

Redshift Space Distortions from the Clipped Galaxy Field

Fergus Simpson
University of Barcelona

FS, James, Heavens, Heymans (2011 PRL)

FS, Heavens, Heymans (2013 PRD)

FS, Blake, Peacock et al (2015)

FS, Harnois-Deraps et al (2015)



Institut de Ciències
del Cosmos



Astrophysics

New submissions

[moderation #140086] arXiv: submit/1199863 on hold

Inbox x



arXiv Moderation moderation@arxiv.org via icc.ub.edu

6 Mar ☆



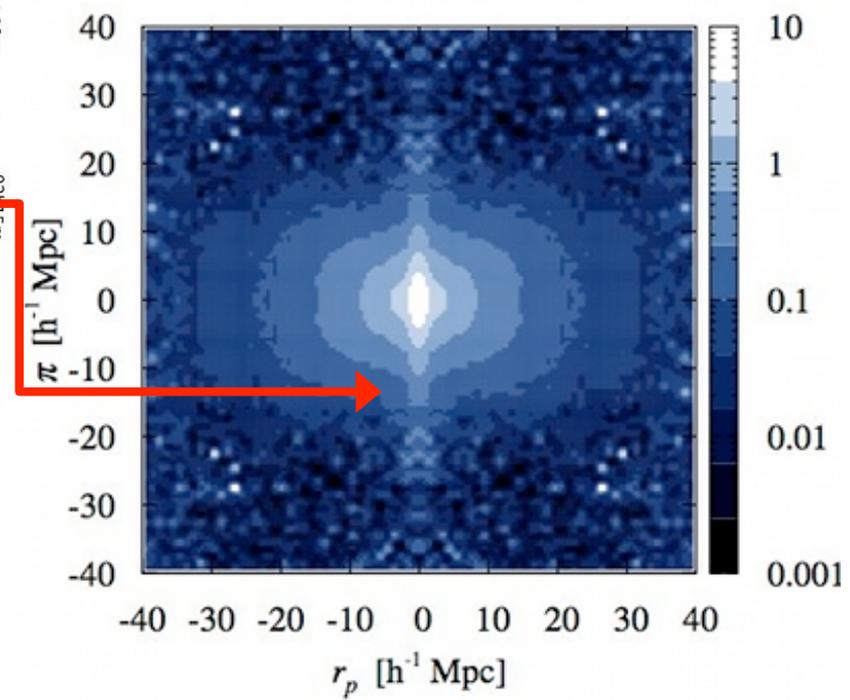
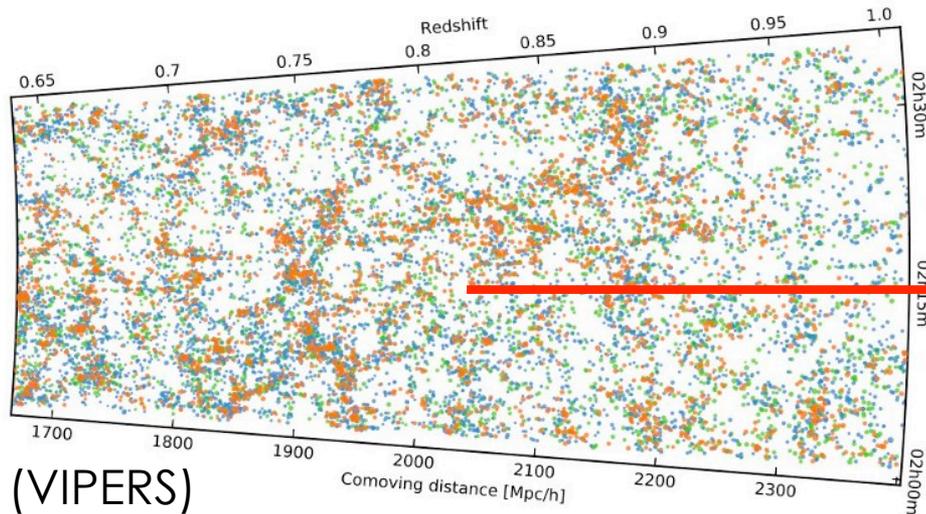
to fergus2 ▾

Your submission is currently on hold pending a decision on classification. The "hold" status merely indicates that one or more of the moderators need additional time to consider your article.

Outline

- Introduction to Clipping
- The Power Spectrum
- Results from GAMA
- Enhancing Weak Lensing & Modified Gravity

Cosmological Fields

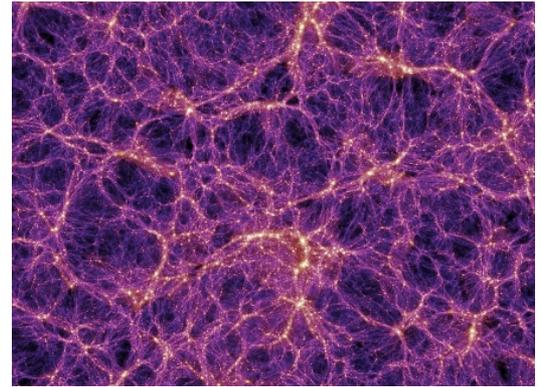
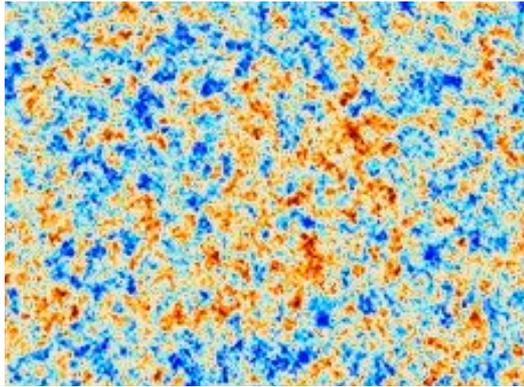


Why do we use $P(k)$, $\xi(r)$?

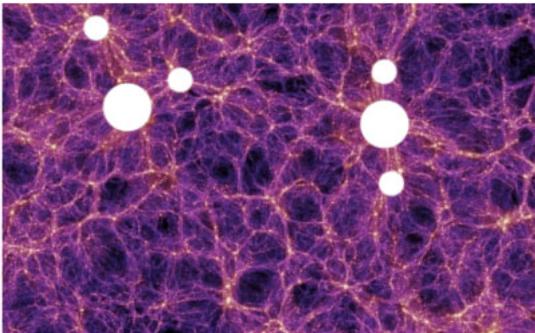
- Data Compression
- Predictability

Predicting Perturbations

Difficulty increases with time...

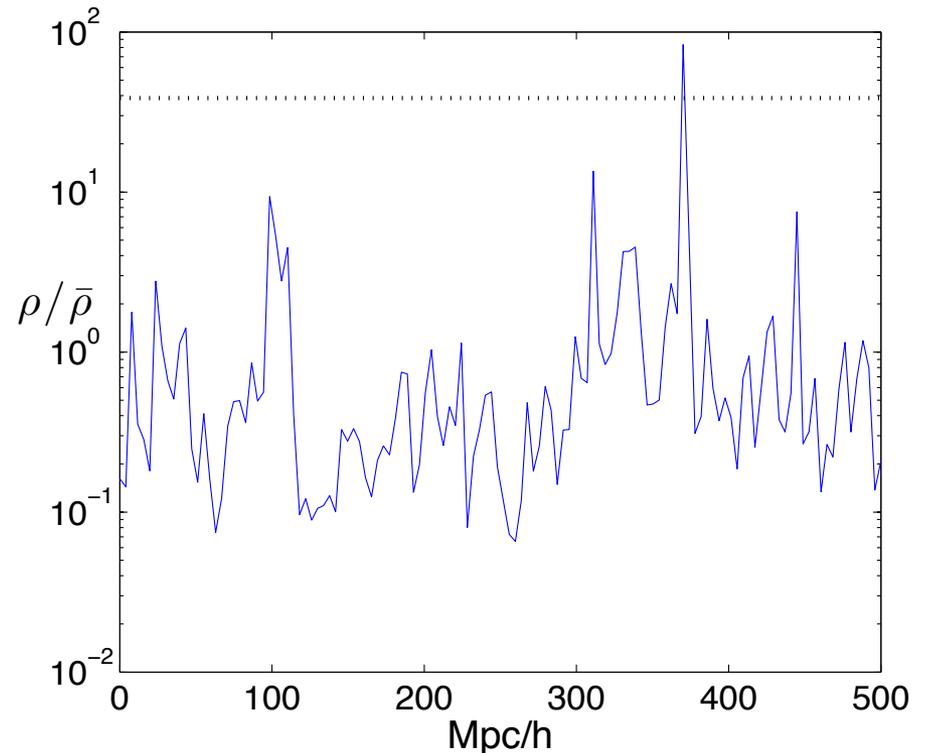


...but *also* with density:



Clipping

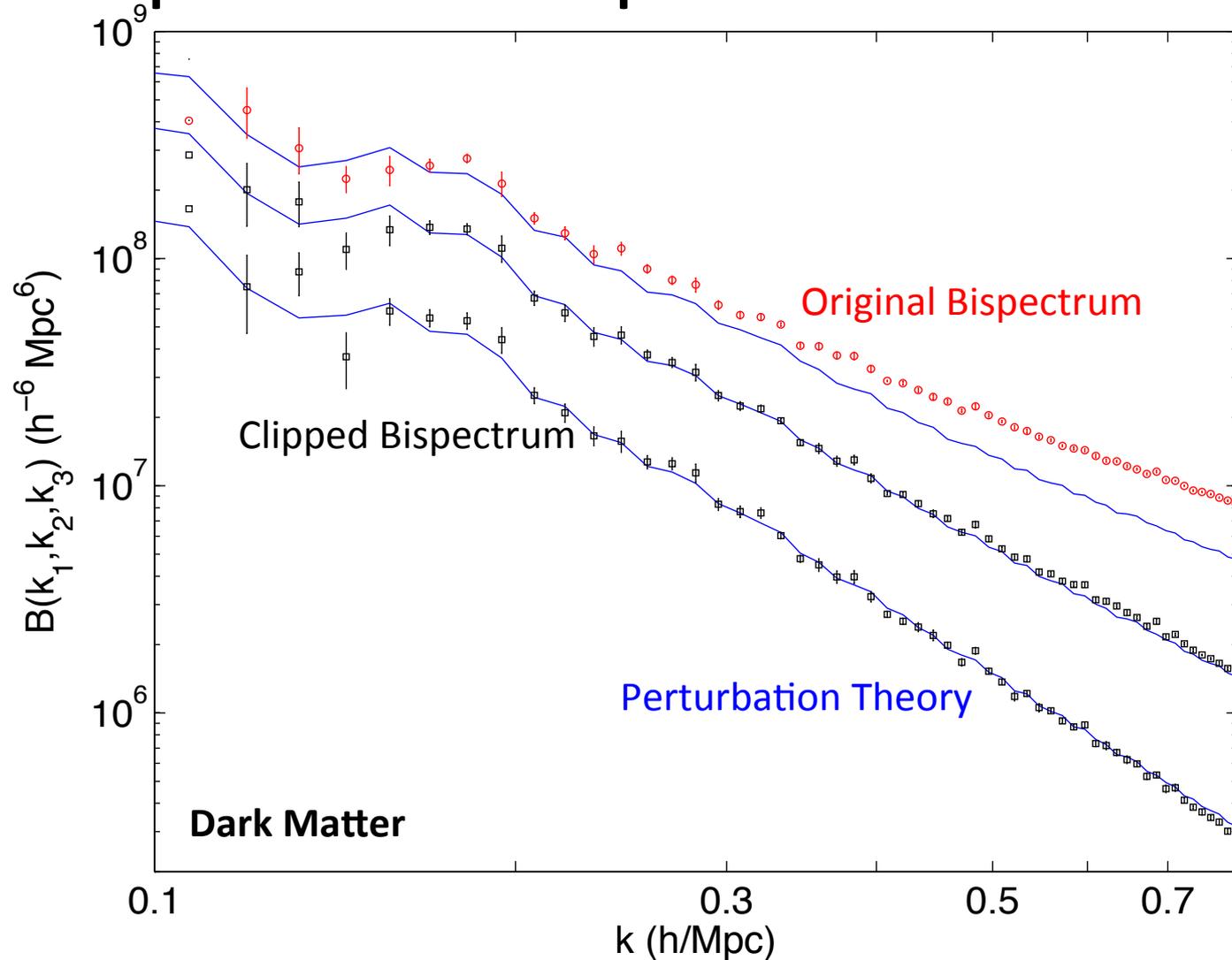
- Enforce a **maximum density threshold**
- **Suppress nonlinear contributions** from both gravitational collapse *and* galaxy bias



Outline

- Introduction to Clipping
- The Power Spectrum
- Results from GAMA
- Enhancing Weak Lensing & Modified Gravity

Power Spectrum-Bispectrum Connection



Two Point Statistics of Clipped Fields

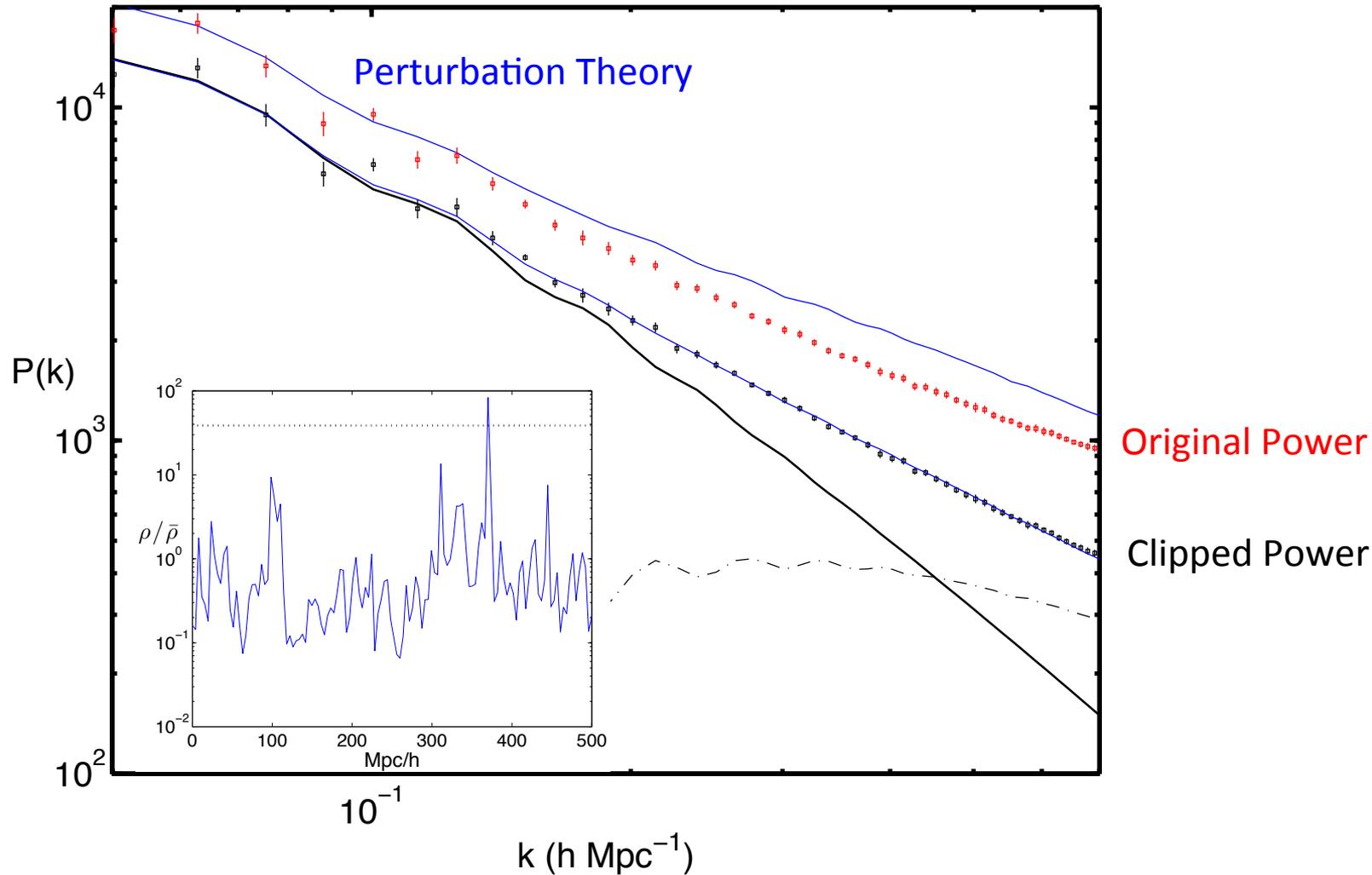
- For a Gaussian Random Field:

$$\xi_C(\vec{r}) = \sum_{n=1}^{\infty} C(n) \xi^n(\vec{r})$$

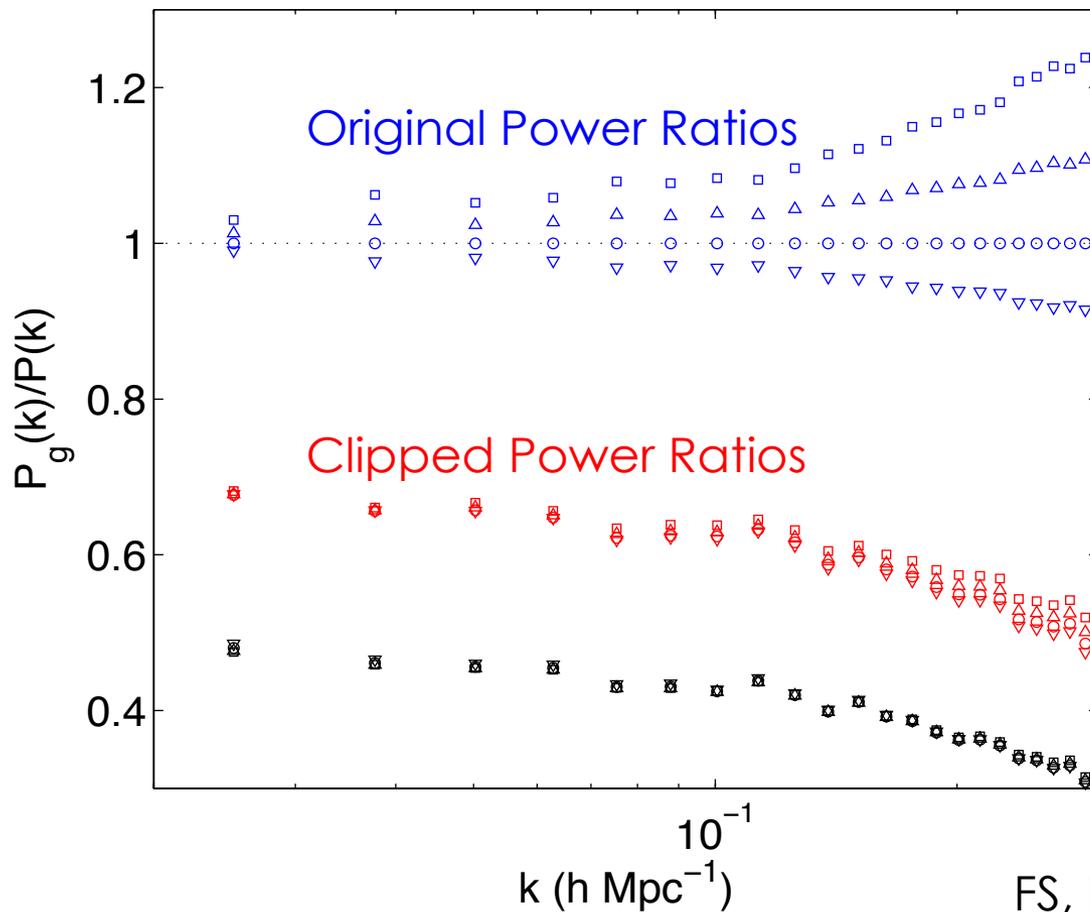
$$C(1) = \frac{1}{4} \left[1 + \operatorname{erf} \left(\frac{\delta_0}{\sqrt{2}\sigma} \right) \right]^2$$

$$C(n) = \frac{H_{n-2}^2 \left(\frac{\delta_0}{\sqrt{2}\sigma} \right)}{\pi 2^{n-1} n! \sigma^{2n-2}} e^{-\frac{\delta_0^2}{\sigma^2}}$$

Galaxy Power Spectrum



Galaxy Bias



□ **Galaxy bias** is more **linear** after clipping

Outline

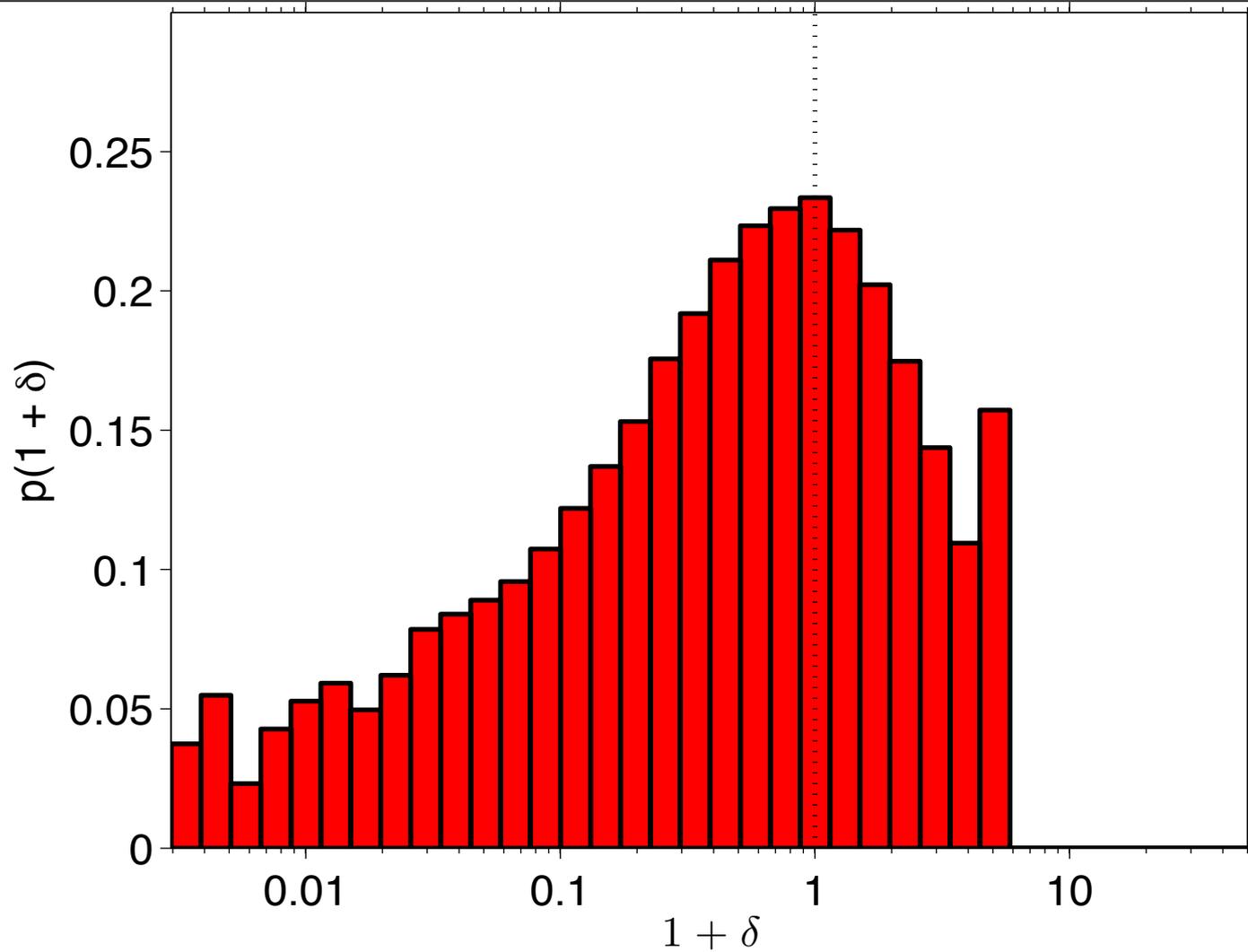
- Introduction to Clipping
- The Clipped Power Spectrum
- Results from GAMA
- Enhancing Weak Lensing & Modified Gravity

GAMA (Galaxy And Mass Assembly)

- Three regions of 72 square degrees
- $r < 19.8$
- Select $z < 0.25$ for higher number density



