

Galaxy groups in deep X-ray surveys: lessons for eROSITA

Alexis Finoguenov

MPE/UMBC

+

S.Giodini, V.Allevato, M. Tanaka, A. Leauthaud, O. Ilbert,, N.Cappelluti, JP Kneib, R. Bielby, H. McCracken, O. Le Fevre, COSMOS

CDFS:

M.Cooper, J.Mulchaey, W.Brandt, Y.Xue, D.Rafferty

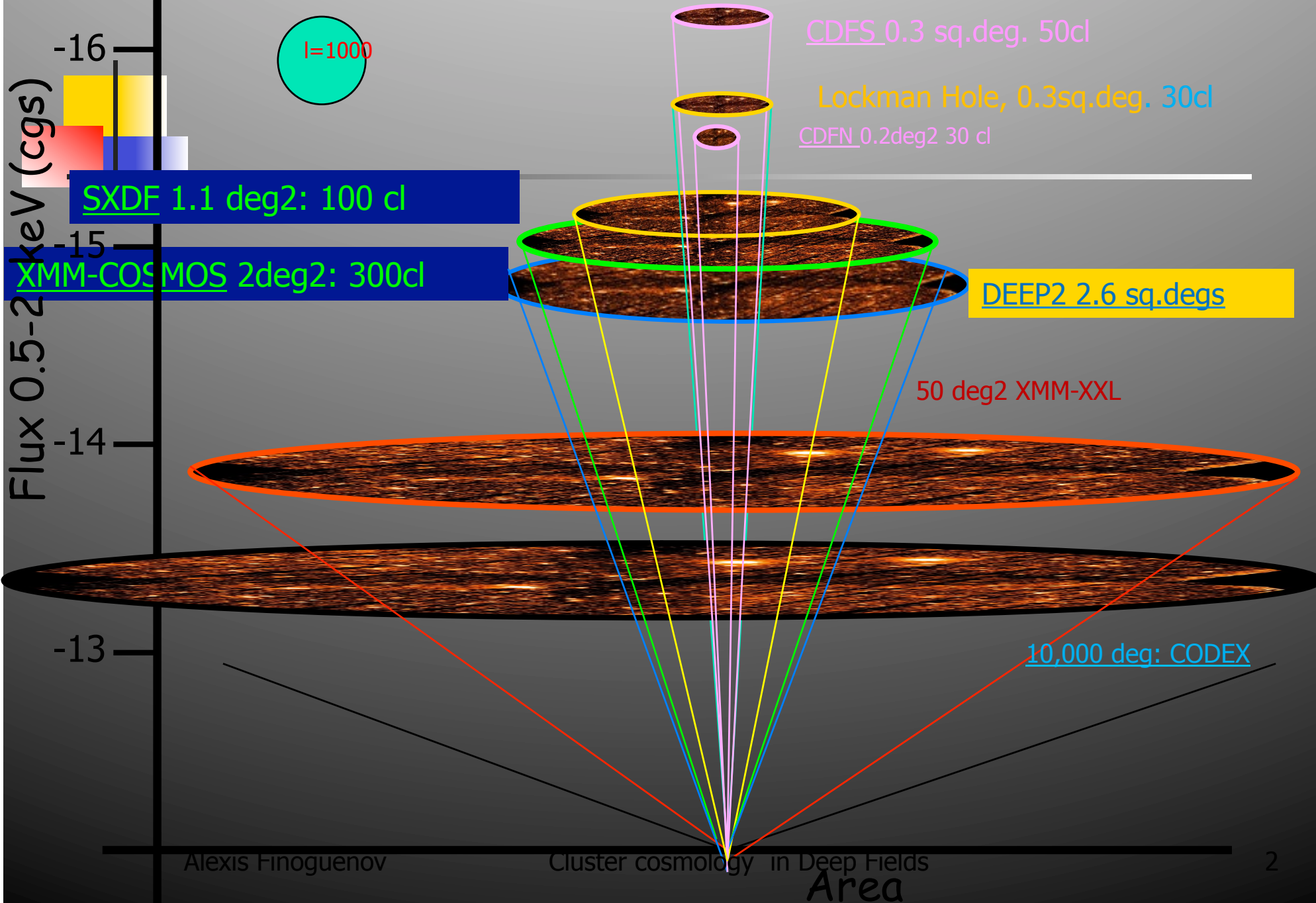
CNOC2: M. Balogh, D. Willman, S. McGee, J.Connelli

DEEP2:

