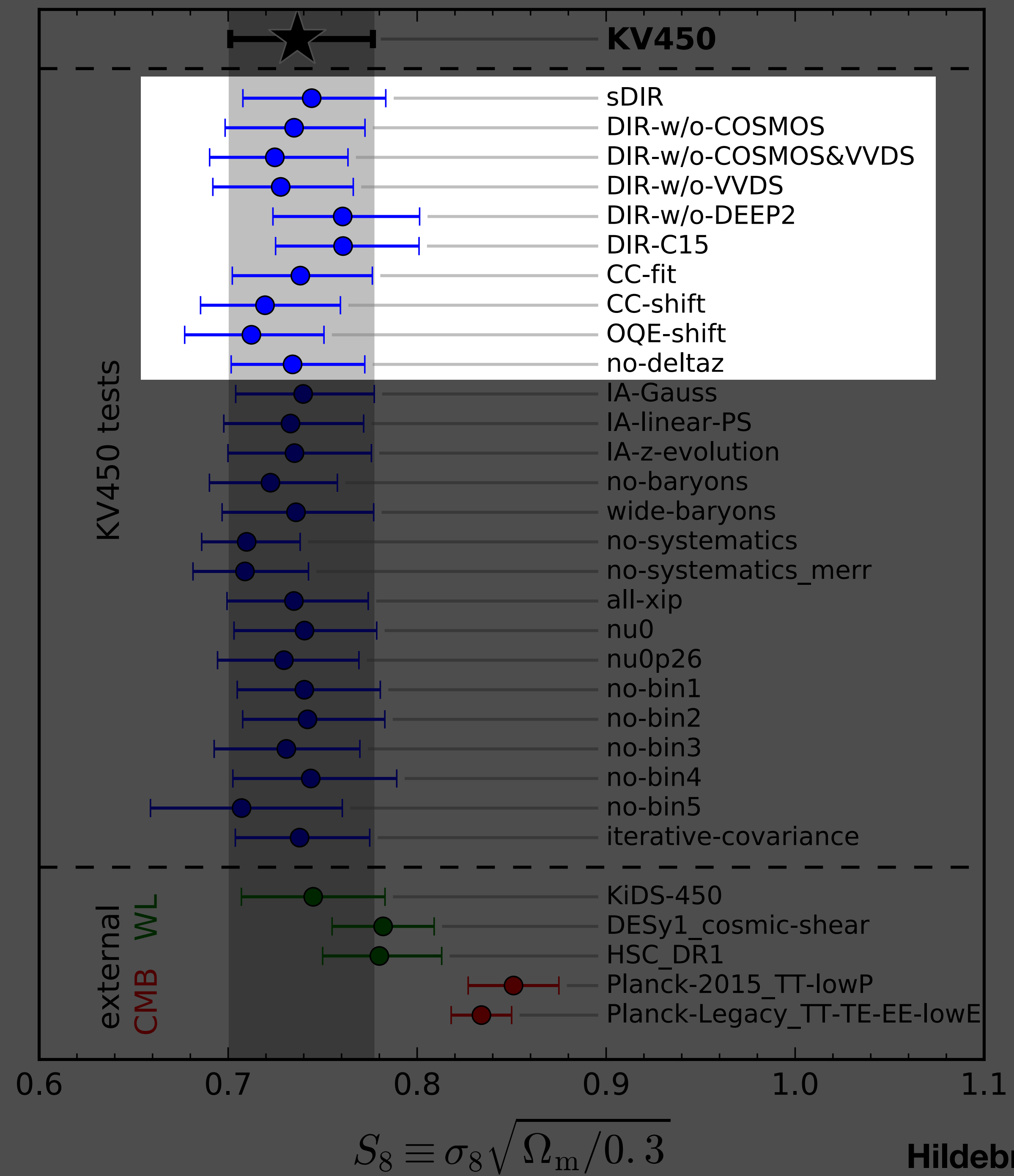
$$\xi_{+}(\theta) = \int_0^{\infty} \frac{d\ell \ell}{2\pi} J_0(\ell\theta) P_{\kappa}(\ell) ; \quad \xi_{-}(\theta) = \int_0^{\infty} \frac{d\ell \ell}{2\pi} J_4(\ell\theta) P_{\kappa}(\ell)$$

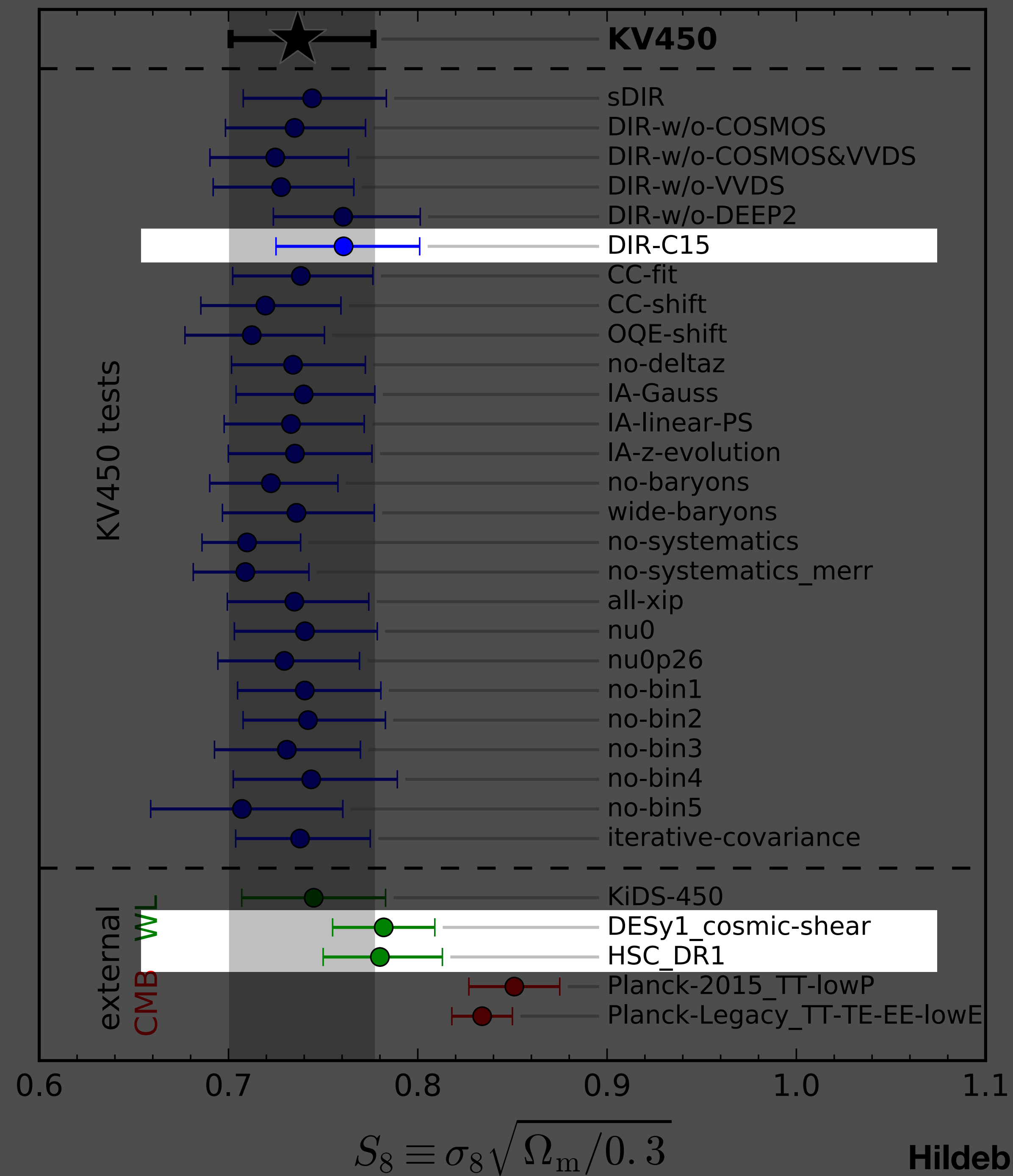
$$P_{\kappa}(\ell) = \frac{9H_0^4 \Omega_m^2}{4c^4} \int_0^{\chi_h} d\chi \frac{g^2(\chi)}{a^2(\chi)} P_{\delta} \left(\frac{\ell}{f_K(\chi)}, \chi \right)$$

