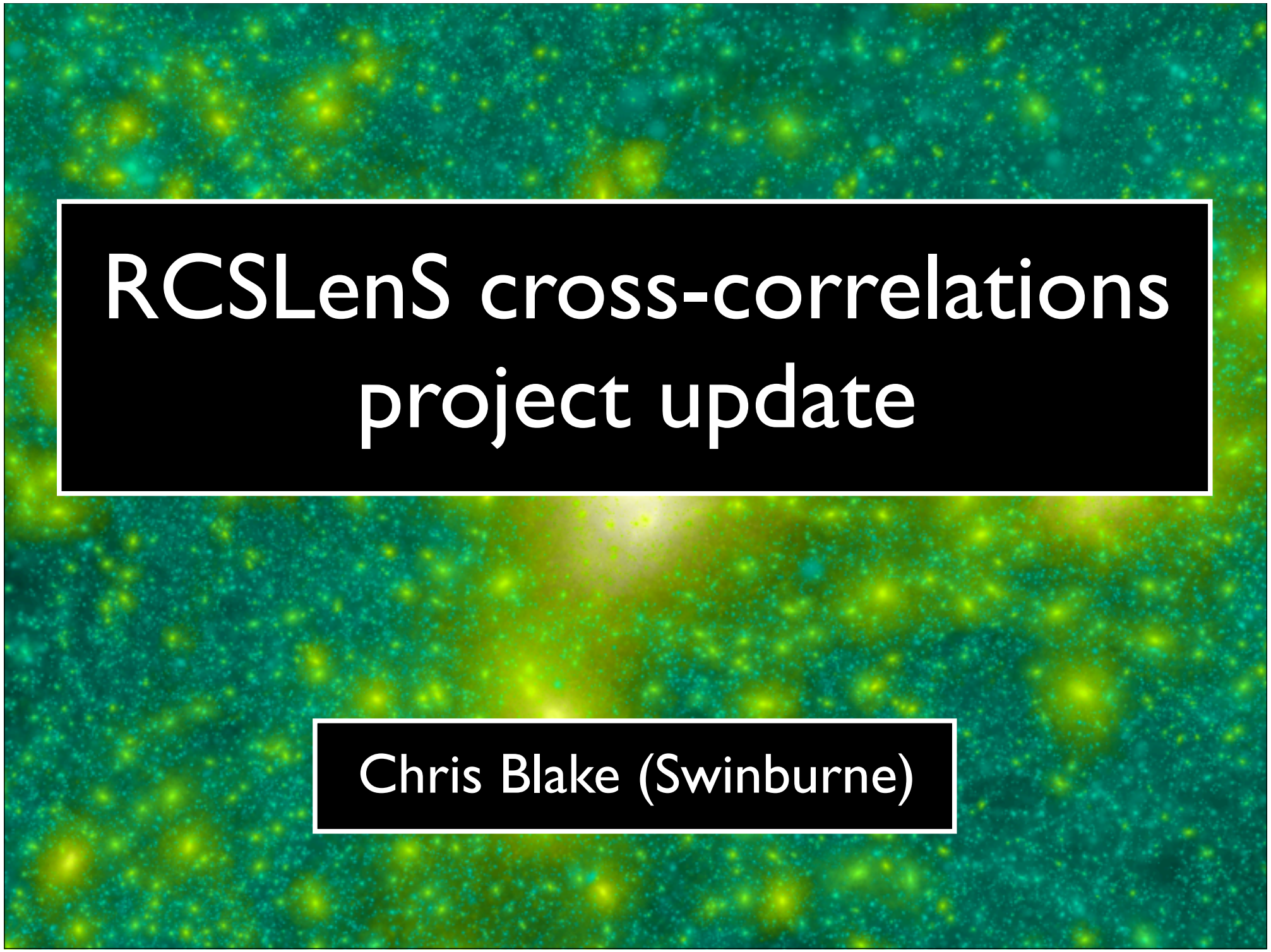
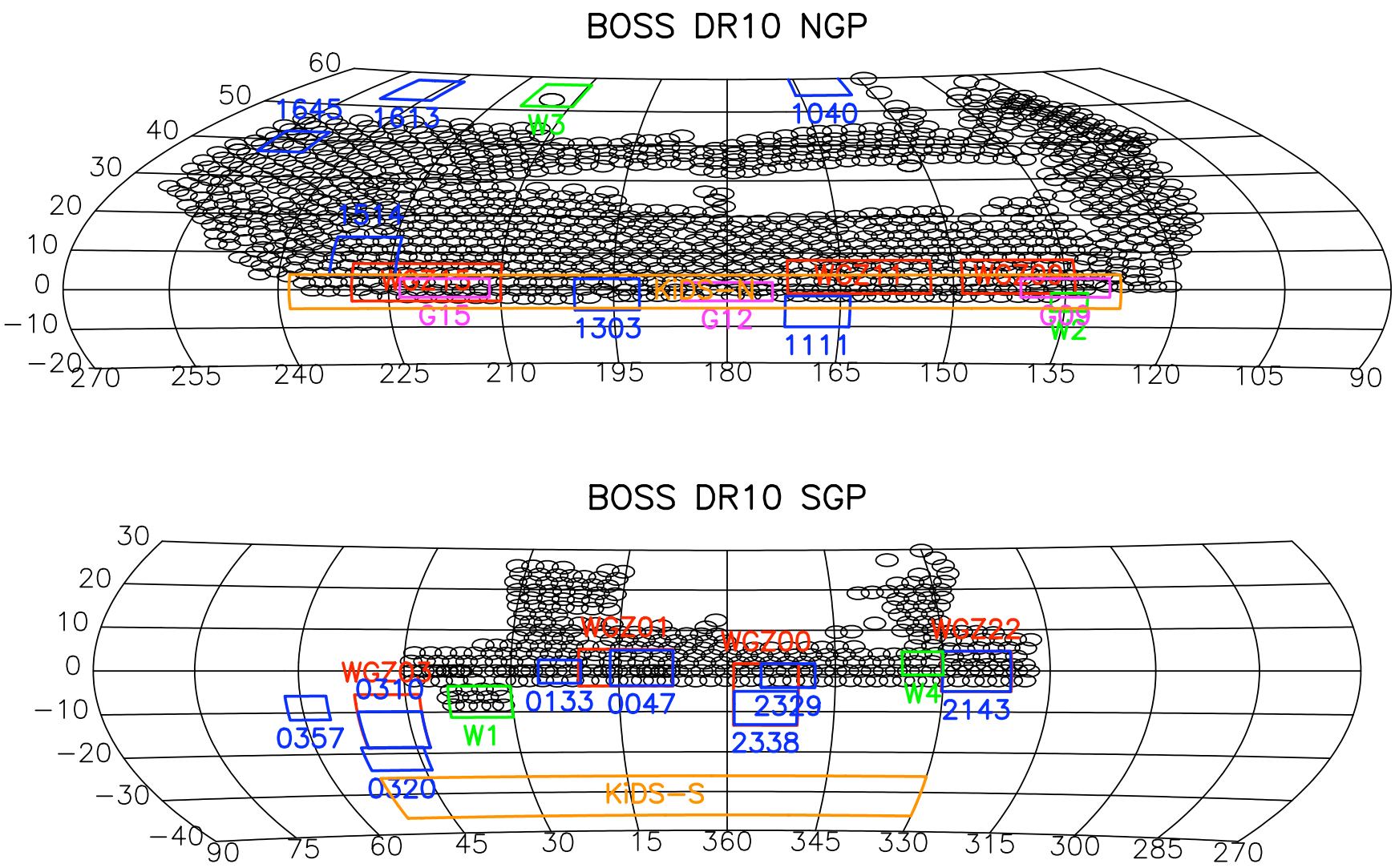
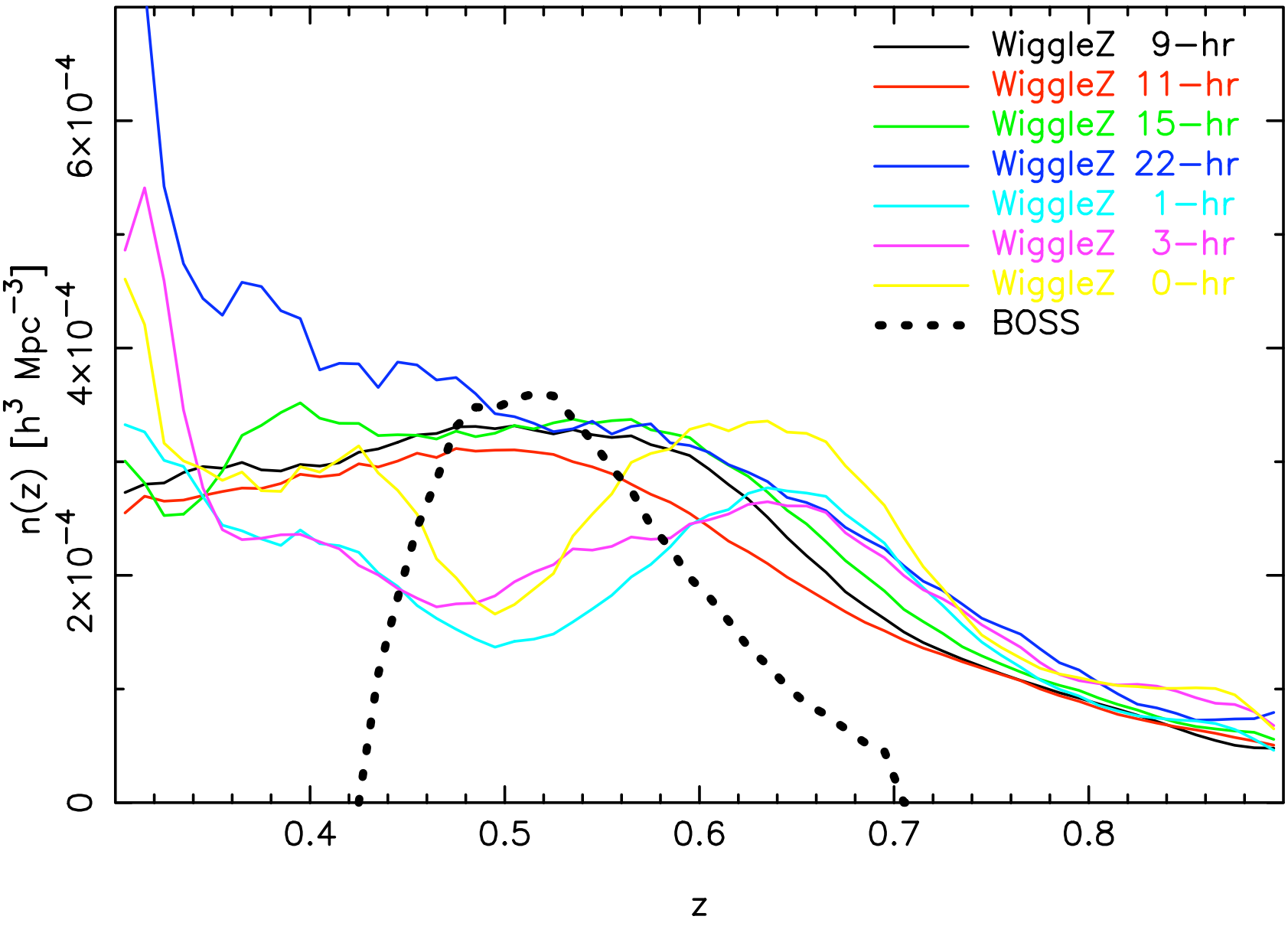

RCSLenS cross-correlations
project update
Chris Blake (Swinburne)

Overlaps with spec-z surveys



Overlaps with spec-z surveys



Gravity tests from cross-correlations

- Measure cross-correlations between RCSLenS/ CFHTLenS sources and WiggleZ/BOSS DR10 lenses
- Measure $\gamma_t(\theta)$ and $\Delta\Sigma_t(R)$
- Part 1 (me) : determination of E_G statistic at z=0.6 with RSD an external input, $[\sigma_8(z), b(z)]$ fits for fixed background cosmology, photo-z tests etc.
- Part 2 (Shahab) : fully self-consistent cosmology fits combining RSD, galaxy-galaxy lensing and shear {i.e. data vector is $[\xi_0(s), \xi_2(s), \gamma_t(\theta), \xi_+(\theta), \xi_-(\theta)]$ } with Planck +other data, including modified gravity

