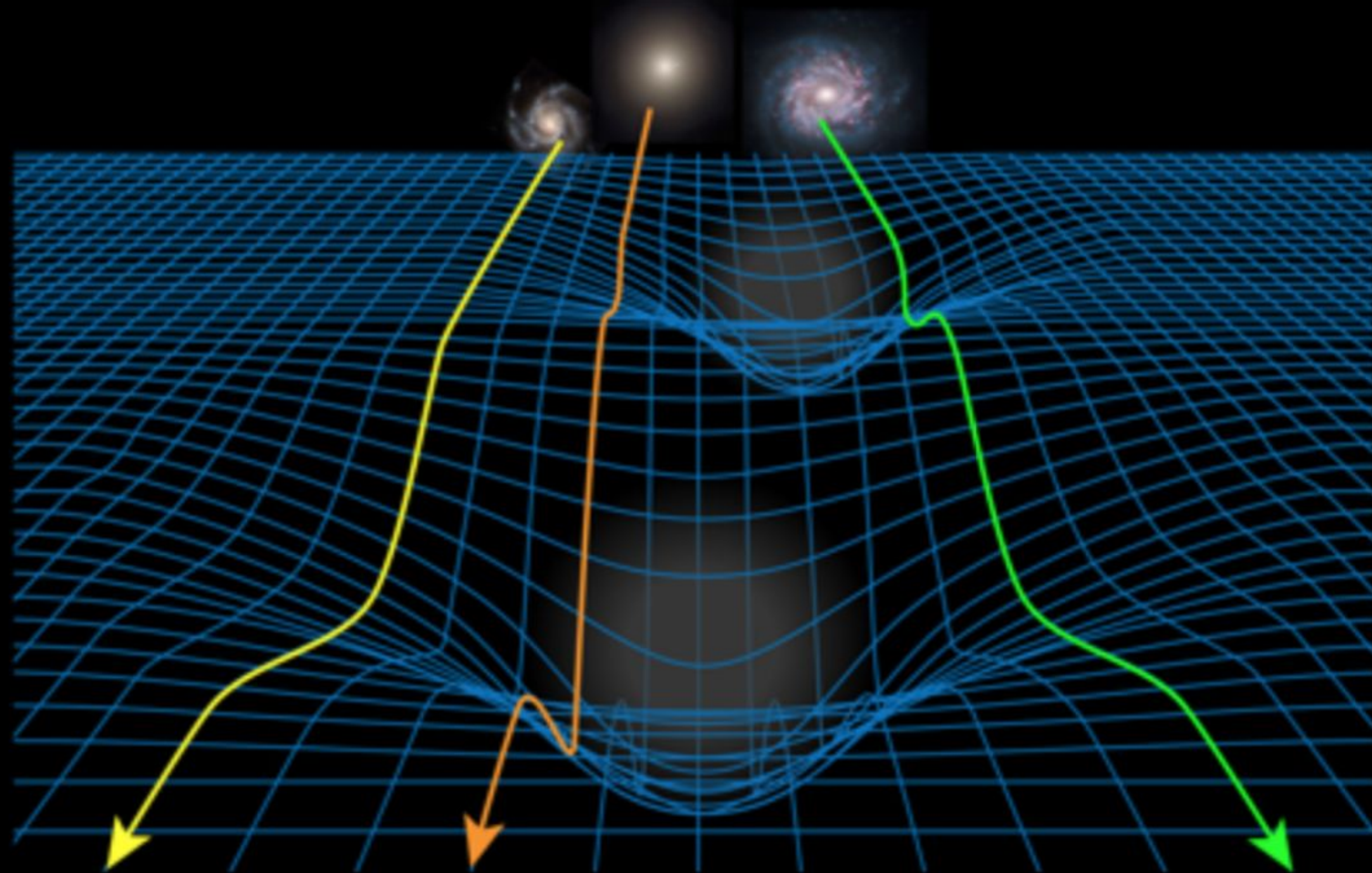


KiDS

cosmology & tests of gravity

Marika Asgari

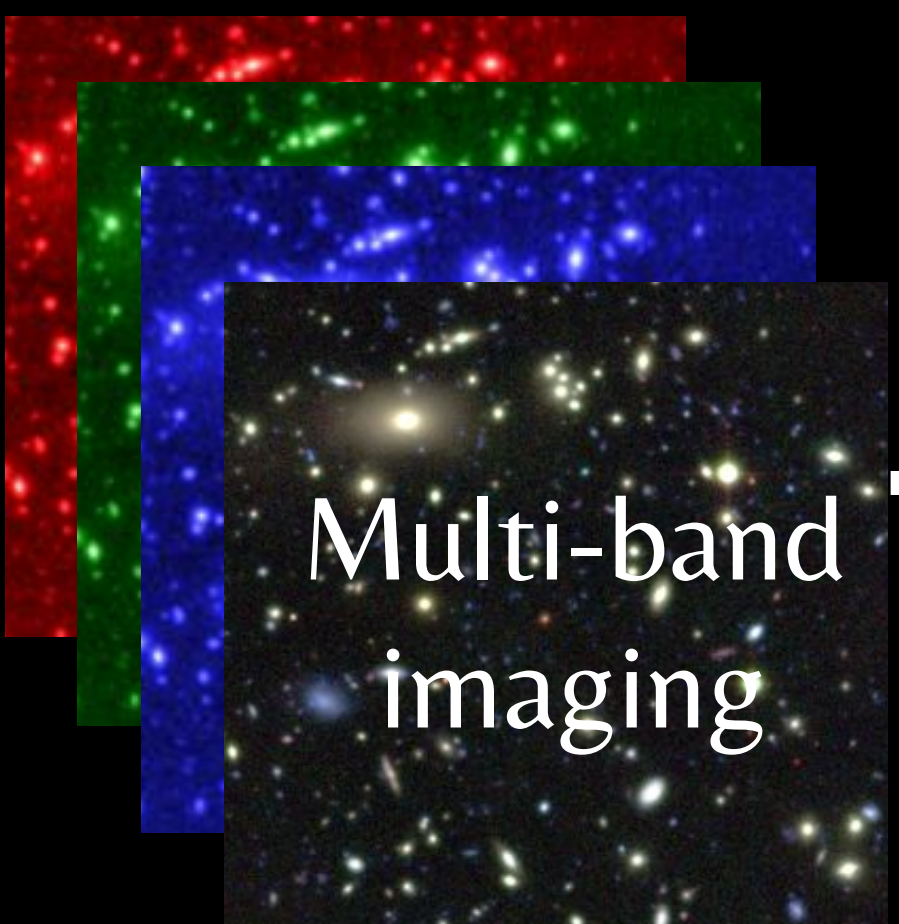


Credit: Stonebraker, APS

Cosmic Shear



+



Blinding!

