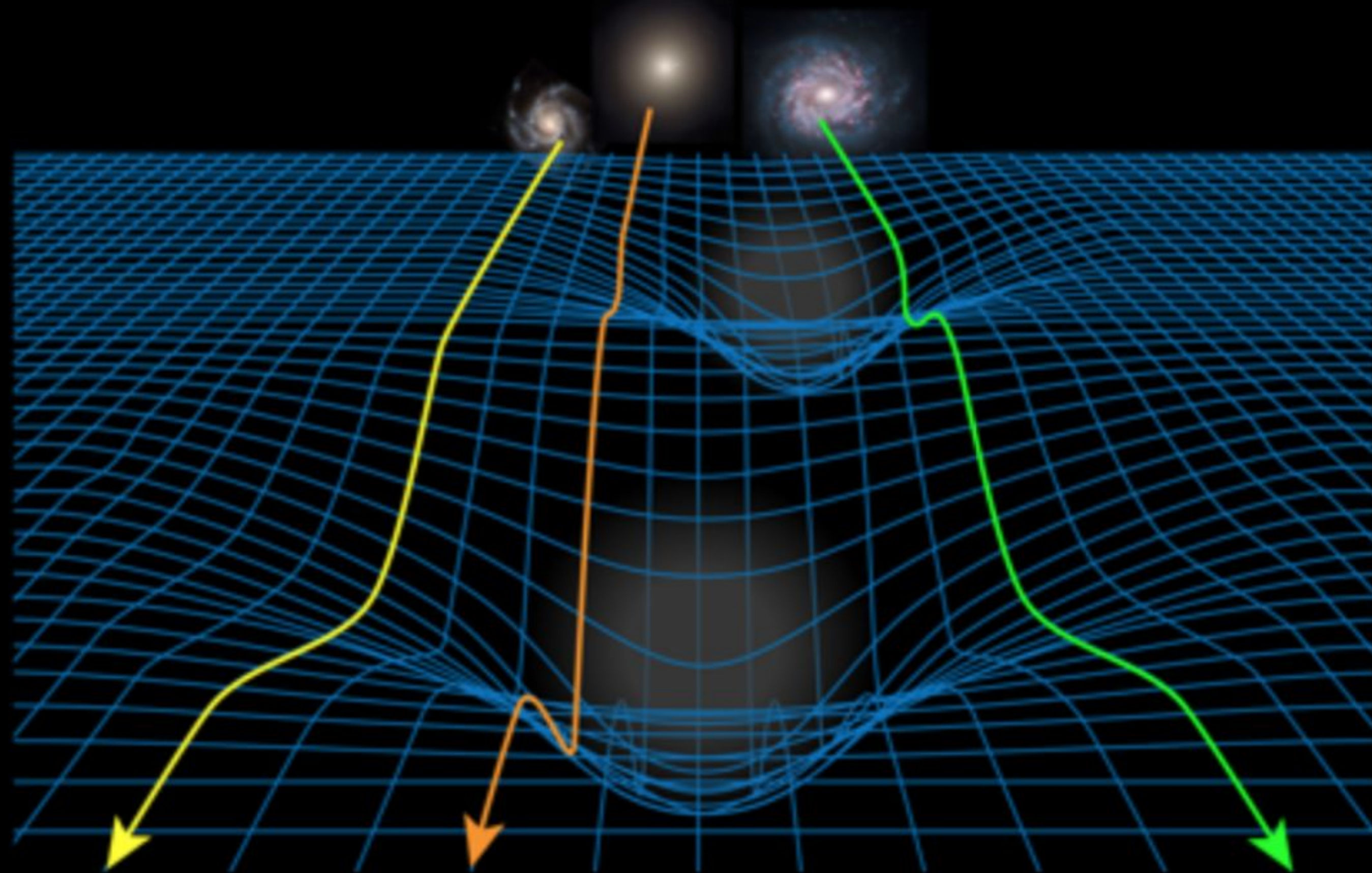


Cosmology with KiDS and cosmic shear

Marika Asgari

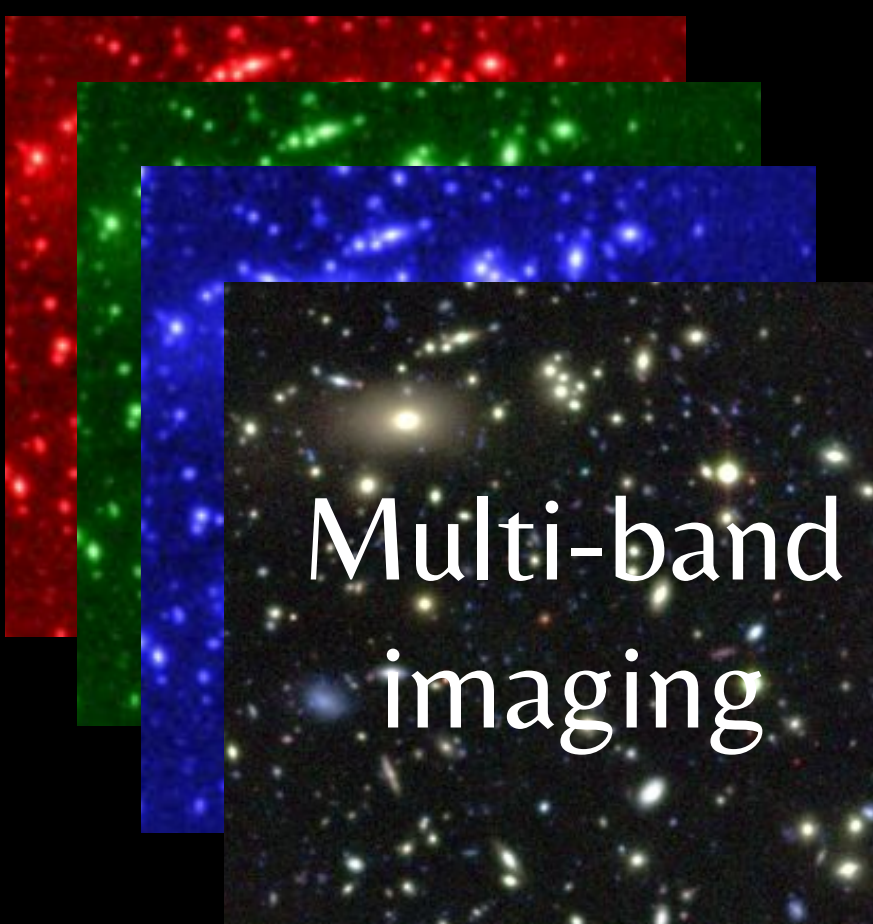


Credit: Stonebraker, APS

Cosmic Shear



+



Blinding!

Object Catalogue

Colours

Galaxies

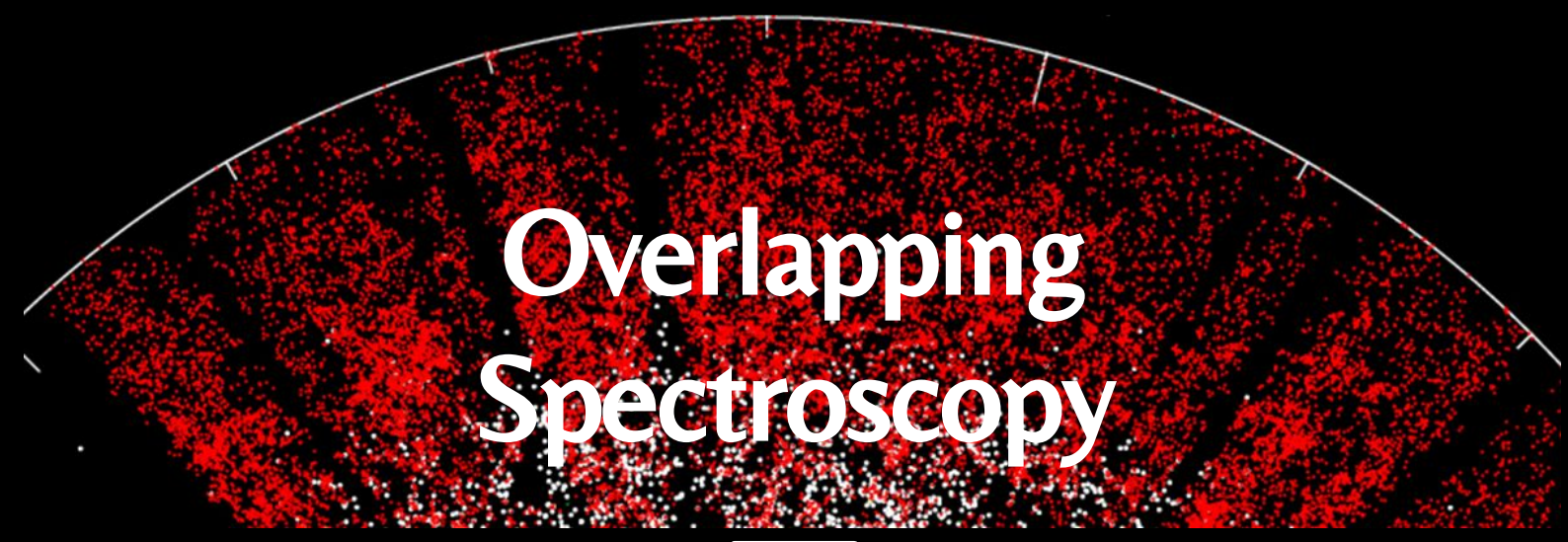
Stars

$P(z)$

Shapes

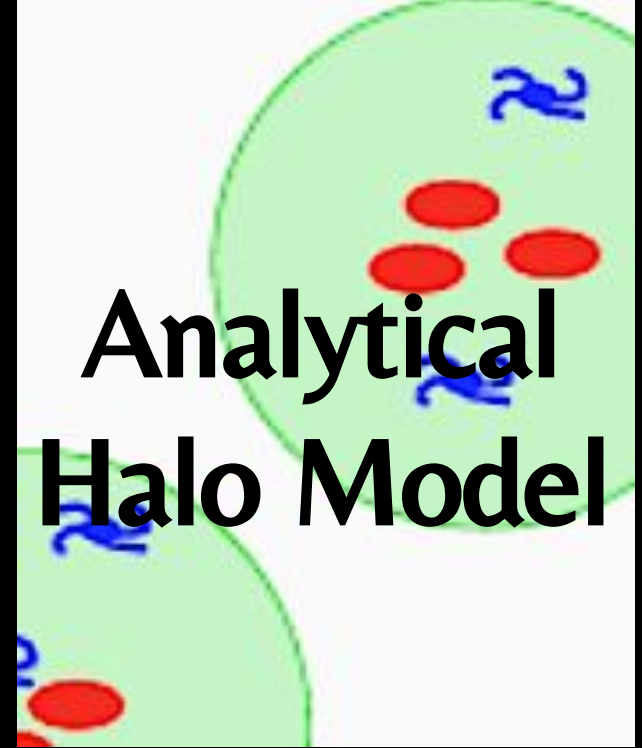
Your Favourite Statistic

Cosmology



Overlapping Spectroscopy

Calibration



Analytical Halo Model

Errors/Models

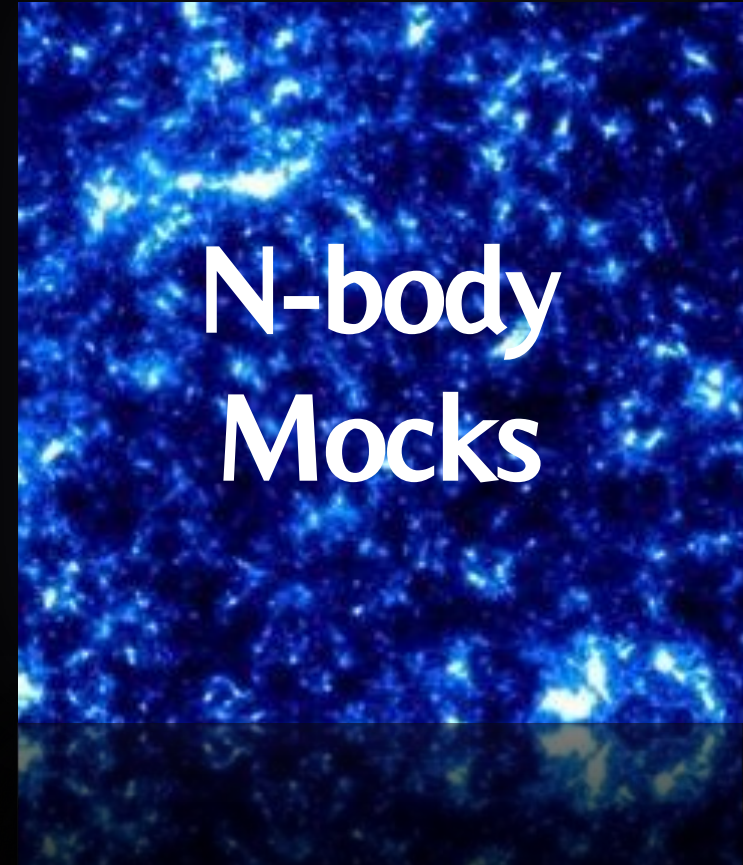


Nuisance



Image Simulations and "null tests"

