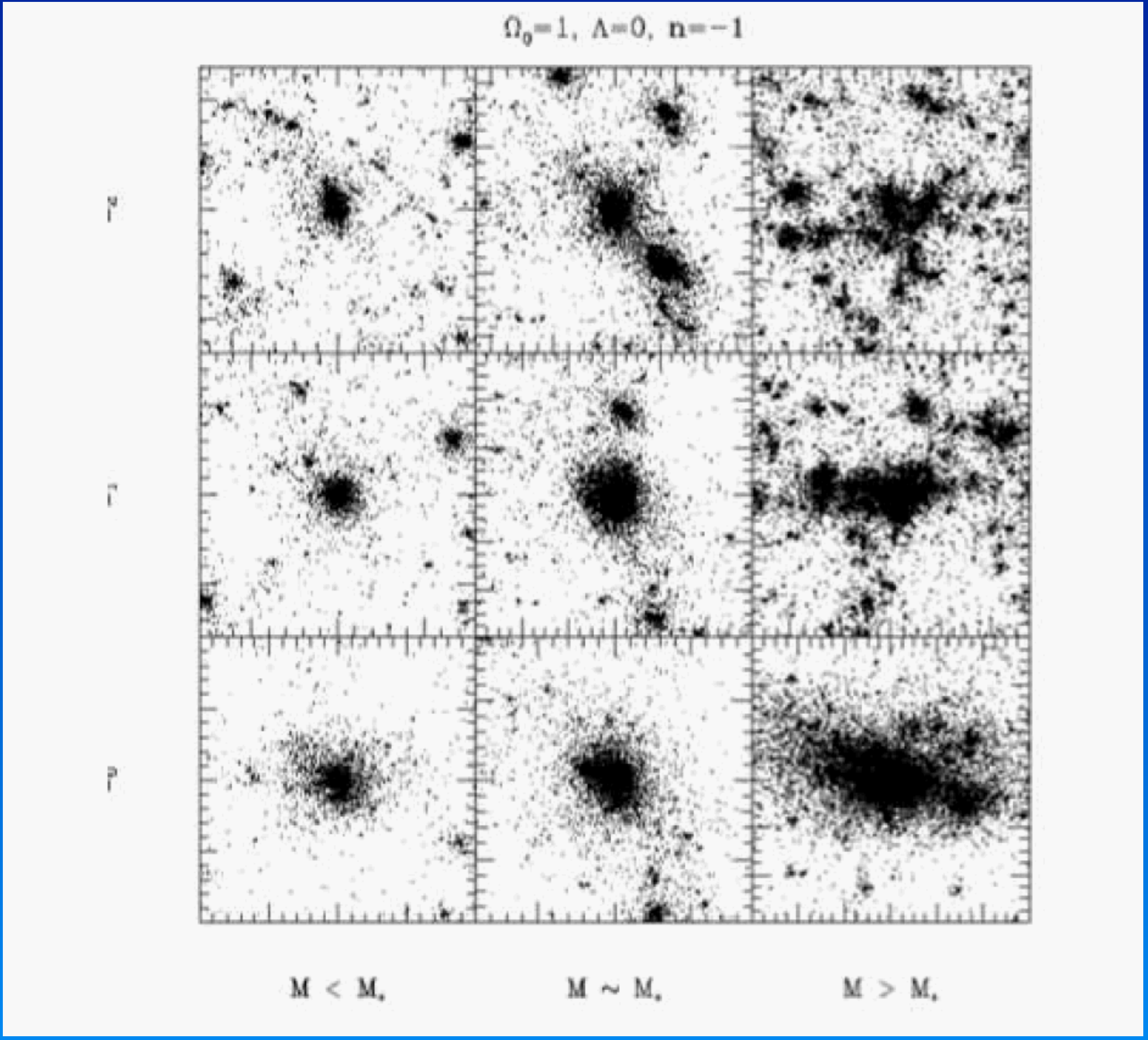