Object Catalogue

Colours

Galaxies

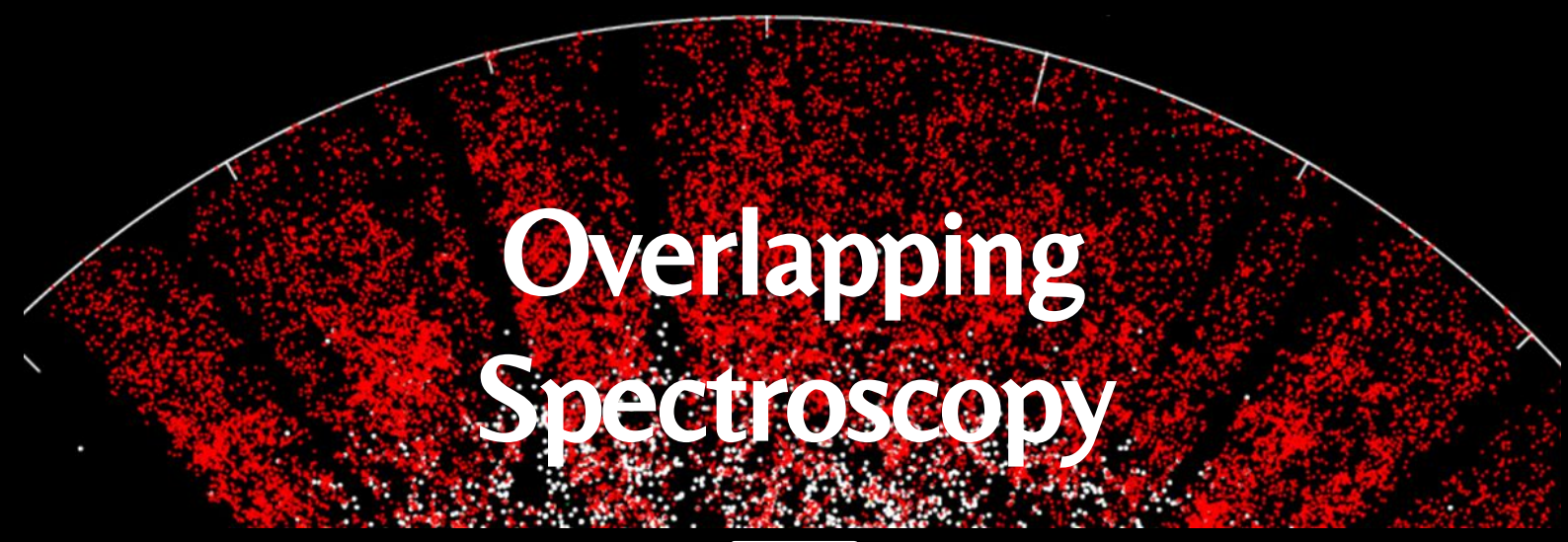
Stars

$P(z)$

Shapes

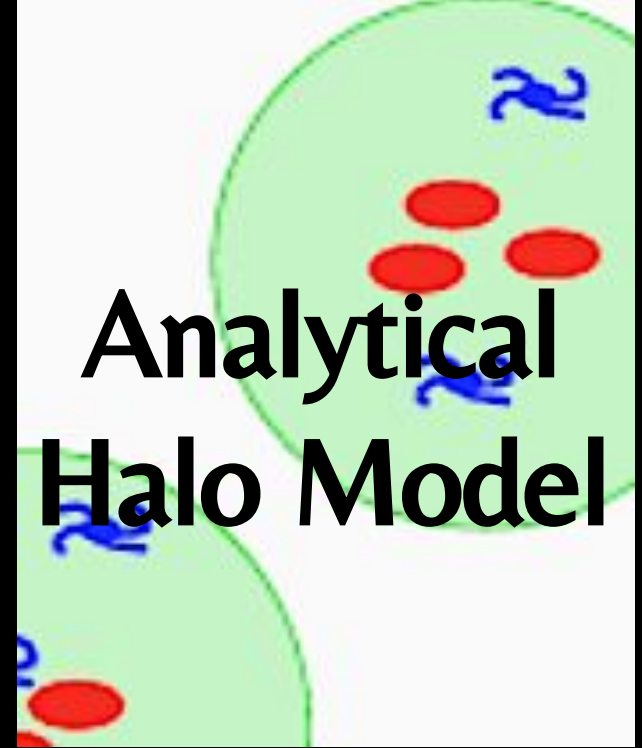
Your Favourite Statistic

Cosmology



Overlapping Spectroscopy

Calibration



Analytical Halo Model

Errors/Models



Nuisance

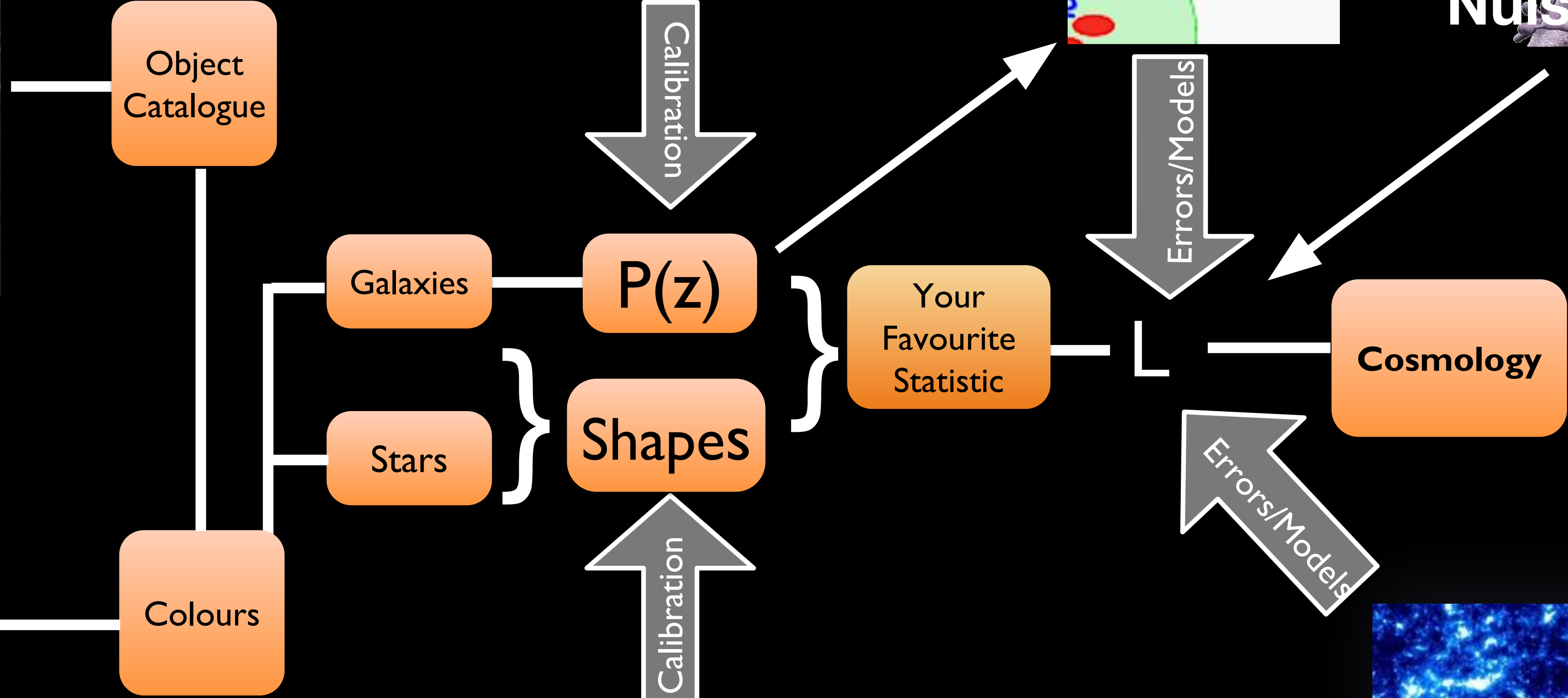
Errors/Models



Image Simulations and "null tests"



N-body Mocks



Combined Probes

	Cosmic shear	Galaxy-Galaxy lensing	Galaxy clustering