Gravity tests from cross-correlations

- E_G statistic?

$$E_G(R) = \frac{1}{\beta}\frac{\Upsilon_{gm}(R, R_0)}{\Upsilon_{gg}(R, R_0)}$$

- Lens-source cross-correlation:

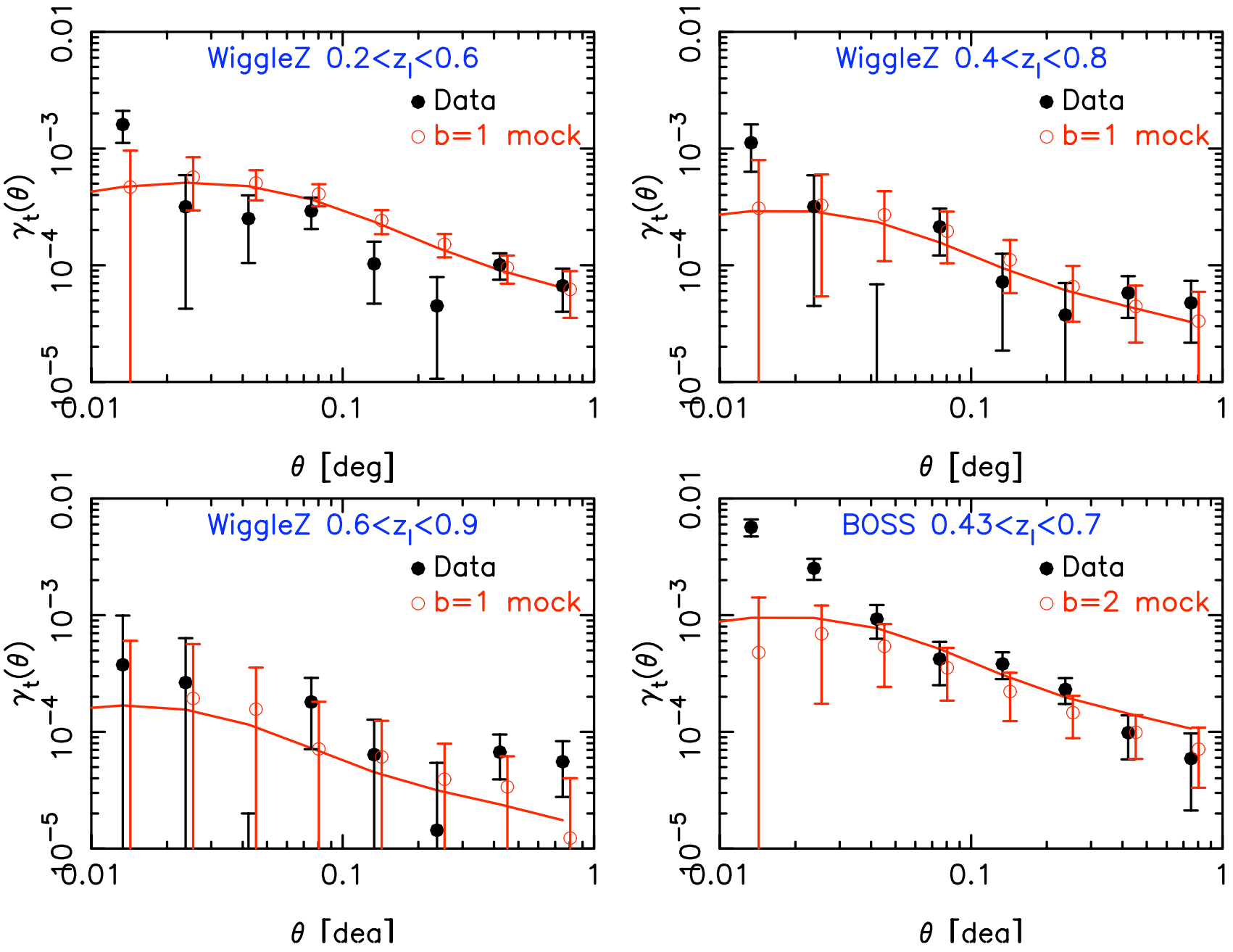
$$\Upsilon_{gm}(R, R_0) = \Delta\Sigma(R) - \frac{R_0^2}{R^2}\Delta\Sigma(R_0)$$

$$\Delta\Sigma(R) = \sum_{lens-source\ pairs} [weights]\ \gamma_t(\theta)\ \Sigma_c(z_s, z_l)$$

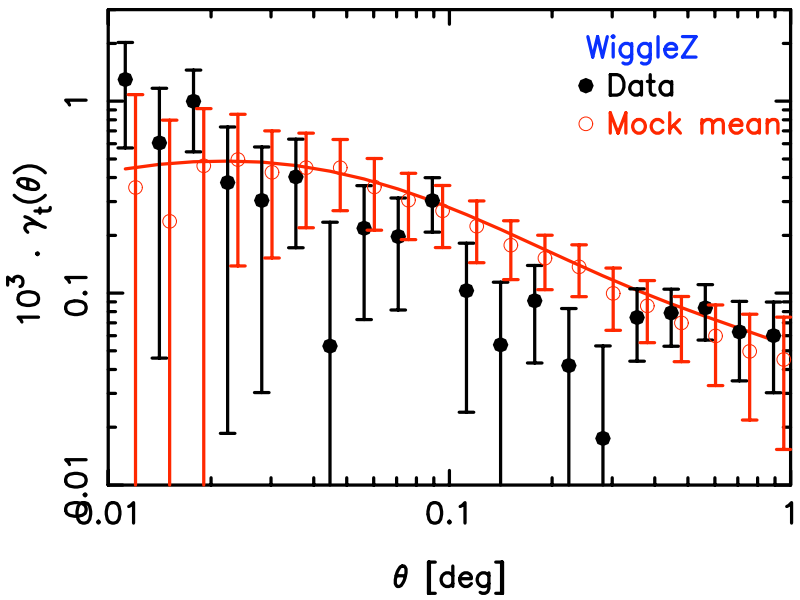
- Lens-lens auto-correlation:

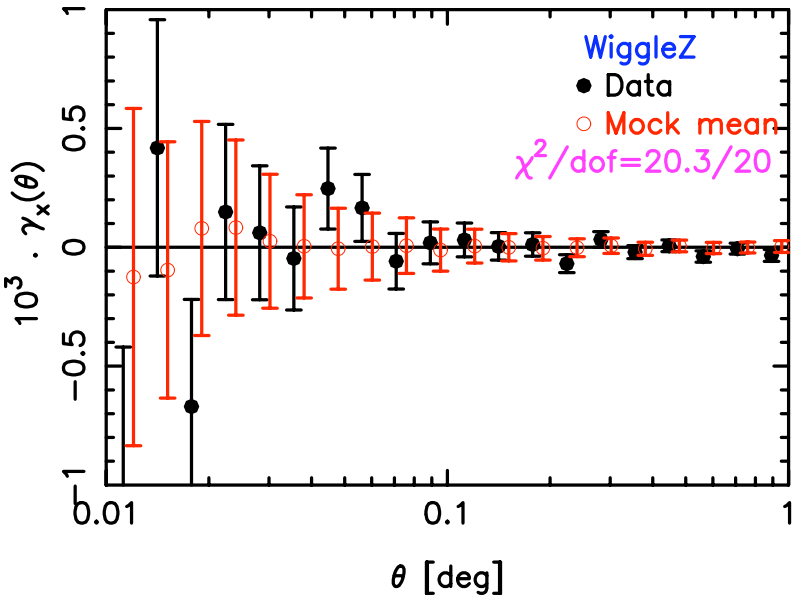
$$\Upsilon_{gg}(R, R_0) = \rho_c \left[\frac{2}{R^2}\int_{R_0}^{R} R' w_p(R') dR' - w_p(R) + \frac{R_0^2}{R^2} w_p(R_0)\right]$$

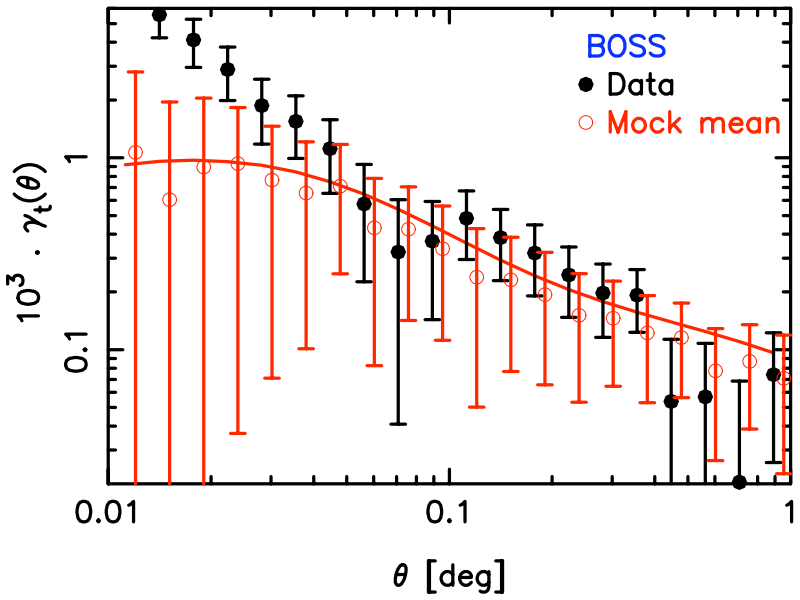
"Results"

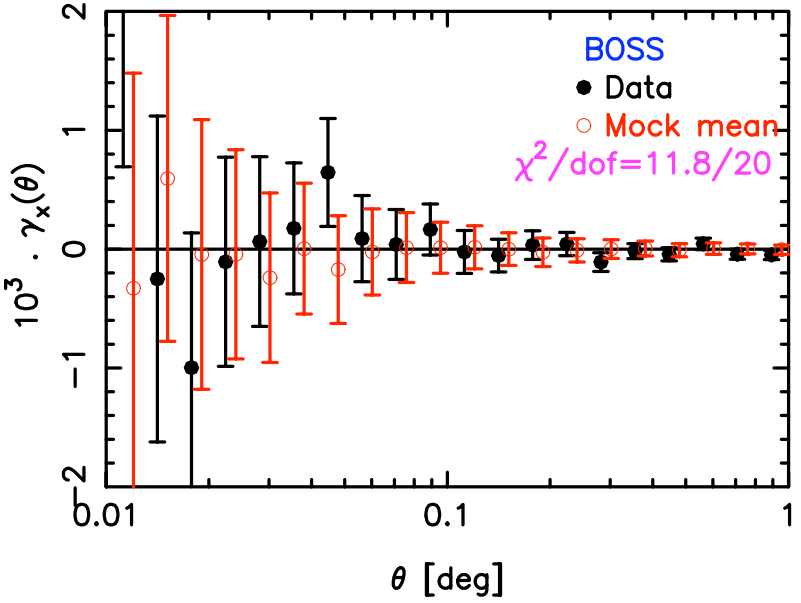

WiggleZ 0.2<z_l<0.6
Data
b=1 mock
WiggleZ 0.4<z_l<0.8
Data
b=1 mock
WiggleZ 0.6<z_l<0.9
Data
b=1 mock
BOSS 0.43<z_l<0.7
Data
b=2 mock
γ_t(θ)
θ [deg]
0.01
0.1
1
10^-3
10^-4
10^-5