credit Catherine Heymans

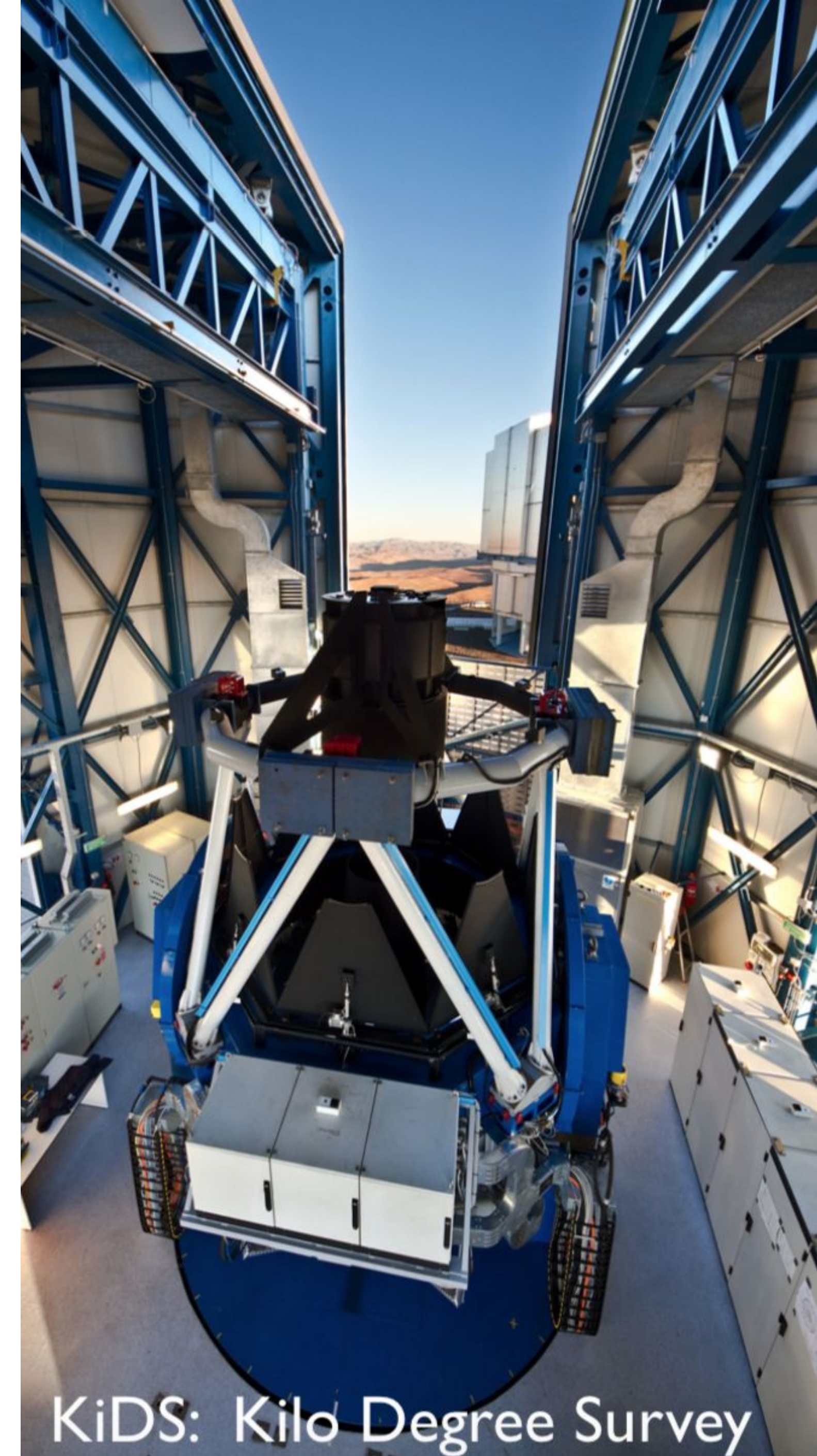


N-body Mocks

Errors/Models

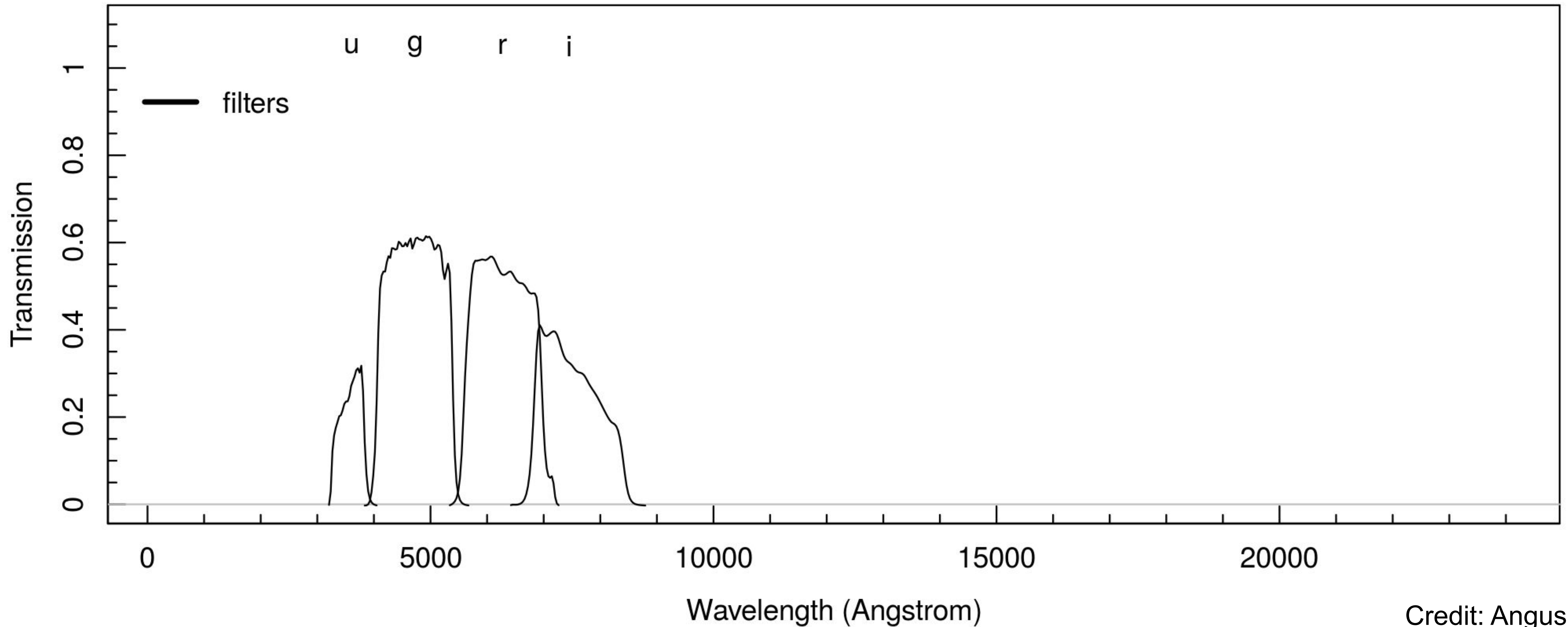
KiDS: Key Facts

- Weak lensing specific survey
- 450 deg² analysed
- shear cats are public
- 15 million galaxies
- 1000 deg² being analysed
- Completed: 1350 deg²
- KiDS+VIKING: 9 photometric bands