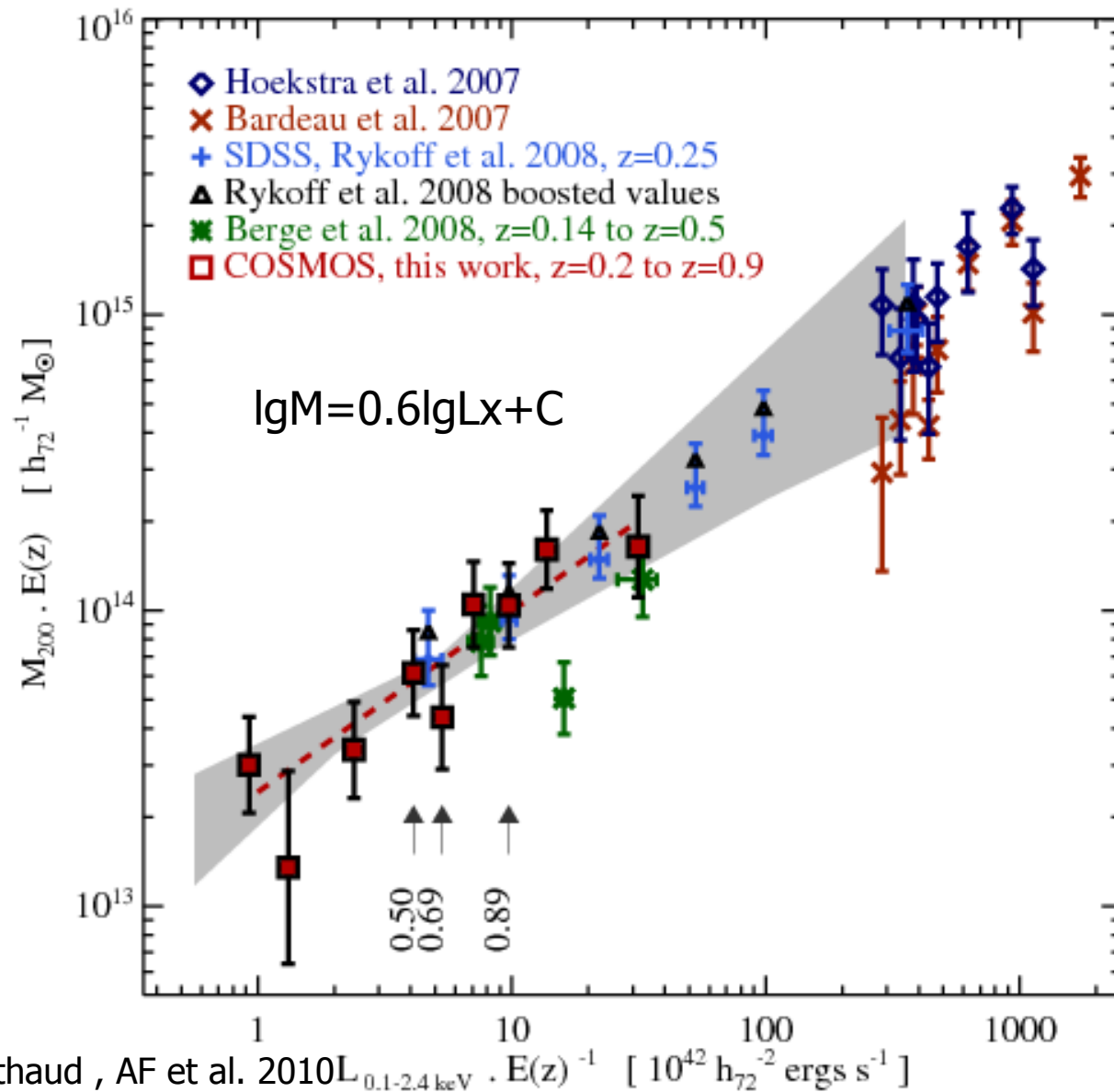
G.Erfanianfar, A.Coil, D.Kocevski, D.Rosario

CFHTLS: M. Mirkazemi

Contiguous X-ray cluster surveys in context

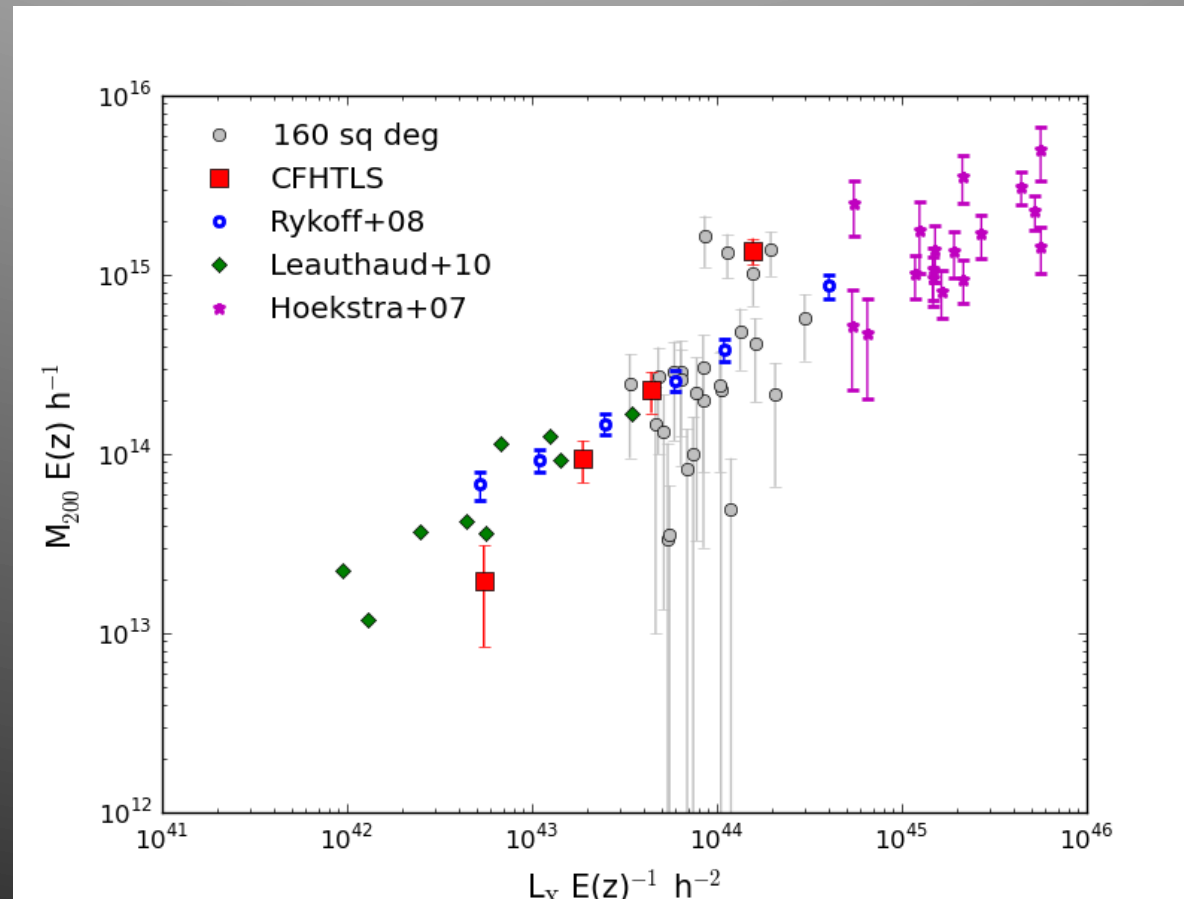
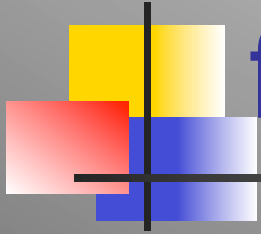