Shape systematics tests

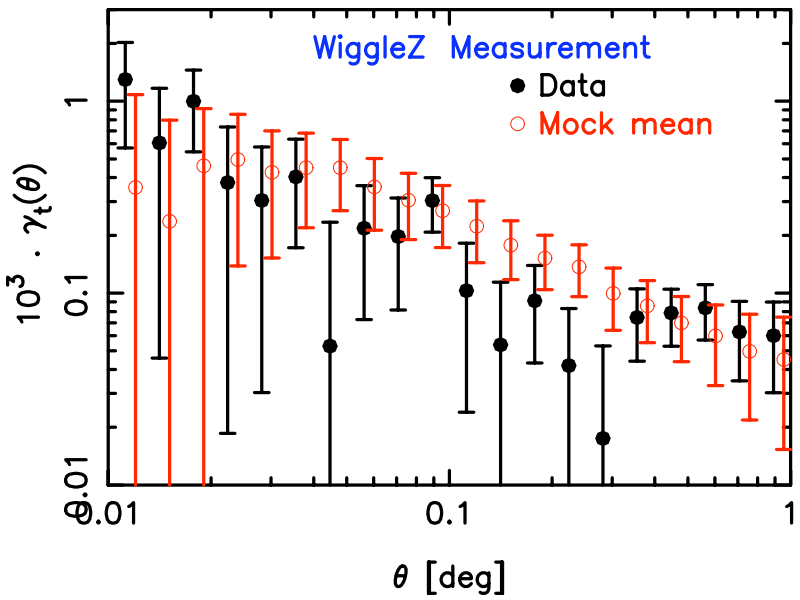


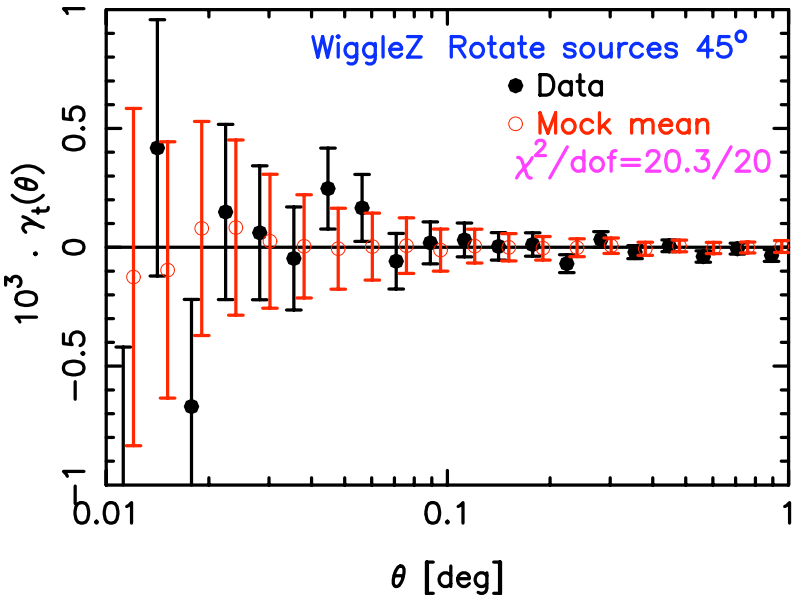


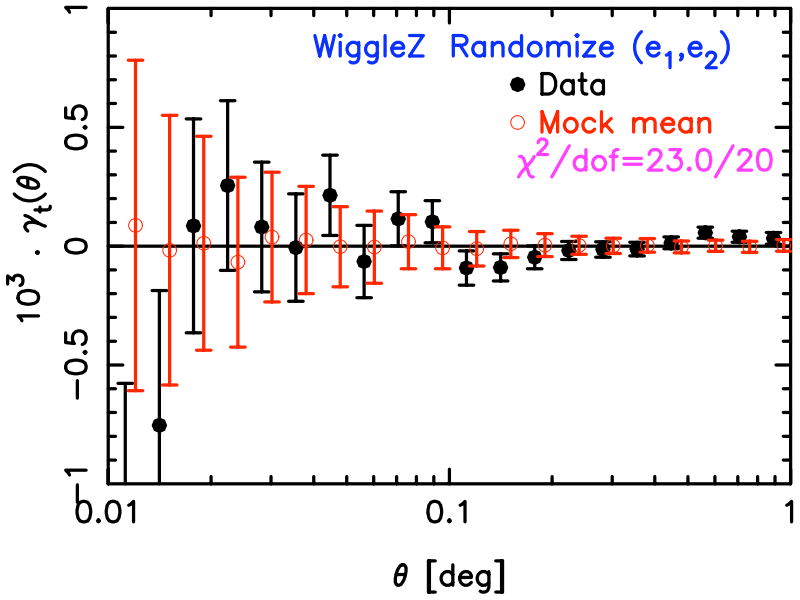


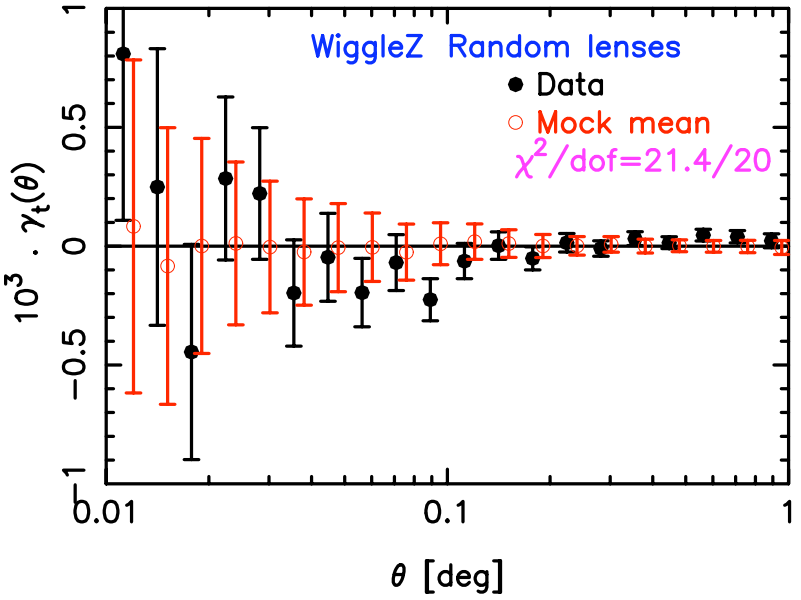


Shape systematics tests

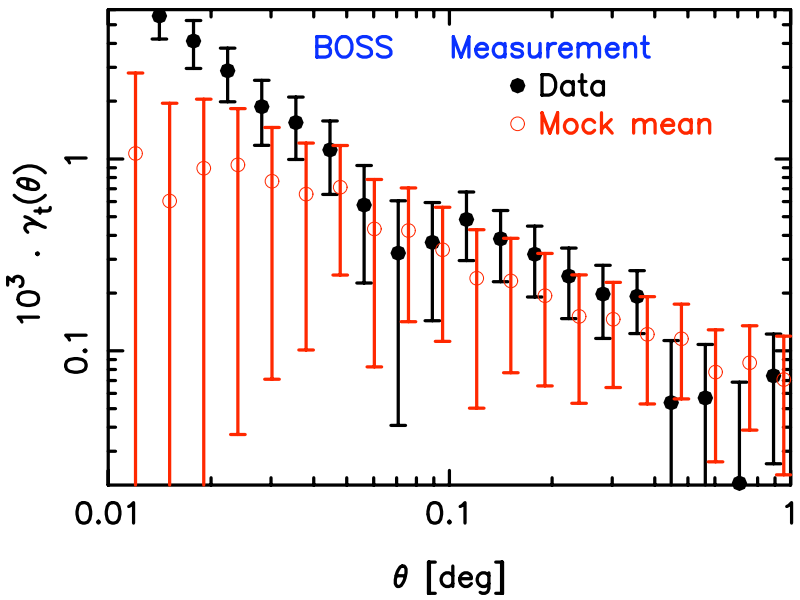


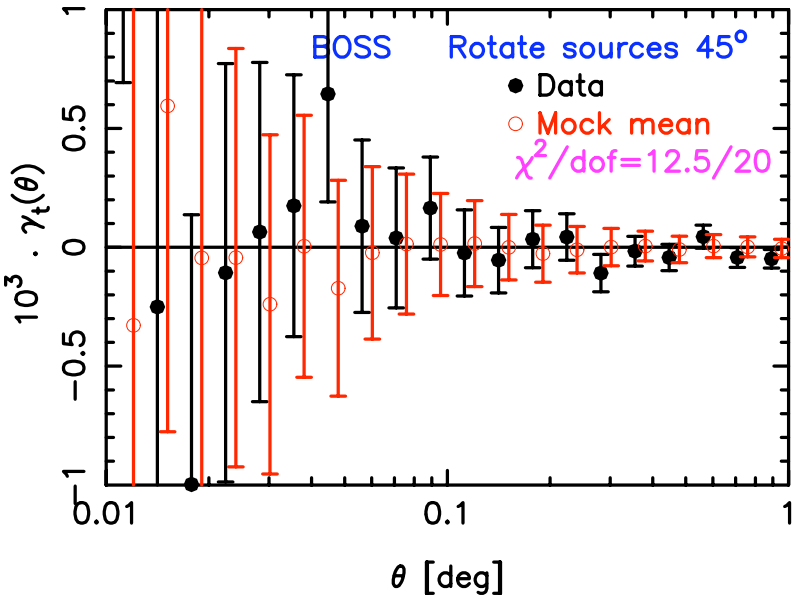


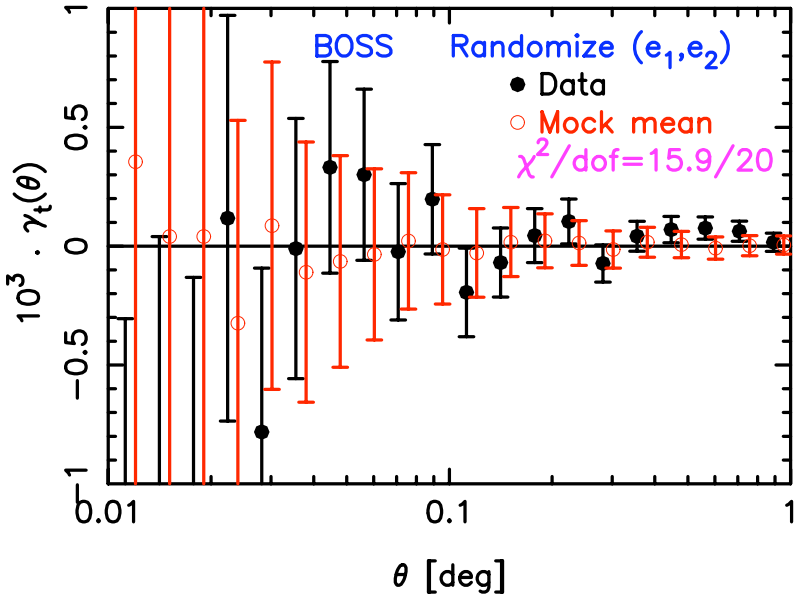