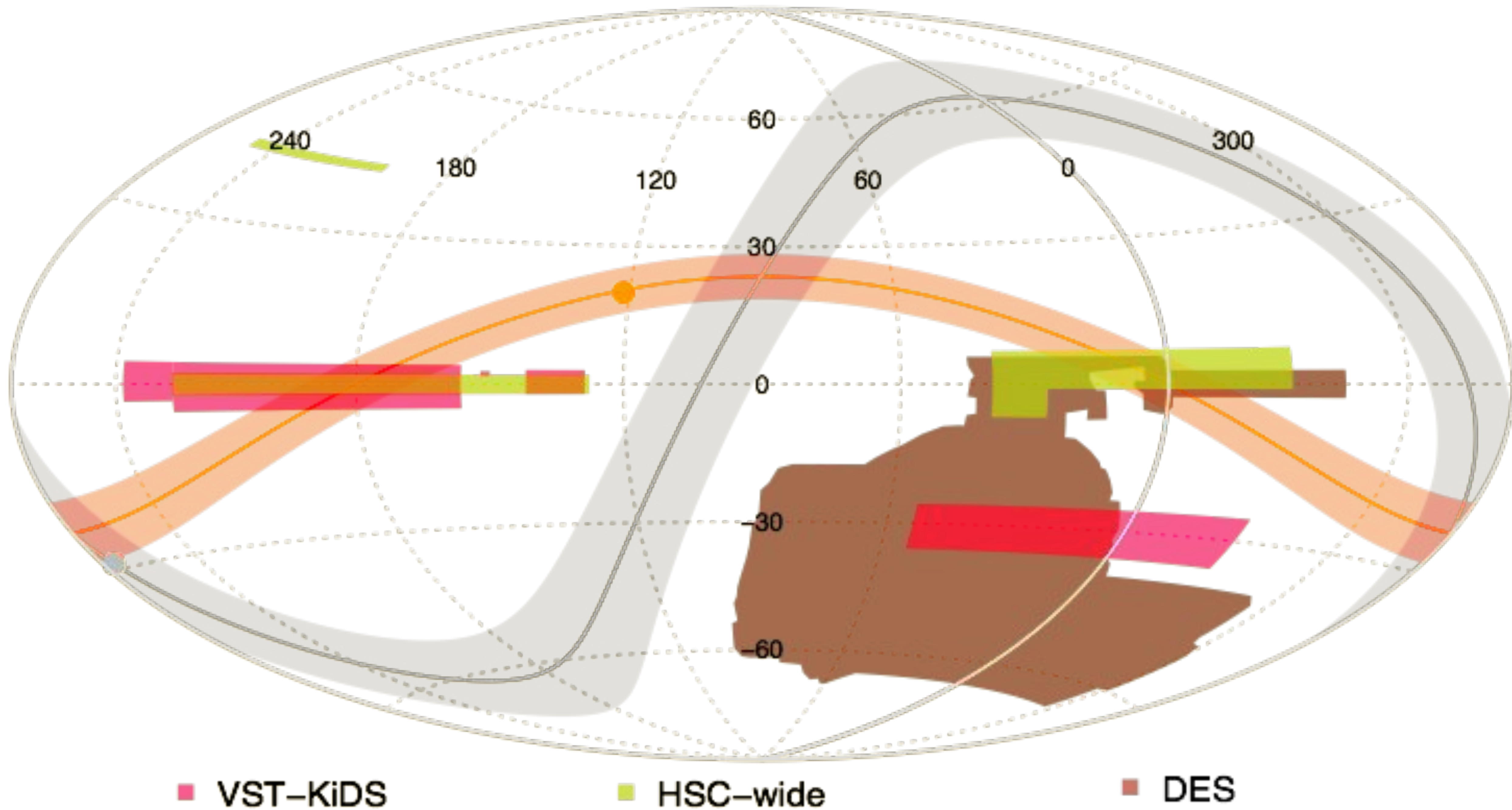
KiDS: Kilo Degree Survey

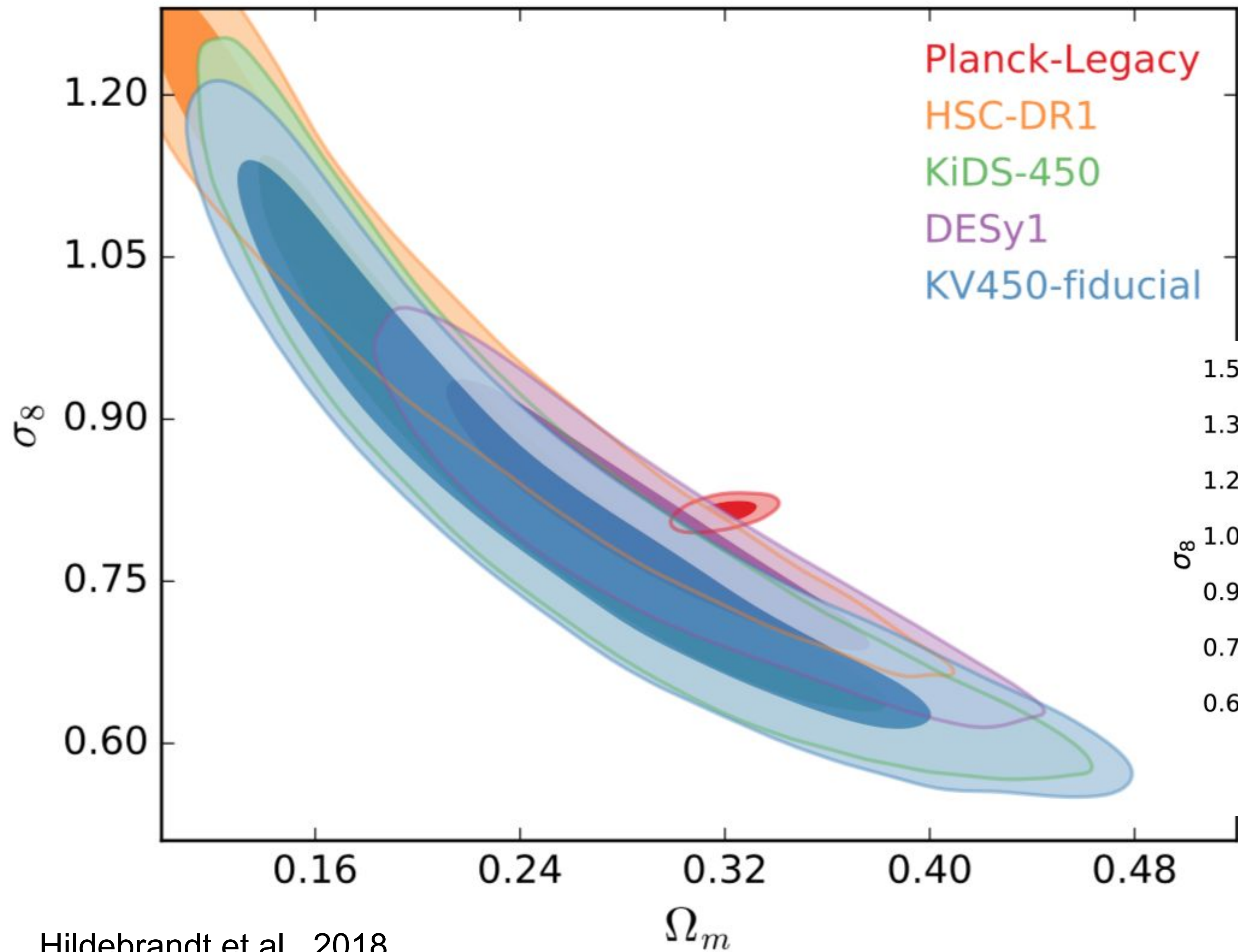
KIDS & VIKING



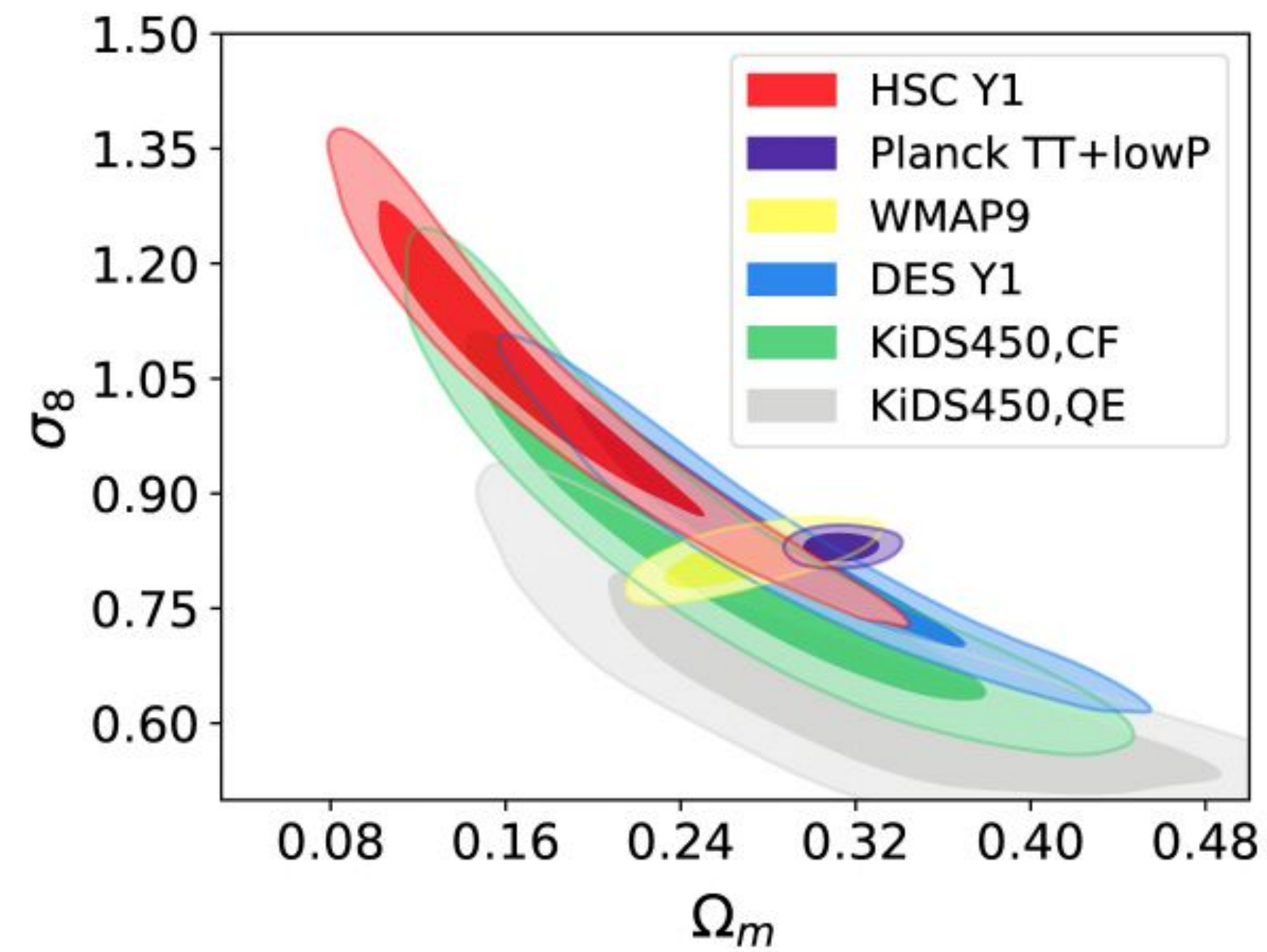
Standard cosmological model

- (flat)- LCDM
 - Simple: ~ 5 parameters
 - Successful in explaining various observations
 - But dark!