Lx-Mass from weak lensing

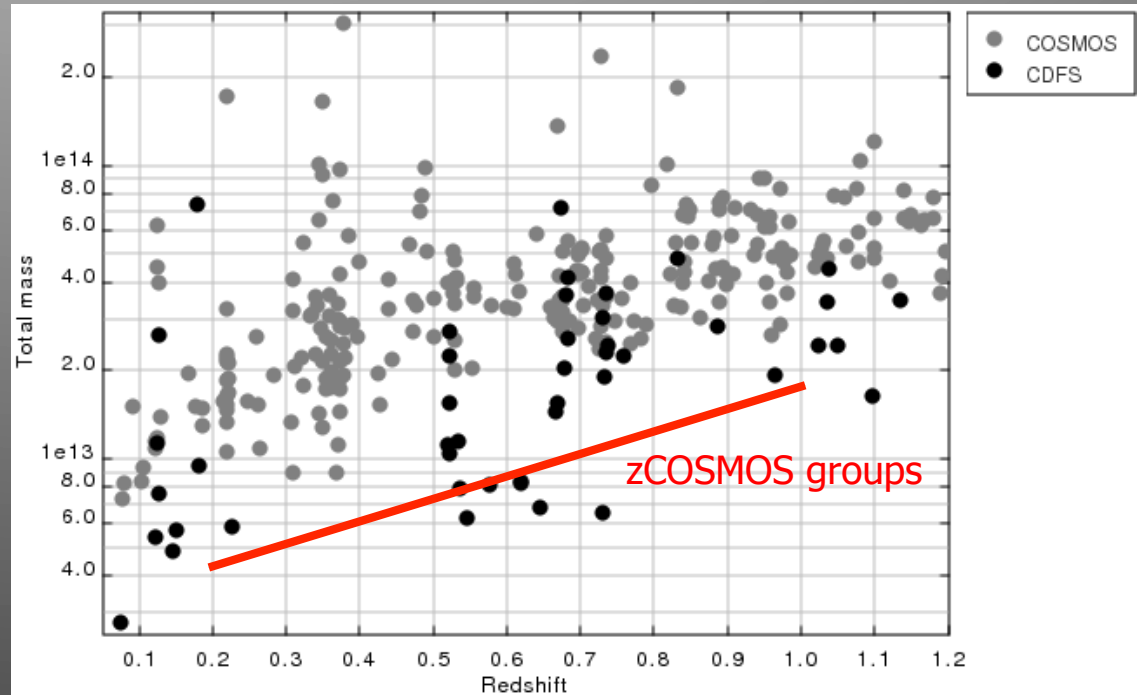
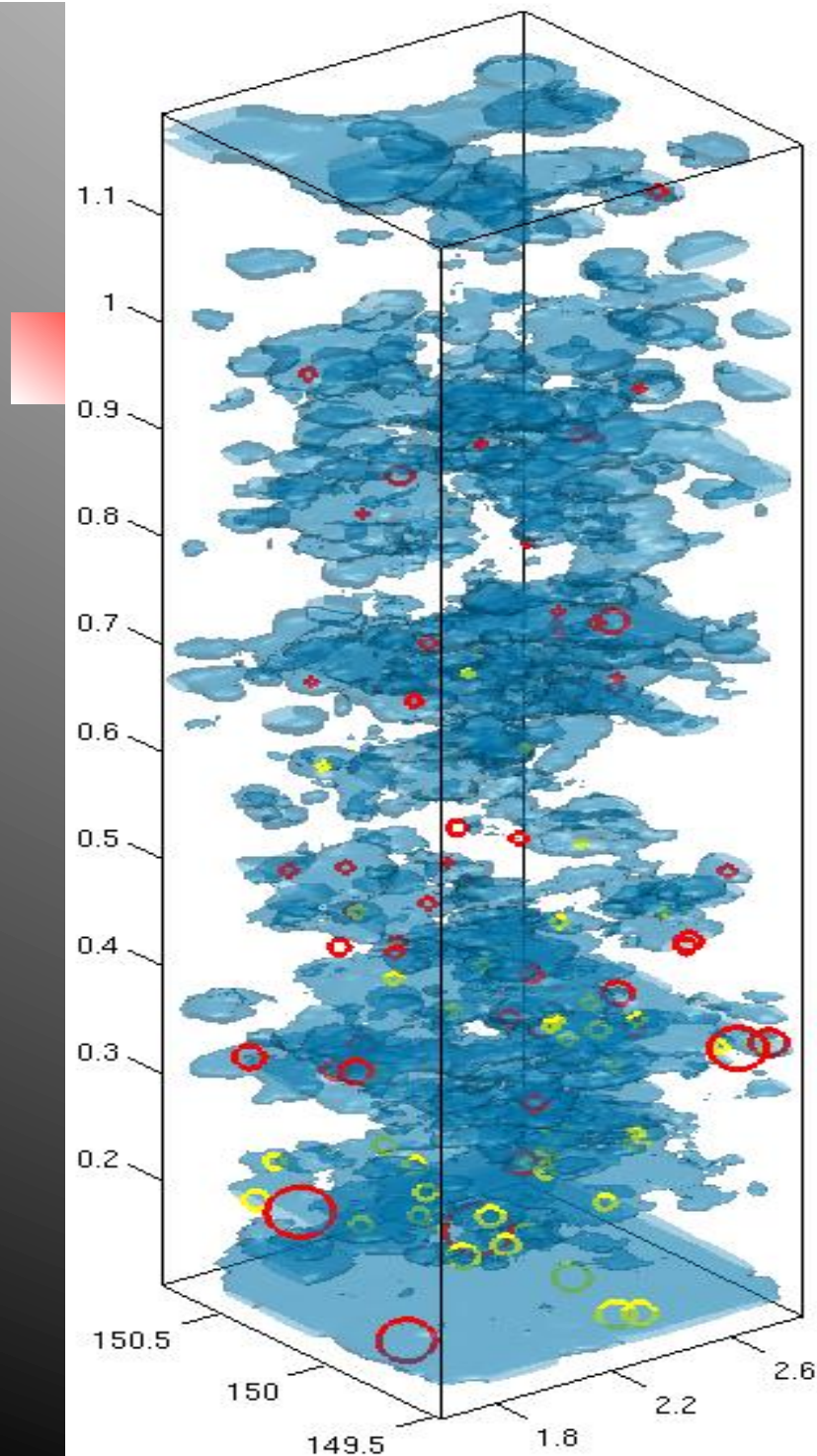