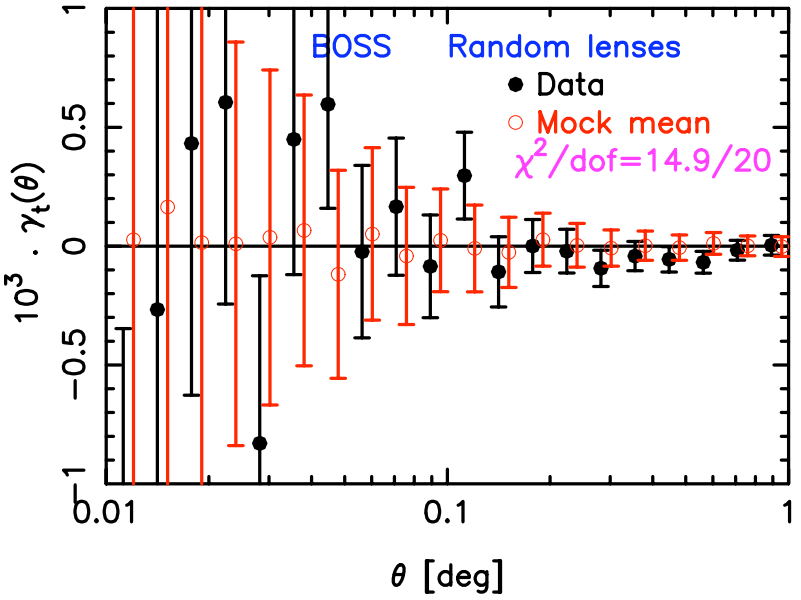


Shape systematics tests



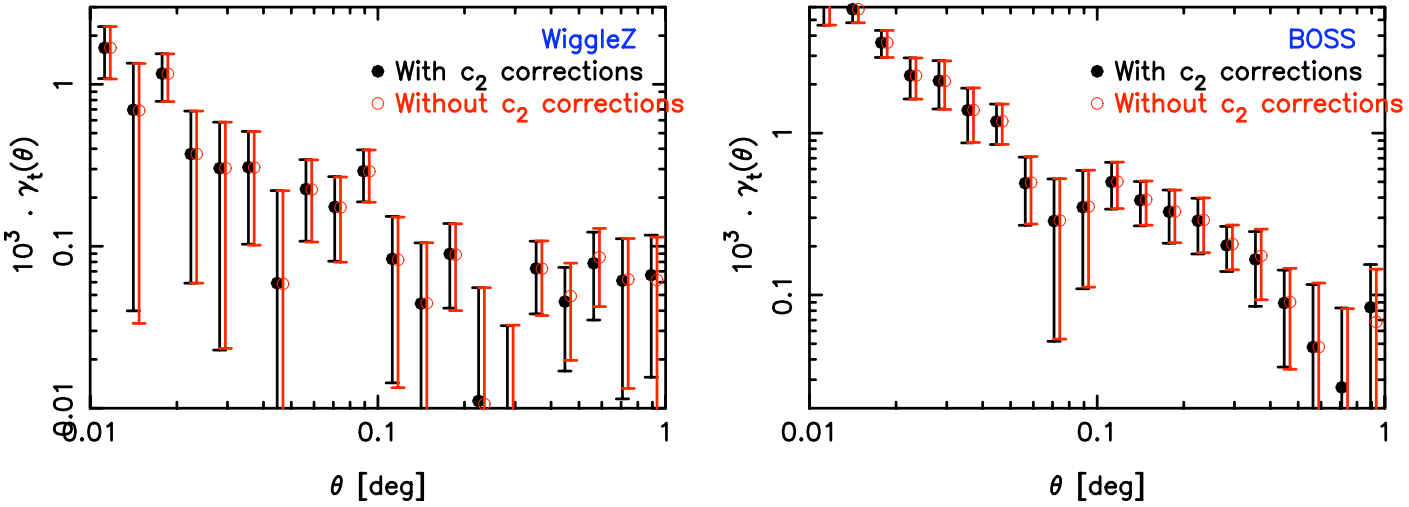




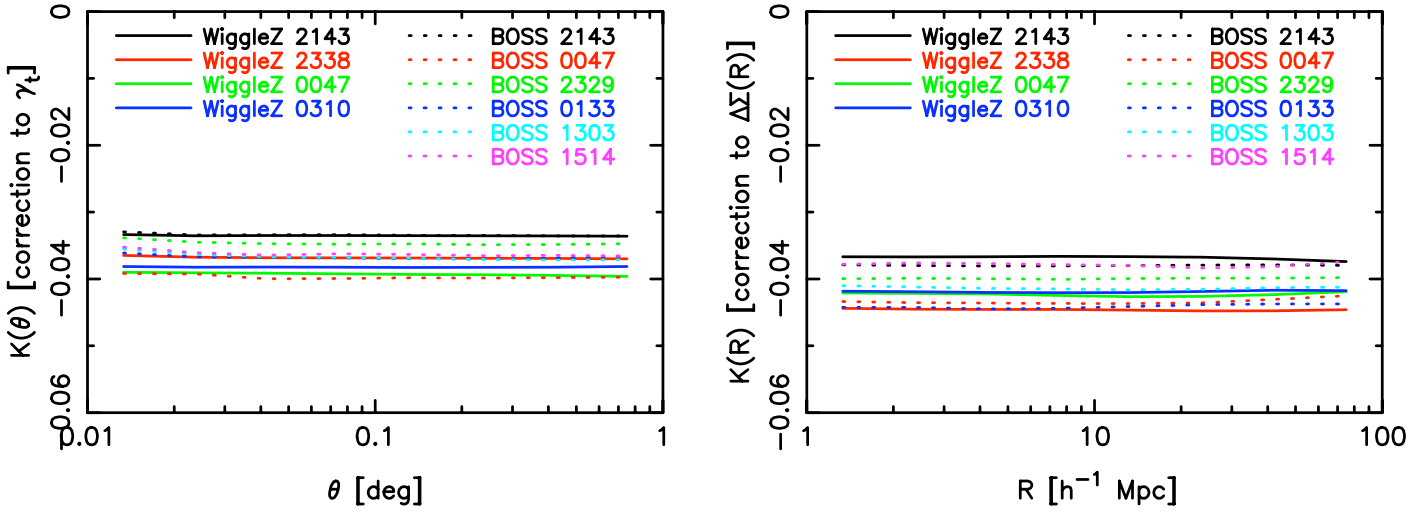


Calibration corrections (1)

- Additive shear bias correction

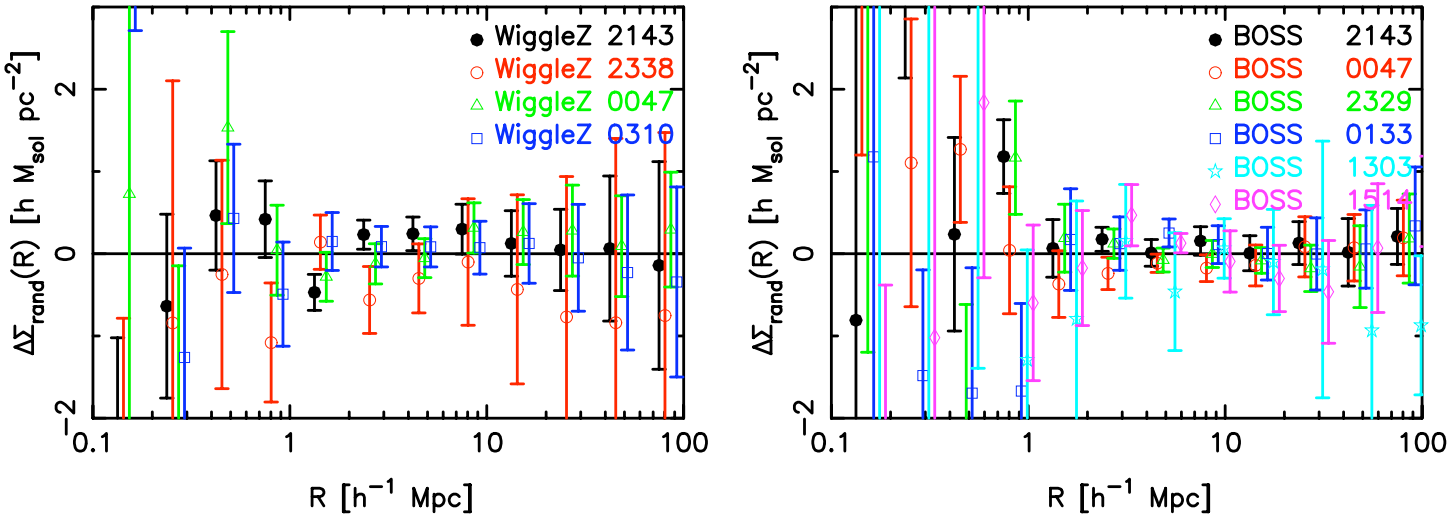


- Multiplicative shear bias correction

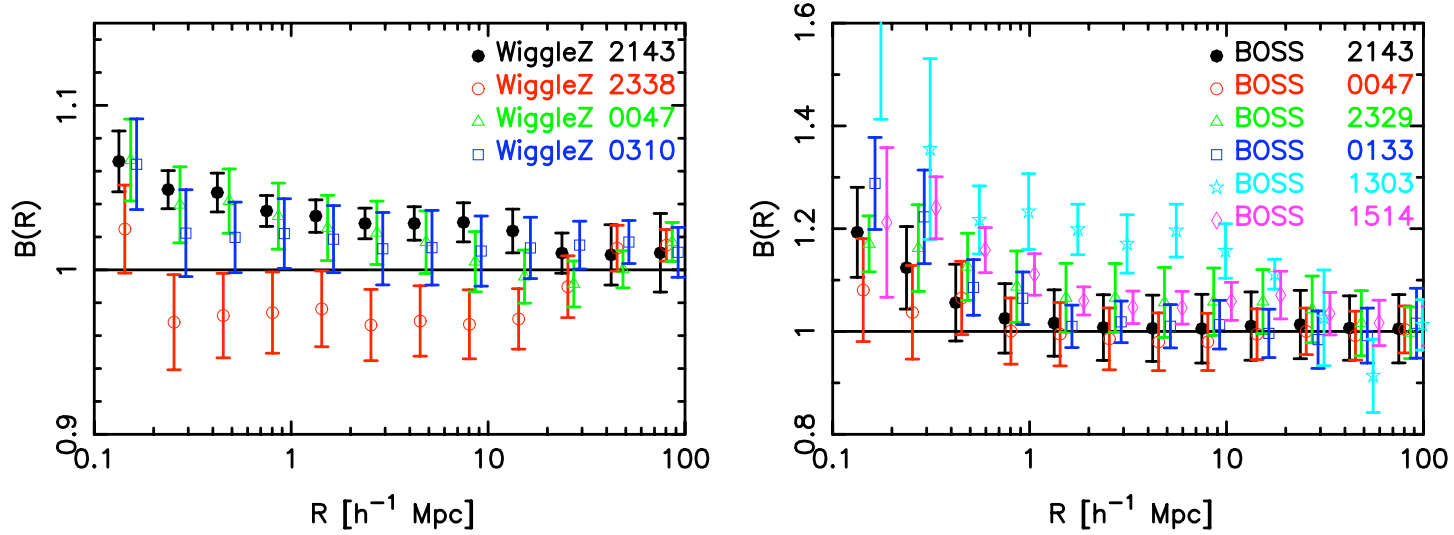


Calibration corrections (2)