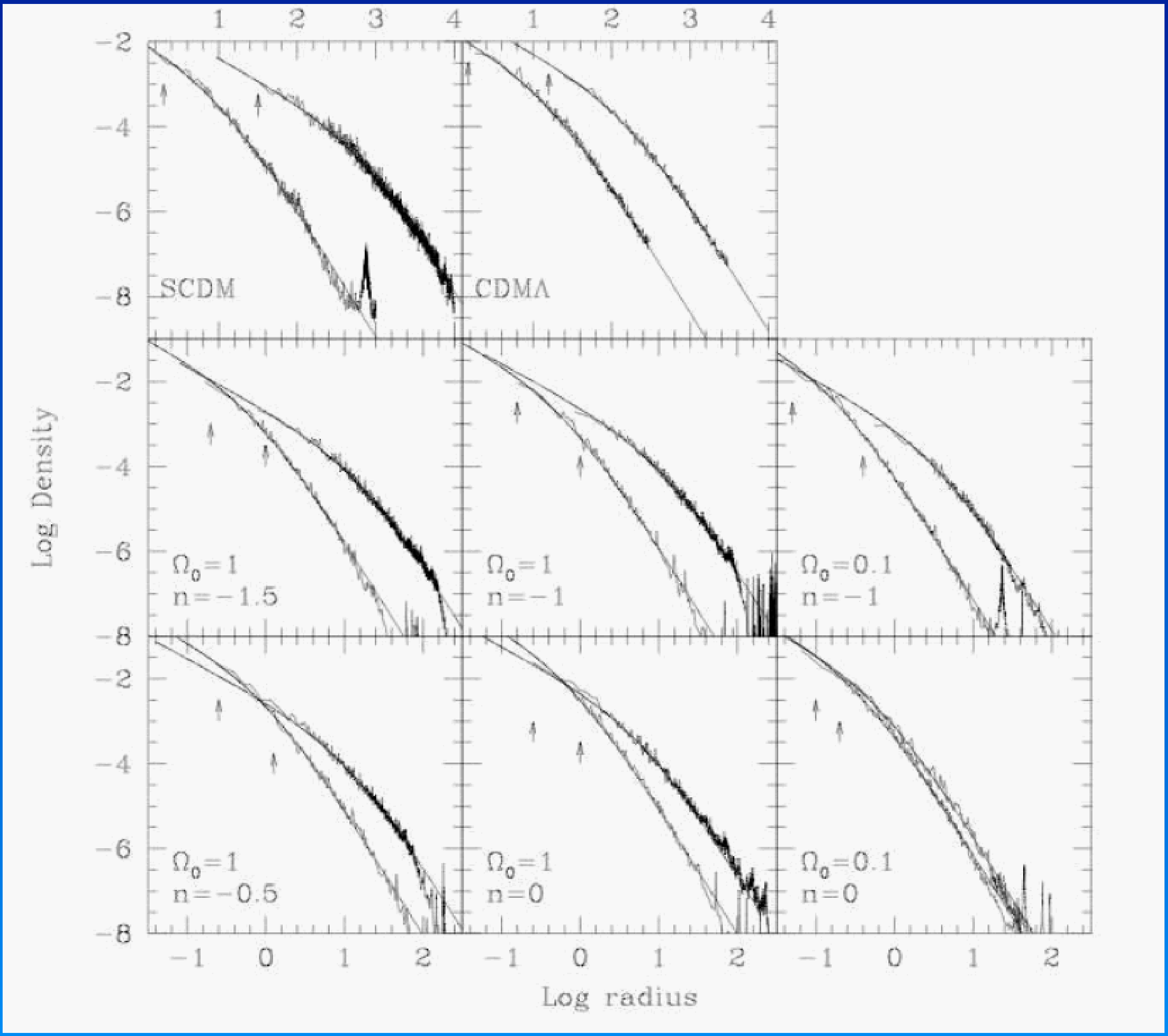
NFW profile