2pt Correlation	Shape-Shape	Shape-Position	Position-Position
Astrophysical effects	Intrinsic Alignments, Baryons	Intrinsic Alignments, Baryons & Galaxy bias	Baryons & Galaxy bias
Systematics	Shape measurement, Redshifts	Shape measurement, Redshifts	RSD modelling Completeness

Phenomenological models

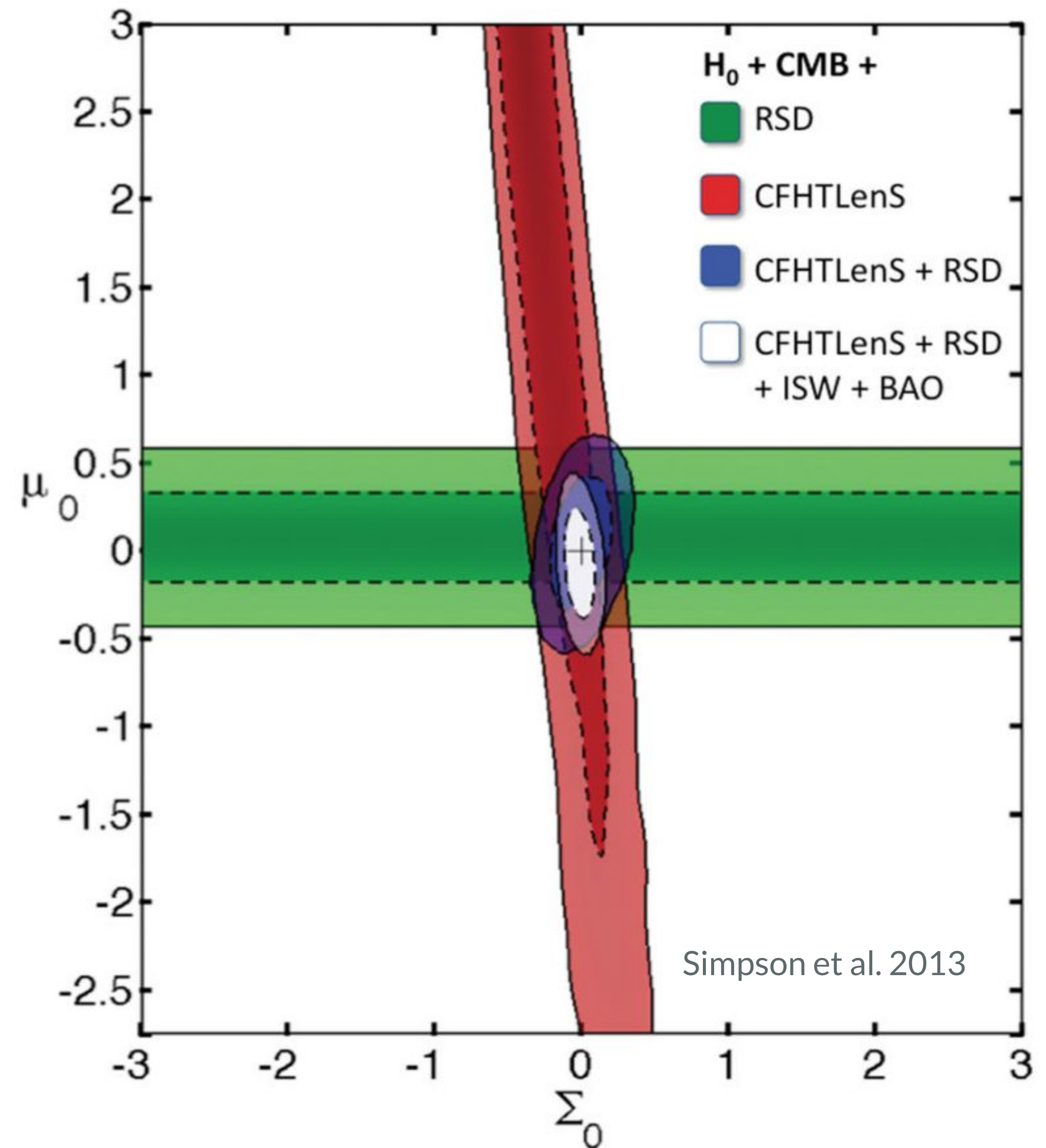
Redshift space distortions (RSD):

$$\Psi(k, a) = [1 + \mu(k, a)] \Psi_{\text{GR}}(k, a)$$

Cosmic shear:

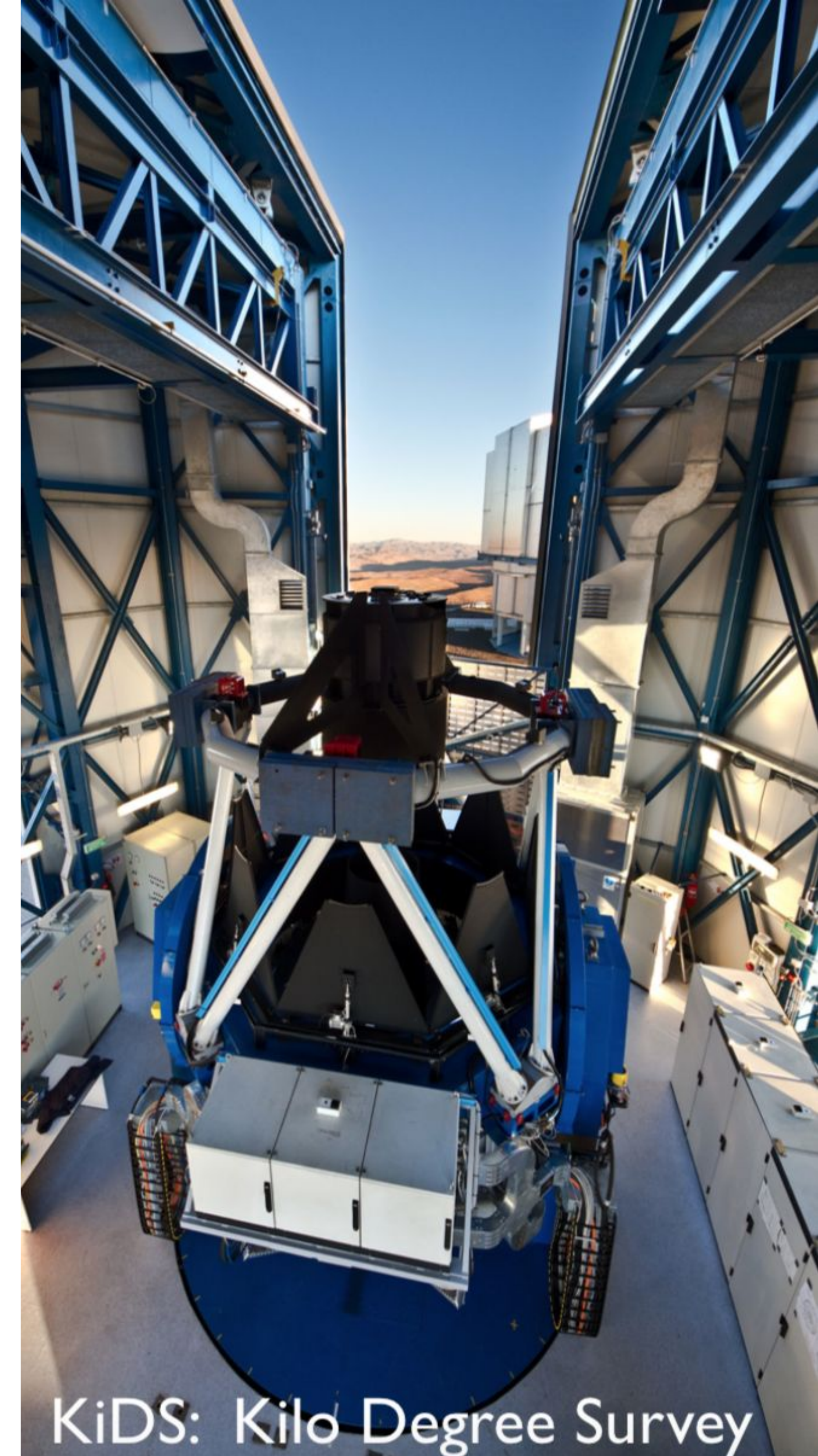
$$[\Psi(k, a) + \Phi(k, a)] = [1 + \Sigma(k, a)] [\Psi_{\text{GR}}(k, a) + \Phi_{\text{GR}}(k, a)]$$

$\Sigma = \mu = 0$ is GR



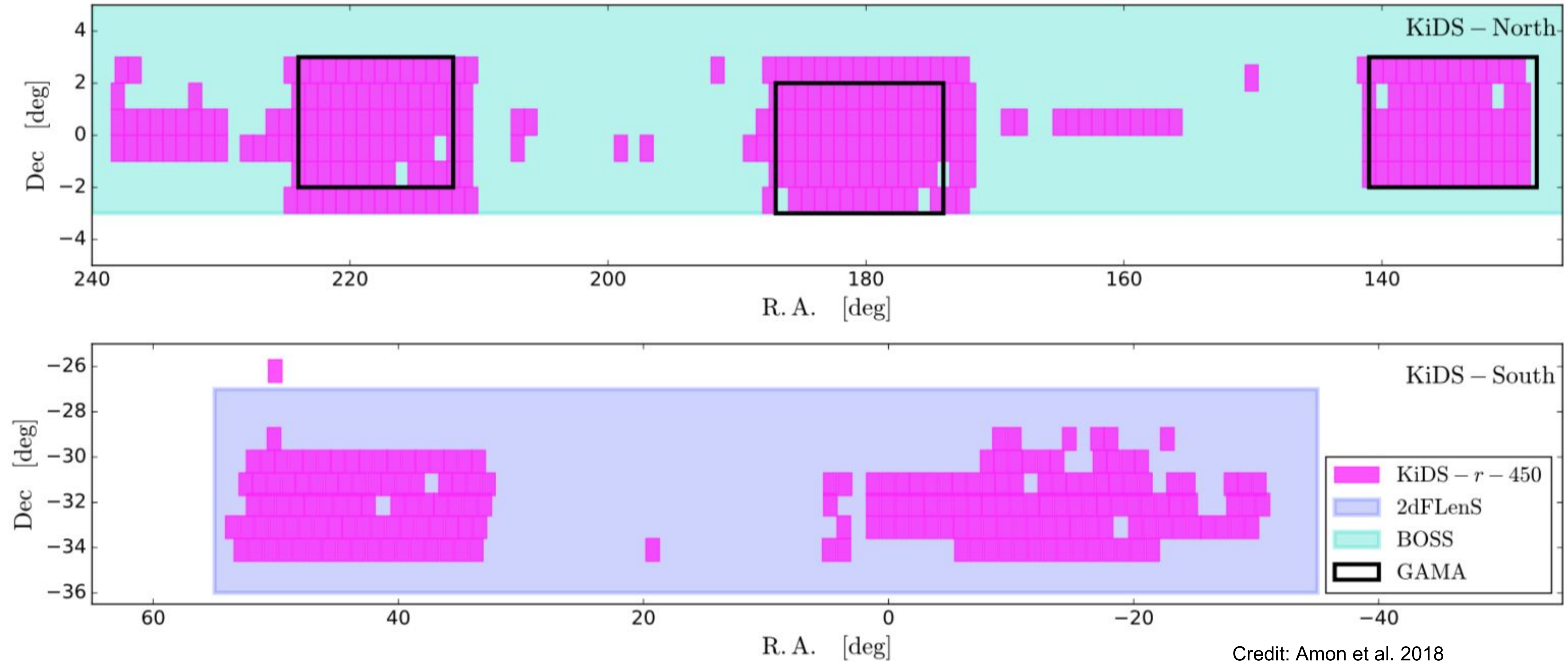
KiDS: Key Facts

- Weak lensing specific survey
- 450 deg² observed
- shear cats are public
- goal: reach 1350 deg²
- 15 million galaxies
- 9 photometric bands