- Distribution of lenses with respect to boundaries



- Multiplicative bias from source-lens association

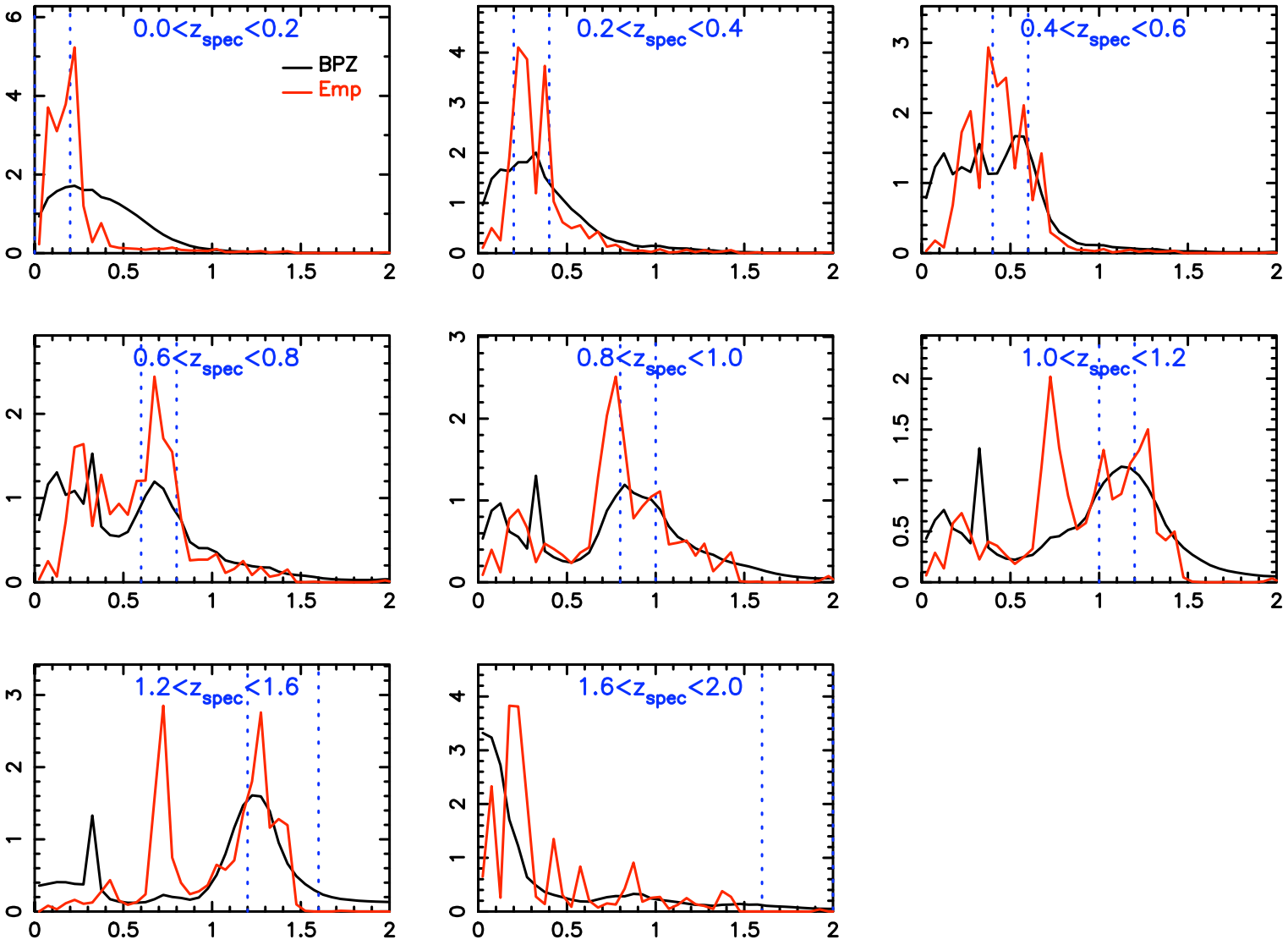


Photometric redshift tests

- We have two types of photo-z available - BPZ and Chris Wolf's "empirical" photo-zs (Emp)
- Emp photo-zs provided in a finely-spaced P(z) vs. log(1+z). I have re-binned in linear dz=0.05 bins and defined an equivalent Z_B using max[$P_{binned}(z)$]
- Aim (1) : understand error distributions and outliers in photo-zs and how this impacts $\Delta\Sigma_t(R)$
- Aim (2) : use full photo-z probability distributions in analyses and demonstrate that science results are insensitive to photo-z methodgy

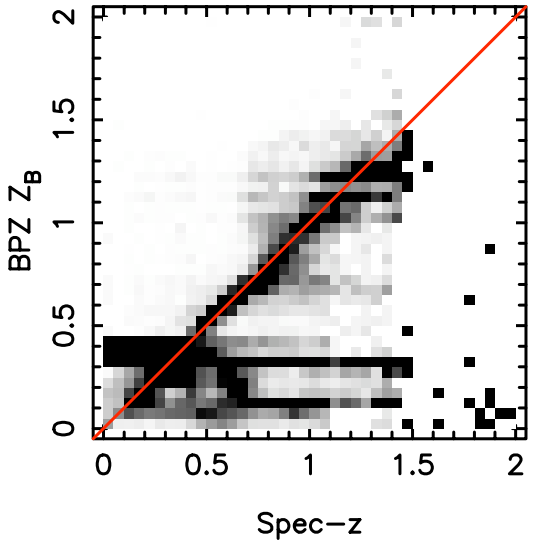
Photometric redshift tests

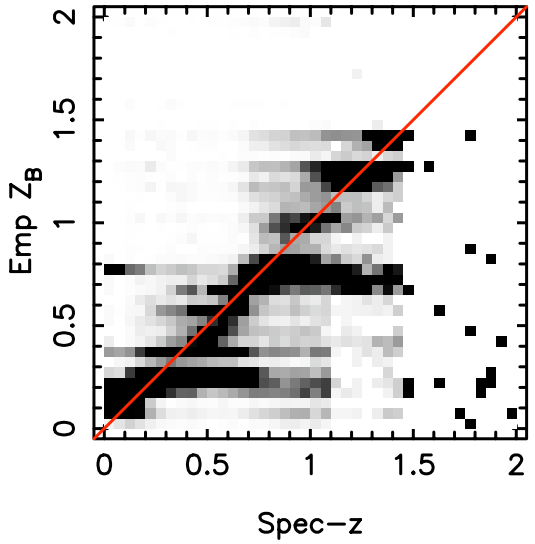
- Summed photo-z distributions in spec-z slices

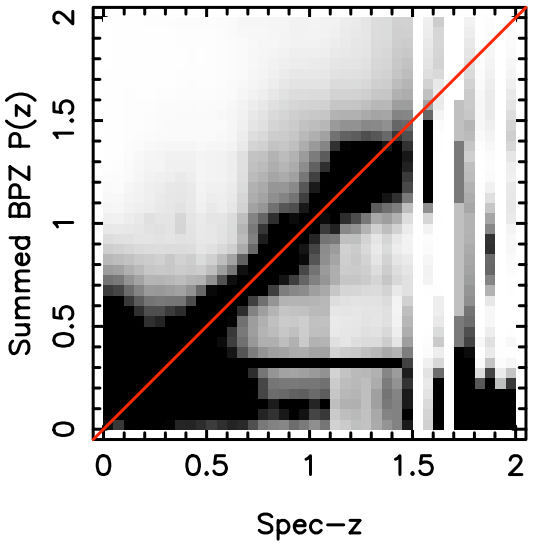


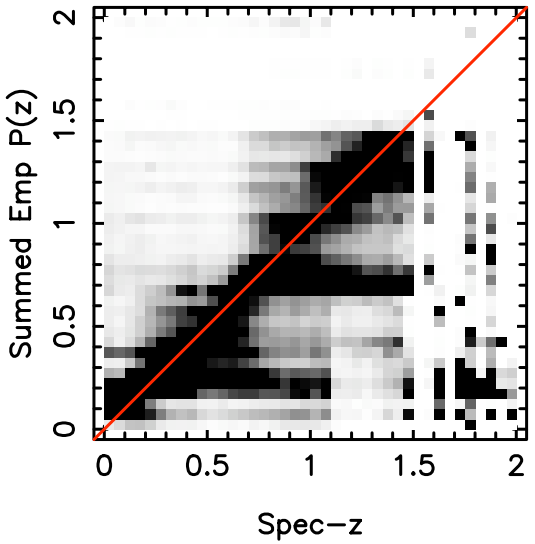
Photometric redshift tests

- Photo-z vs spec-z distributions



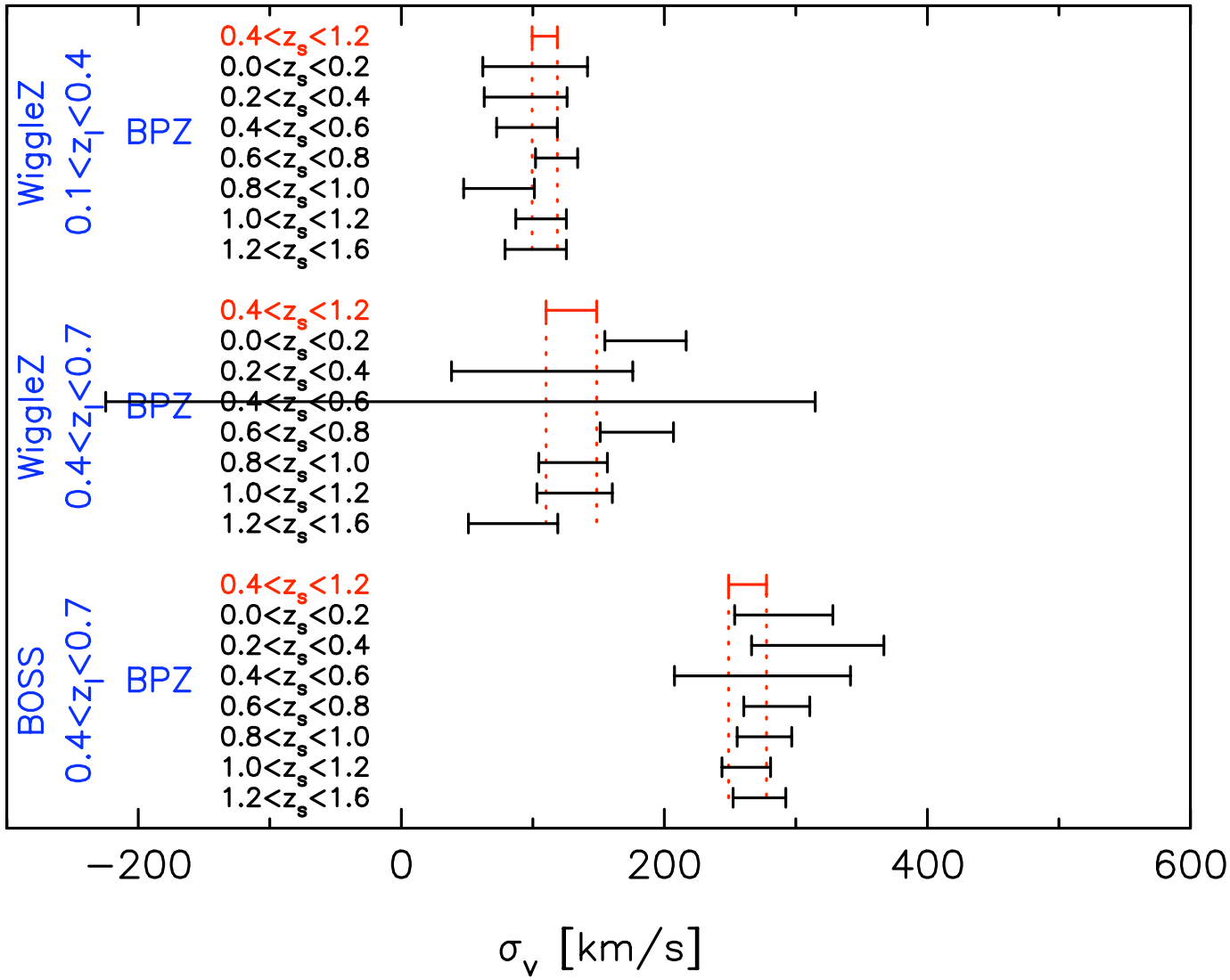






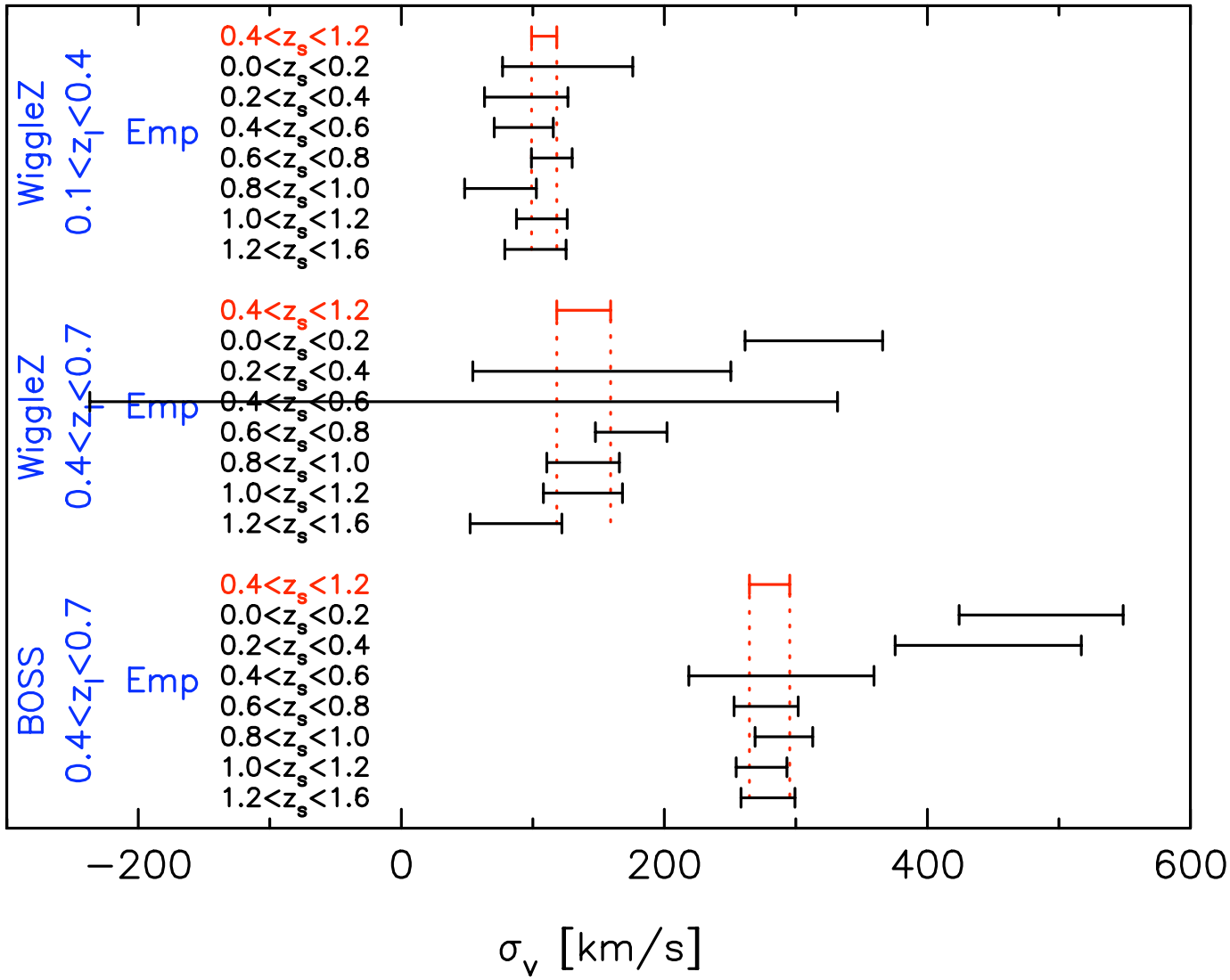
Photometric redshift tests

- Singular isothermal sphere fits in z-slices (BPZ)