Cargèse2008.

NFW profile



Log Density
Log radius
SCDM
CDMΛ
$\Omega_0=1$
$n=-1.5$
$\Omega_0=1$
$n=-1$
$\Omega_0=0.1$
$n=-1$
$\Omega_0=1$
$n=-0.5$
$\Omega_0=1$
$n=0$
$\Omega_0=0.1$
$n=0$

NFW profile

Analytical expression:

$$\rho(r) = \frac{\rho_s}{(r/r_s)(1+r/r_s)^2}$$

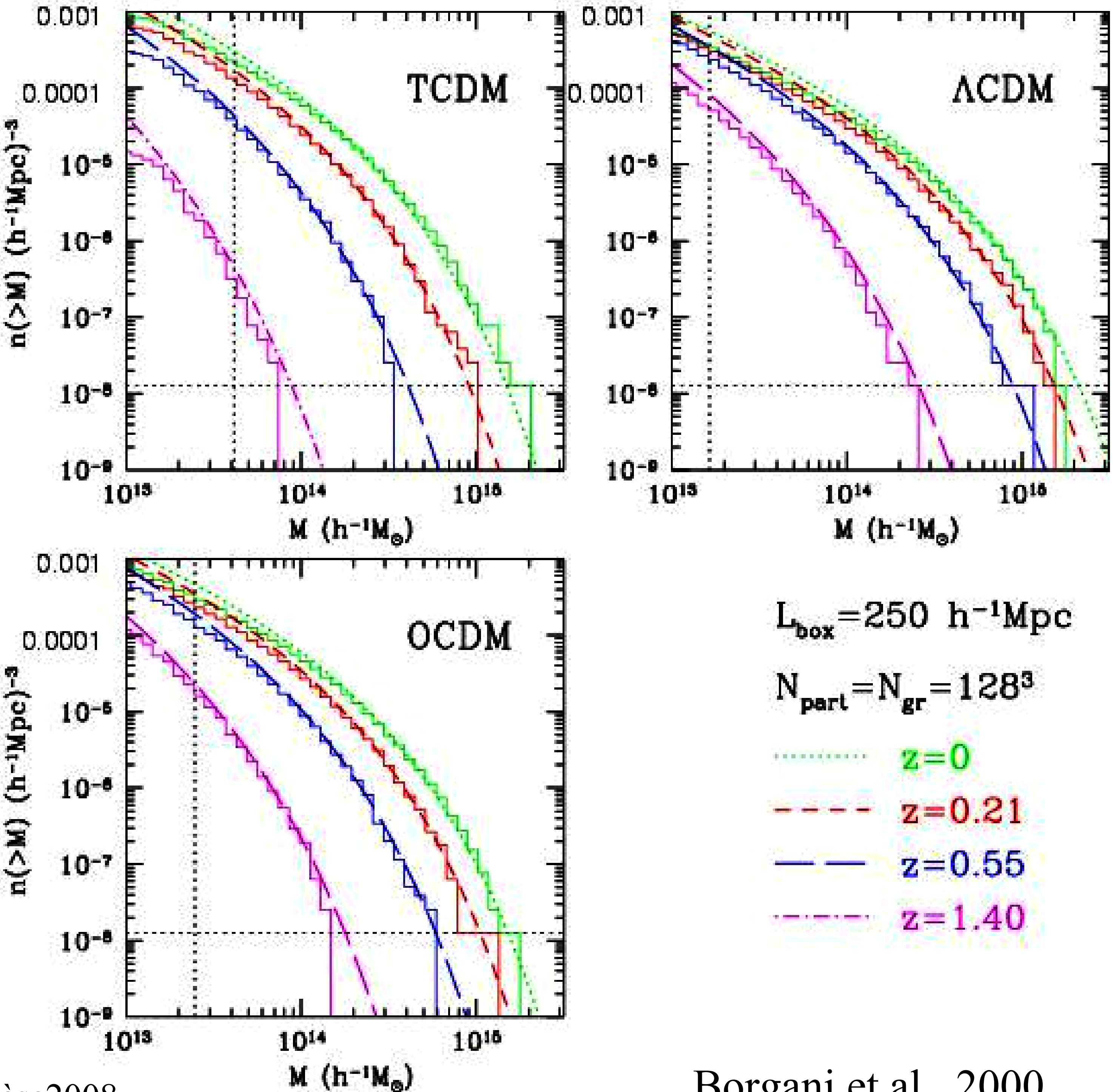
and concentration parameter:

$$c = \frac{r_v}{r_s}$$

halos are a two parameters family:

M and c or r_s

MASS FUNCTION



Borgani et al., 2000

Variance of the field :

$$\overline{\tilde{\delta}^2(x)} = \sigma^2(R)$$

$$\sigma_8 = \sigma(8h^{-1}\mathrm{Mpc})$$

σ_8 measures the amplitude of matter fluctuations

The mass function:

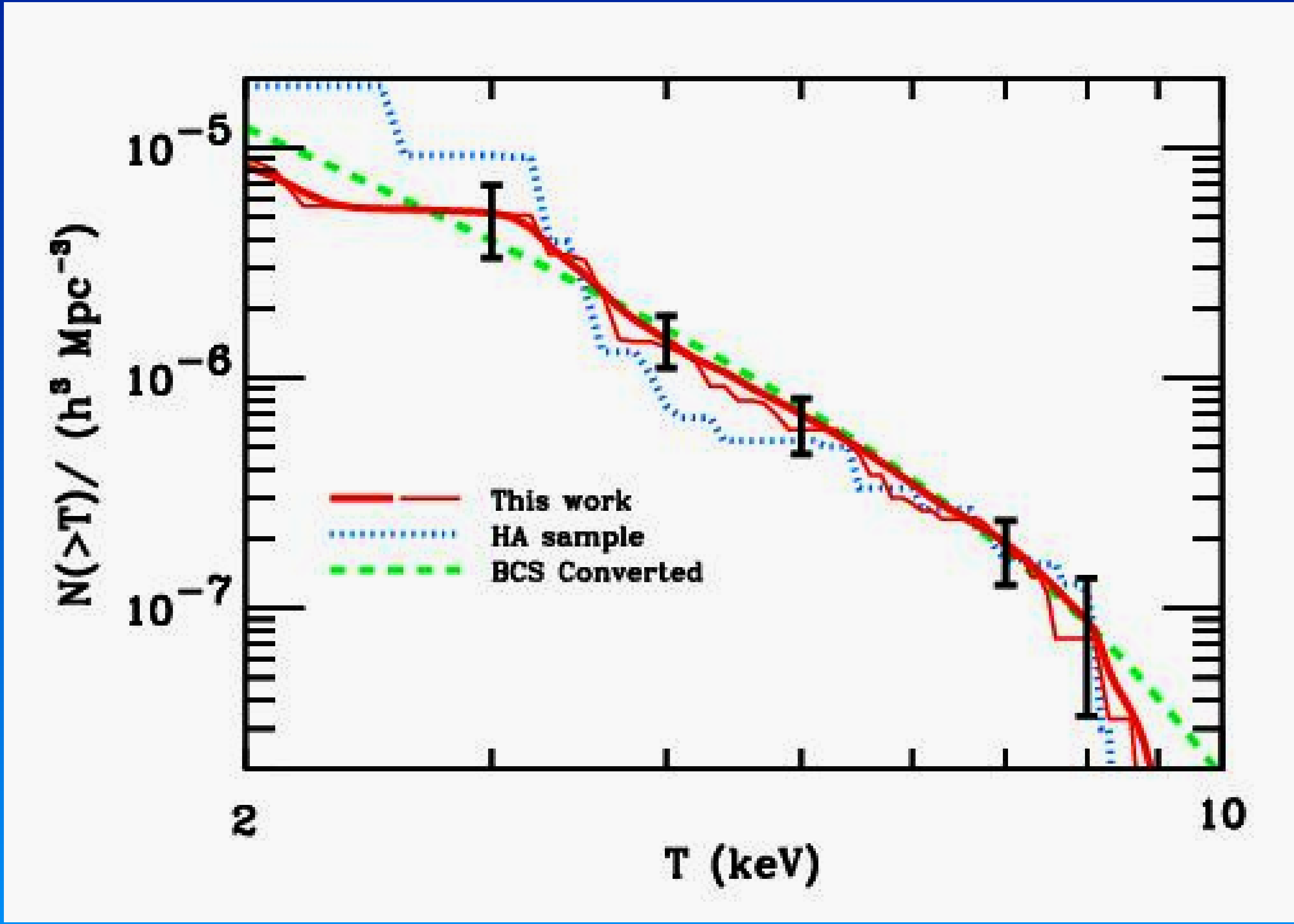
$$N(M) = -\frac{\rho}{M^2\sigma(M)}\delta_{NL}\frac{\ln\sigma}{\ln M}\mathcal{F}(\nu_{NL})$$

with:

$$\nu_{NL} = \frac{\delta_{NL}}{\sigma(M)}$$

useful for σ_8

A new estimation of the local N(T)