$$g(\chi) = \int_{\chi}^{\chi_h} d\chi' p_{\chi}(\chi') \frac{f_K(\chi' - \chi)}{f_K(\chi')}$$

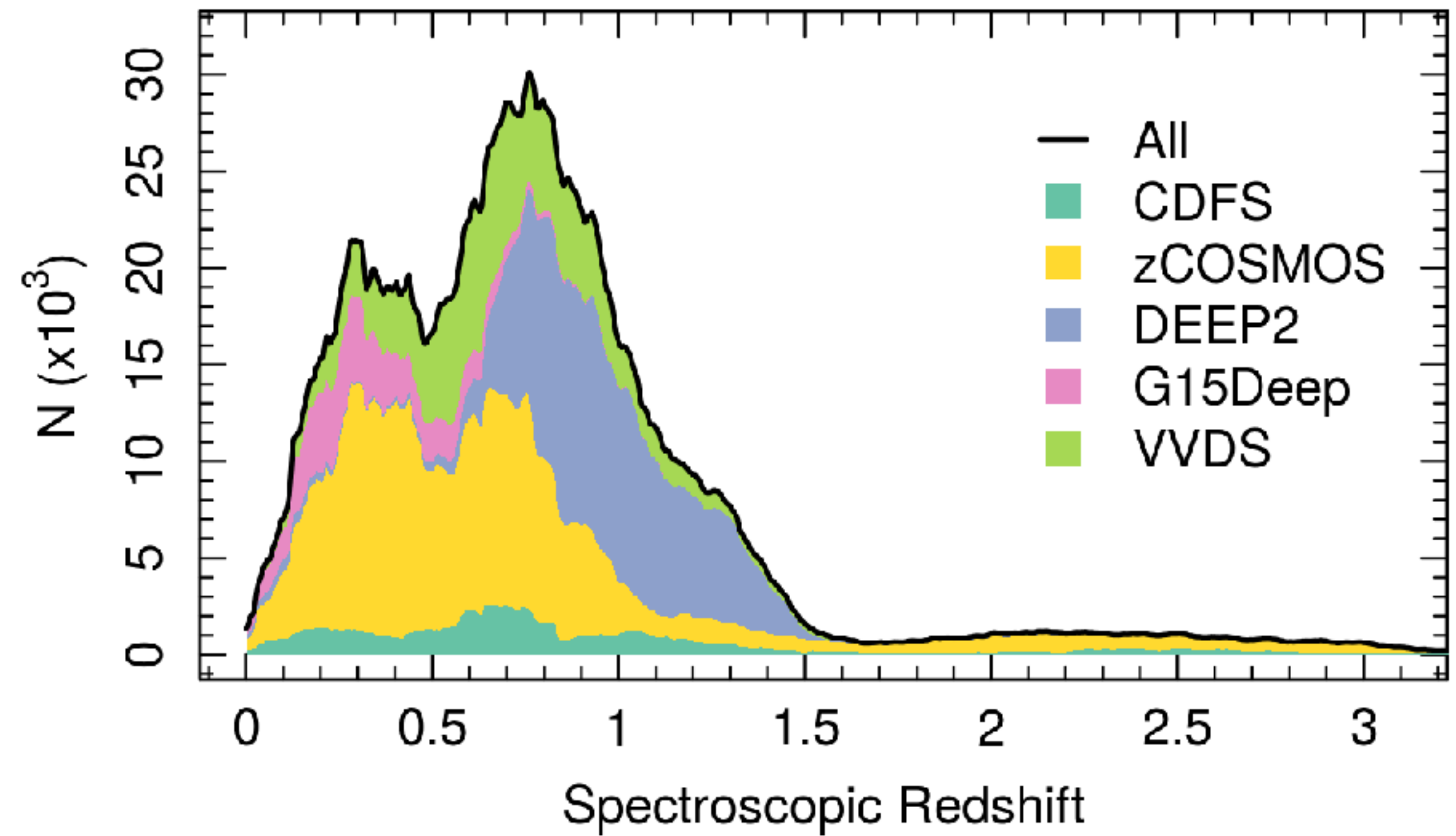
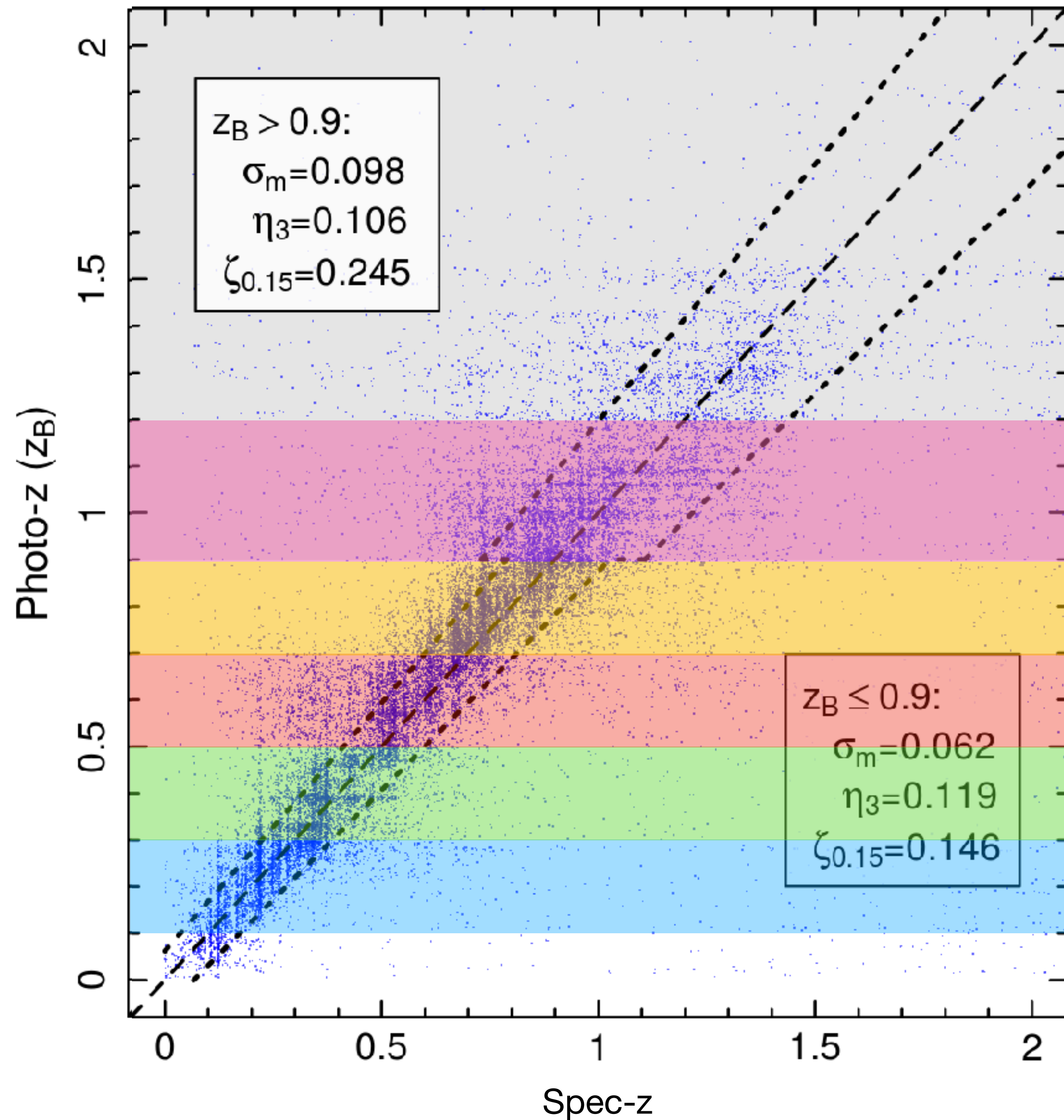