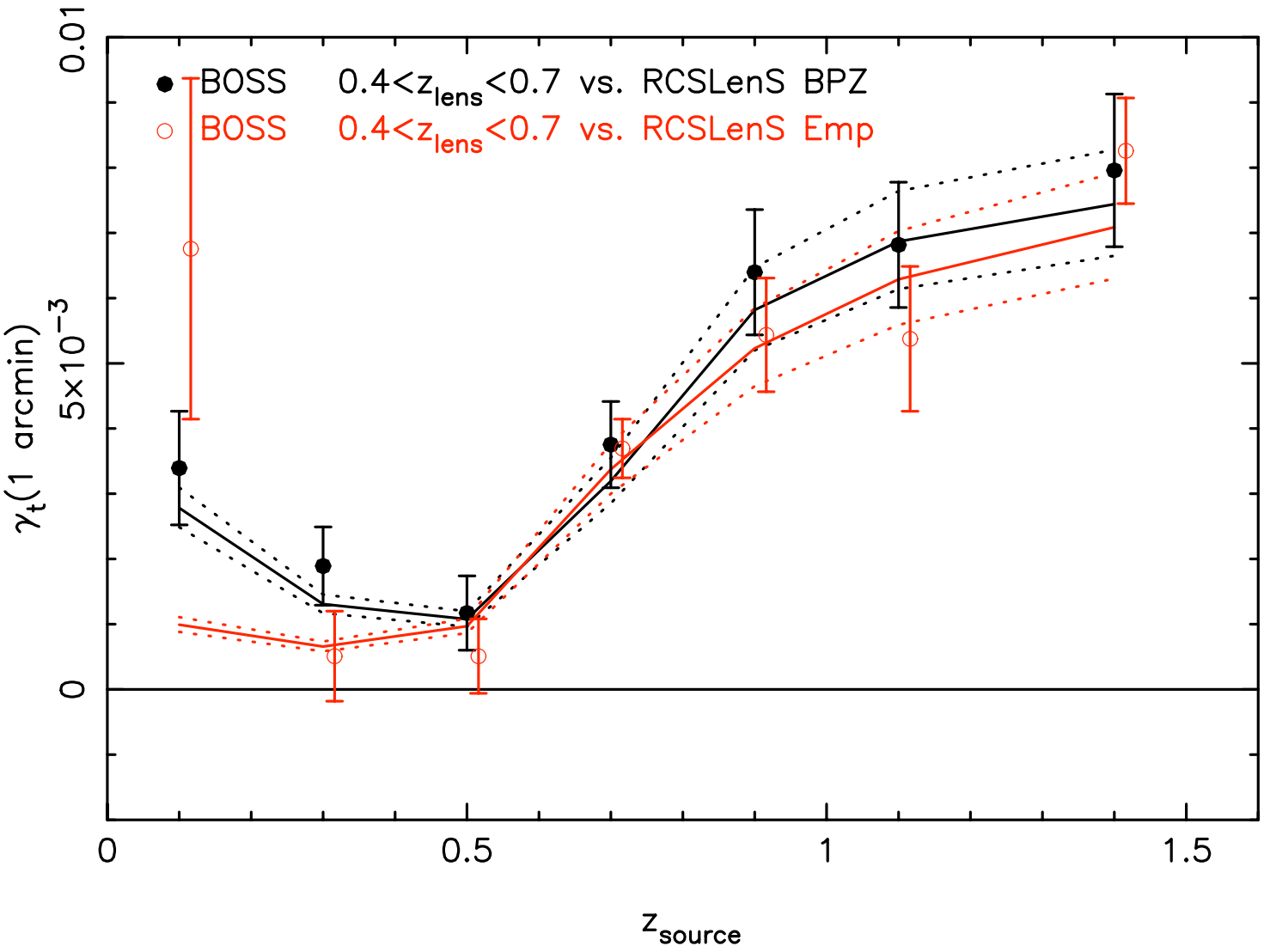
Photometric redshift tests

- Singular isothermal sphere fits in z-slices (Emp)



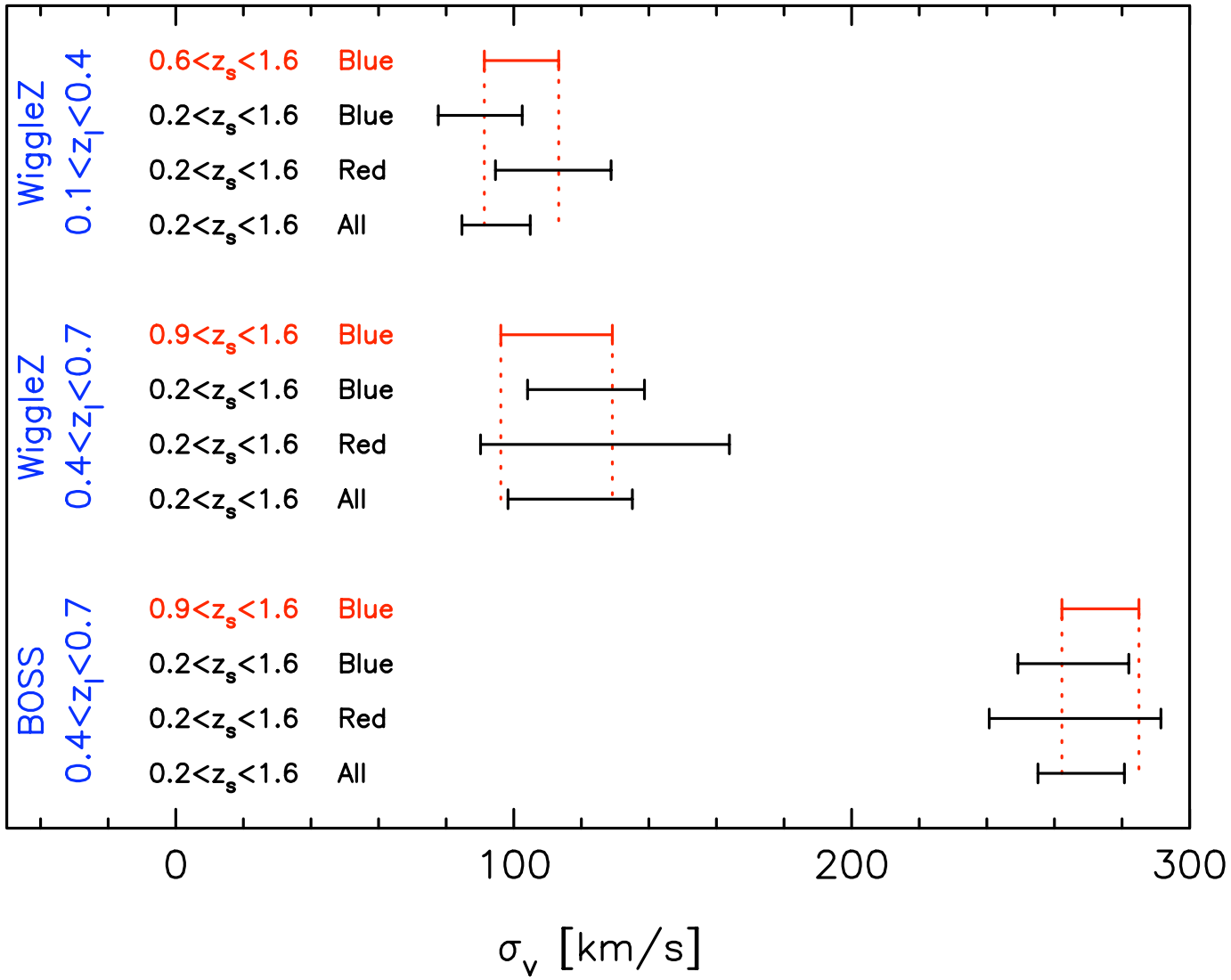
Photometric redshift tests

- Variation with redshift (model fixed by "robust" sample)



Intrinsic alignment tests

- Singular isothermal sphere fits cutting by BPZ T_B



Use of N-body simulations

arXiv:1202.2332

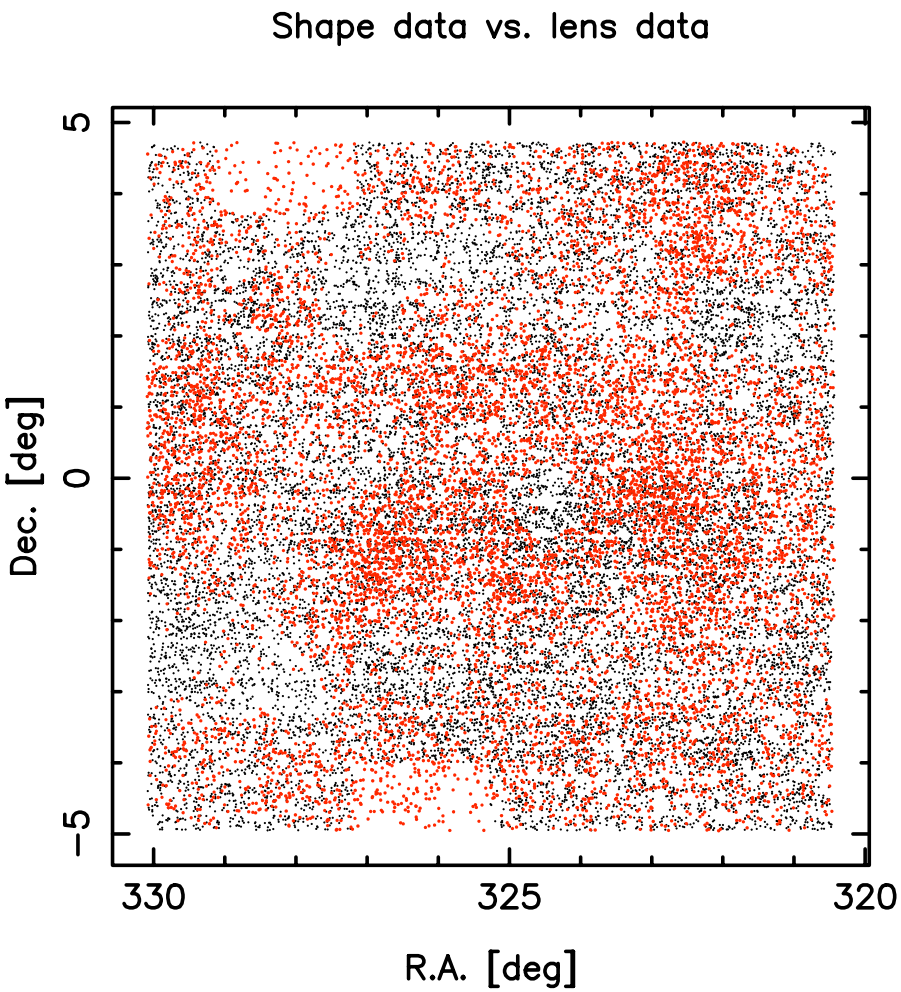
Gravitational Lensing Simulations I : Covariance Matrices and Halo Catalogues