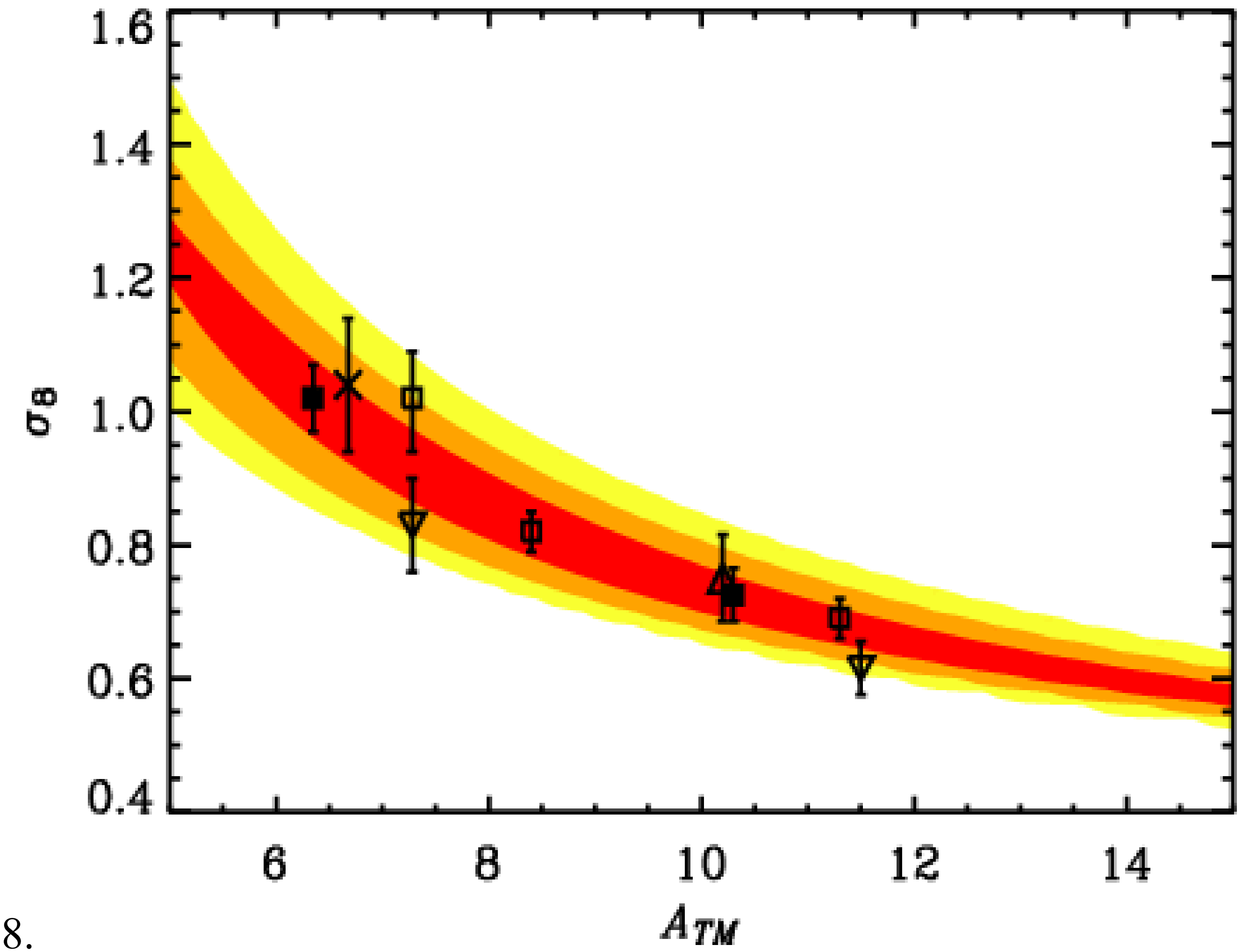


Mass-temperature relation:

$$T_x = A_{TM}\,(Mh)^{2/3}\,(1+z)(\Omega\Delta_v/178)^{1/3}\ \mathrm{keV}$$

A_{TM} is a free parameter ...