Leauthaud, AF et al. 2010

Preliminary CODEX results from CFHTLS



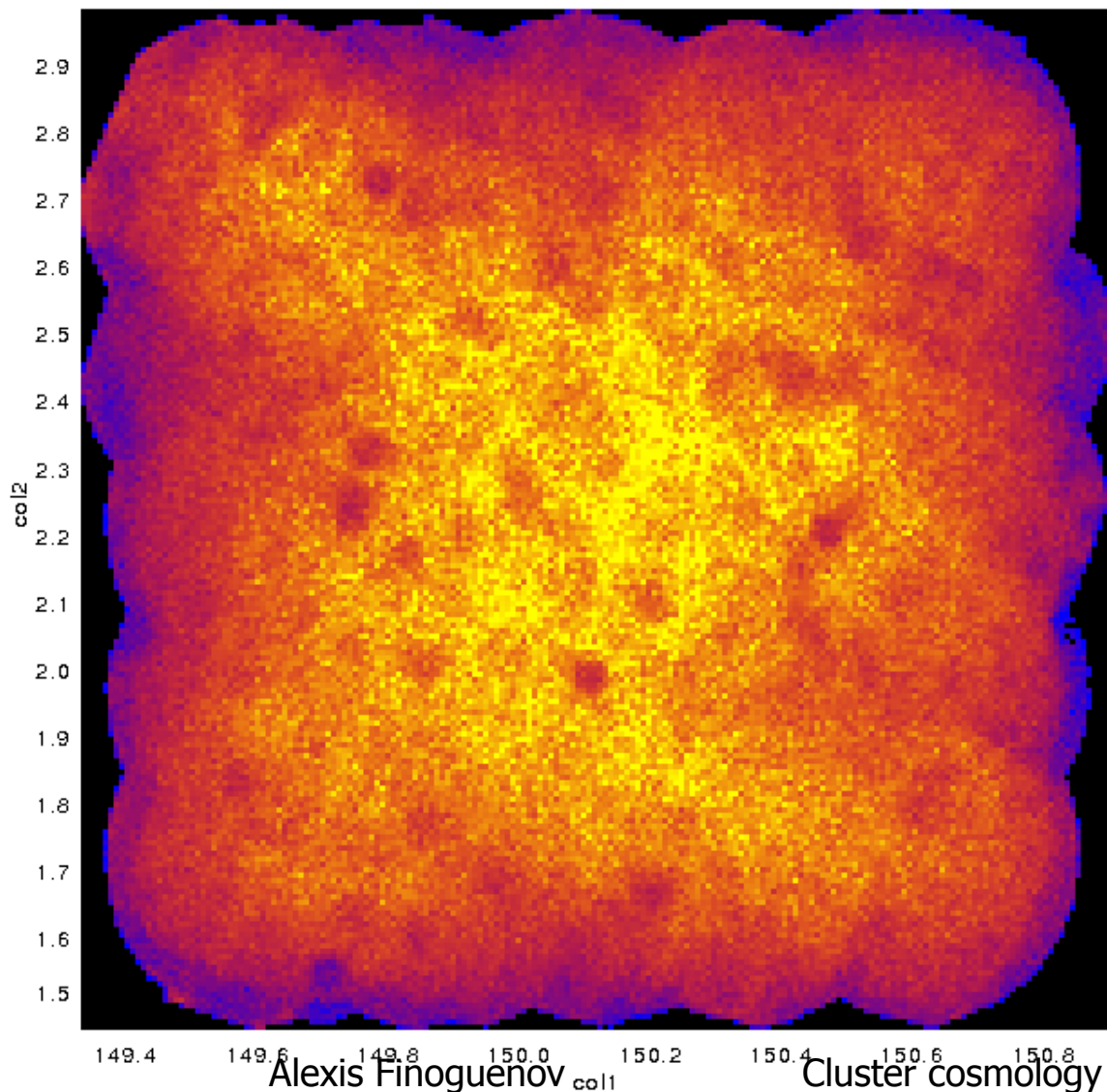
Groups and LSS



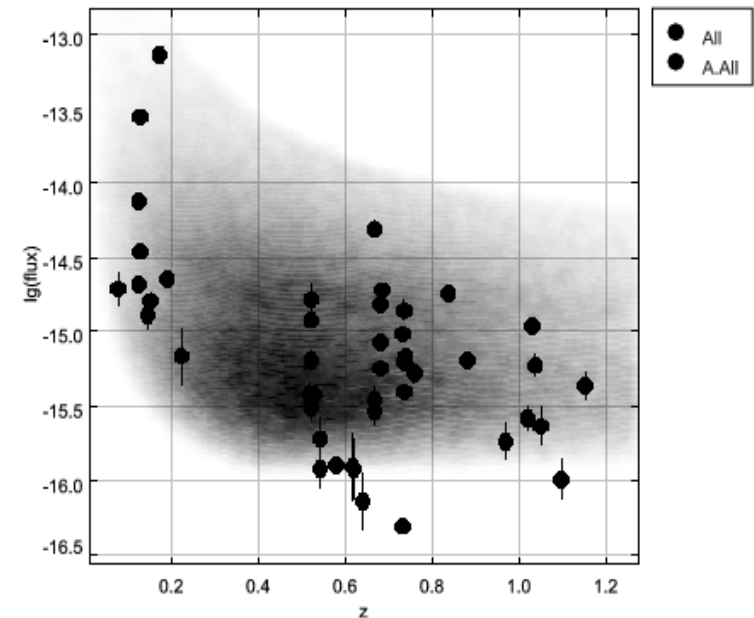
K.Kovac

LSS at 0.12, 0.22, 0.34, 0.37,
0.51, 0.73, 0.89

Random catalog: space density of objects

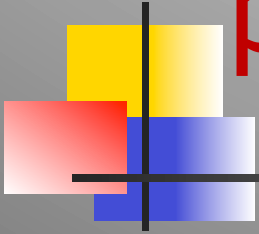