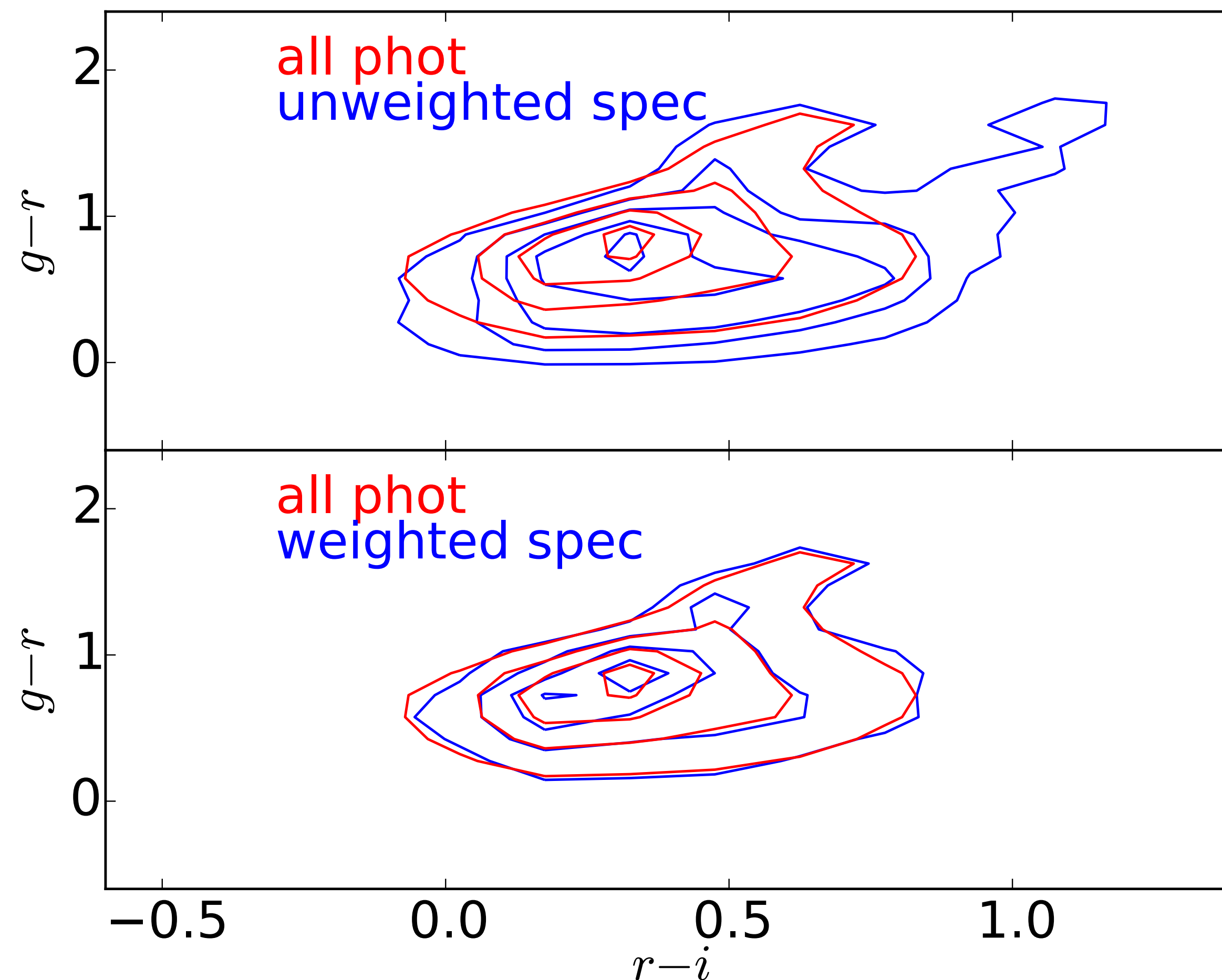
Photometric redshifts



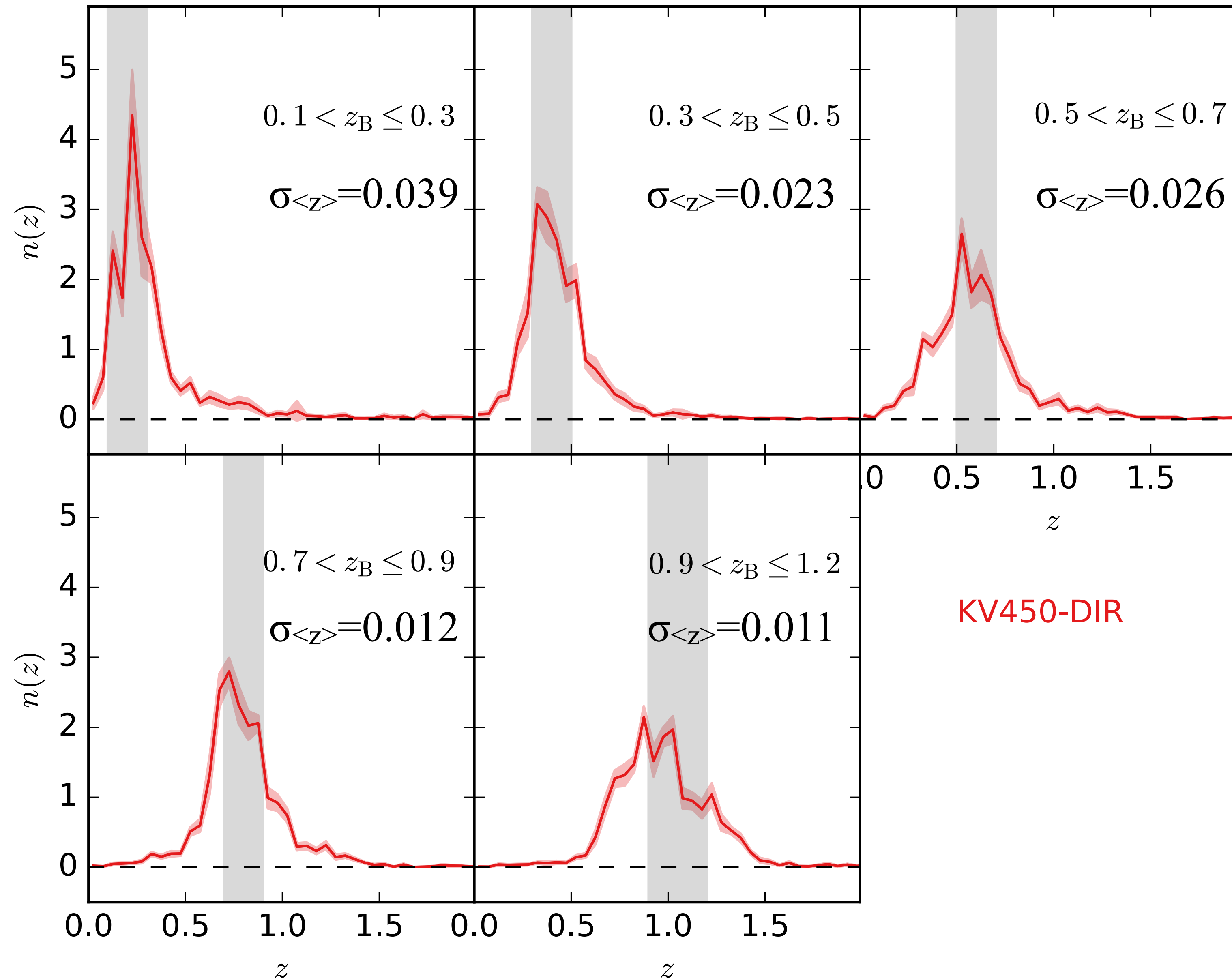
Redshift calibration

Re-weight spec-z surveys to be more representative.