Clipping the PDF



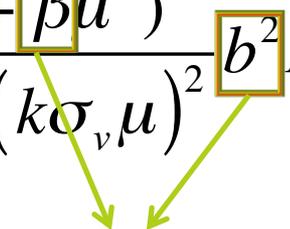
Redshift Space Model

$$\delta(x) = \delta_G + O(\delta_G^2) + O(\delta_G^3) + \delta_X$$

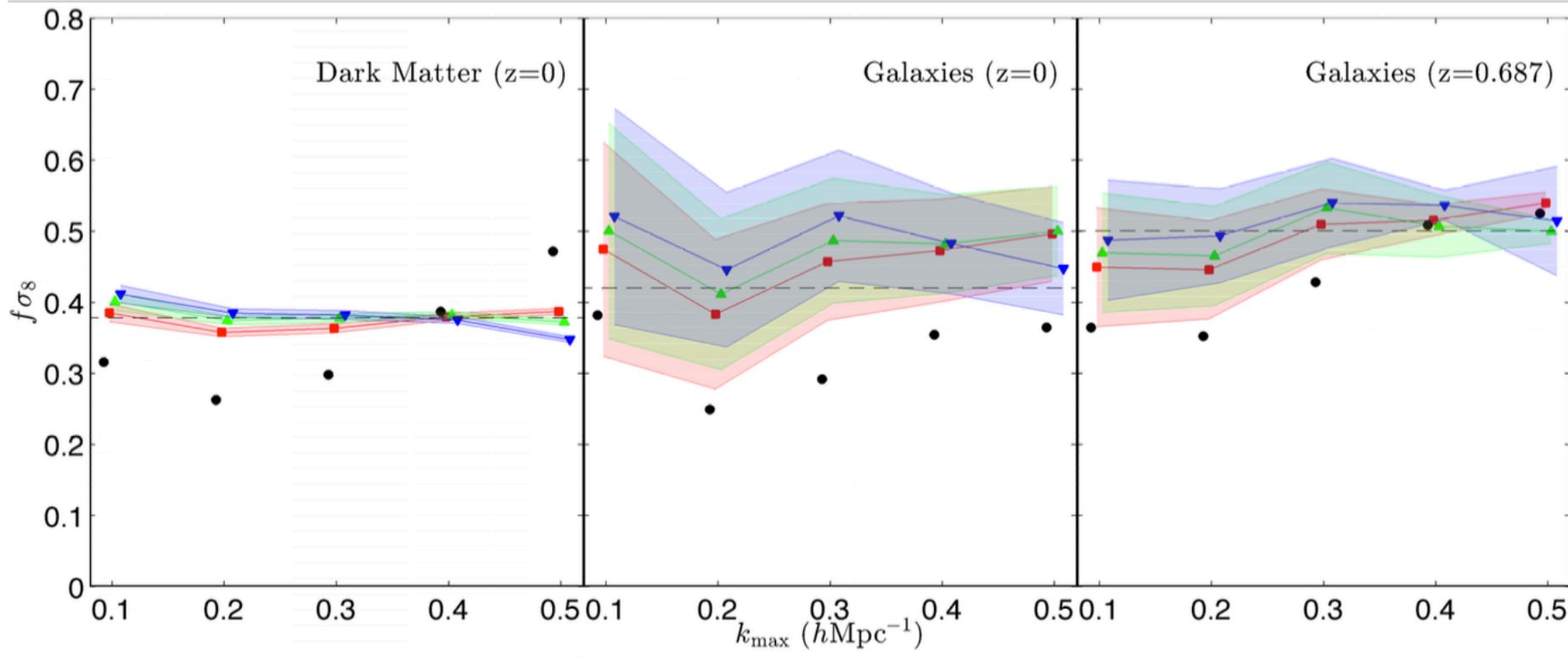
- Kaiser model with “Fingers of God”

$$P_c(k, \mu) = \mathbb{C} \left\{ \frac{(1 + \beta u^2)^2}{1 + (k\sigma_v \mu)^2} b^2 P(k) \right\}$$