$P_{cl} > P_{agn}$

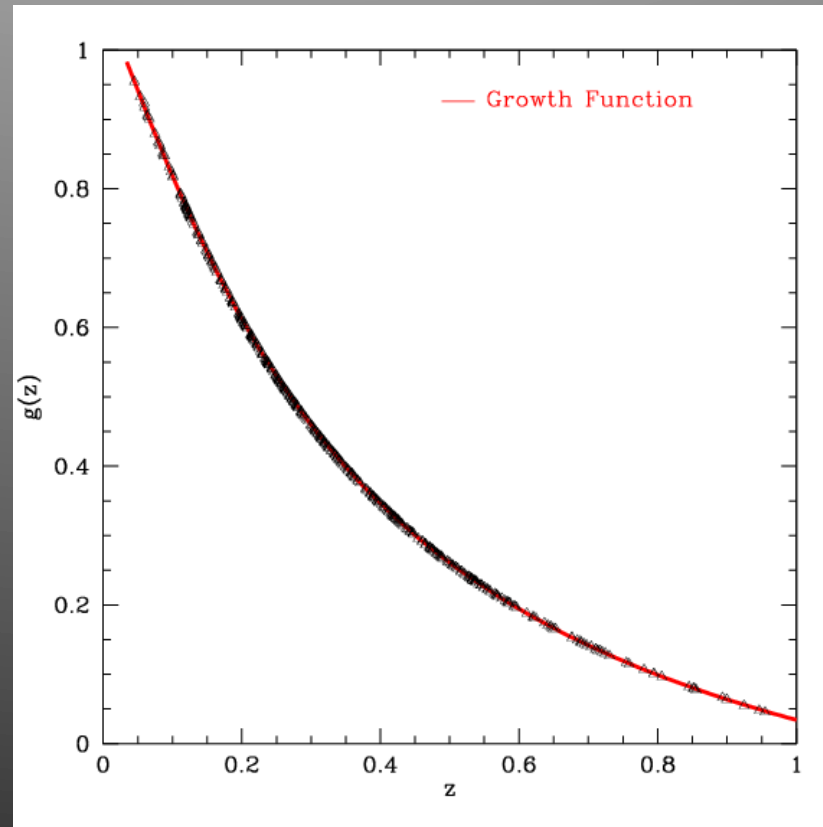


How cosmology enters two point statistics

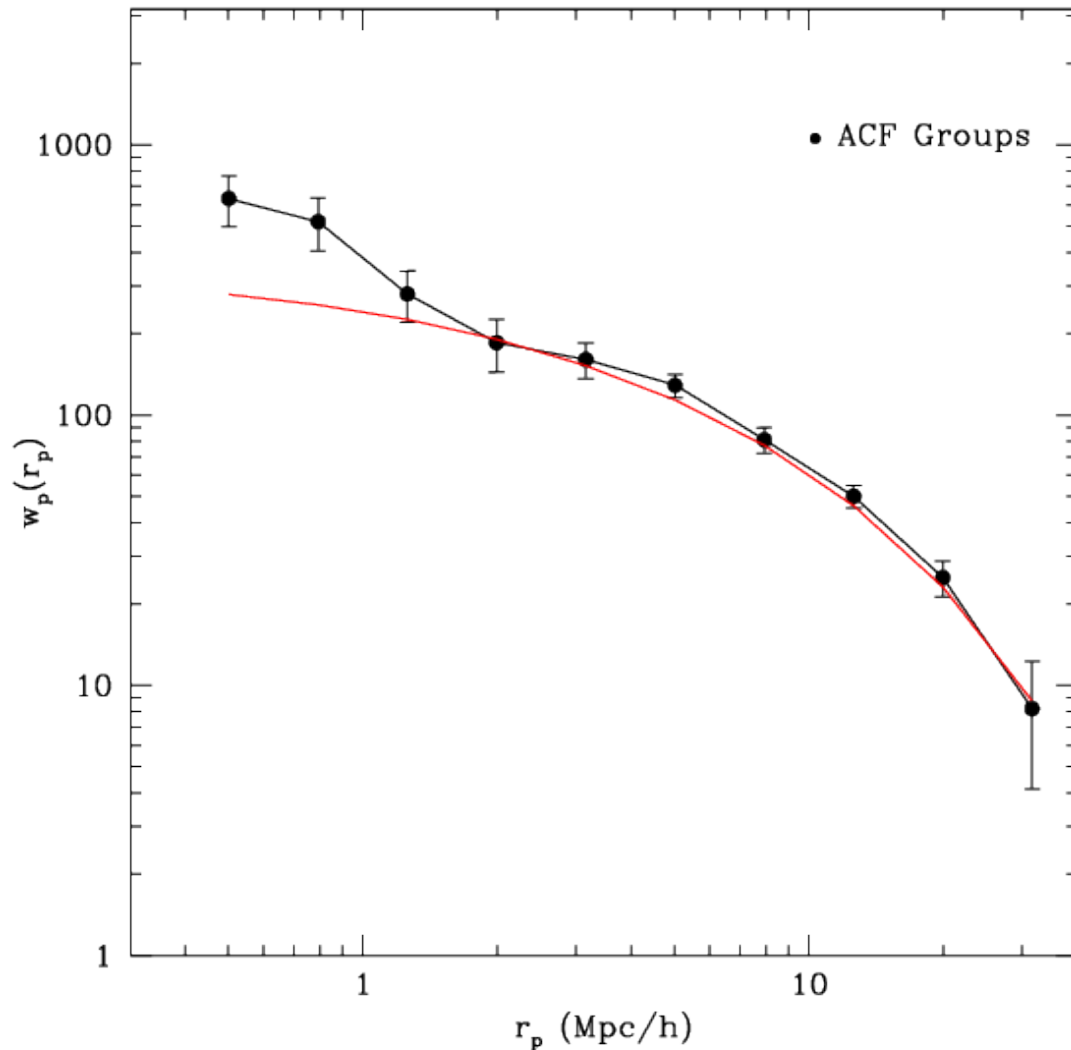
2



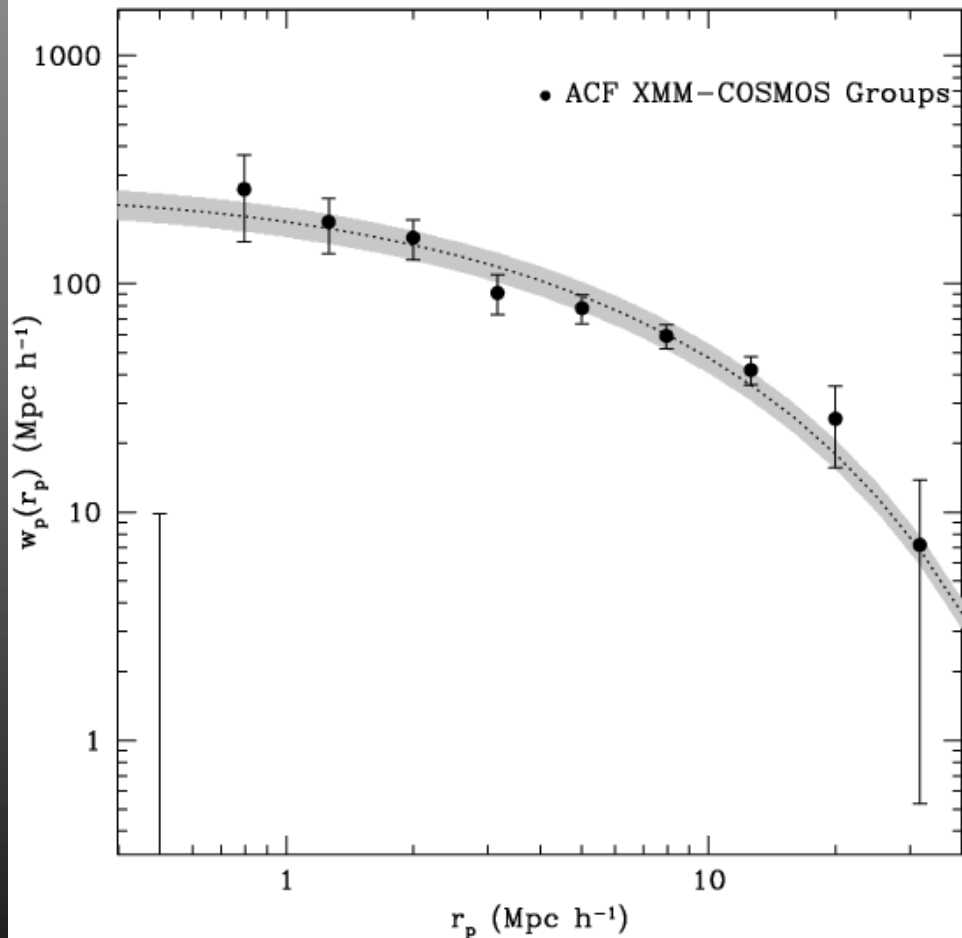
$$\sqrt{\frac{\sum_{i,j} b_i b_j g_{pair}}{N_{pair}}}$$



First surprise: 1-halo term!