KiDS: Kilo Degree Survey

KiDS-450 footprint



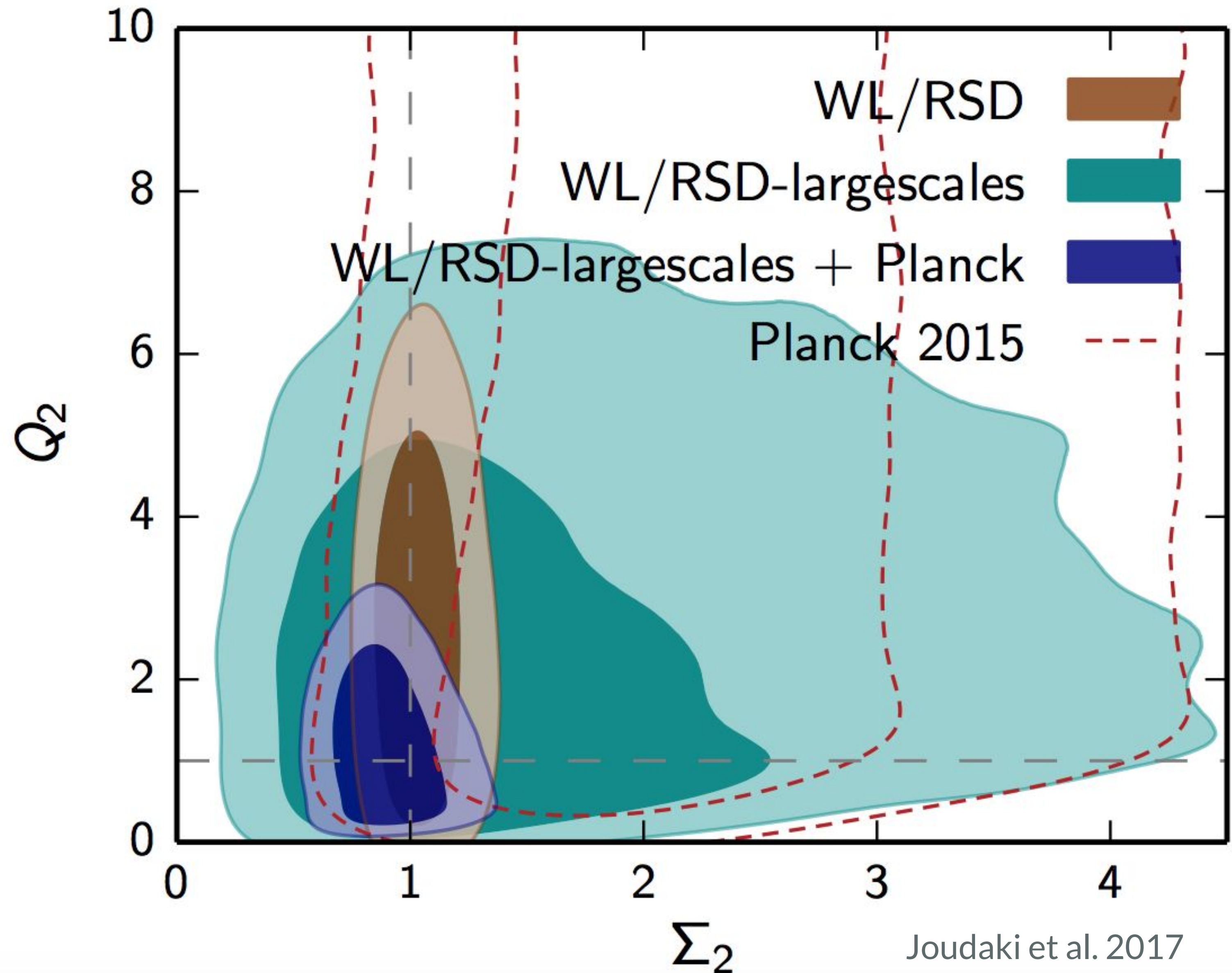
Credit: Amon et al. 2018

Combined probes

- cosmic shear: KiDS
- Galaxy positions: 2dFLenS and BOSS

Q: modifies the Poisson eq

$\Sigma=Q=1$ is GR

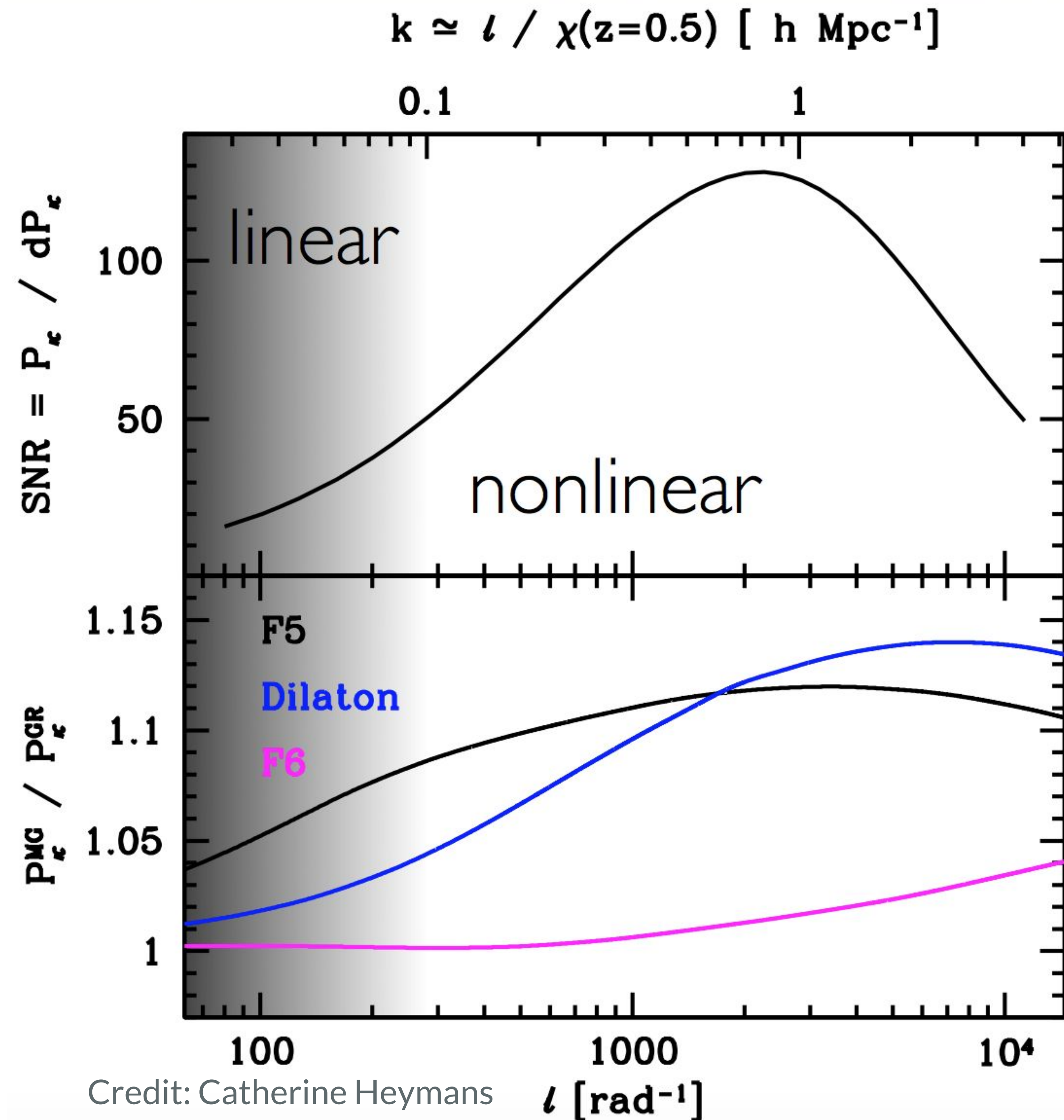


Complications!