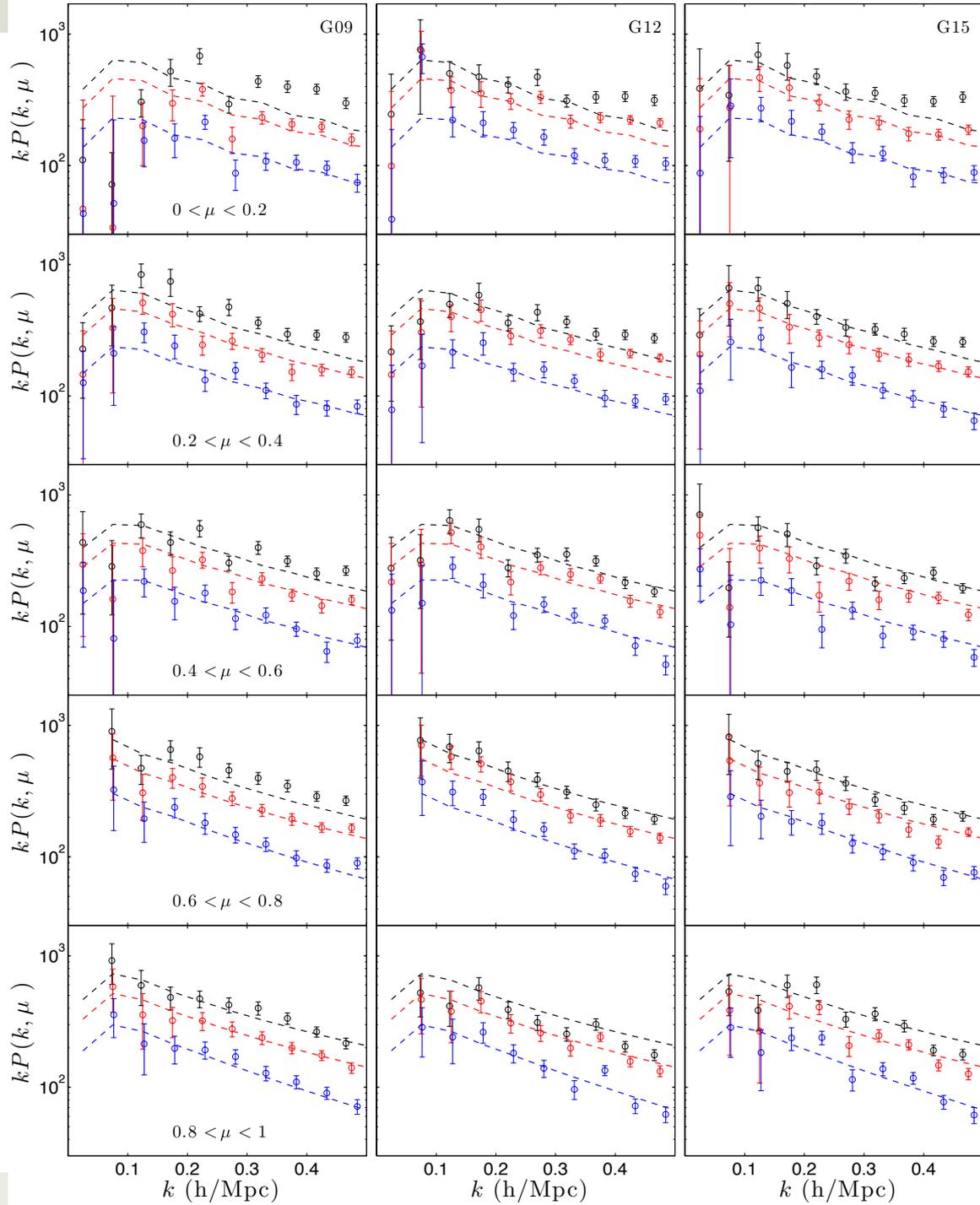
$f\sigma_8$



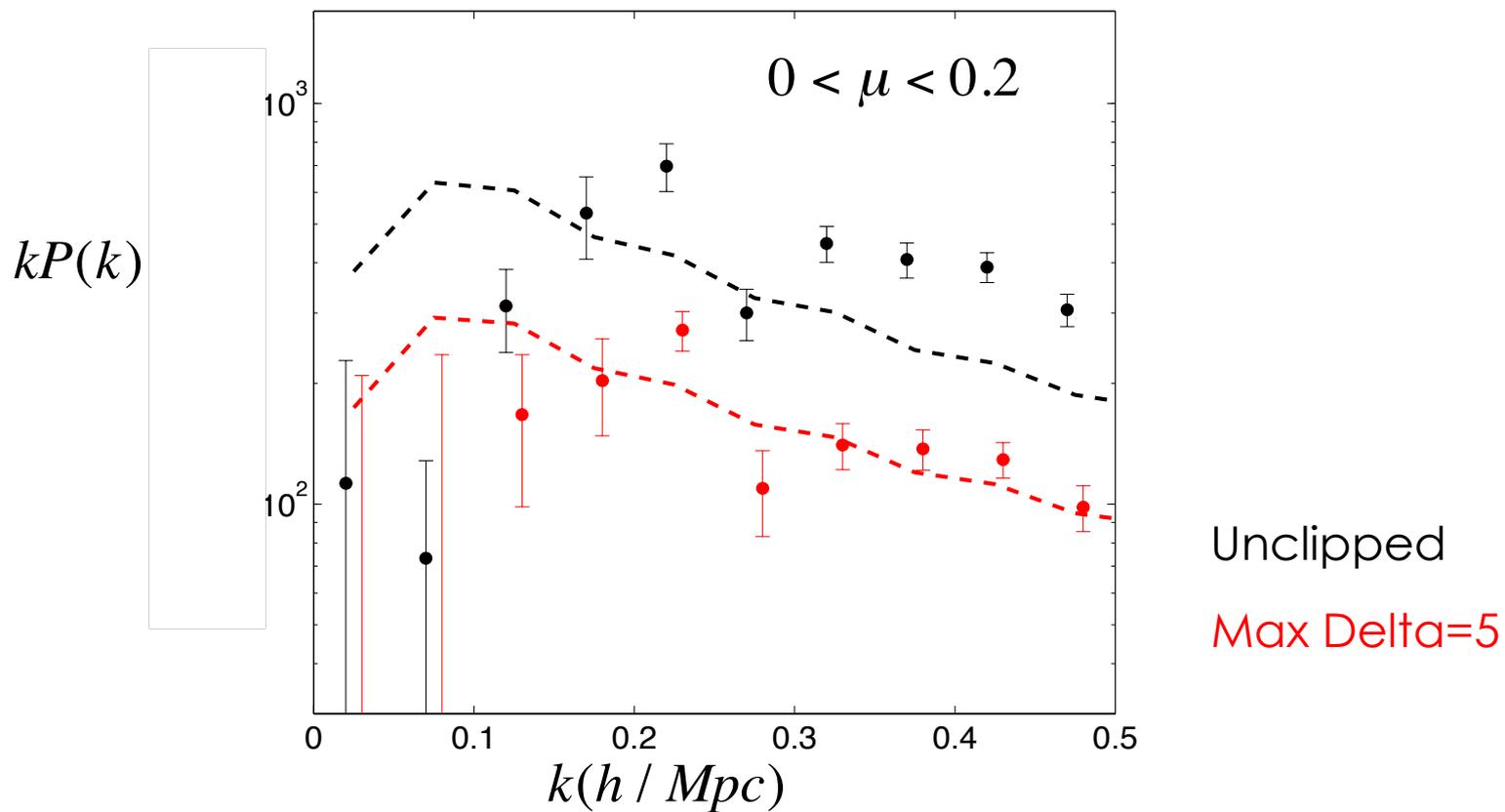
Simulation Results



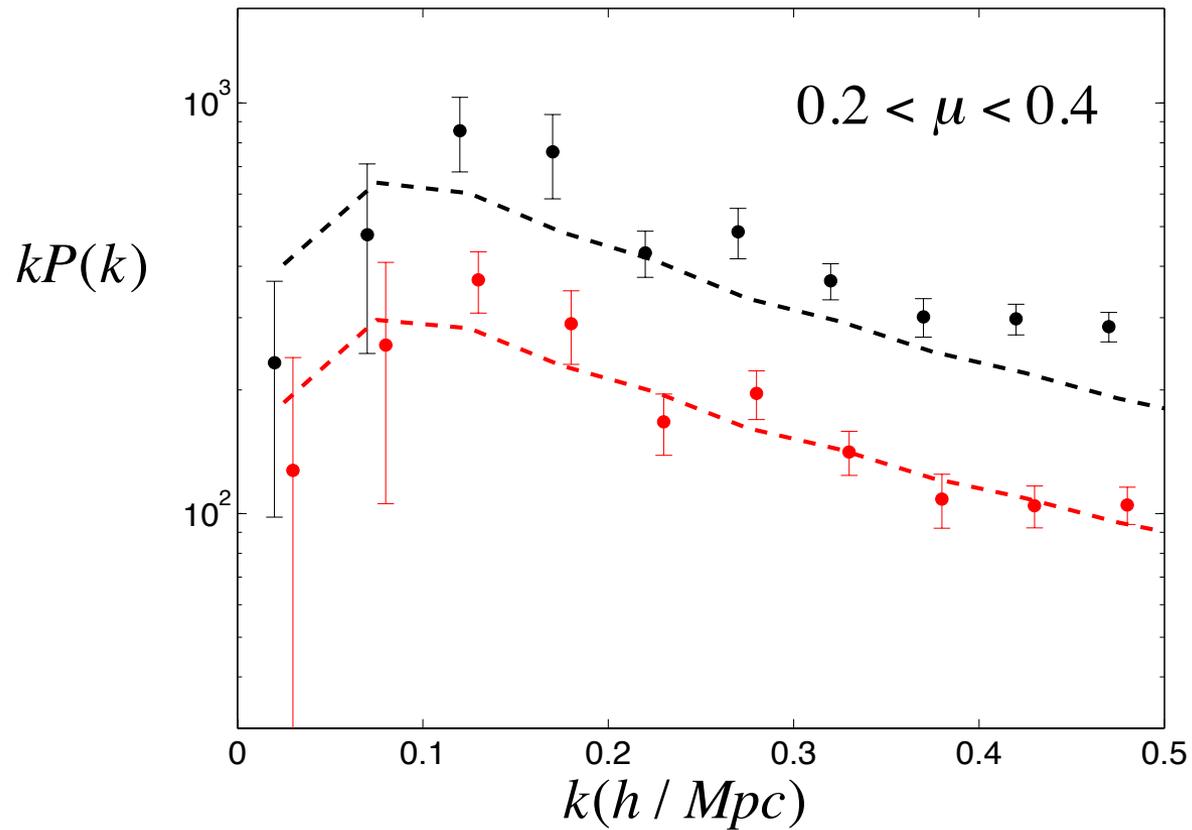
But see Michael Wilson's poster.....