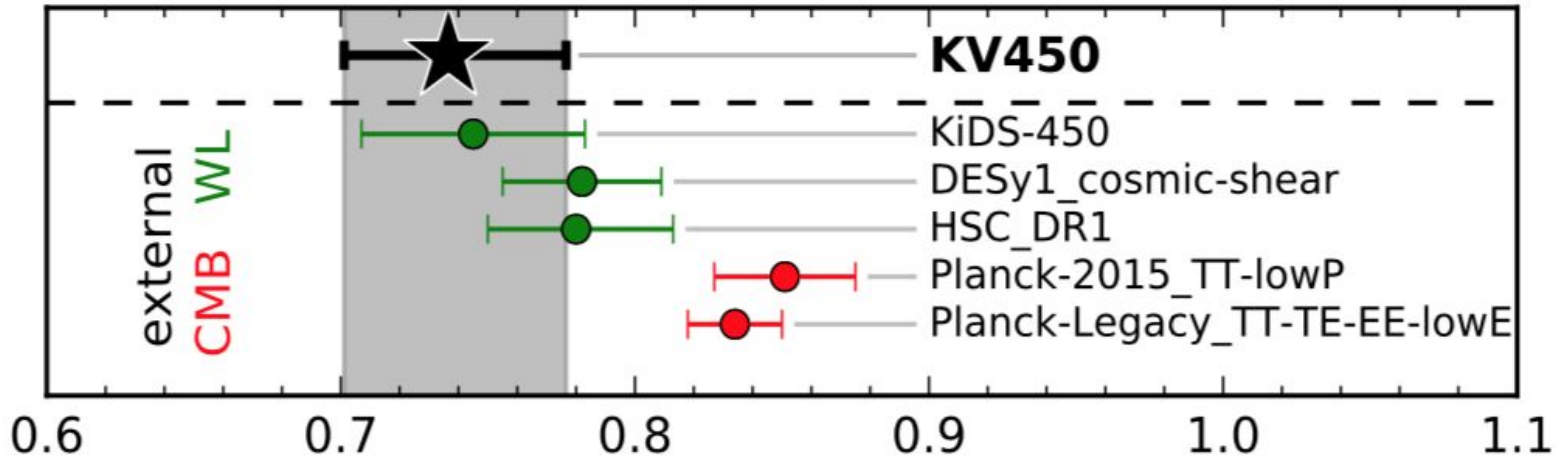




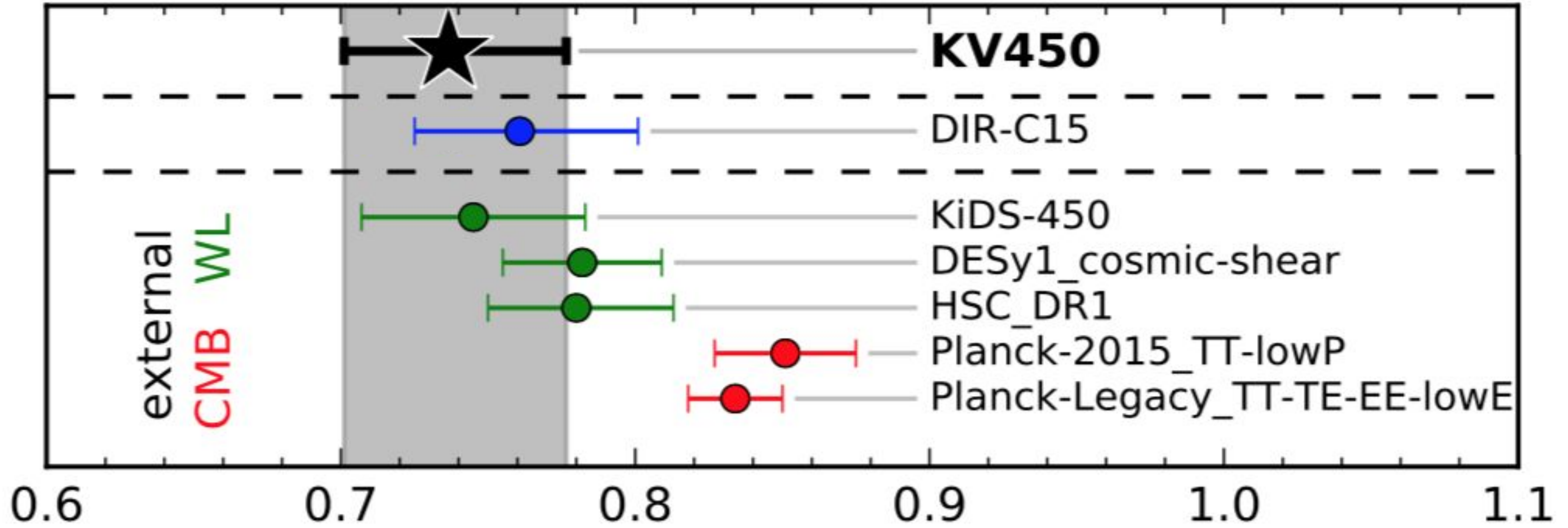
Hildebrandt et al. 2018



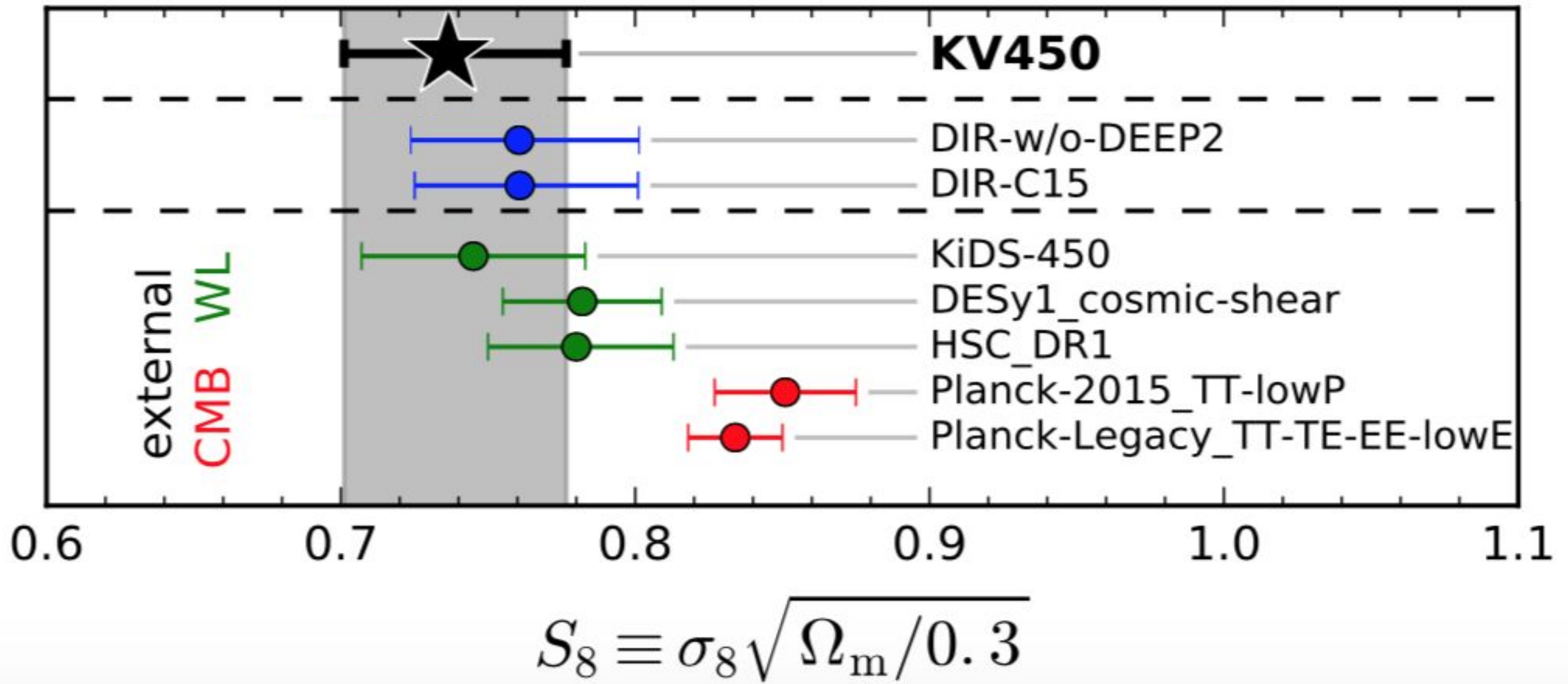
Hakage et al. 2018



$$S_8 \equiv \sigma_8 \sqrt{\Omega_m / 0.3}$$



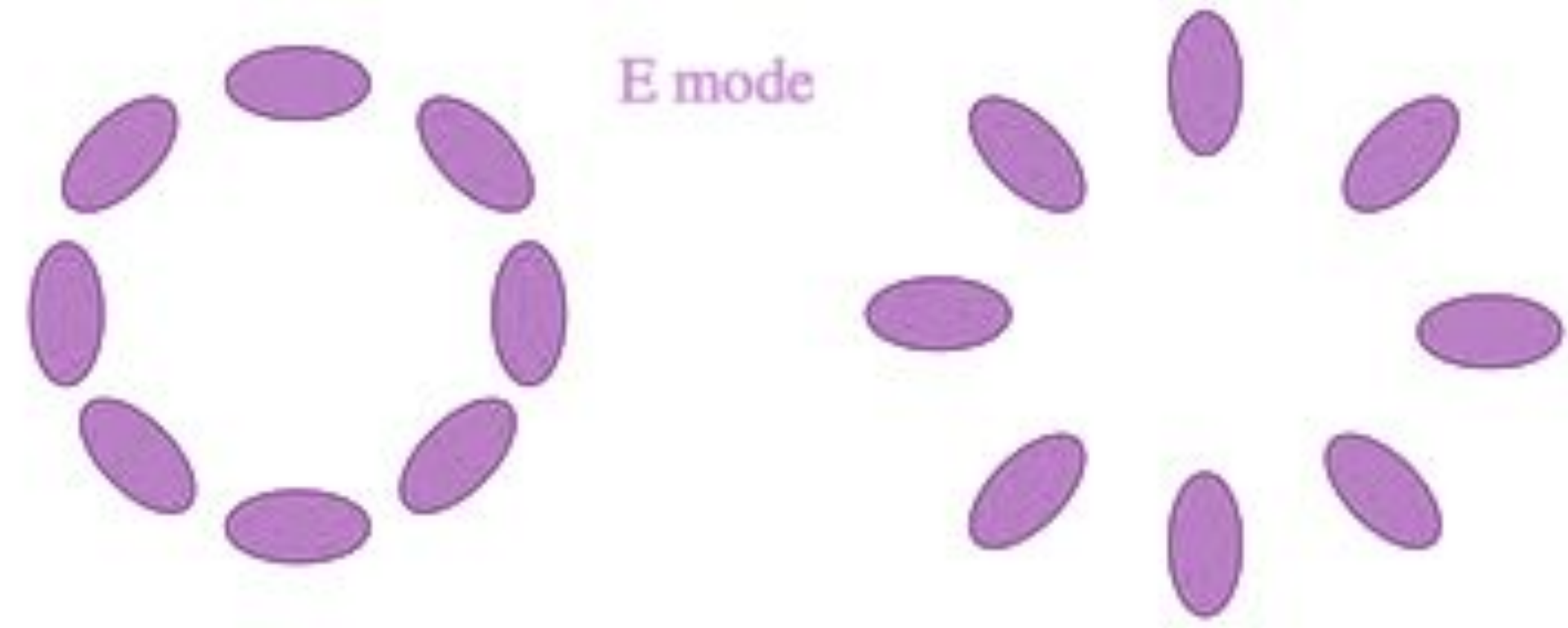
$$S_8 \equiv \sigma_8 \sqrt{\Omega_m / 0.3}$$



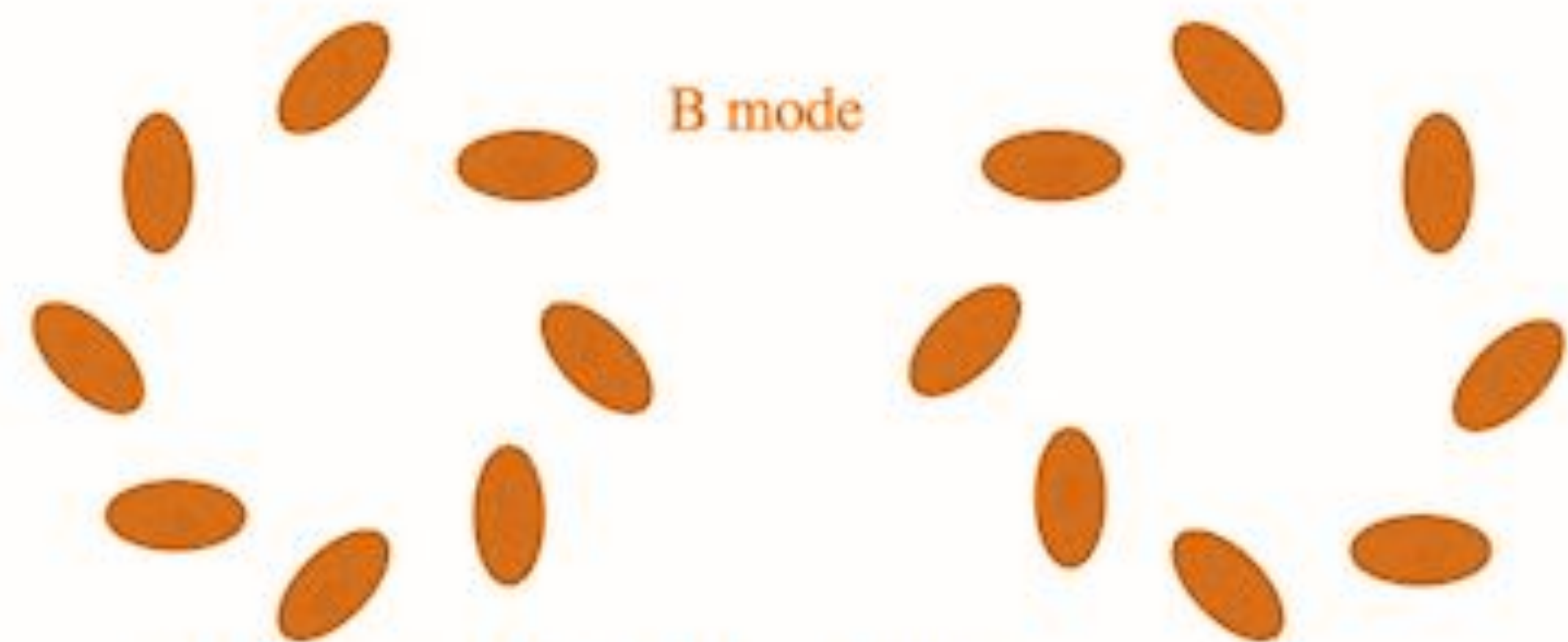
Complications!

Complete Orthogonal Sets of E/B-Integrals (COSEBIs)

- ★ Clean E/B-modes
- ★ Well-defined modes
- ★ Complete
- ★ Efficient
- ★ Gaussian distributed
- ★ Insensitive to small scales