σ_8 from X-ray clusters:



Ω_m From X-ray Clusters

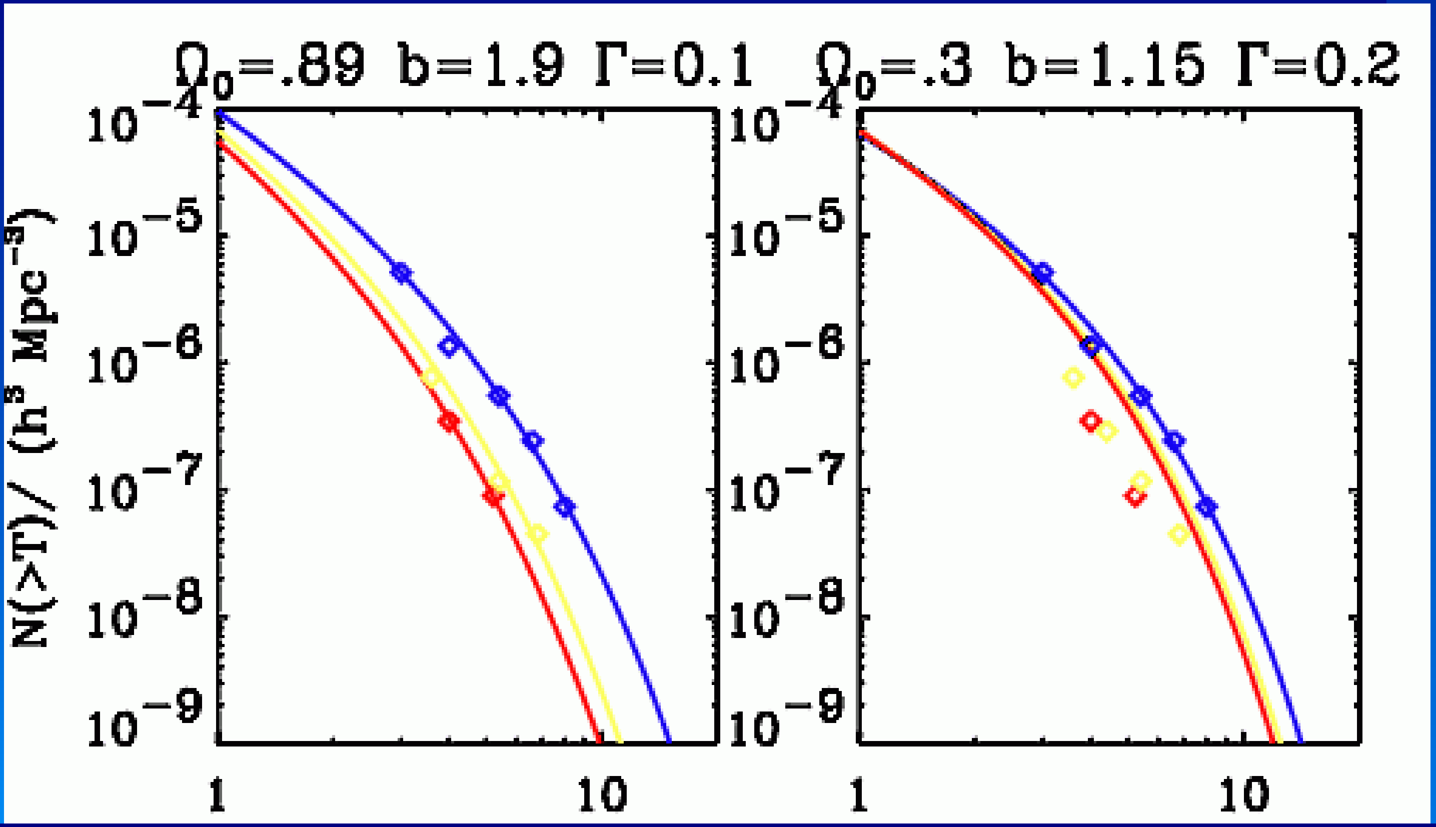
Number evolution

Principle:

Growth rate of linear perturbations:

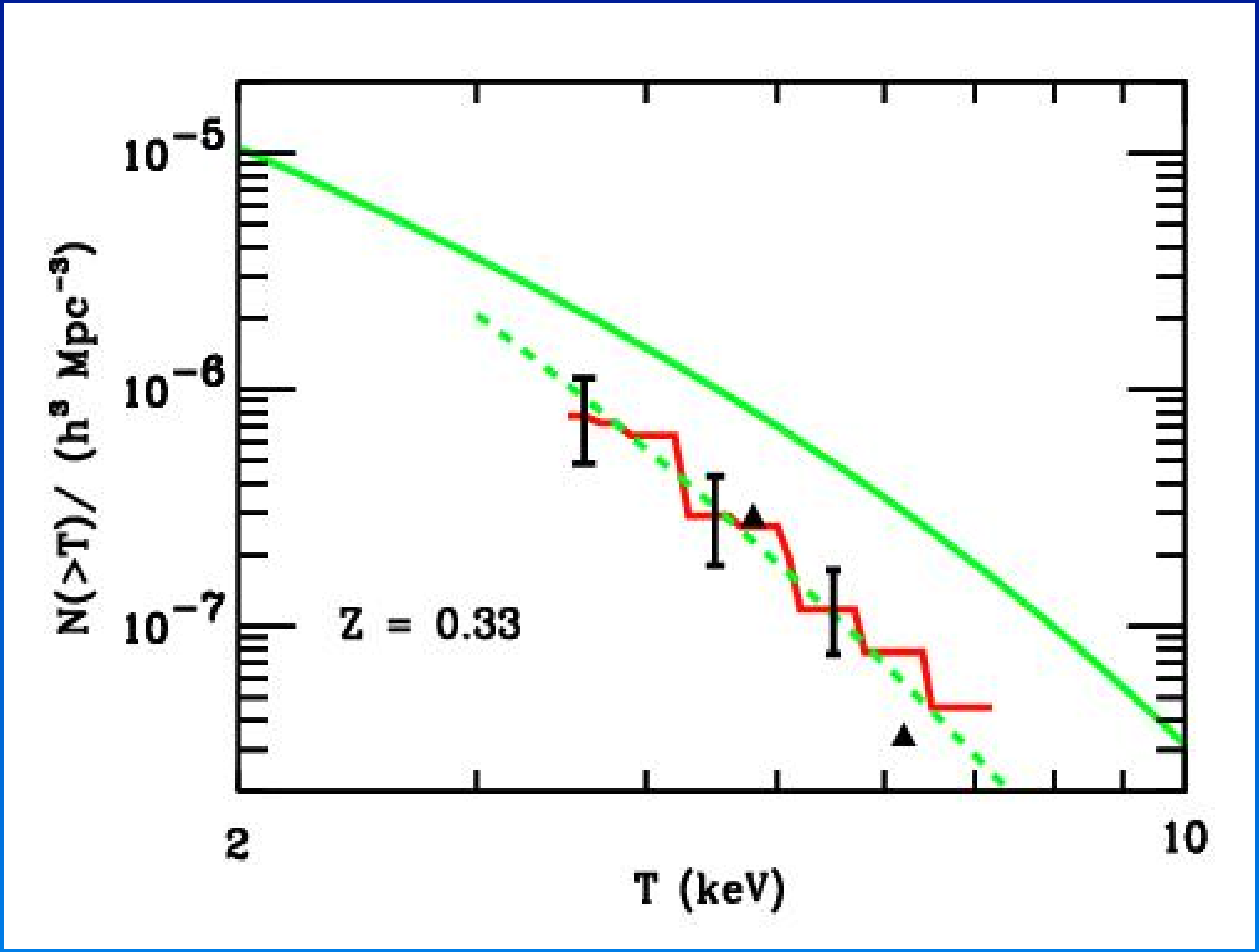
$$\sigma(M, z) = A(z, \Omega_m, \ldots)\sigma(M, 0)$$