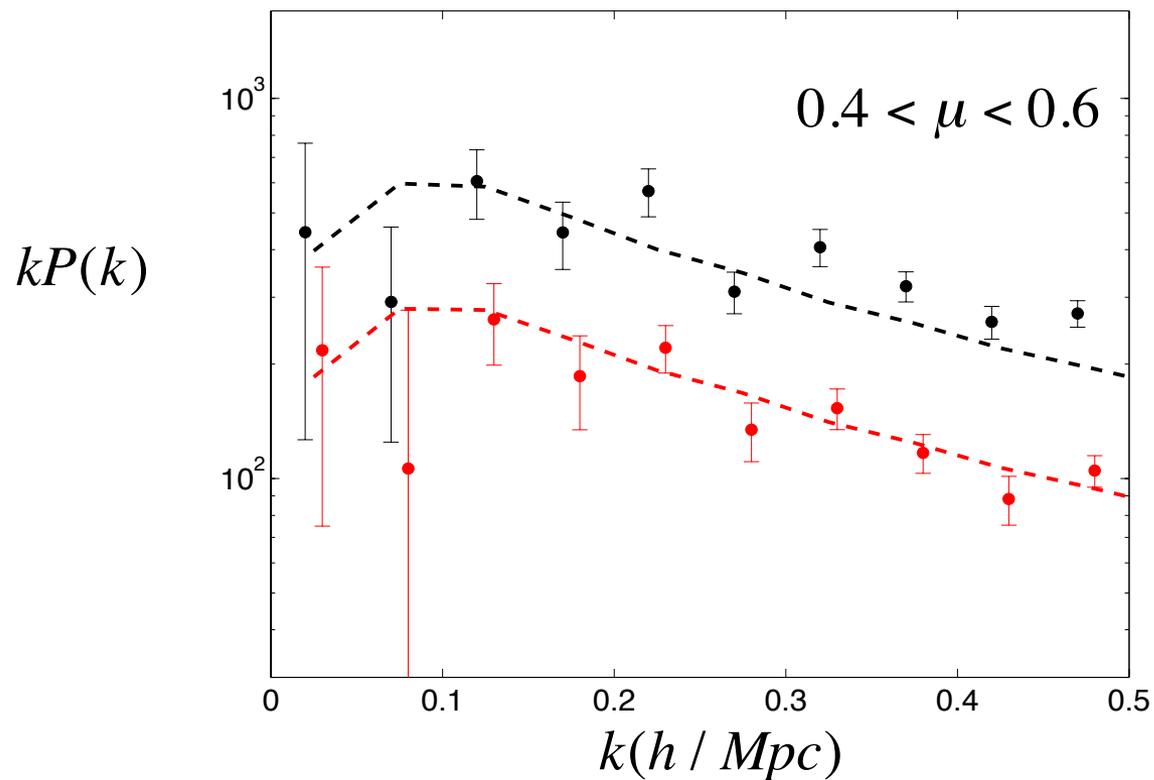
Clipped GAMA $P(k, \mu)$



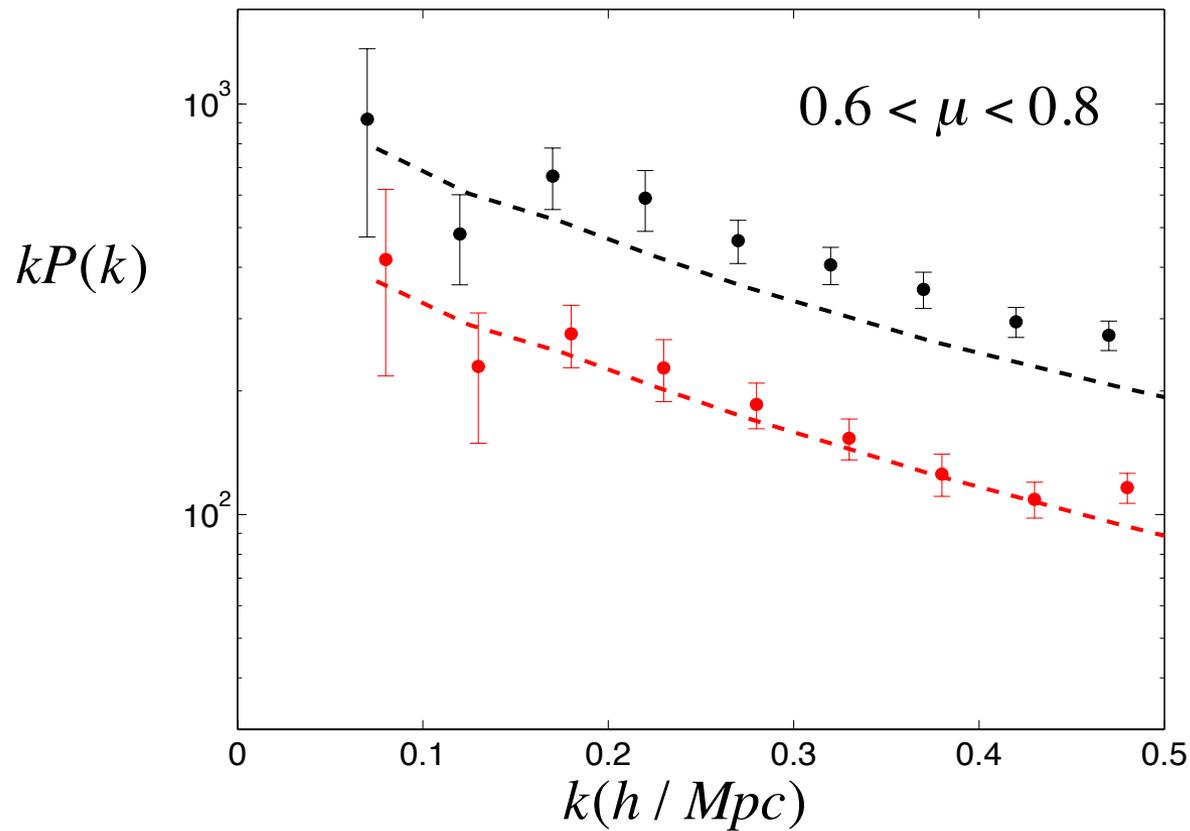
Clipped GAMA $P(k, \mu)$



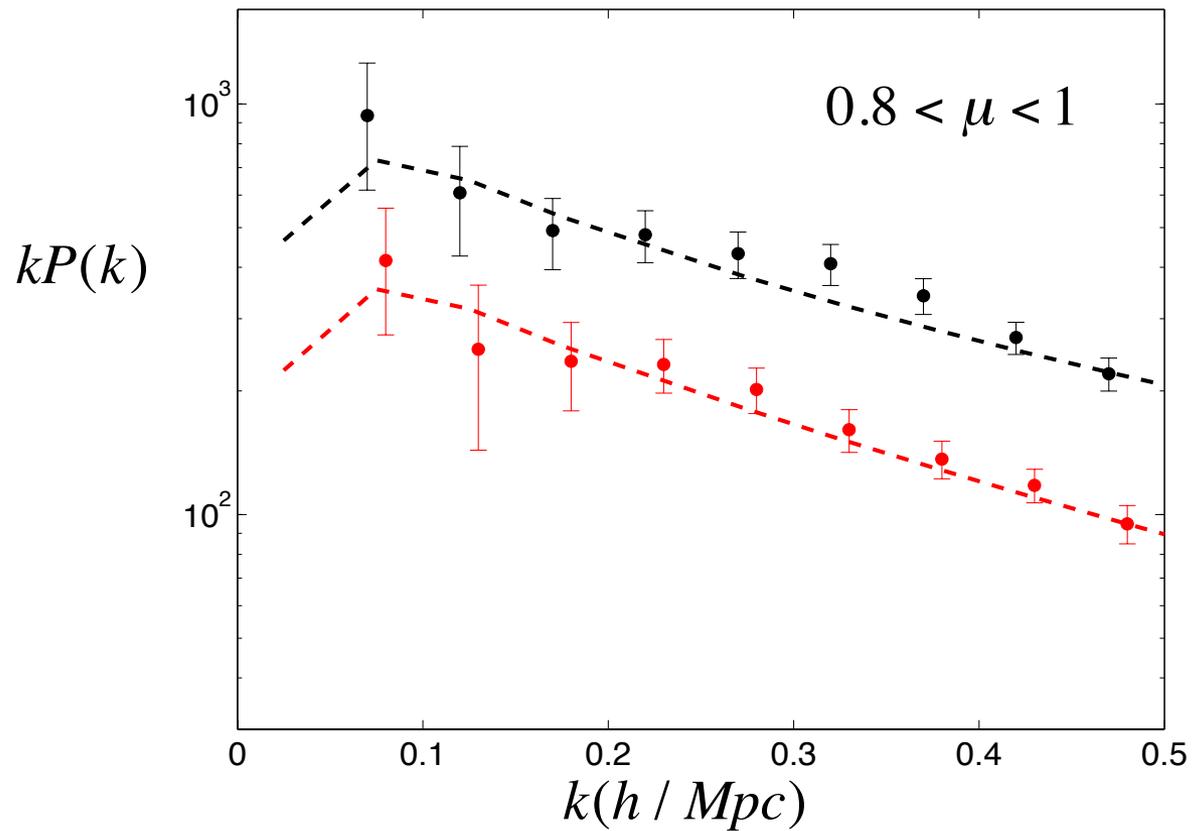
Clipped GAMA $P(k, \mu)$



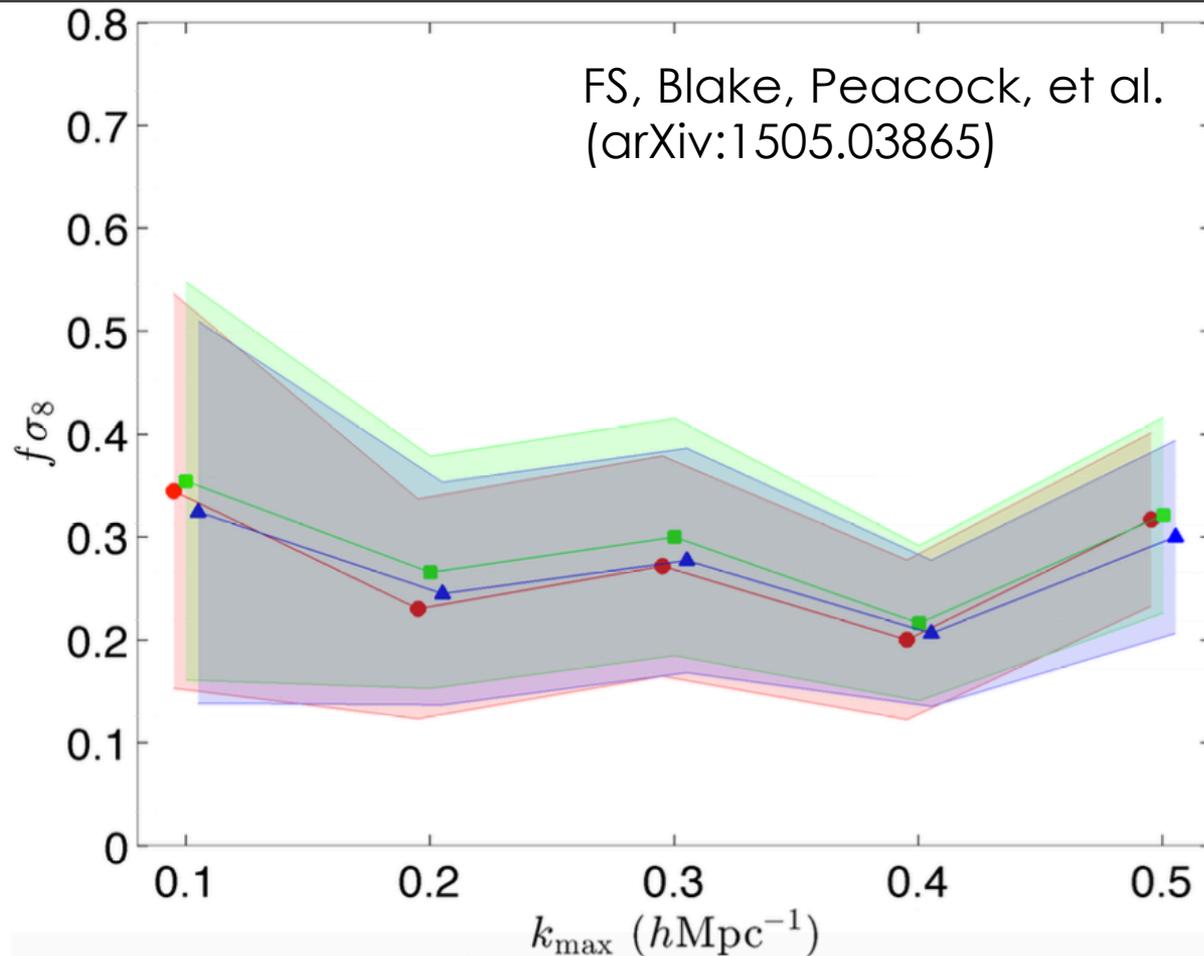