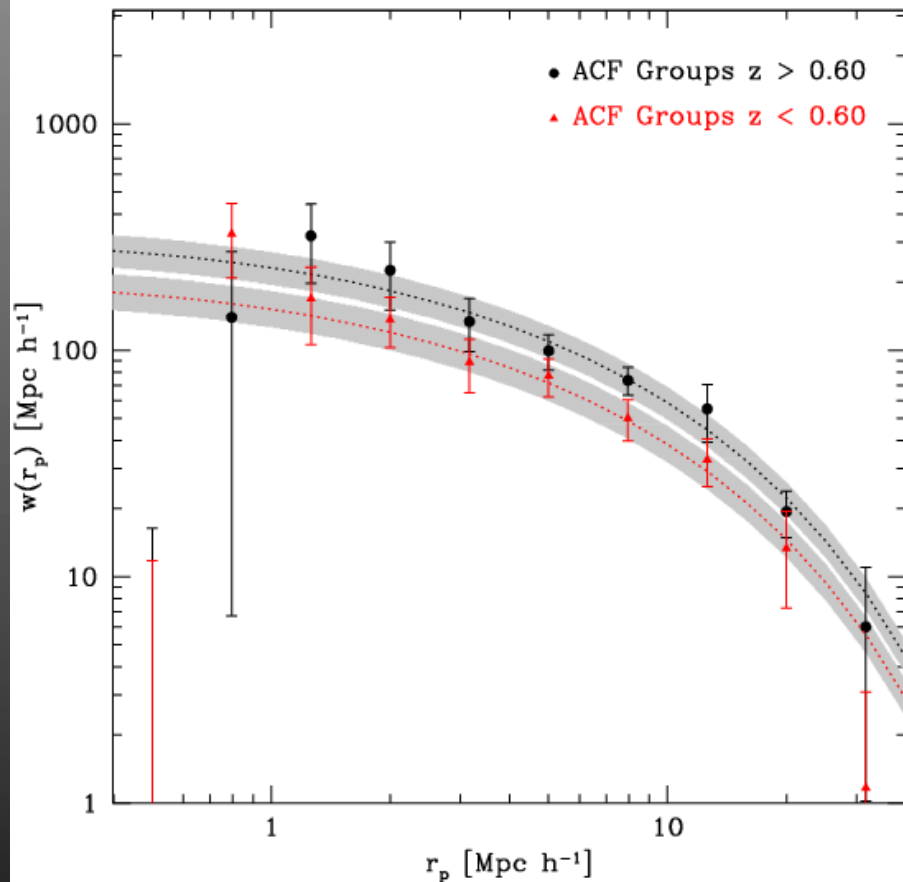


Final results – perfect agreement



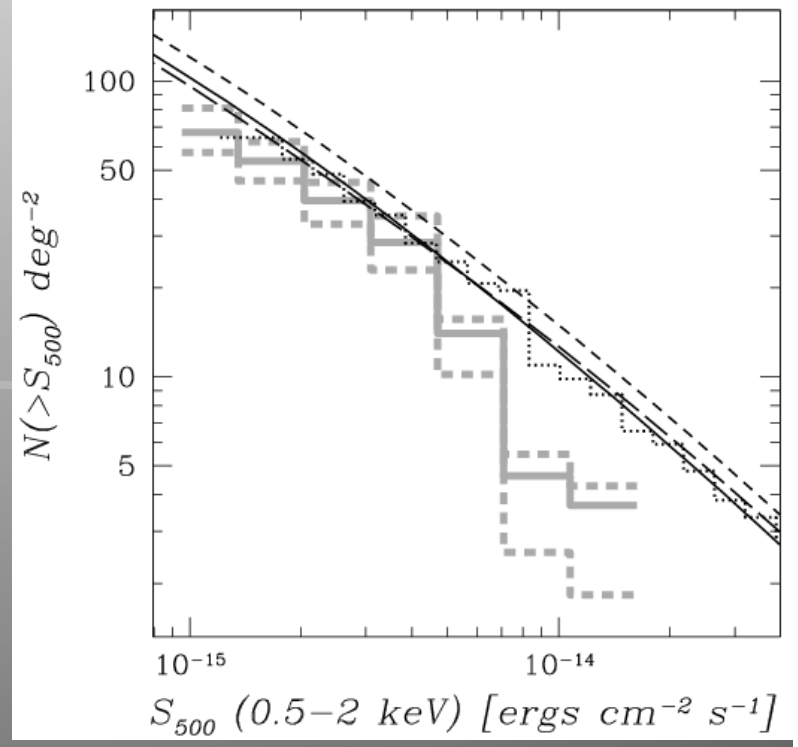
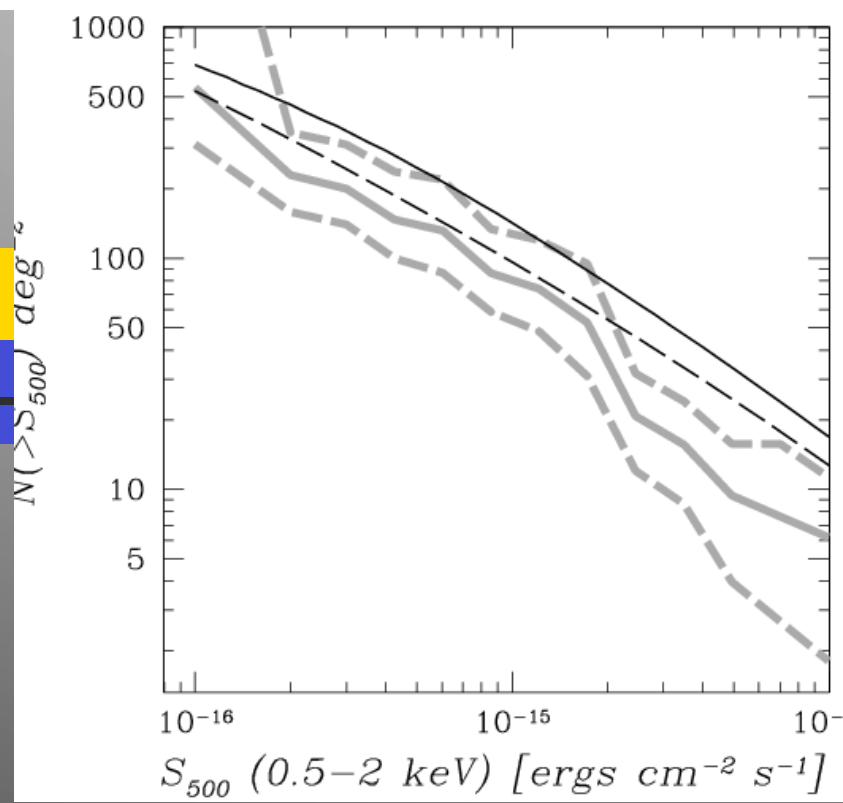
- $b_{acf} = 2.31 \pm 0.17$
- $b_{wl} = 2.36 \pm 0.15 / -0.16$
- $\langle z \rangle = 0.70$