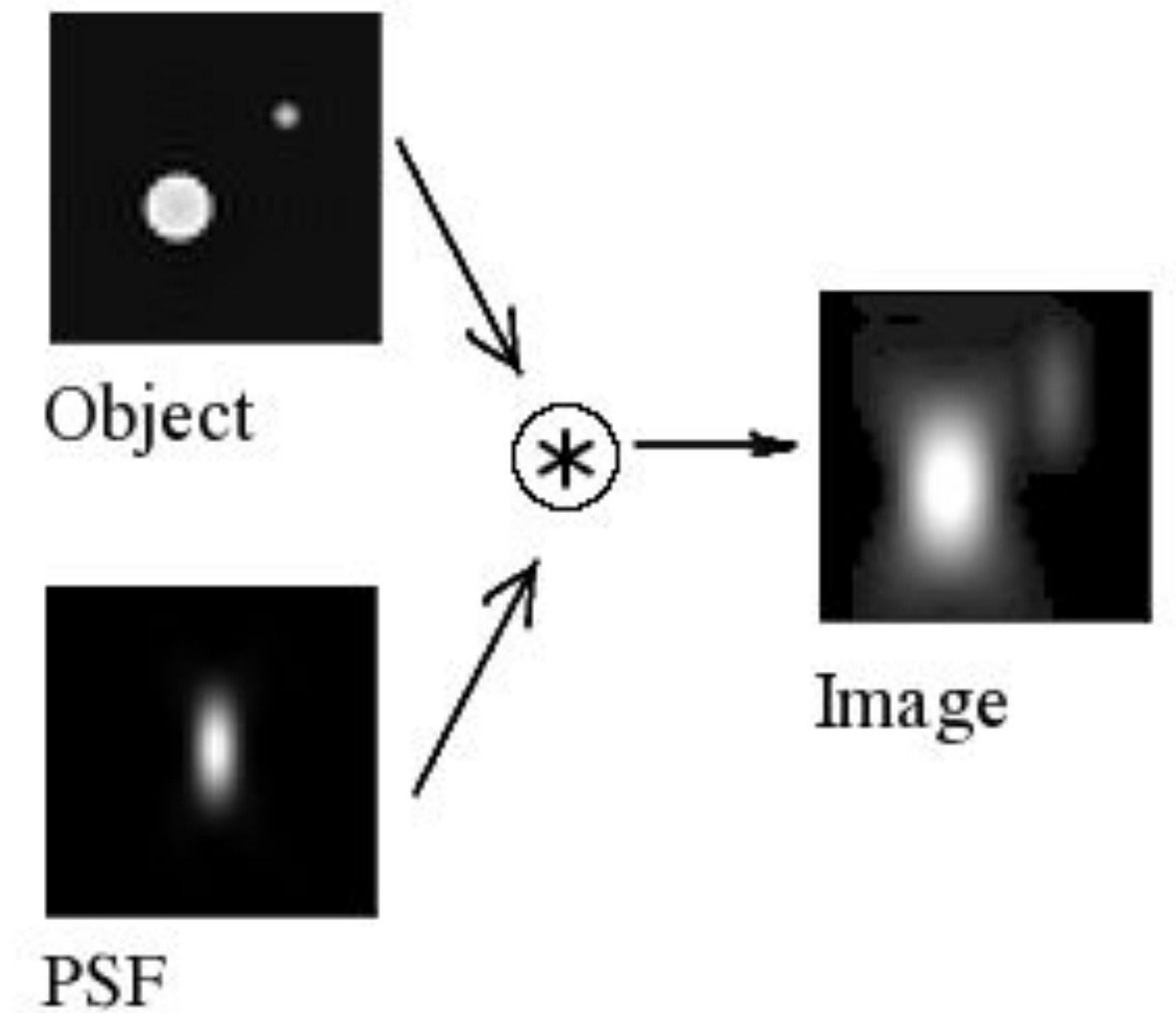
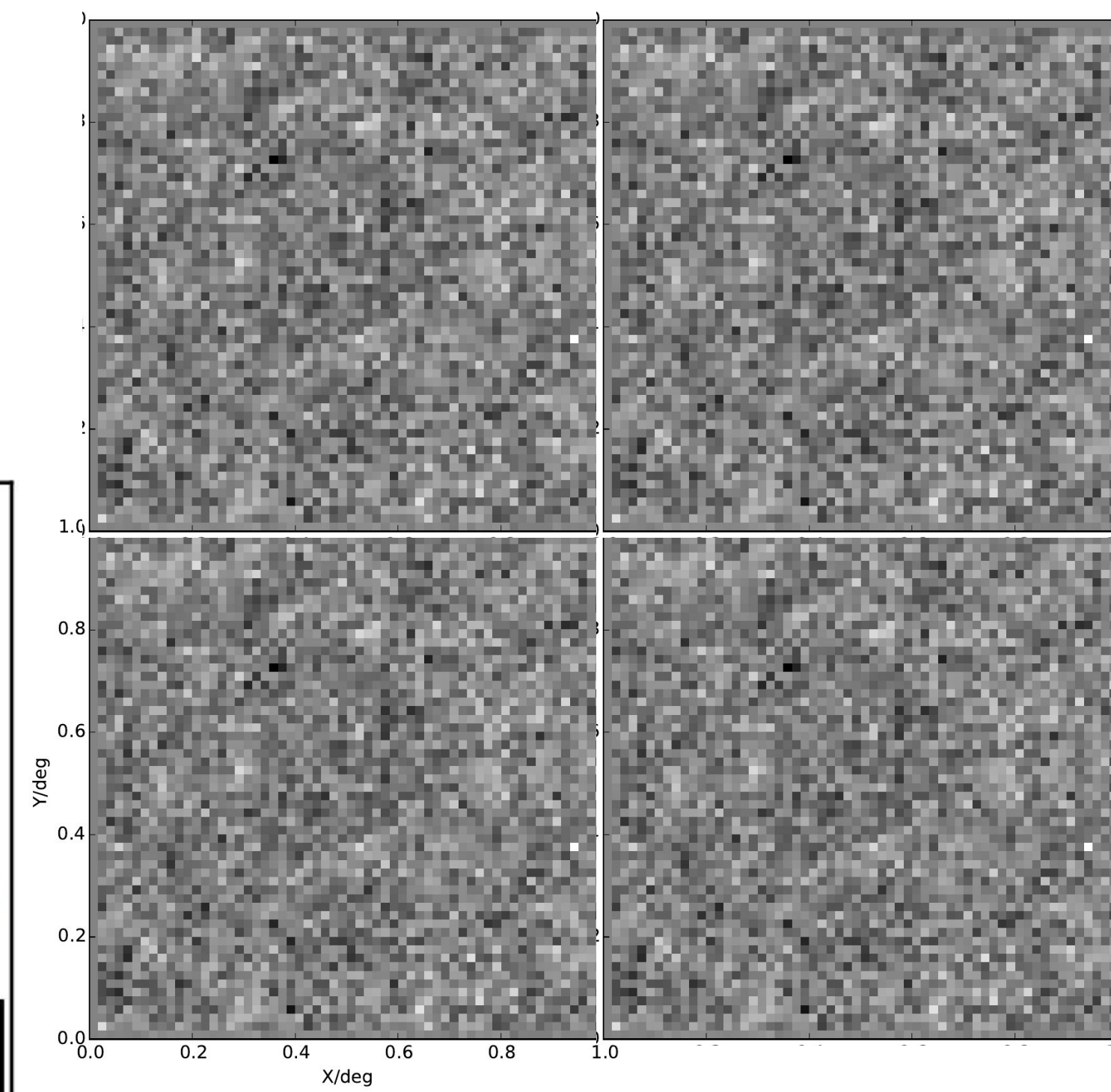
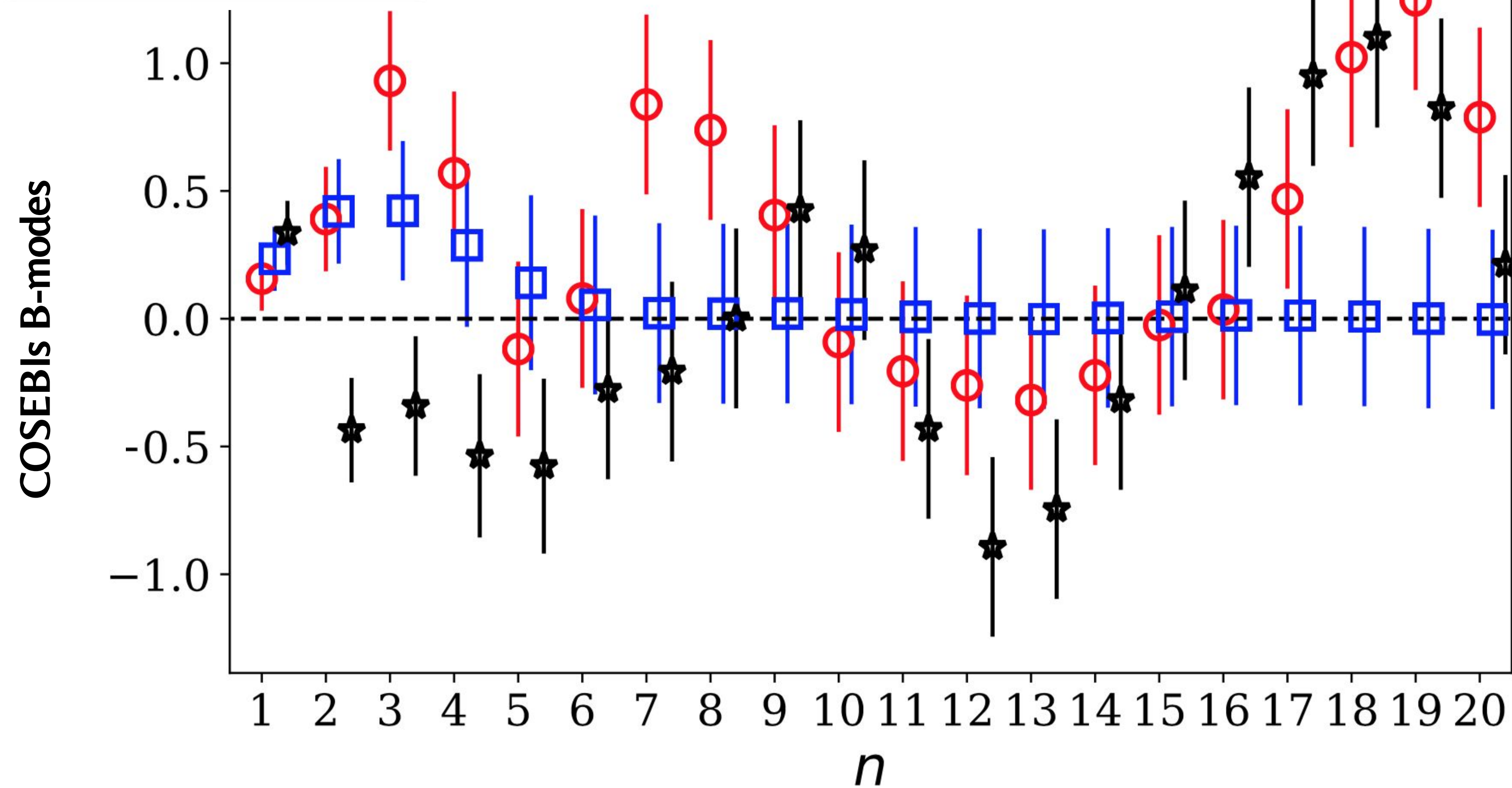


$$\xi_+ = \text{E-modes} + \text{B-modes}$$



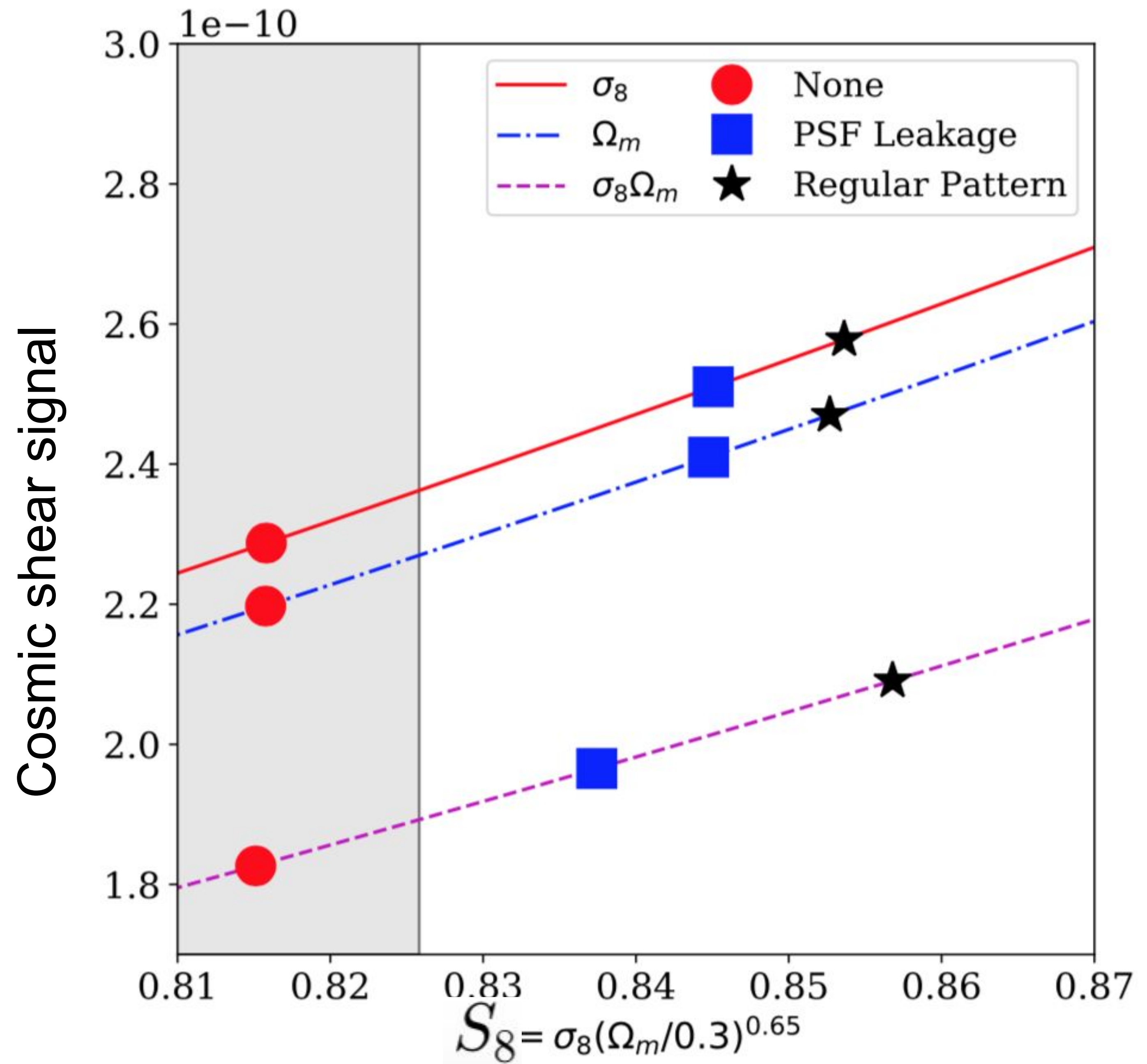
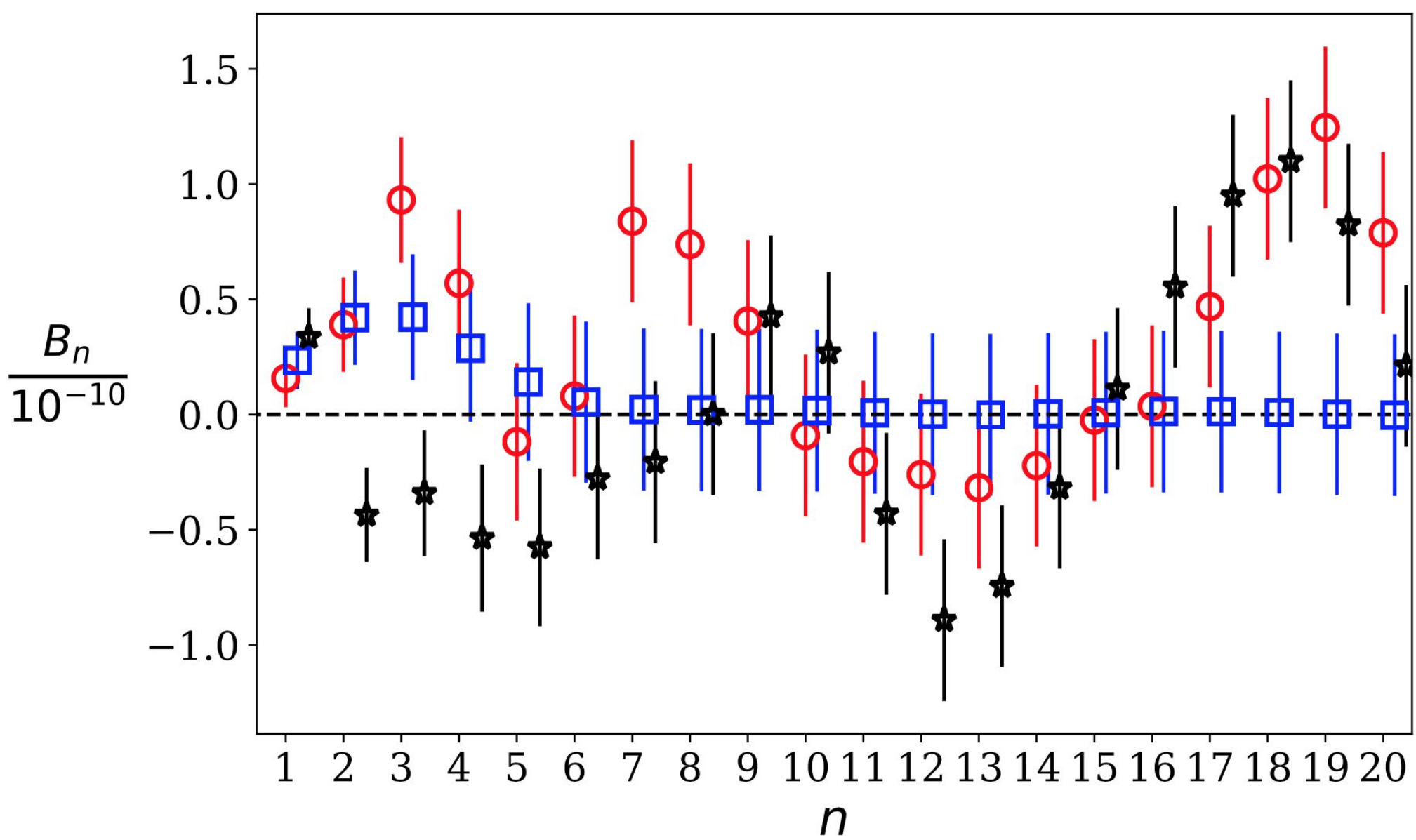
Systematics and B-modes