Clipped GAMA $P(k, \mu)$



Clipped GAMA $P(k, \mu)$



Results from GAMA

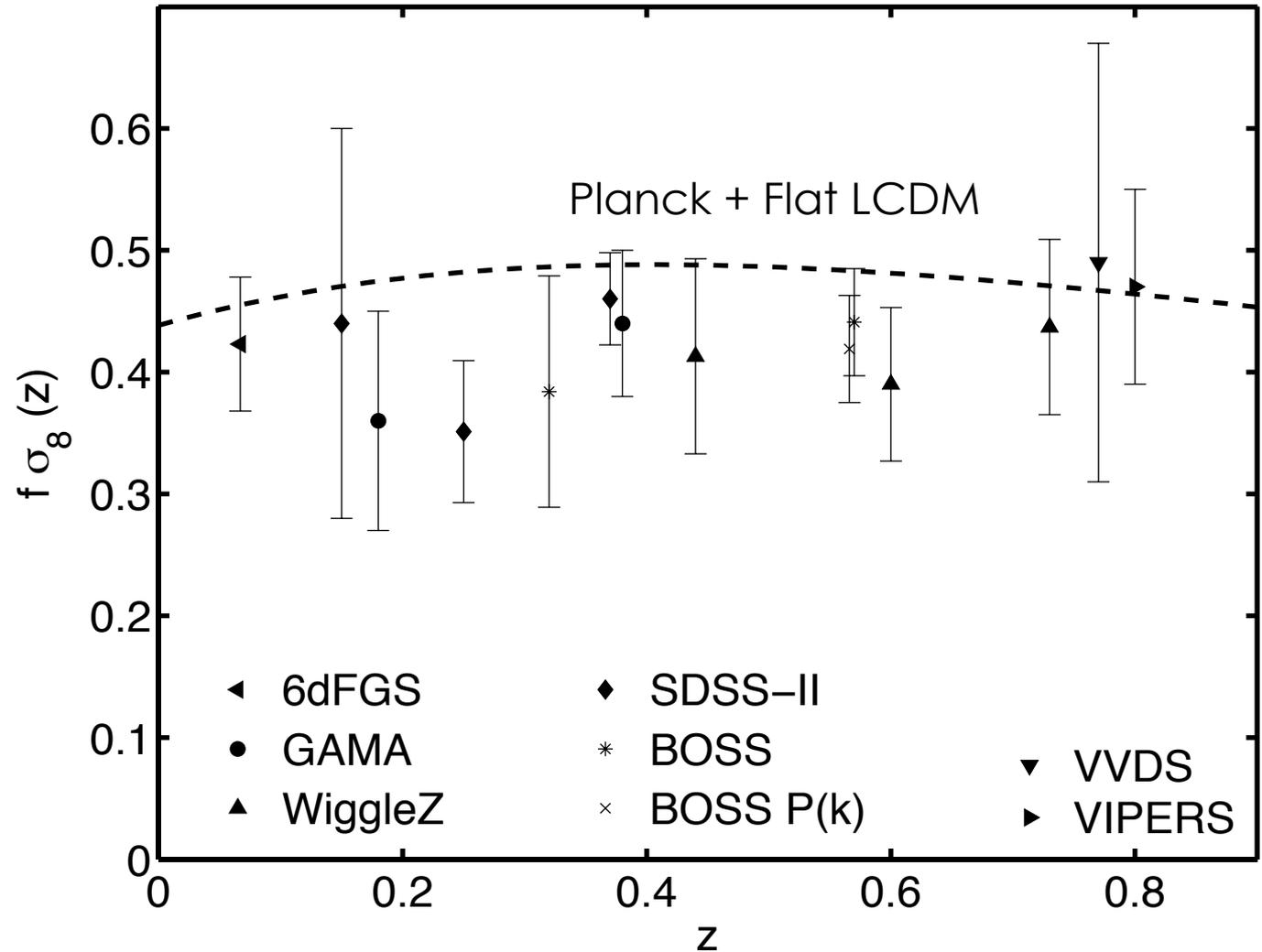


Max Delta=8
(6% galaxies
clipped)

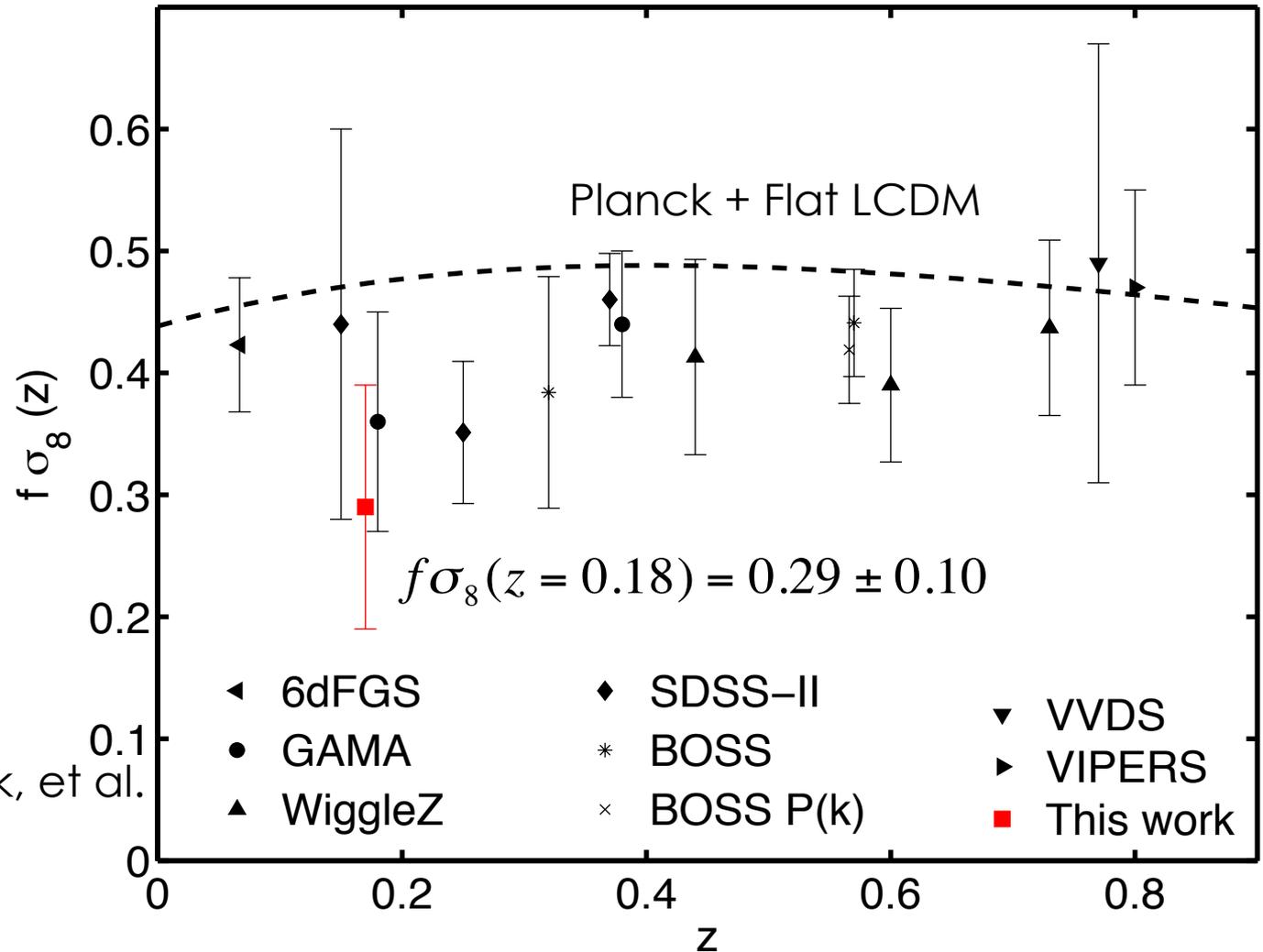
Max Delta=5
(15% galaxies
clipped)