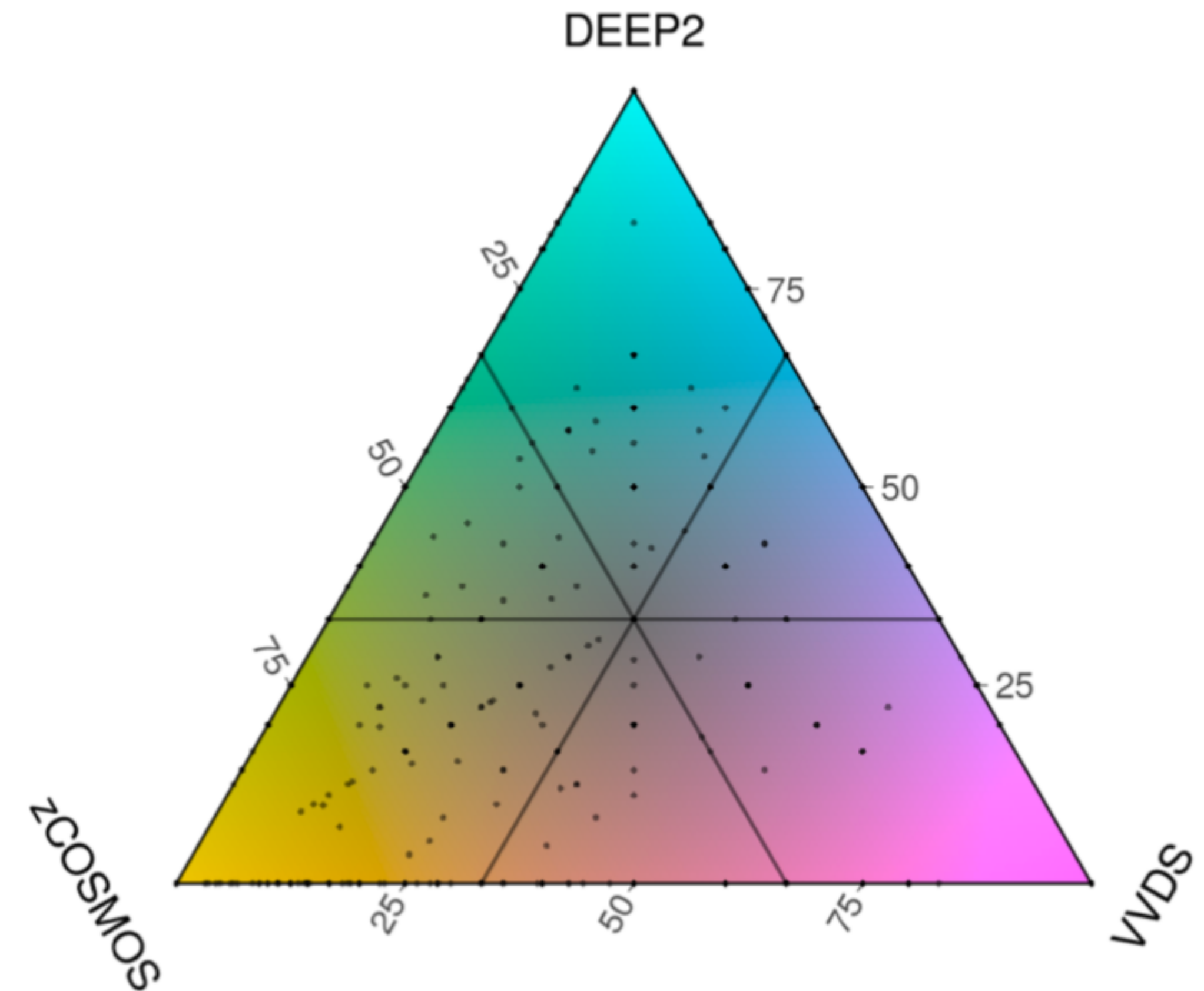
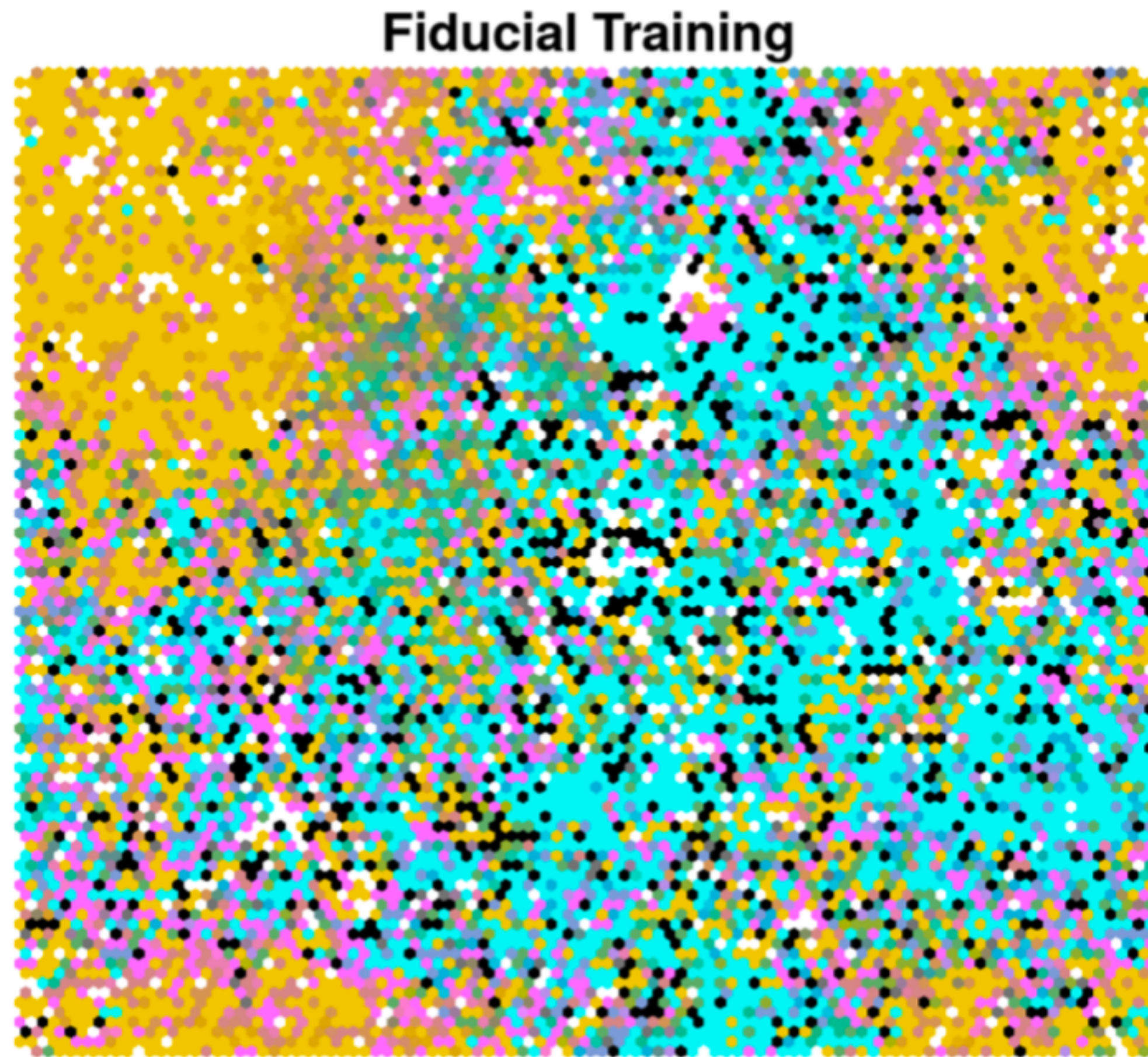
1. Magnitude space needs to be fully covered.
2. Requires unique relation colour-redshift relation.