- DES SV
- PSF leakage
- Regular Pattern



Based on Asgari et al. 2019

Effect of systematics on cosmological parameters

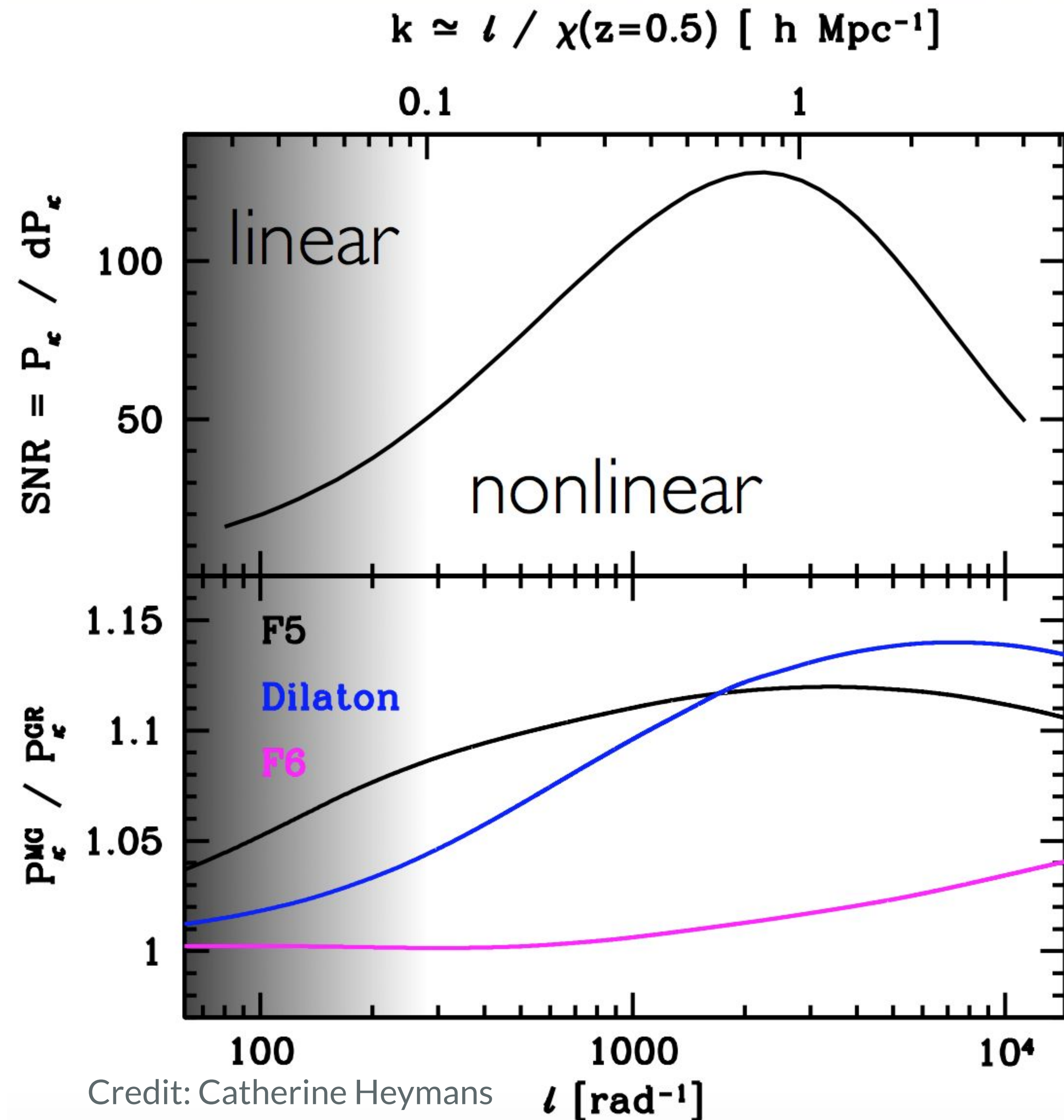


B-modes are not an issue for current data, so why do we see some tension?

Input Theory

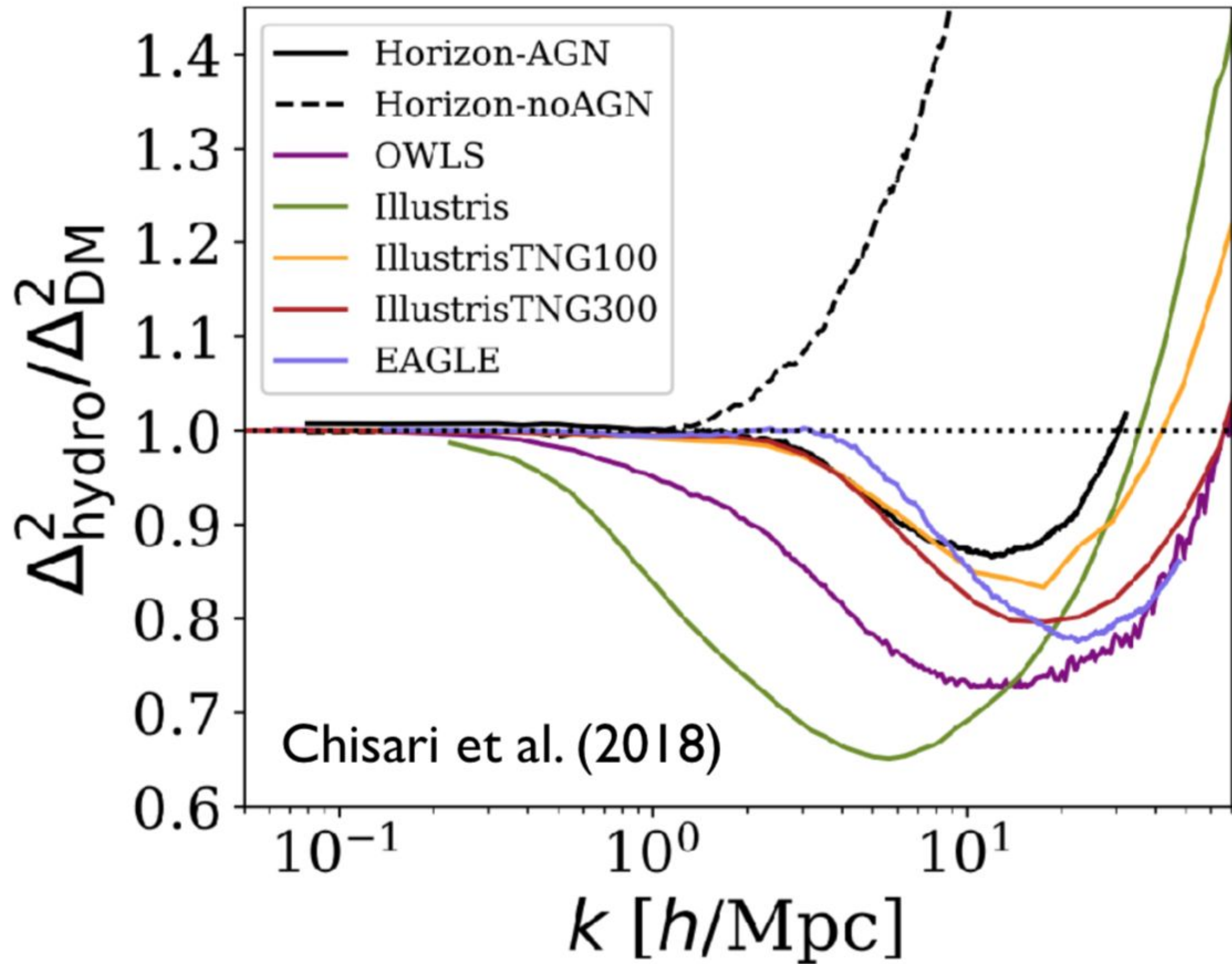
To model cosmic shear we need the lensing power spectrum!

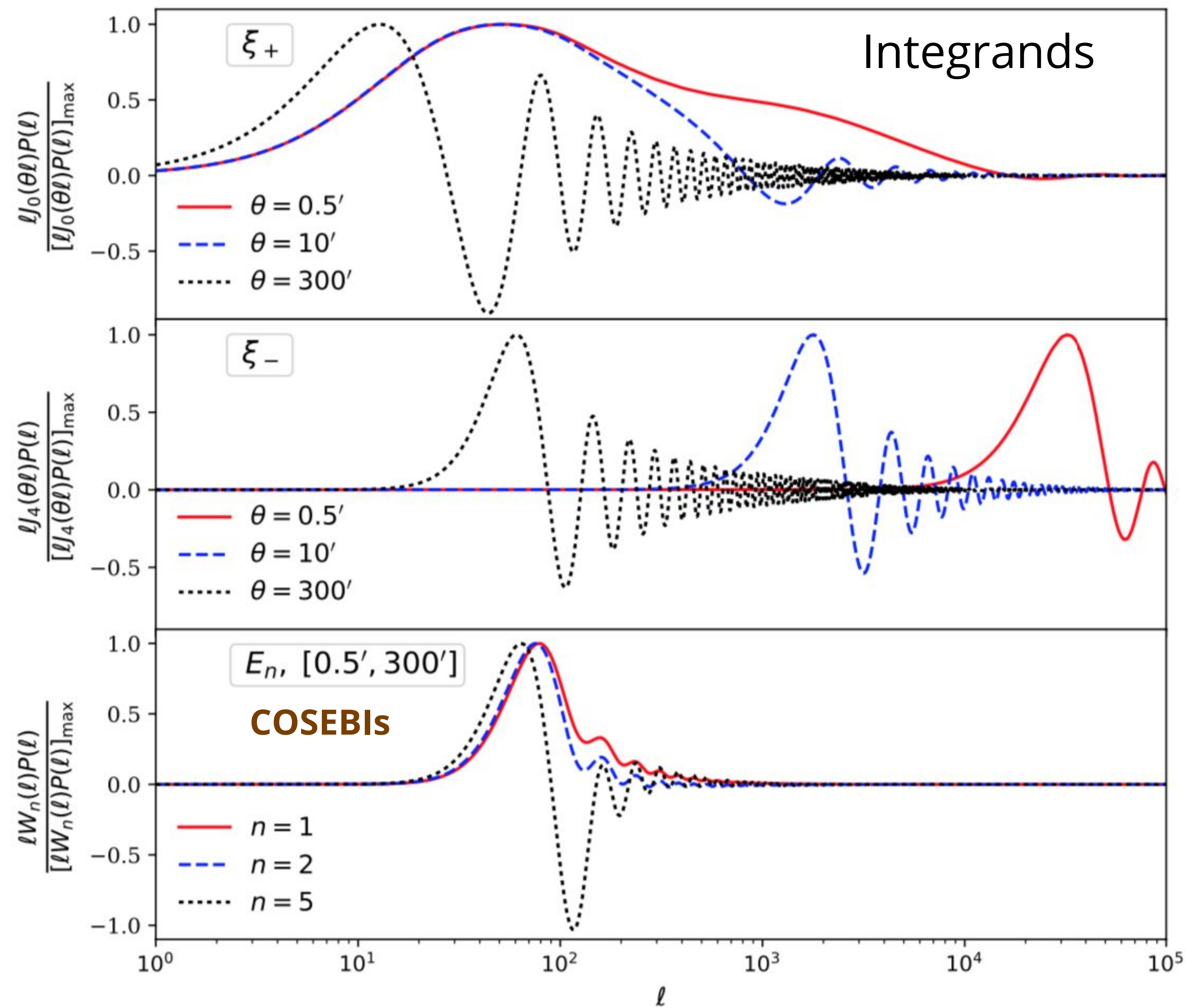
Nonlinear matter power spectrum is important.