Max Delta=4
(20% galaxies
clipped)

Context



Context

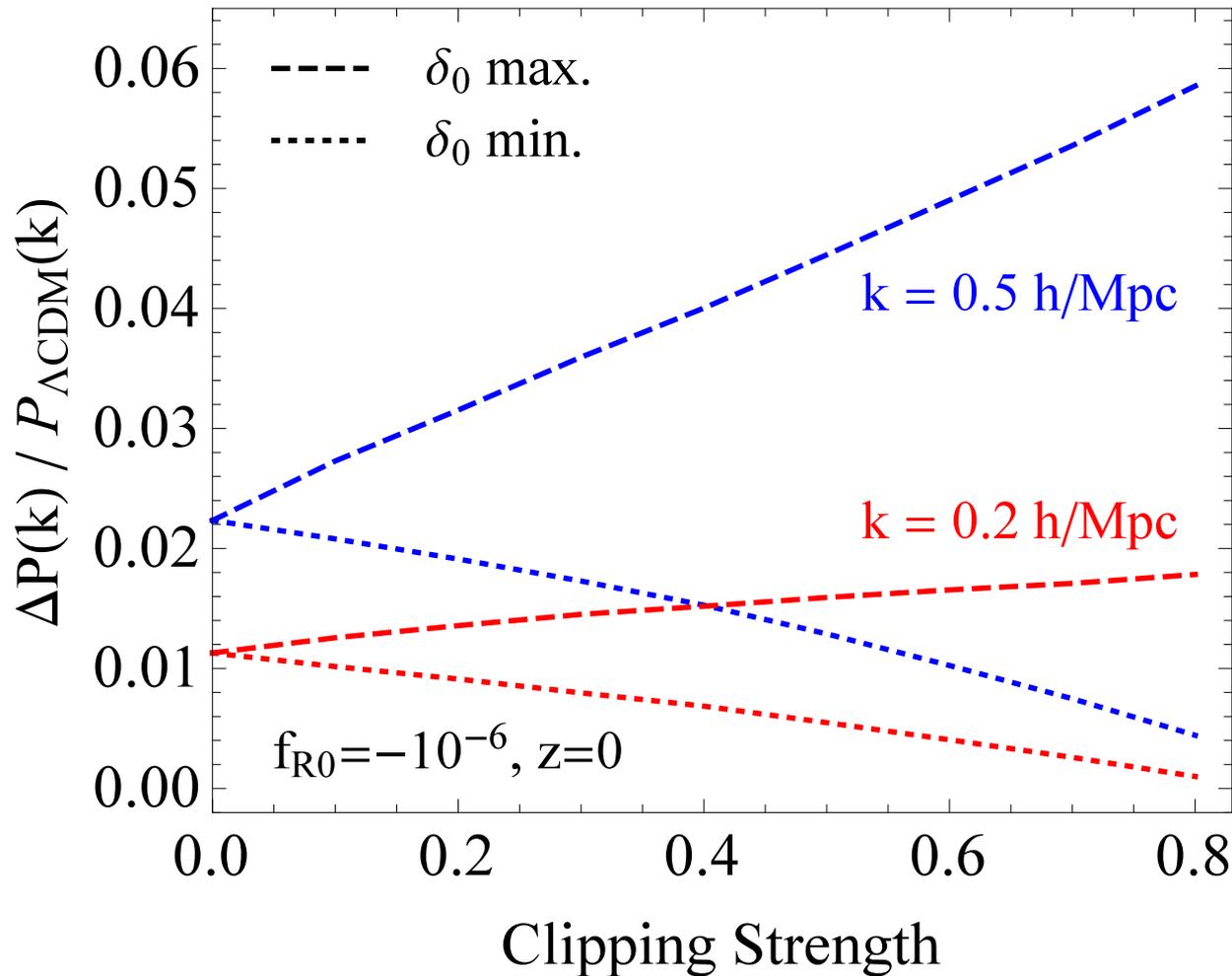


FS, Blake, Peacock, et al.
(arXiv:1505.03865)

Overview

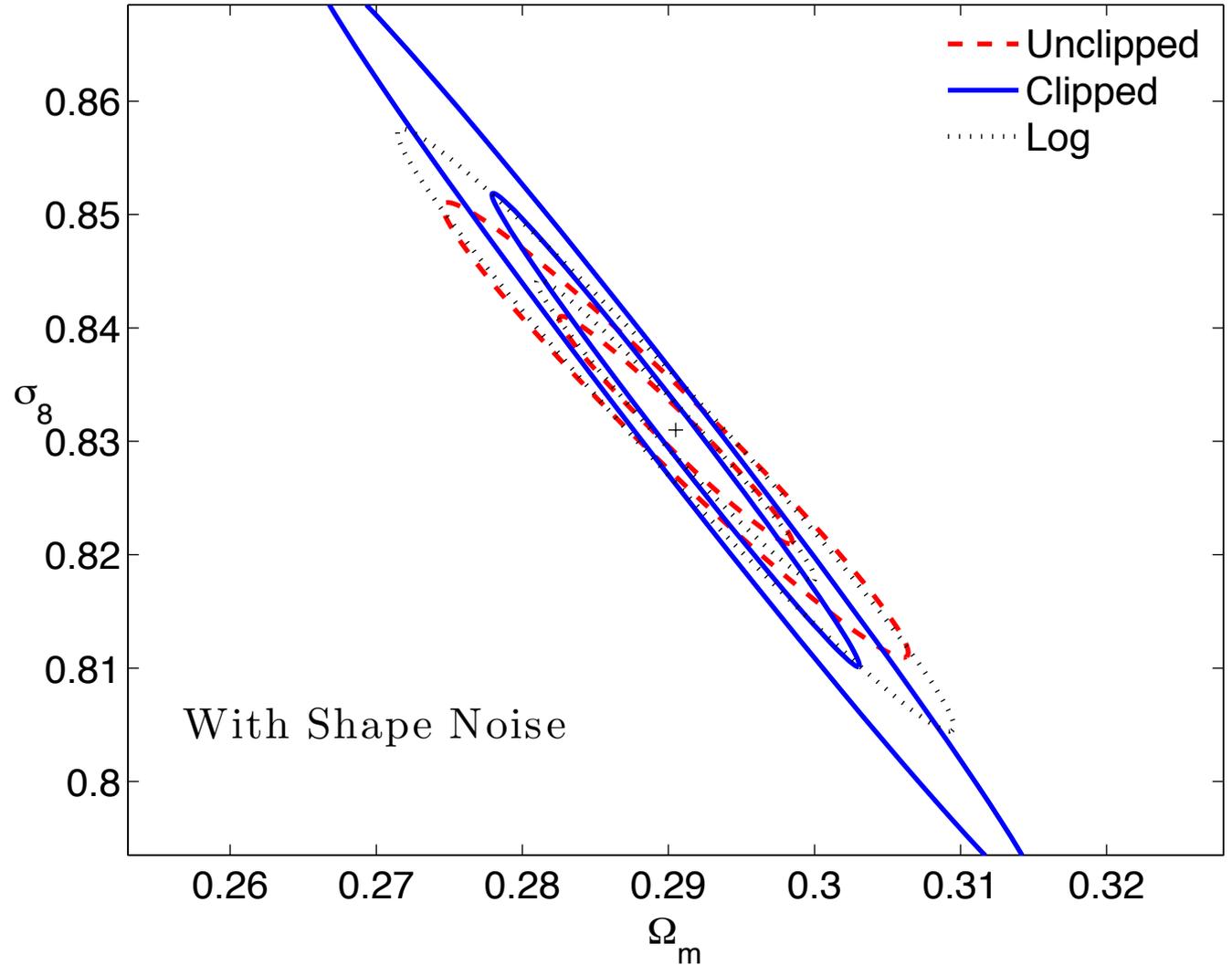
- Introduction to Clipping
- The Power Spectrum
- Results from GAMA
- Enhancing Weak Lensing & Modified Gravity

Unscreening with Clipping



Lombriser, FS, Mead
(PRL 2015)

Today on astro-ph



FS et al.
(arXiv:1507.04862)