- $\log M = 13.60 \pm 0.11 / -0.10$

Breaking onto z range



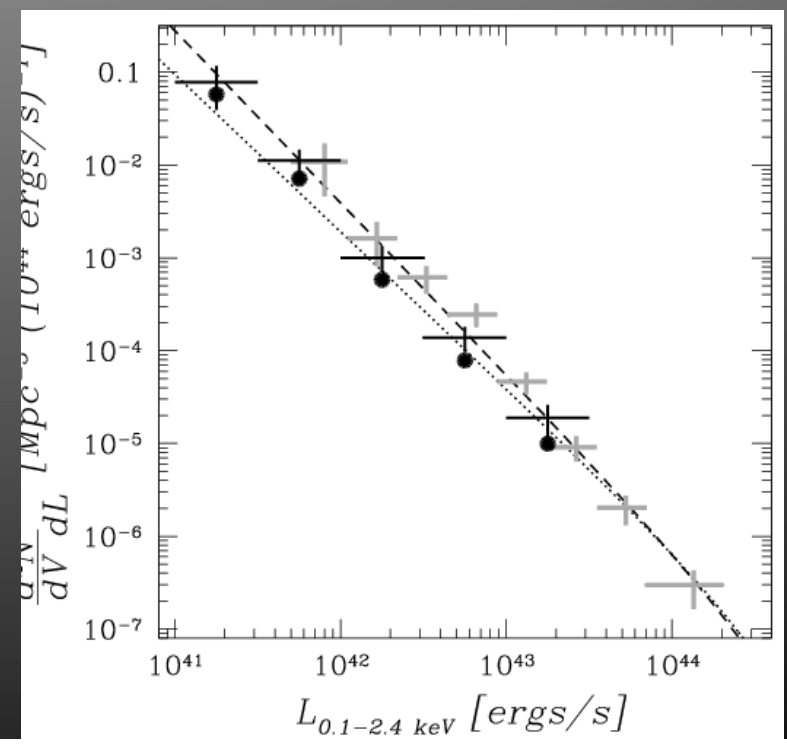
- $b_{\text{obs}} = 2.08 \pm 0.20$
- $b_{\text{wl}} = 1.92 \pm 0.11 / -0.12$
- $\langle z \rangle = 0.37$
- $\log M = 13.54 \pm 0.11 / -0.10$