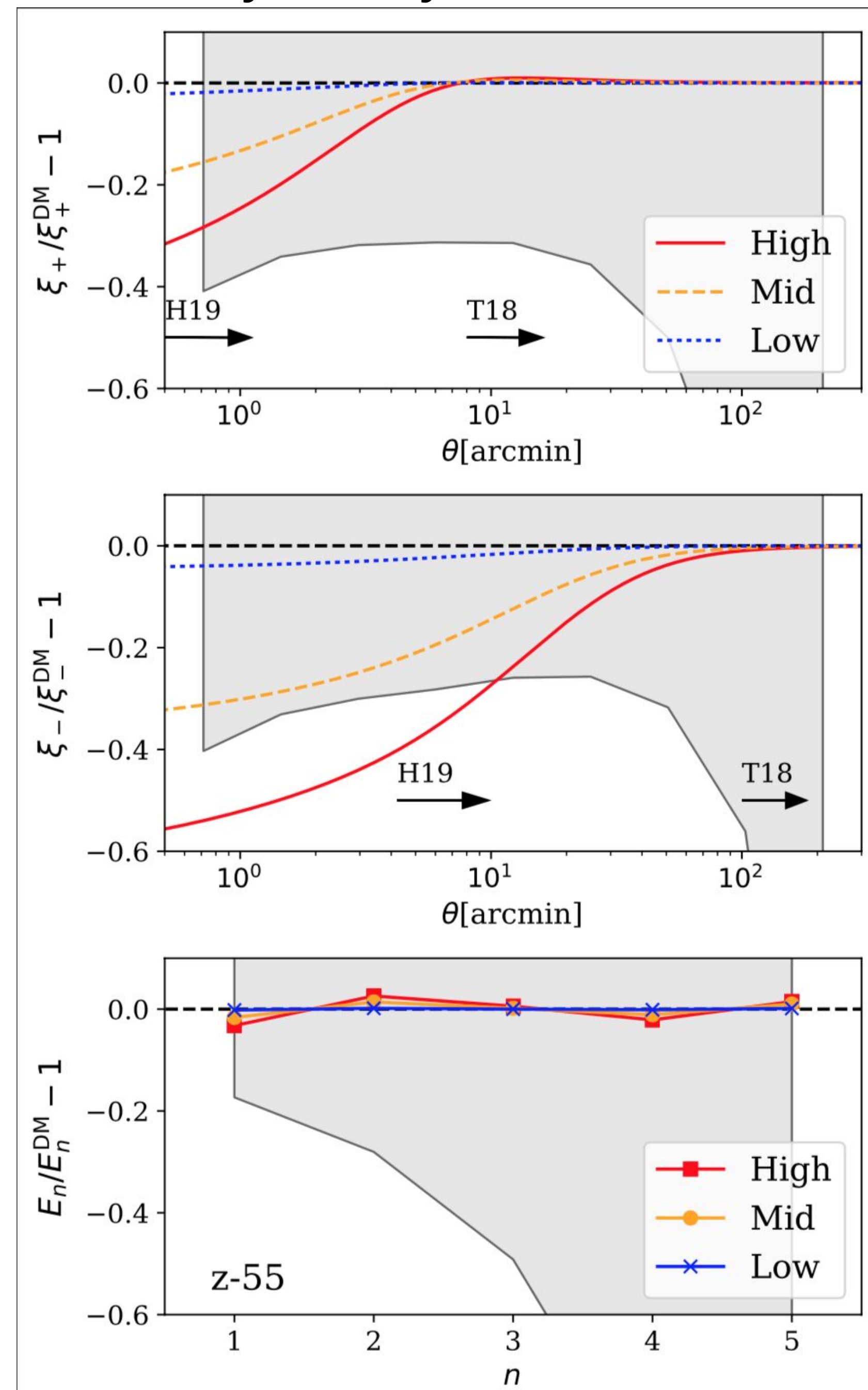
Baryons!