Input Theory

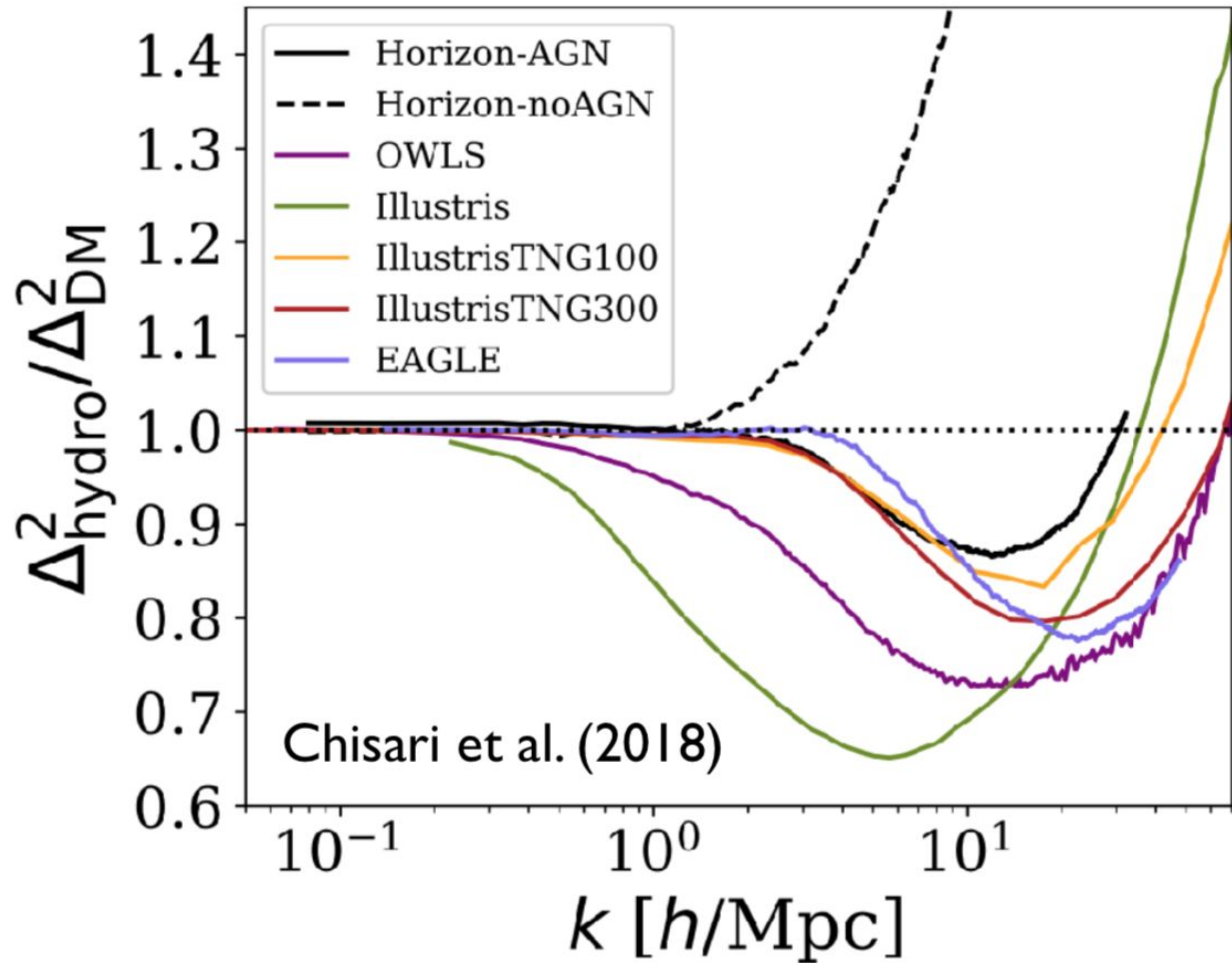
To model cosmic shear we need the lensing power spectrum!

Nonlinear matter power spectrum is important.