Redshift distributions



Self-organising map



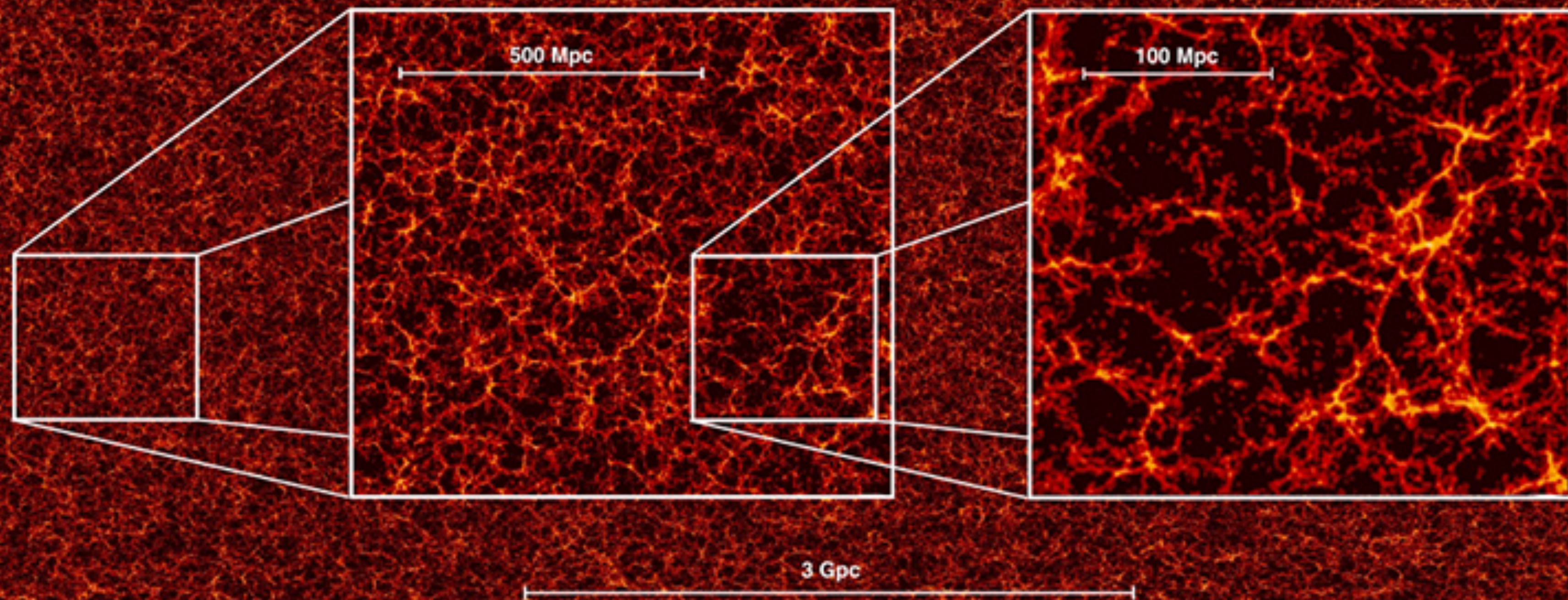
~99% coverage of 9D mag space in KV450.

Wright et al. in prep.



Testing KiDS-VIKING photo-z on MICE

MICE Grand Challenge: an all-sky lightcone Nbody simulation using 4000^3 particles and 4096 processors