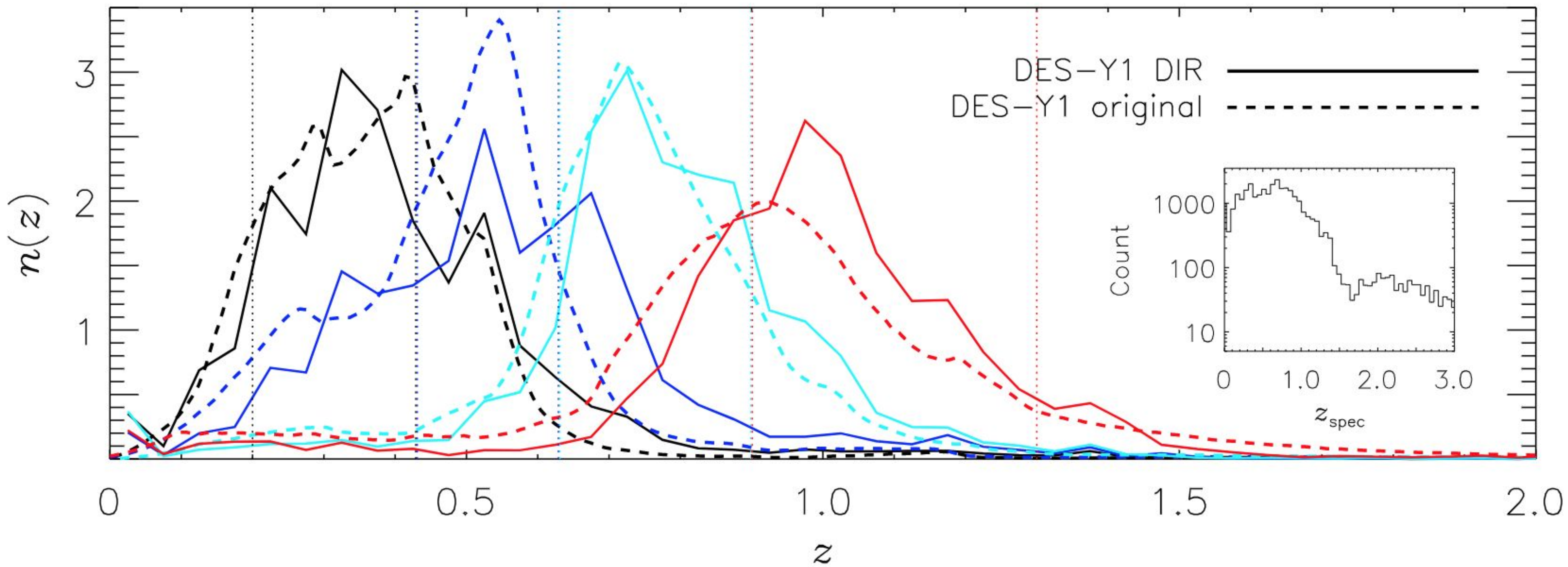
Hydro sims do not agree with each other

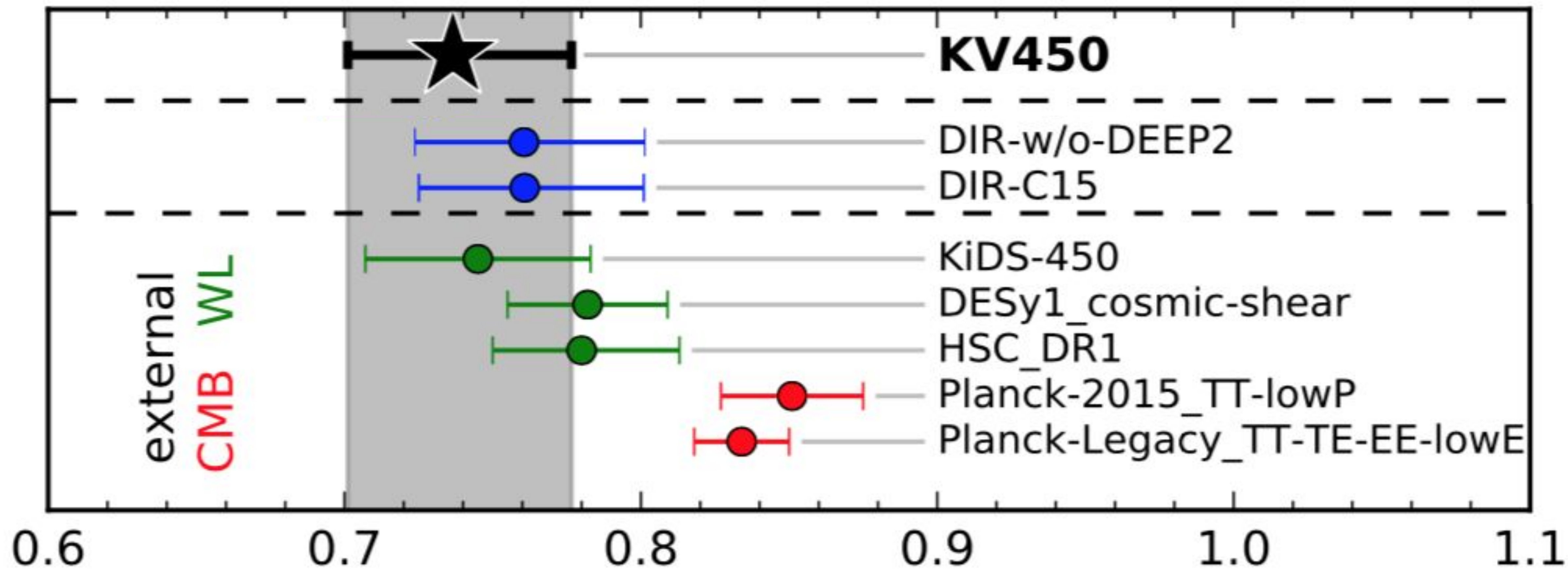




Sensitivity to Baryon FeedBack







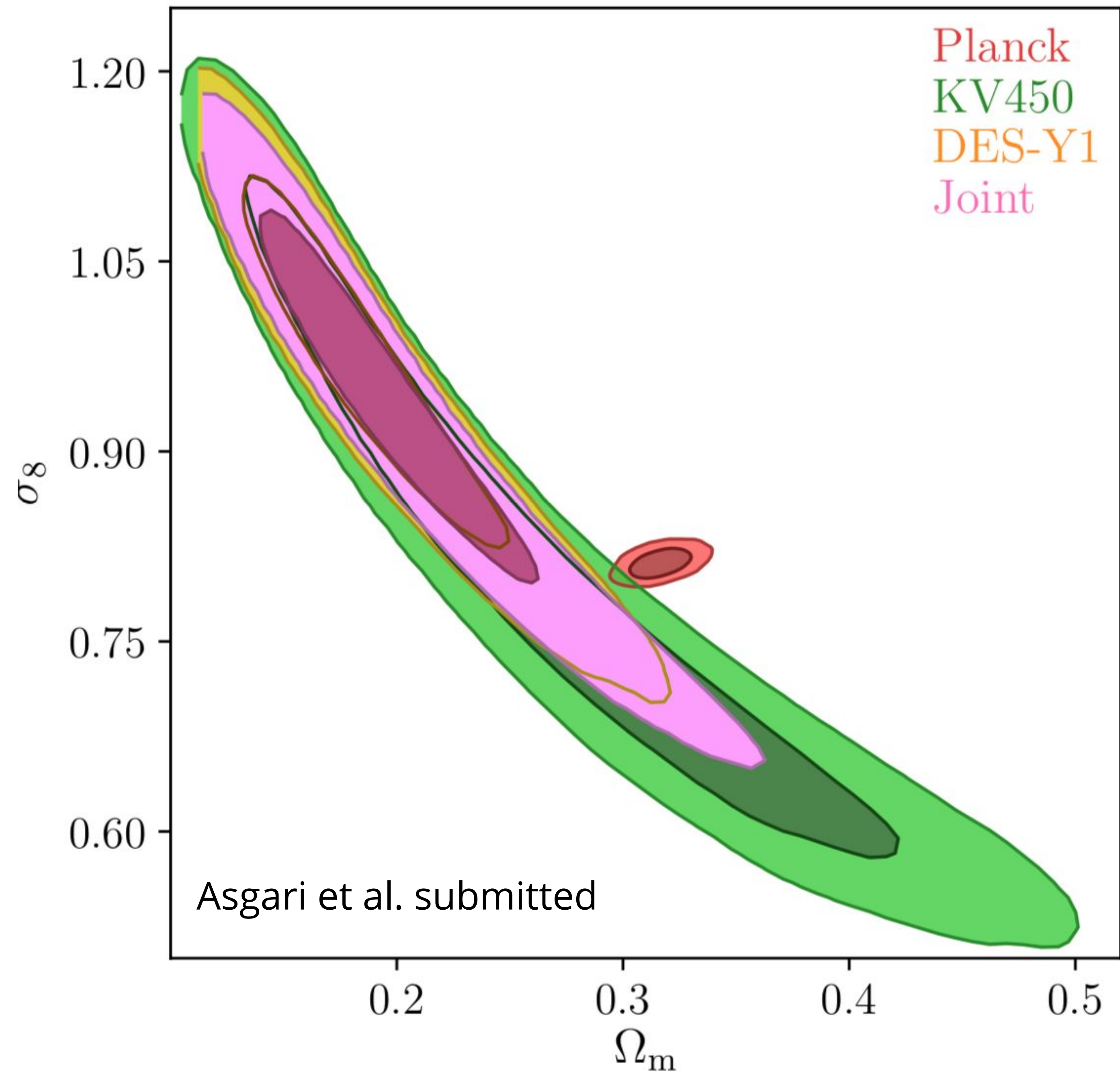
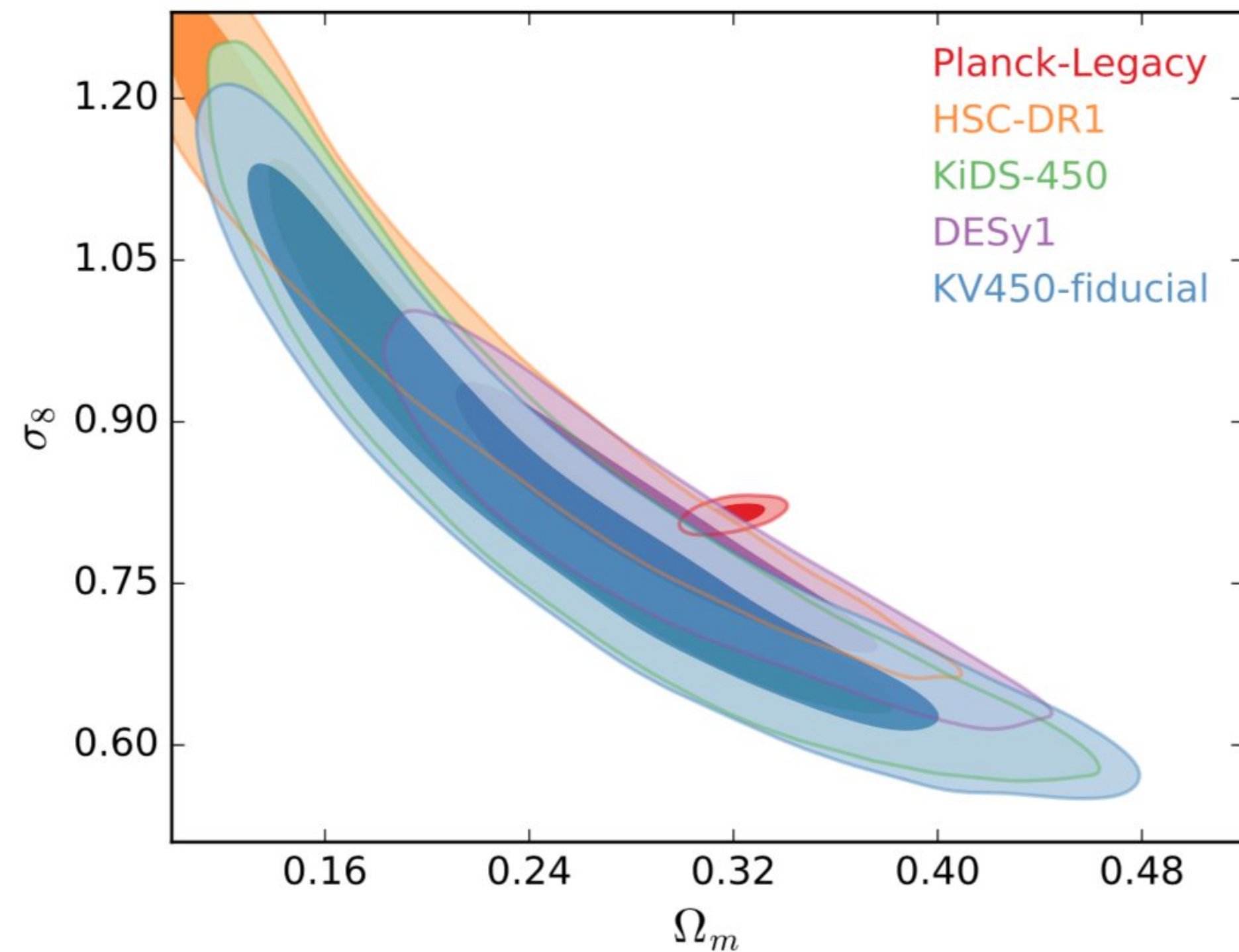
$$S_8 \equiv \sigma_8 \sqrt{\Omega_m / 0.3}$$

Combined cosmic shear with COSEBIs

Asgari et al. submitted, will be on arXiv in a few weeks

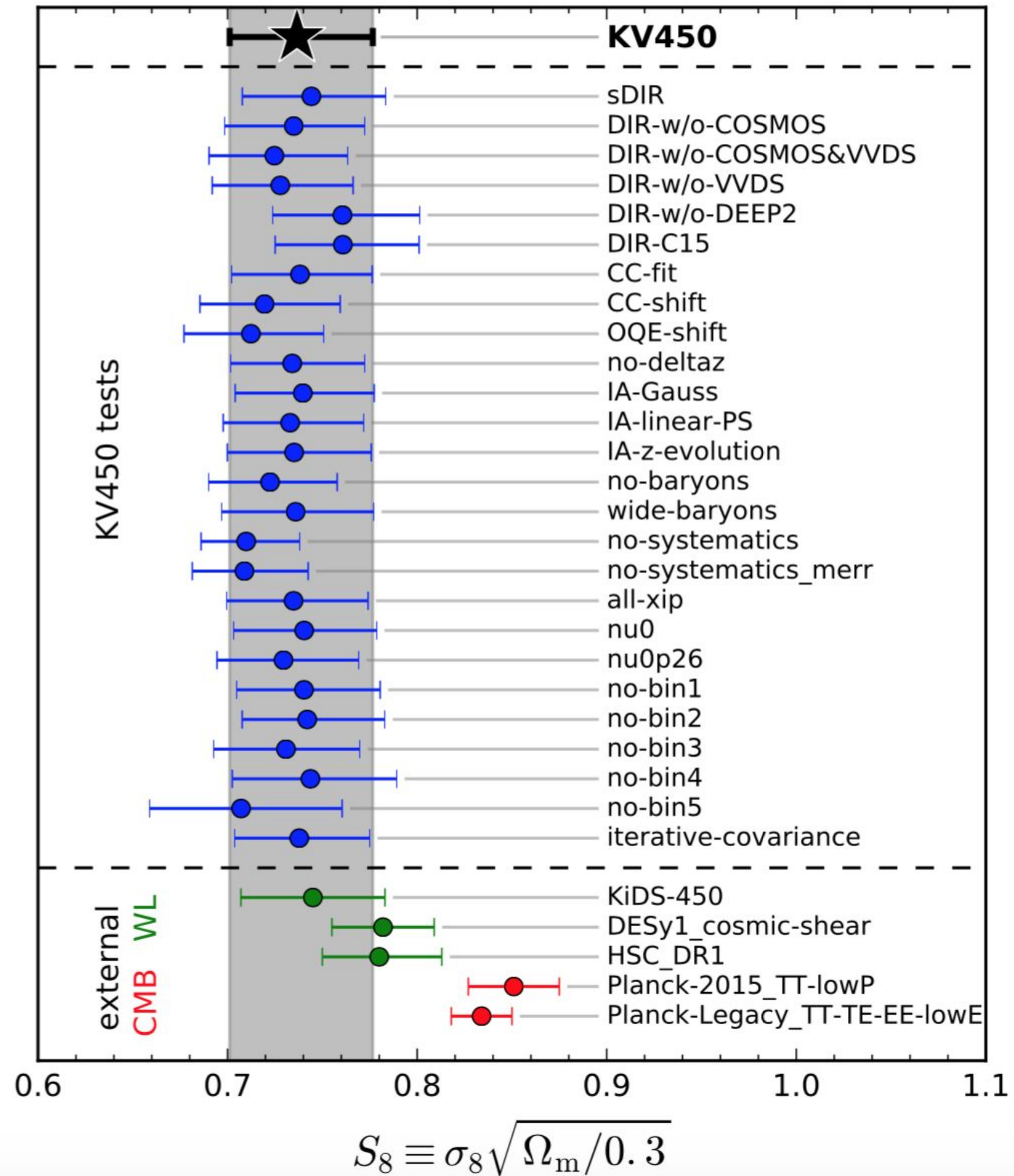
20% tighter constraints for DES-Y1

3.2 sigma tension between Planck & joint analysis

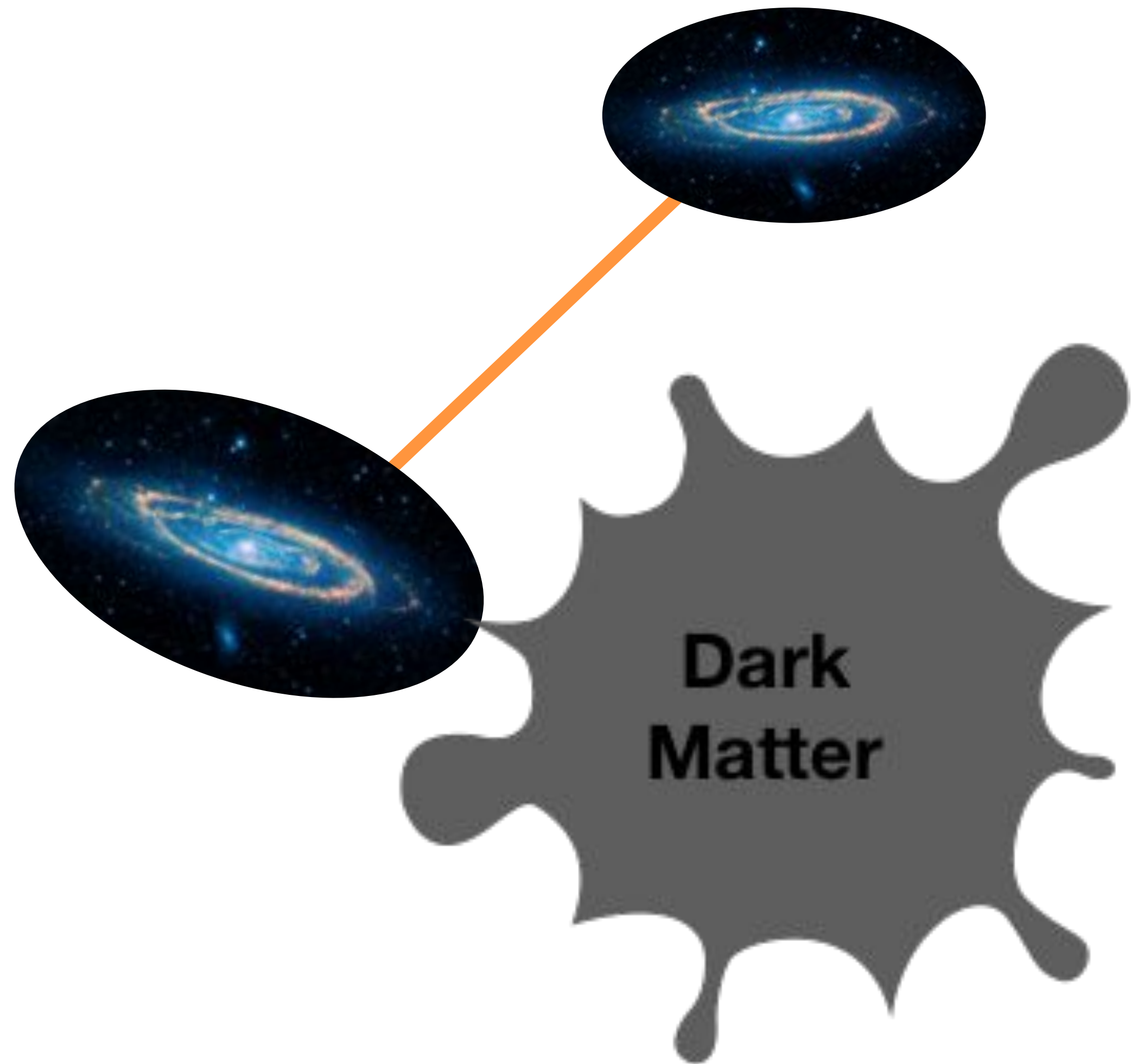


Final remarks

- Data analysis is complicated!
- A cosmological analysis goes beyond cosmology
- Tension is exciting
- Non-linear modelling is needed
- COSEBIs is awesome and public



Intrinsic Alignments



Shear correlation

3
2
1
0