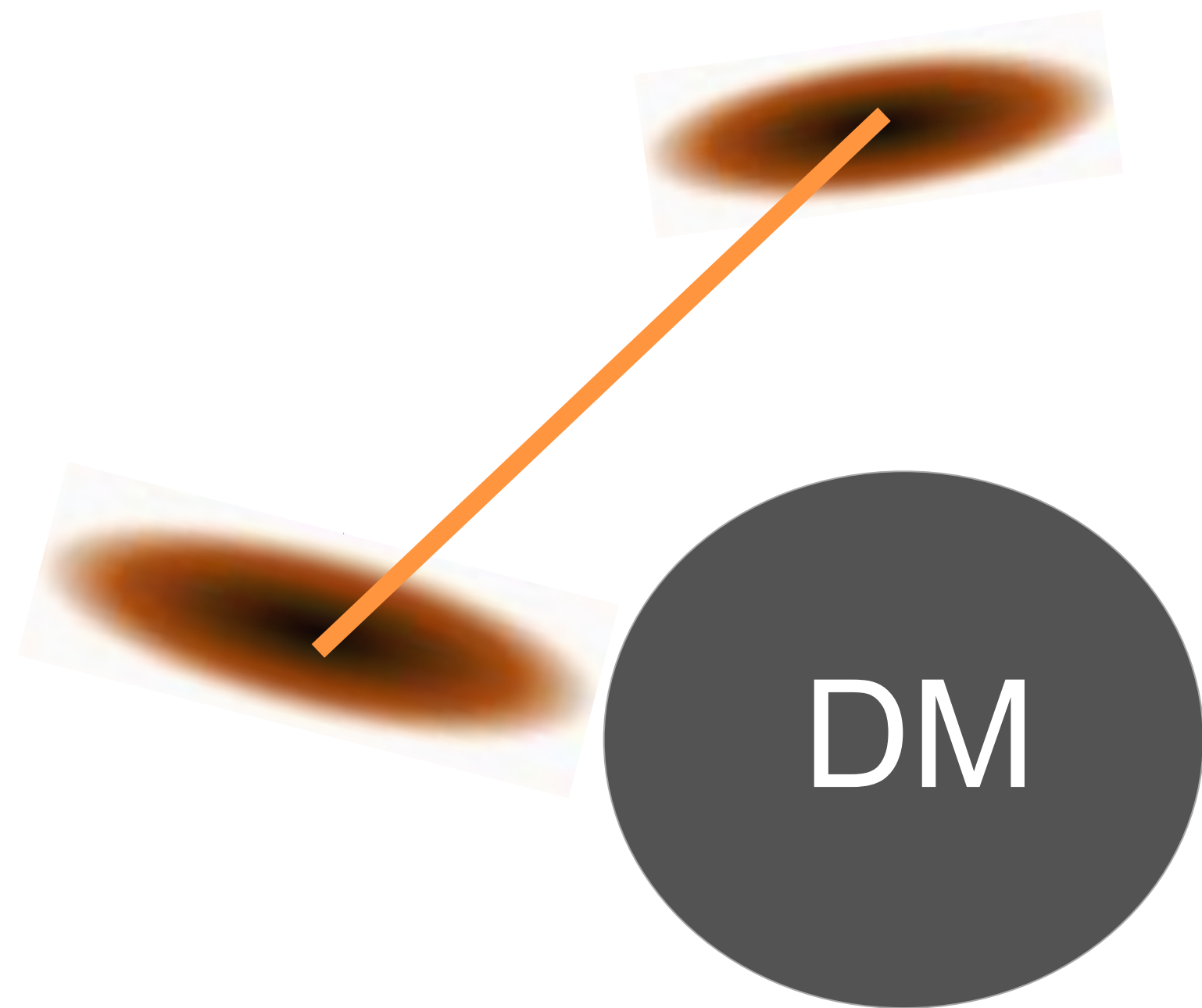


Baryons!