- Groups $z > 0.6$
- $b_{\text{obs}} = 2.57 \pm 0.21$
- $b_{\text{wl}} = 2.74 \pm 0.18 / -0.22$
- $\langle z \rangle = 0.86$
- $\log M = 13.74 \pm 0.08 / -0.10$

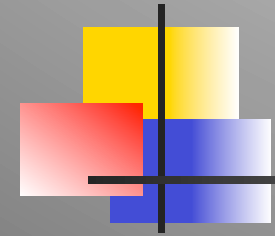


Groups vs LCDM

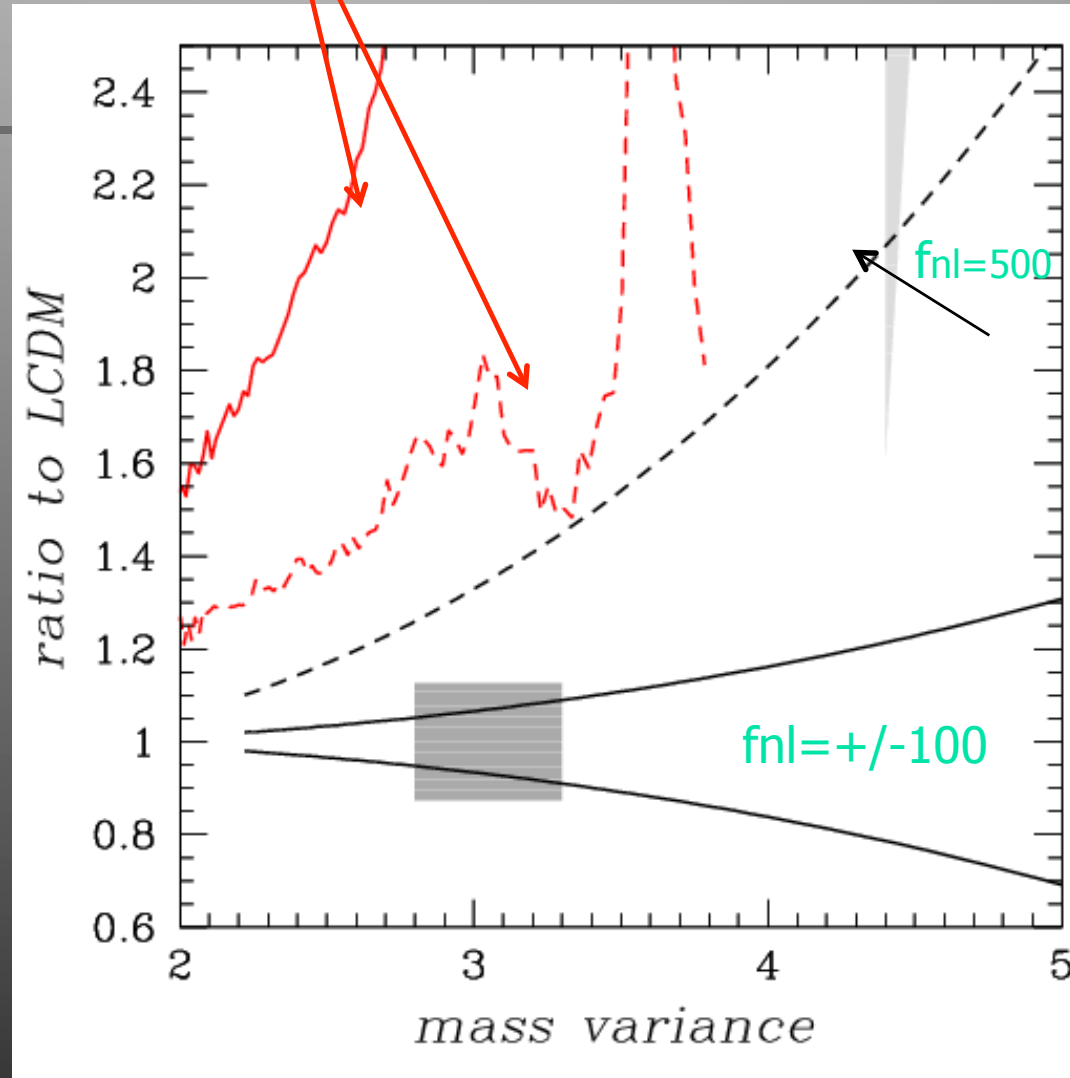
Finoguenov et al. 2010



Interacting Dark Energy (Baldi et al 2010)



Specifics of cosmology with growth of structure experiments





Conclusions

- **X-ray surveys enormously help in understanding of galaxy groups**
- **Number counts of groups is consistent with cosmology, which implies high completeness of X-ray surveys towards detection of massive groups**
- **2-point statistics is reproduced using weak lensing calibration. This limits the scatter in the Lx-M relation to 20% in mass.**
- **Stacked detection of zCOSMOS groups. Individual X-ray detections of such groups in CDFS at 300 src/deg²**