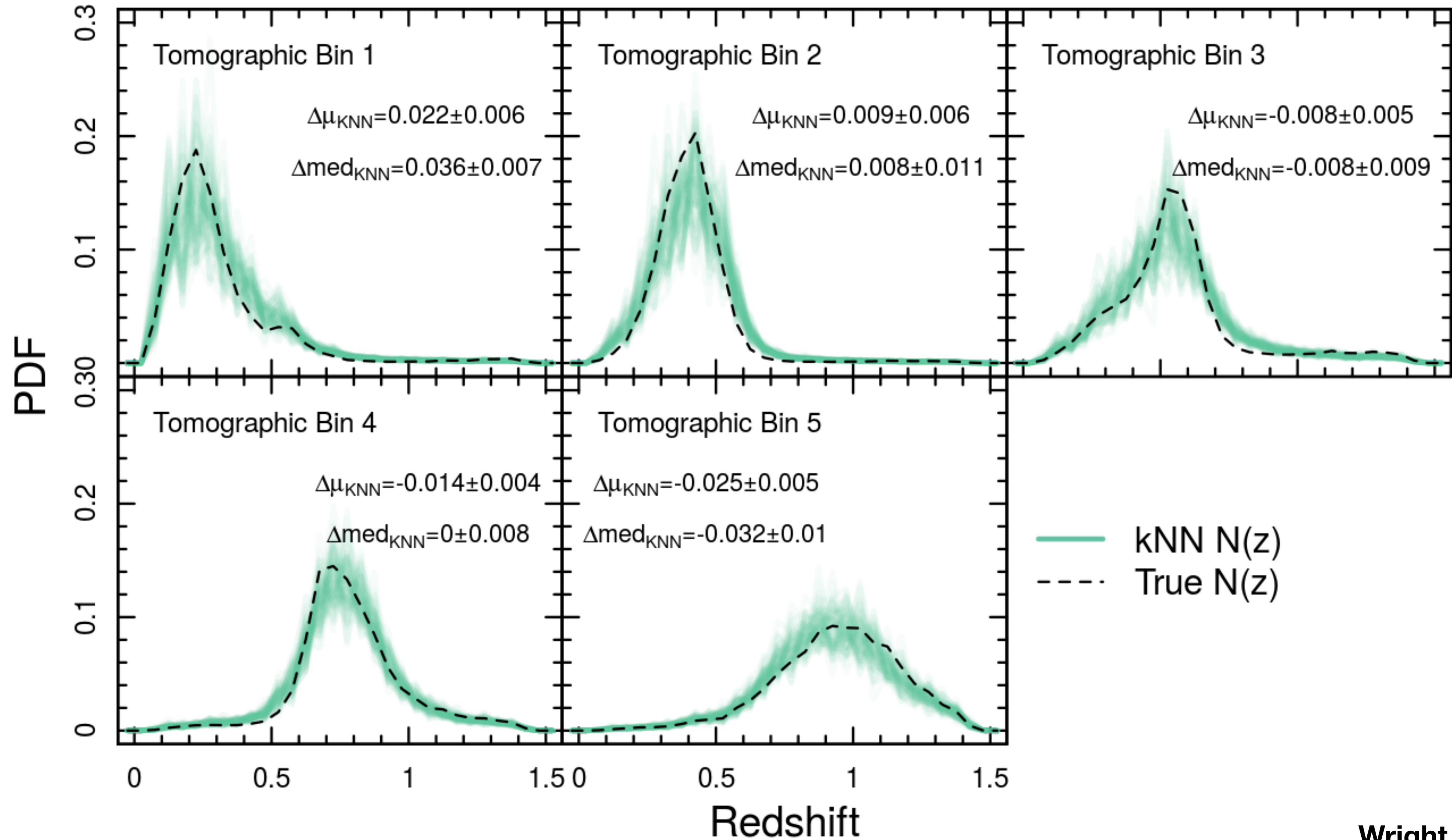


Cosmological Simulations @ Marenostrum Supercomputer

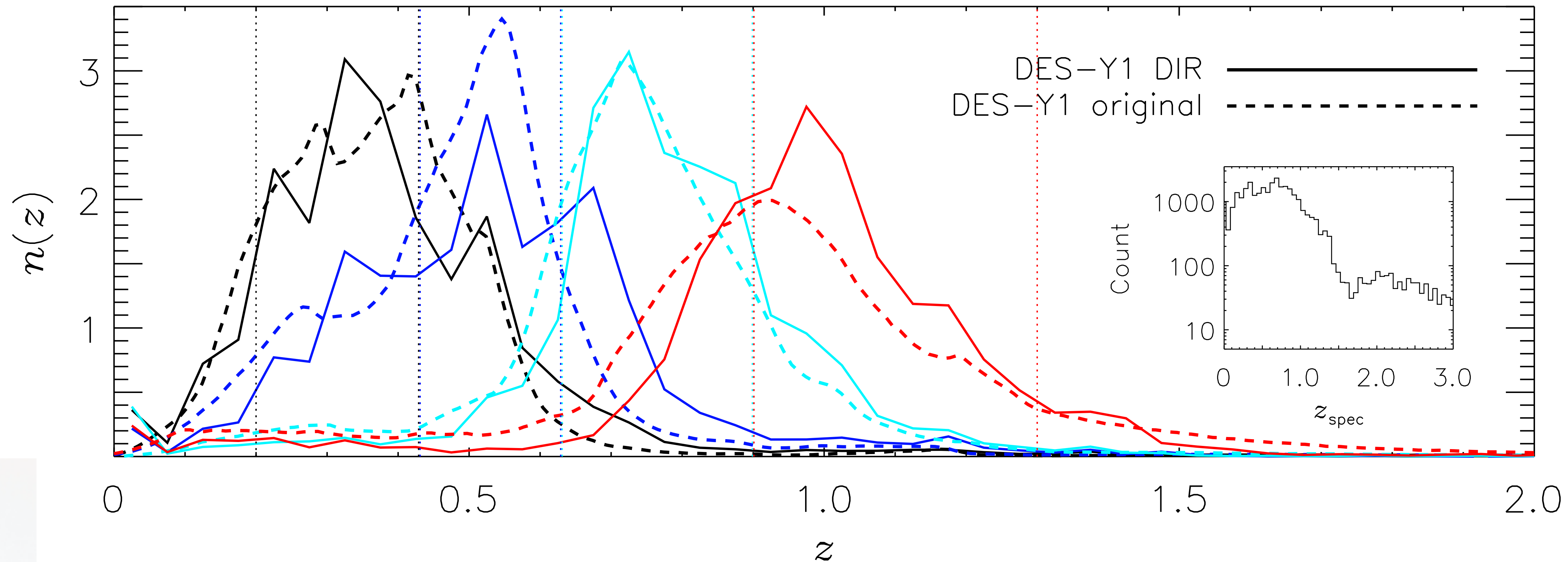
MICE

~200 million galaxies over 5000 sq.deg and up to a redshift $z=1.4$
Not the same as the data but similarly complex as the data.