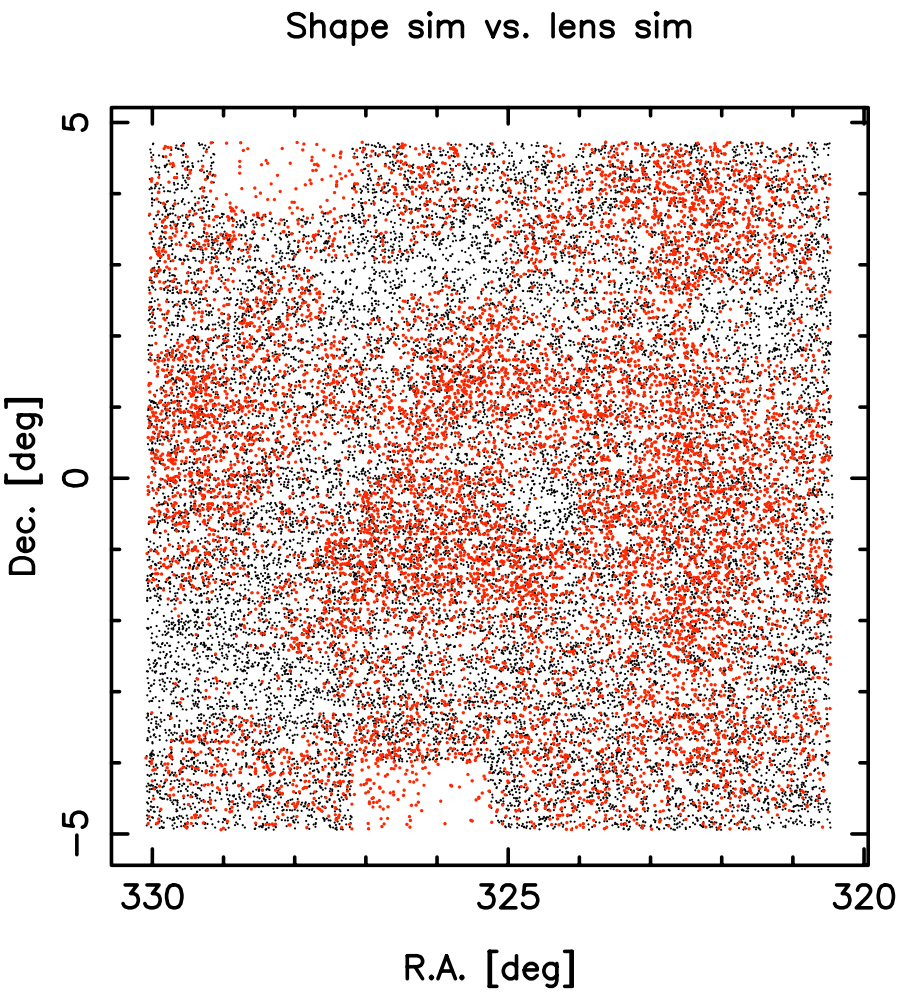
Joachim Harnois-Déraps[1,2⋆], Sanaz Vafaei[3]† and Ludovic Van Waerbeke[3]‡
[1] *Canadian Institute for Theoretical Astrophysics, University of Toronto, M5S 3H8, Canada*
[2] *Department of Physics, University of Toronto, M5S 1A7, Ontario, Canada*
[3] *Department of Physics and Astronomy, University of British Columbia, Vancouver, V6T 1Z1, B.C., Canada*

- Harnois-Deraps & van Waerbeke are generating ~1000 500 Mpc/h P^3M simulations with full ray-tracing
- I subsample the simulations to generate mock catalogues matching : source and lens N(z)'s, number densities, angular selection functions, photo-z errors
- Simulations used for constructing covariance matrices, pipeline/modelling tests ...

Use of N-body simulations

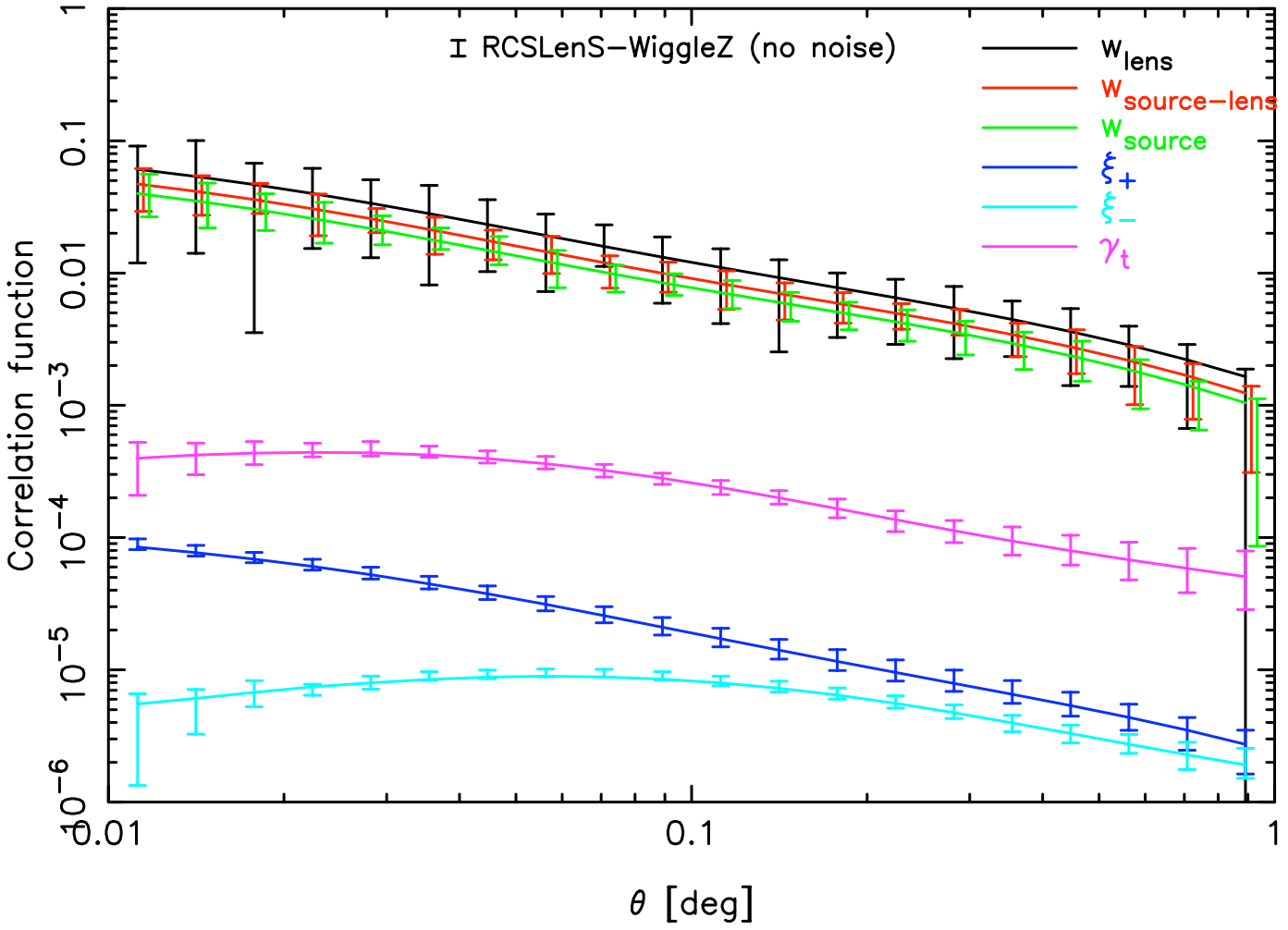
- Mocks incorporating angular selections (e.g. 2143 region)





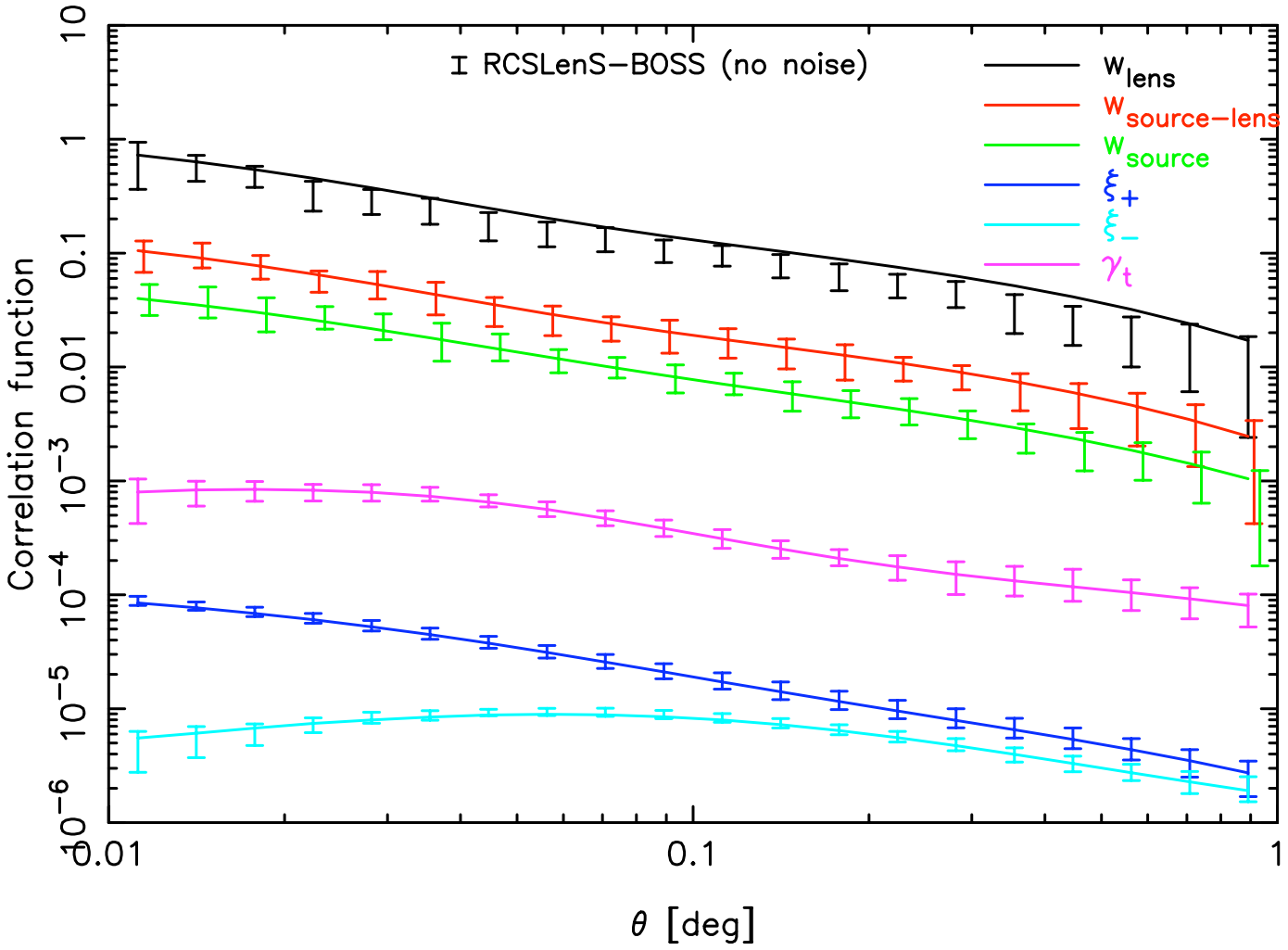
Use of N-body simulations

- Performance of mocks compared to input cosmology
  [new results using KiDS simulations]