Hydro sims do not agree with each other

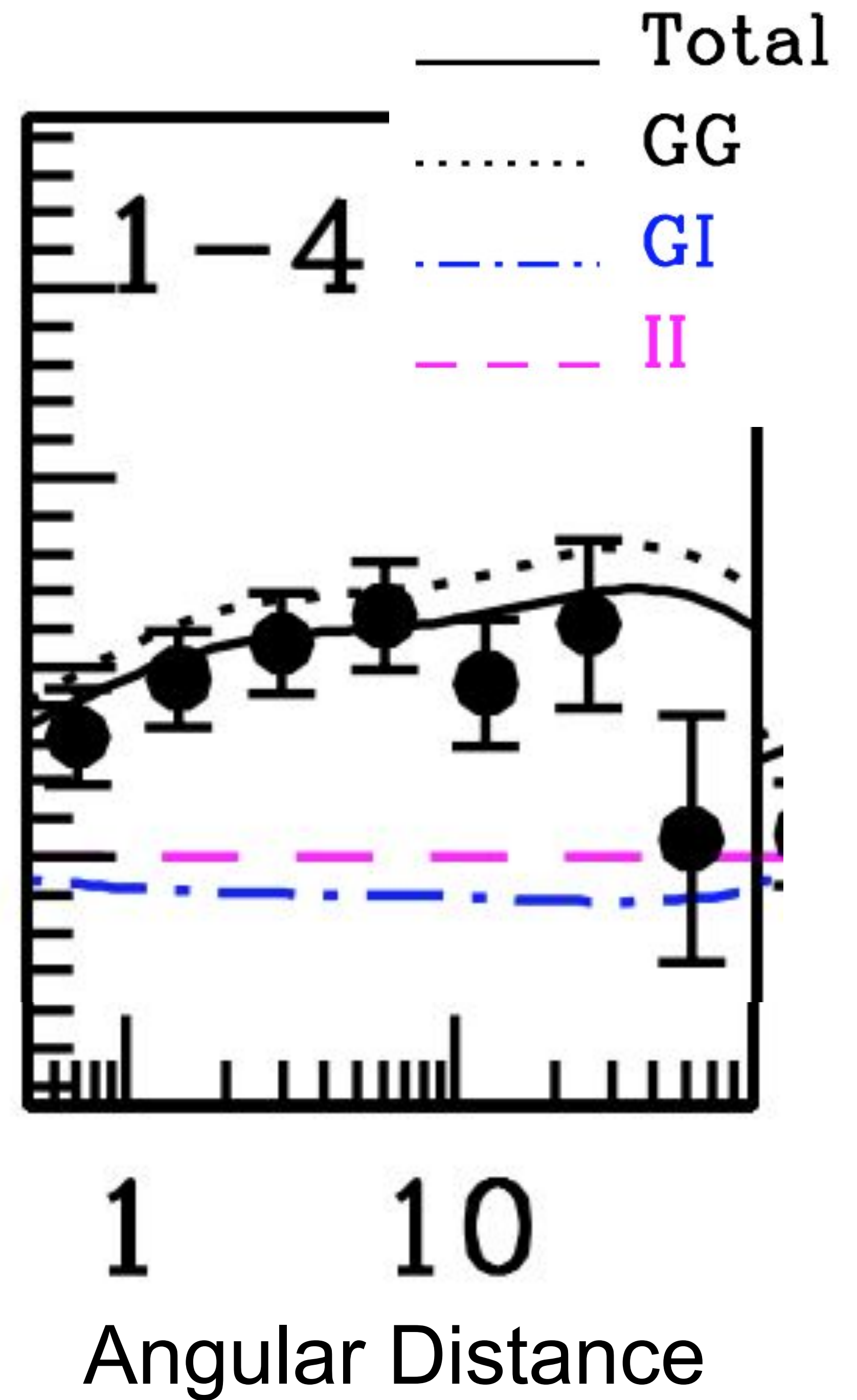


Intrinsic Alignments



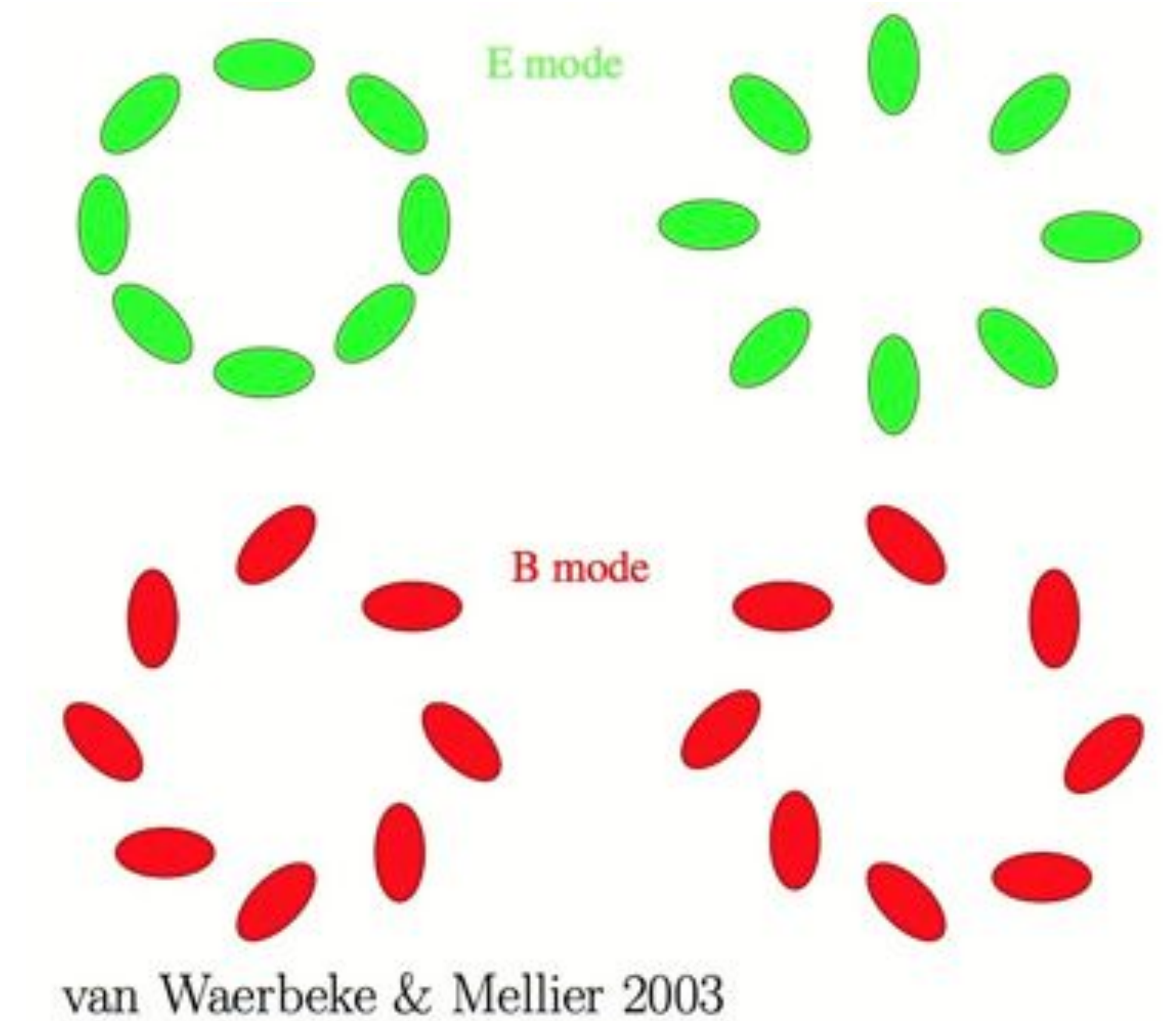
Shear correlation

3
2
1
0



Systematic in Cosmic shear

- Lensing can only* produce E-modes
- B-mode can be used to diagnose the data



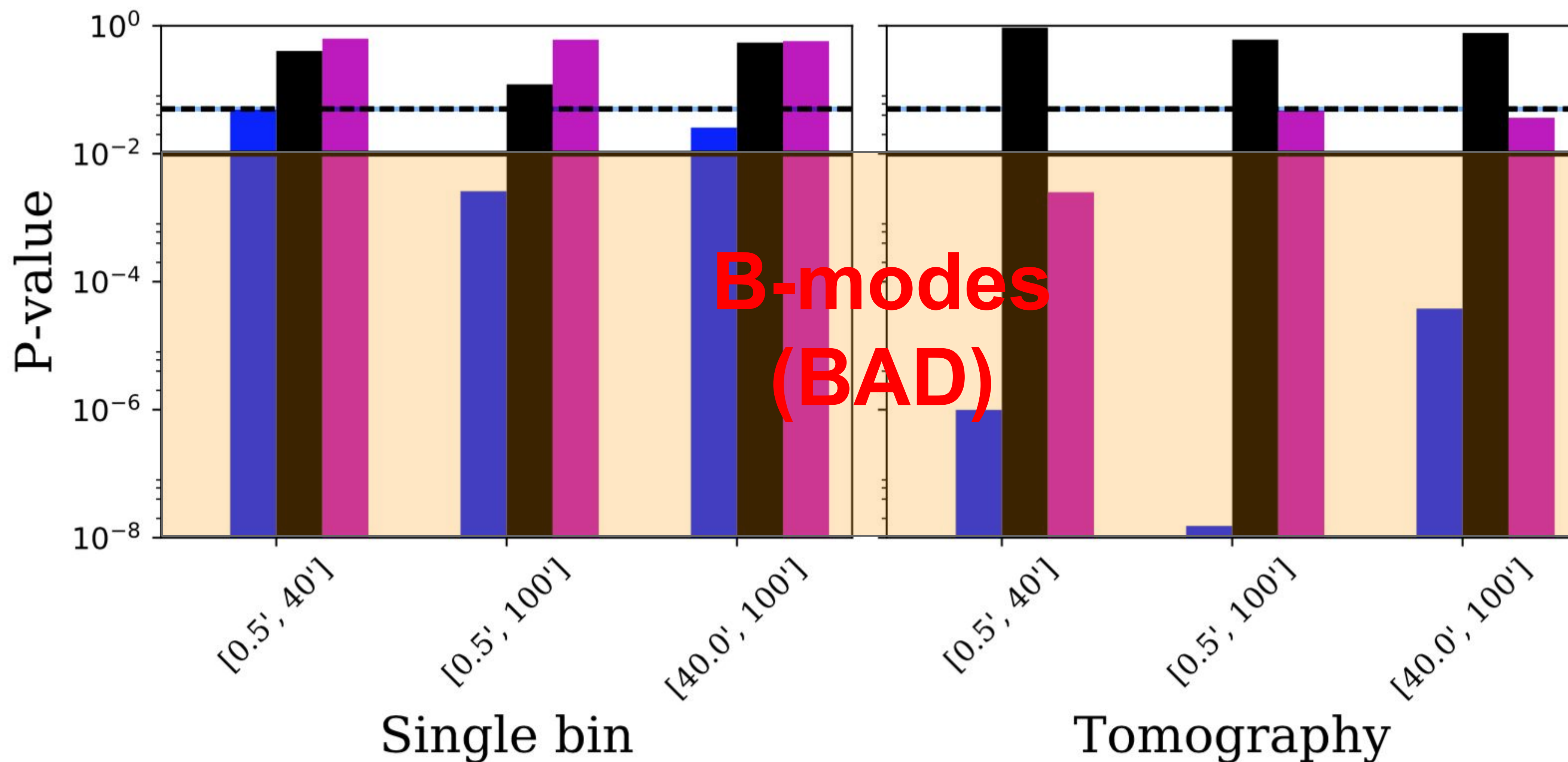
B-modes in public cosmic shear data

Asgari et al. 2018 (in prep)

Blue:
DES-SV

Black:
KiDS-450

Magenta:
CFHTLenS



Final remarks

- Data analysis is complicated!
- Attempt at observing beyond LCDM models have been done

Questions for the audience:

- How do you include cosmic back reaction in this framework?
- How does it affect lensing?
- Is there a signature that is unique to it?