Tests on MICE2

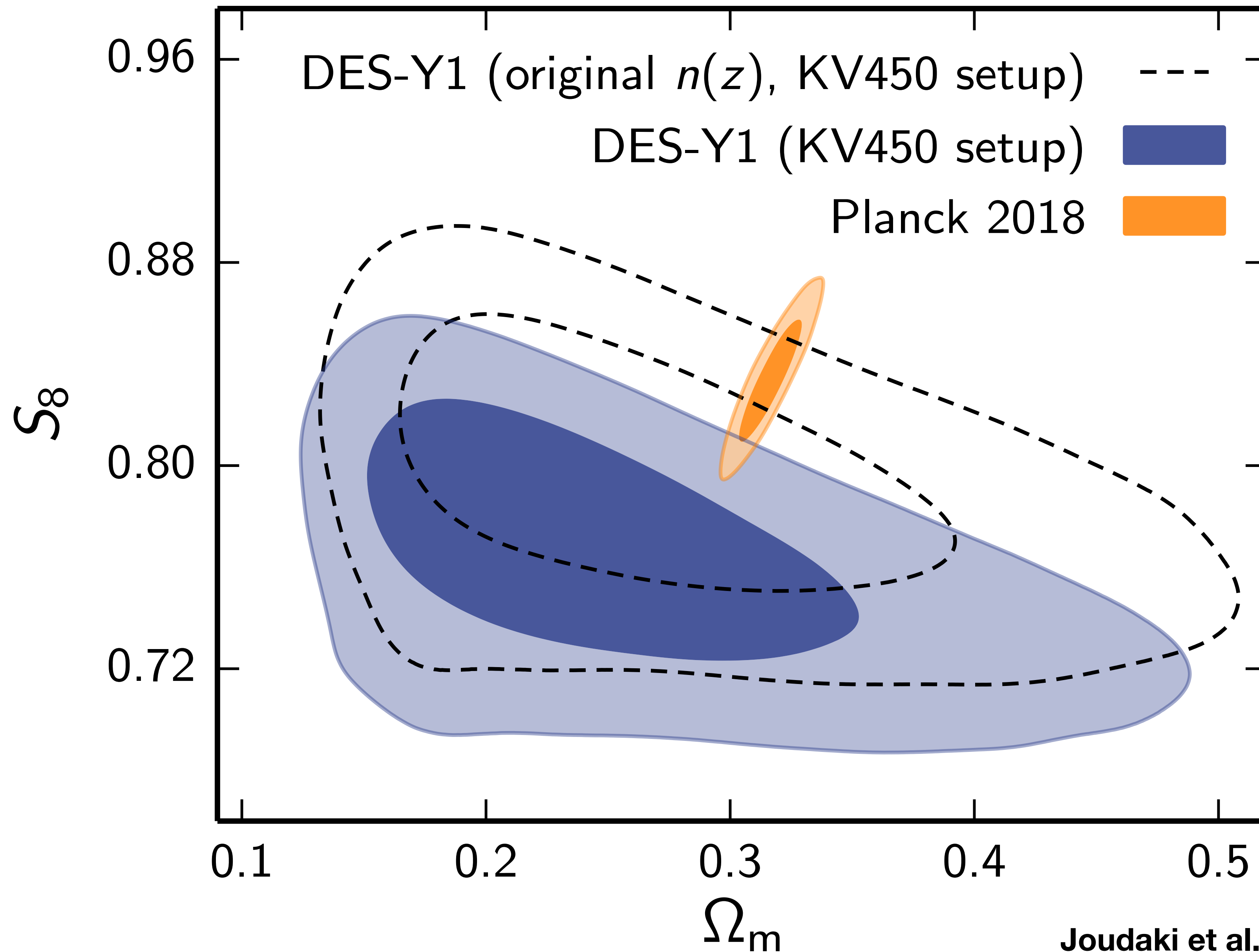


Spectroscopic calibration of DES-Y1

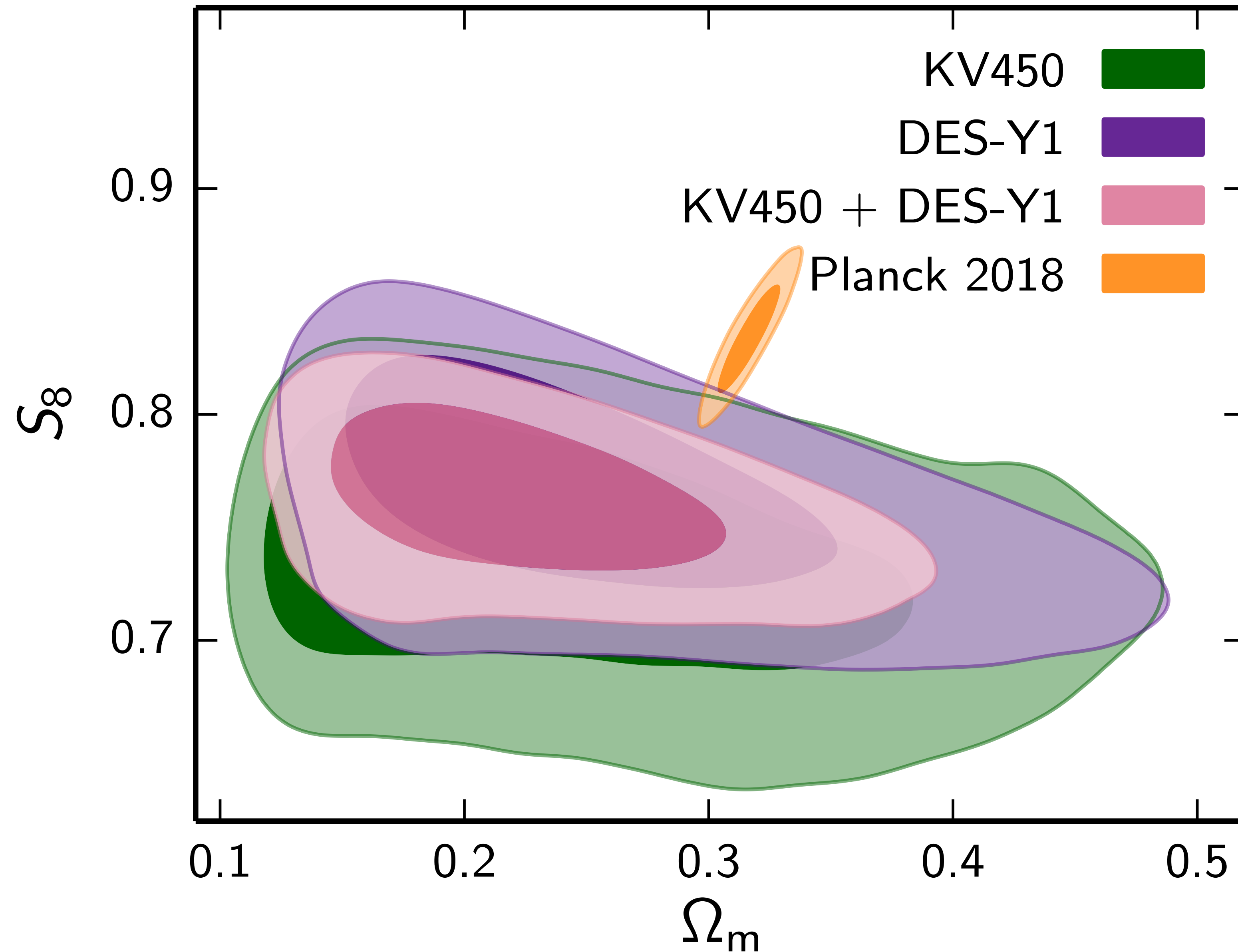


Caveat: Re-weighting done in 4D only.