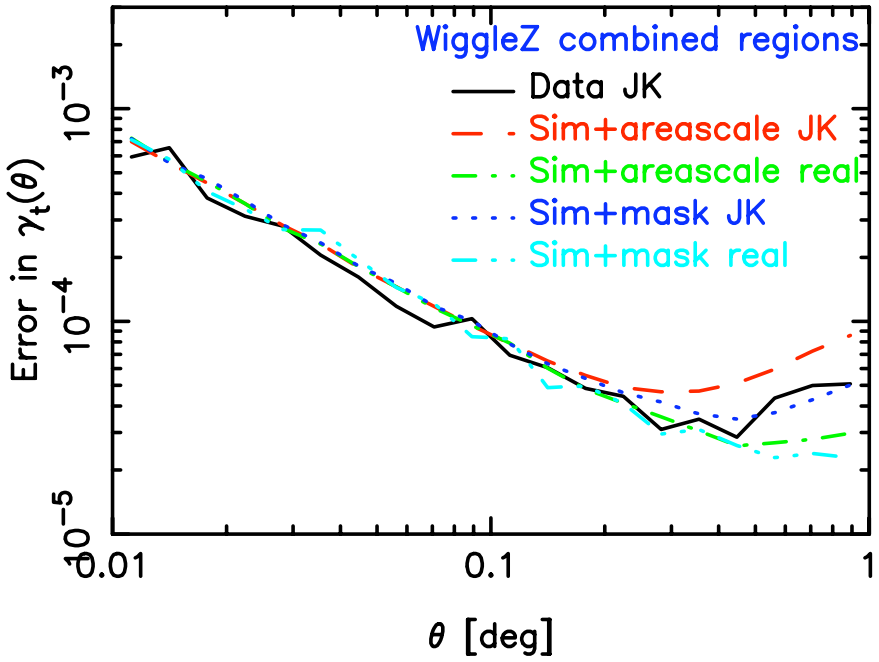
Use of N-body simulations

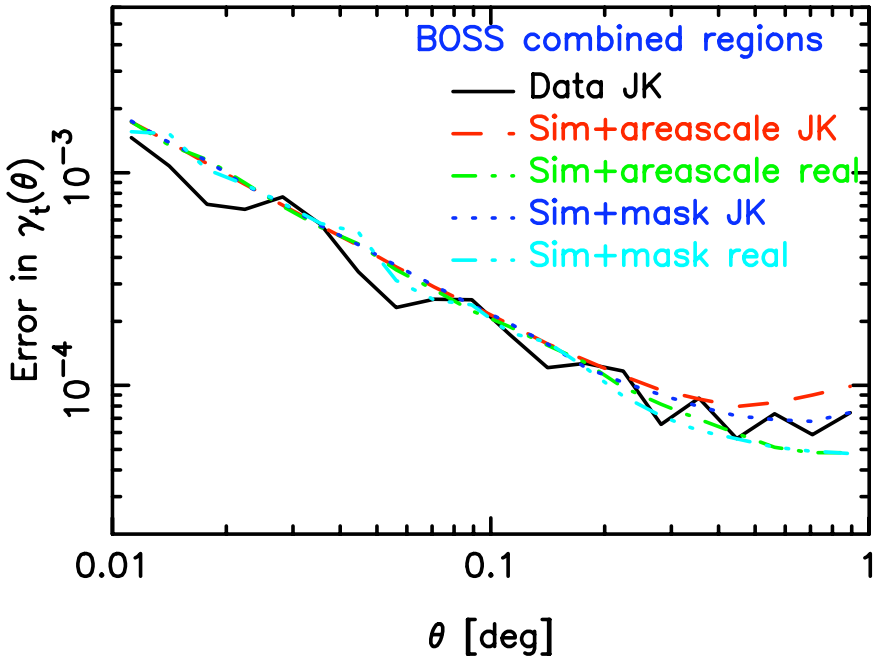
- Performance of mocks compared to input cosmology
  [new results using KiDS simulations]



Use of N-body simulations

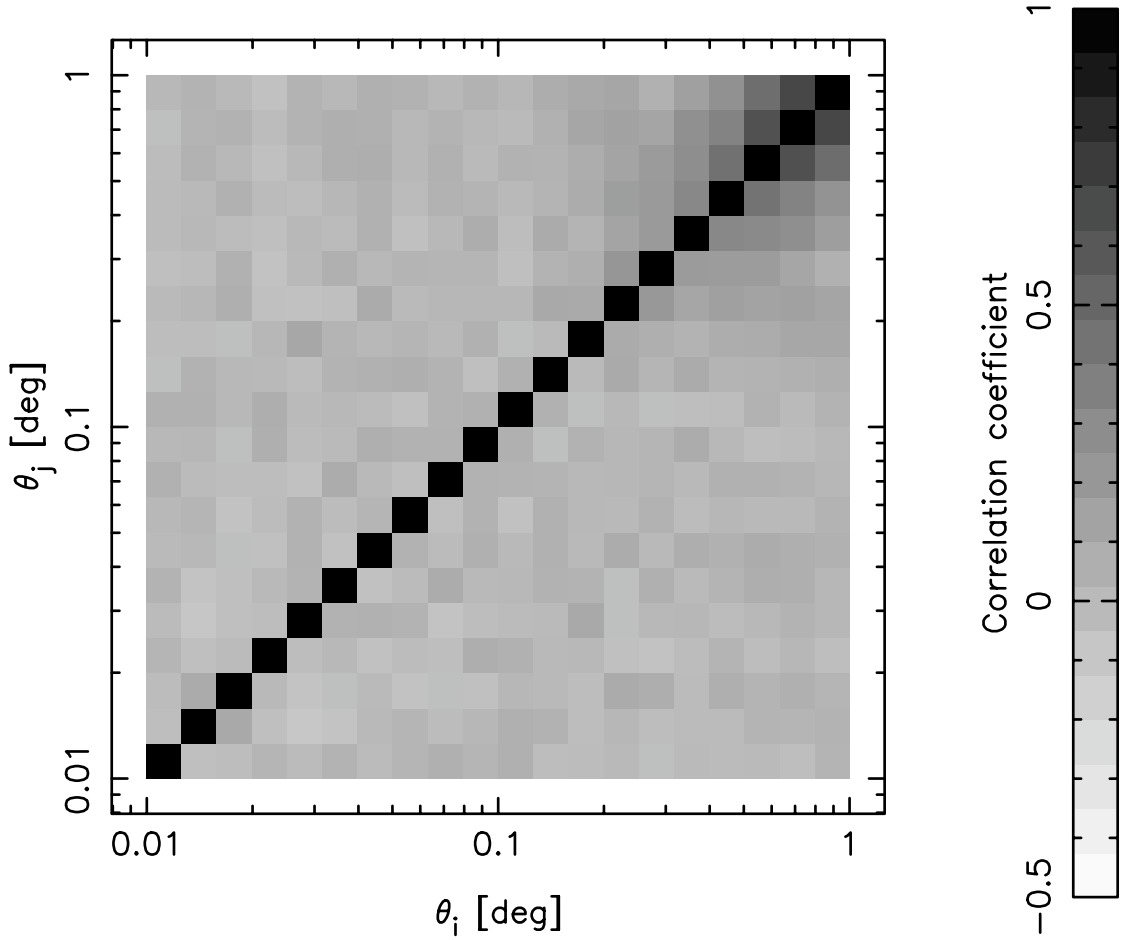
- Determination of covariance matrices
  [these are old results from CLONE simulations, being updated]





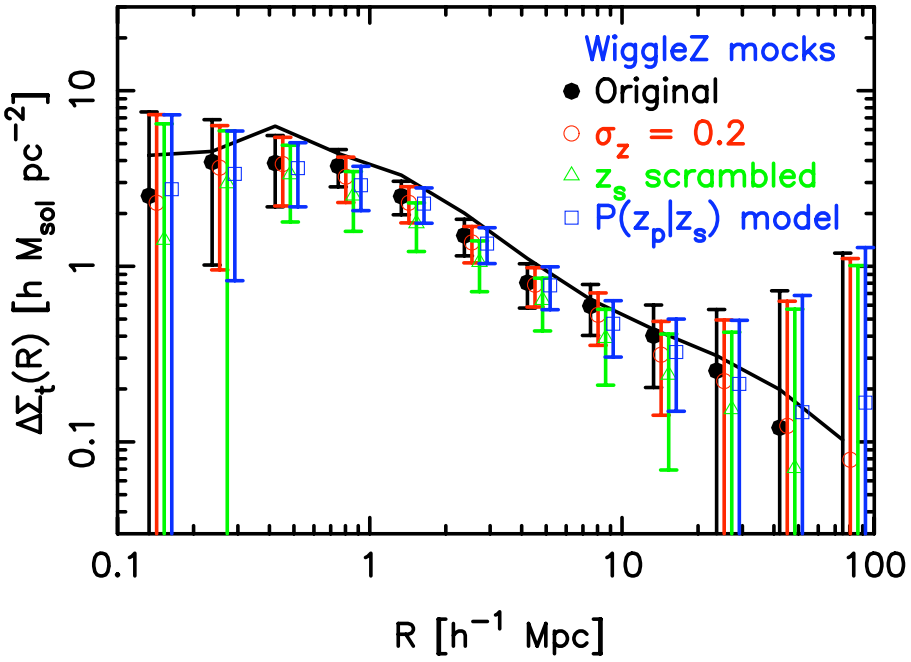
Use of N-body simulations

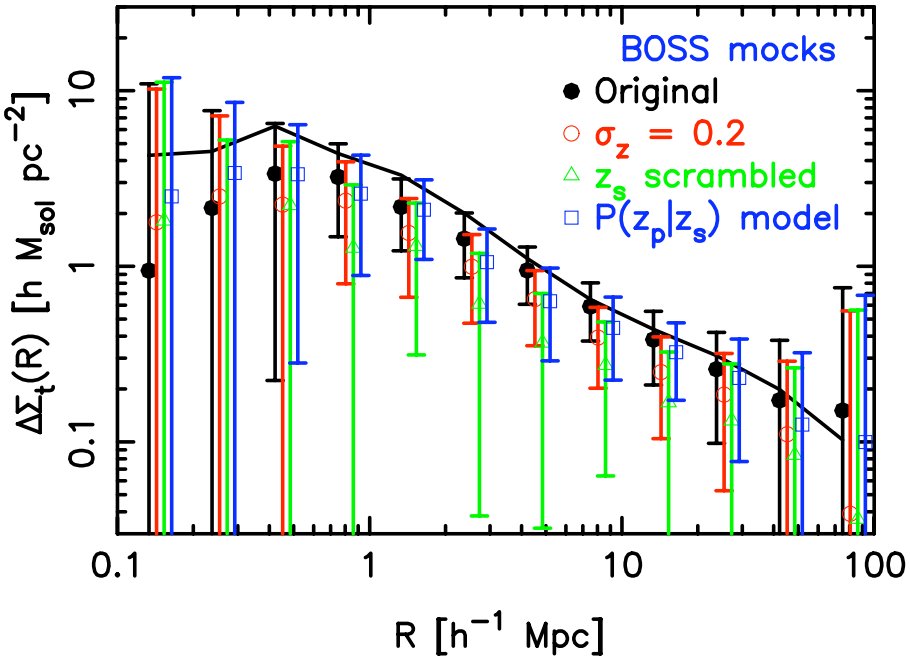
- Determination of covariance matrices
  [these are old results from CLONE simulations, being updated]



Use of N-body simulations

- Quantifying impact of photo-z error distribution
  [these are old results from CLONE simulations, being updated]





Next steps (paper 1)

- Complete mock catalogue studies with KiDS simulations [September]
- Finalize methodology for incorporating photo-z errors in $\Delta\Sigma_t(R)$ measurement [October]
- Finalize cross-correlation measurements using BOSS DR10 when available [October/November]
- Draft paper [December]

Next steps (paper 2)

- Establish cosmology-fitting pipeline including Planck + all lensing statistics
- Construction of WiggleZ/BOSS HOD catalogues from KiDS simulations
- Determine covariance matrices using full data vector

$$[\xi_0(s), \xi_2(s), \gamma_t(\theta), \xi_+(\theta), \xi_-(\theta)]$$

- Standard cosmology + modified gravity fits