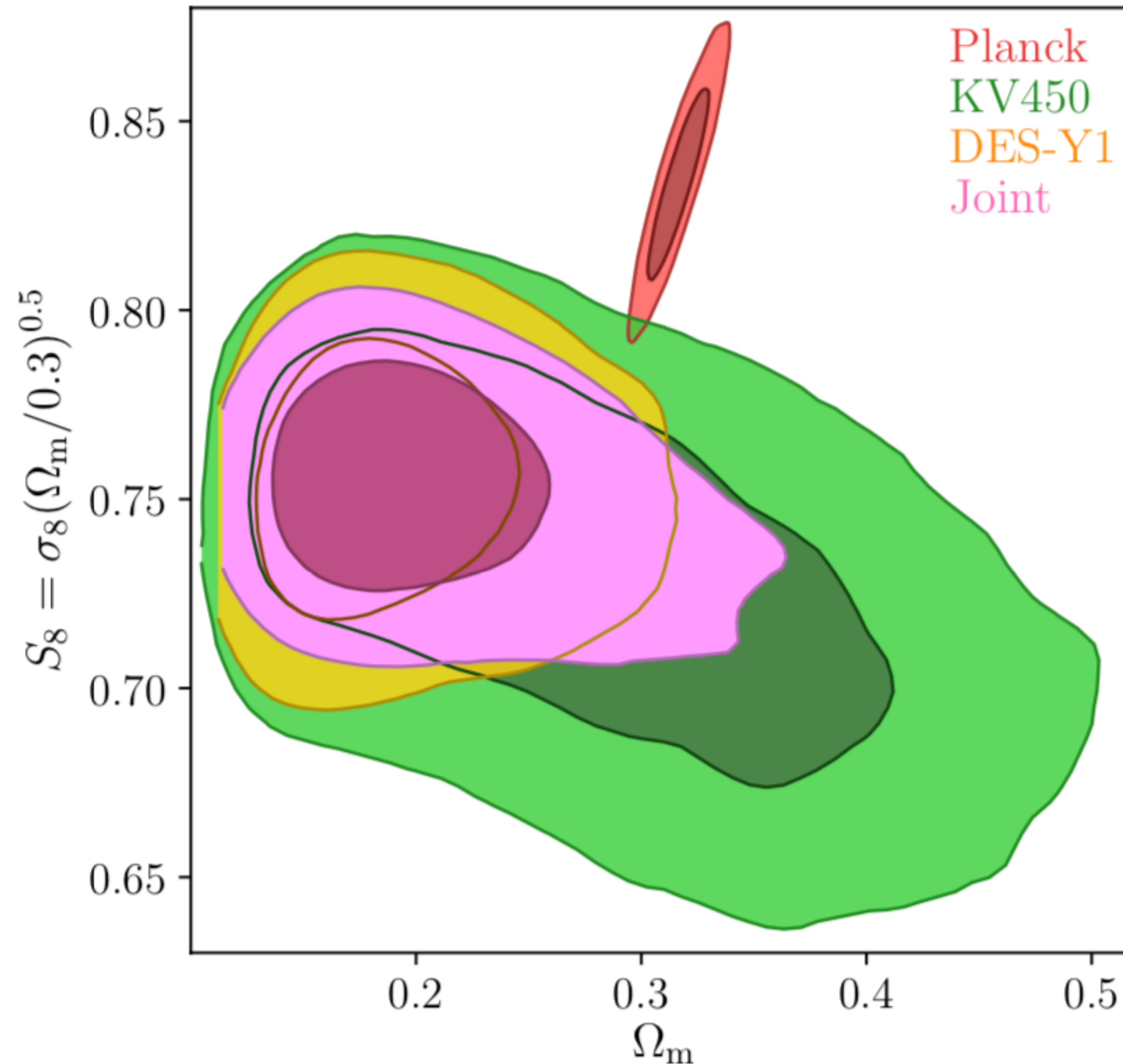
S_8 constraints



KV450 and DES-Y1 combined



Same with COSEBIs



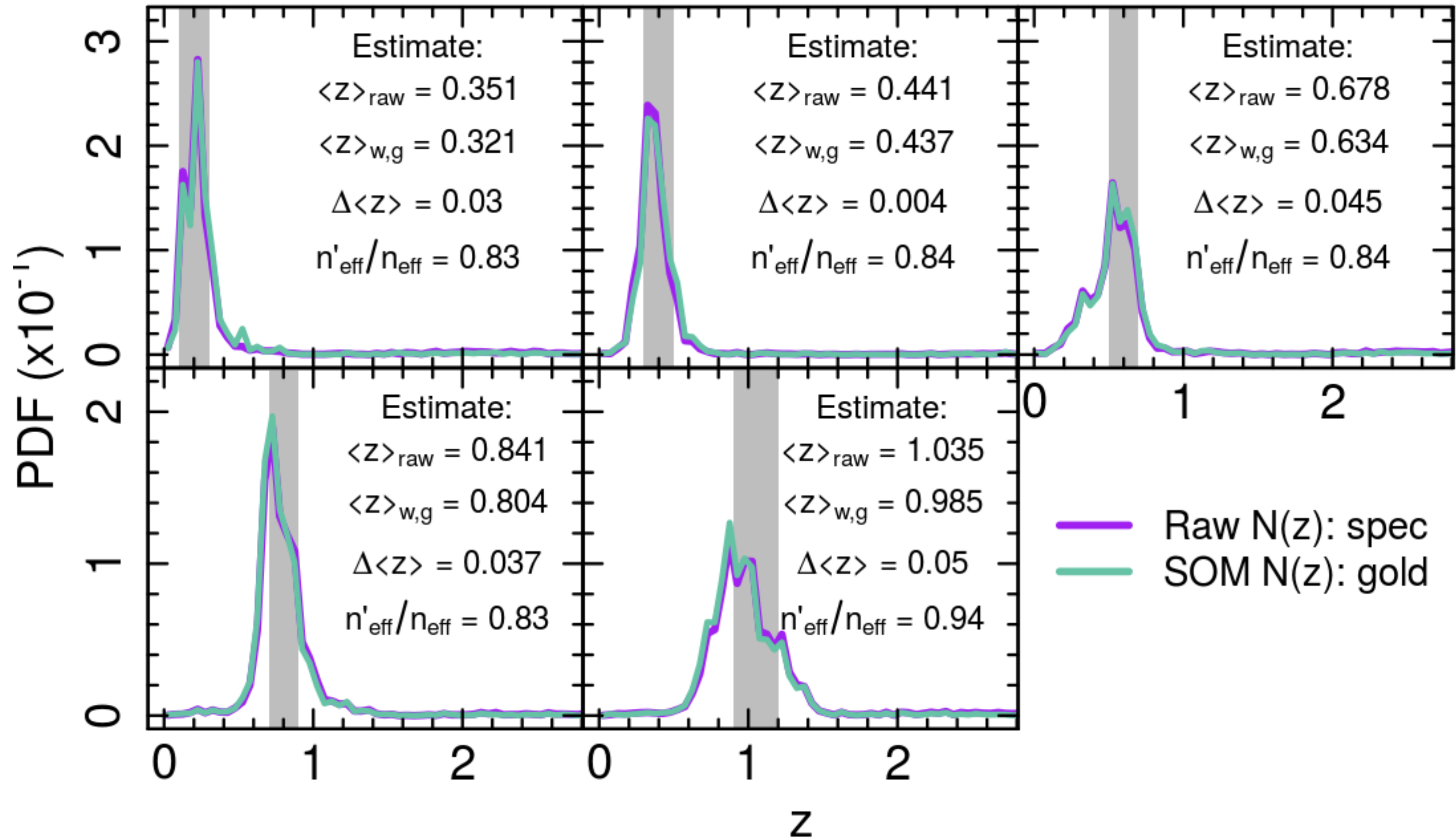
**3.2 σ tension
between WL
and Planck**



Problems with the redshifts

- Calibration with photo-z (e.g. COSMOS-2015):
 - Outliers => **underestimate** $\langle z \rangle$
 - Bias => **underestimate** $\langle z \rangle$
- Calibration with spec-z:
 - Magnitude-space coverage => **underestimate** $\langle z \rangle$
 - Uniqueness of colour-redshift relation => **underestimate** $\langle z \rangle$
 - Wrong spec-z => $\langle z \rangle$ drawn to the mean of all spec-z
- Clustering redshifts:
 - Evolving galaxy bias
 - Magnification effects

KV450 “gold” sample



~85% of the sources.
Mean redshifts good to $\sigma_{\langle z \rangle} < \sim 0.007$.

Summary & Outlook

- $\sim 2\text{-}3\sigma$ tension in S_8 between Planck and low- z WL measurements (KV450, DES-Y1 recalibrated).
- Are we “wrong”? Systematics? **Redshift calibration?**
- Other LSS probes show similar discrepancies.
Related to H_0 crisis? Serious problem for Λ CDM?
- Exciting times: KiDS+VIKING and DES finished;
all 3 stage-III surveys analysing several times more data now.