Principle



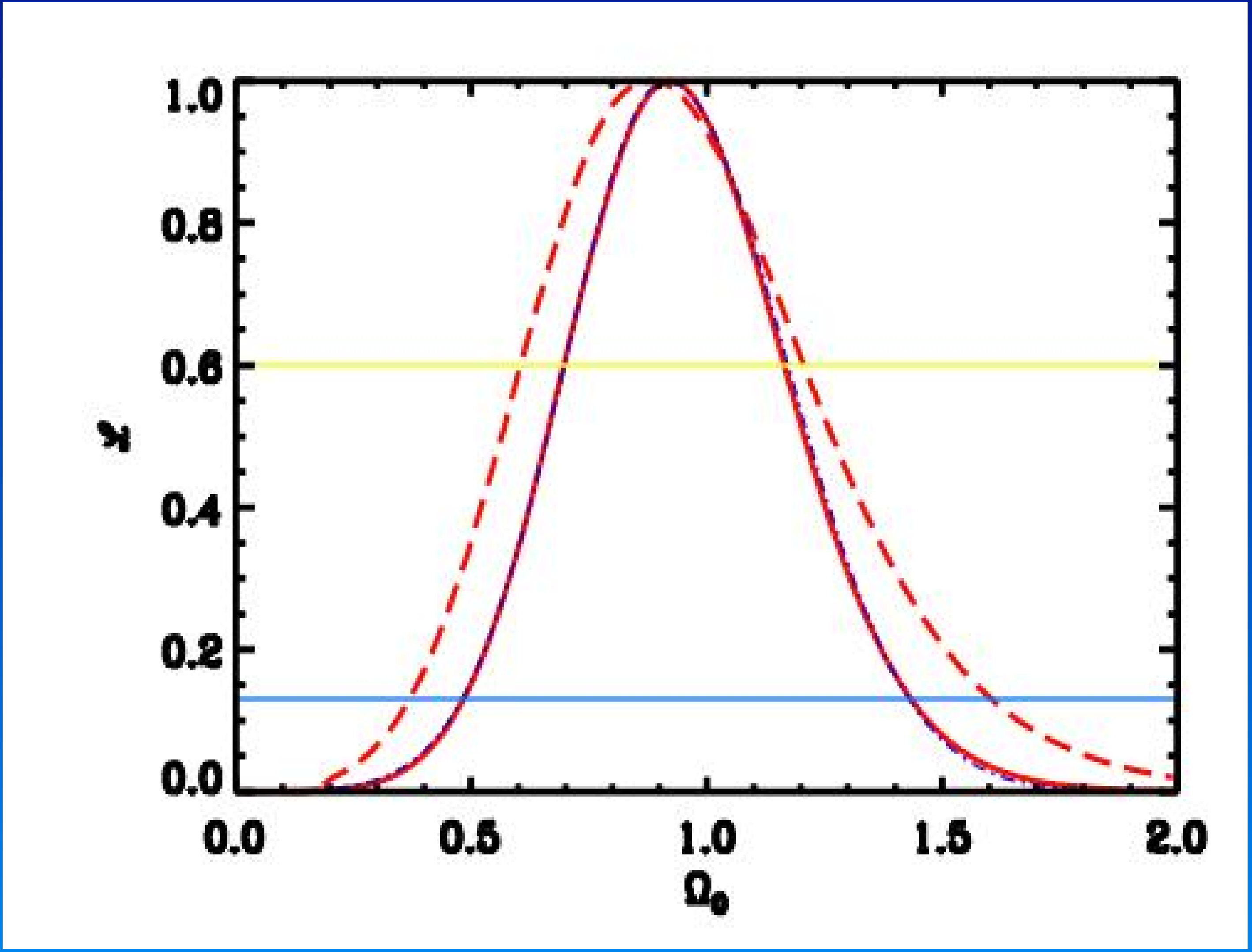
Oukbir, Blanchard, 1992, A&A, 262, L21

Estimated N(T) at z ≈ 0.33



Using Henri's sample (1997)

Likelihood on Ω_m



Blanchard et al (2000)

Ω_m

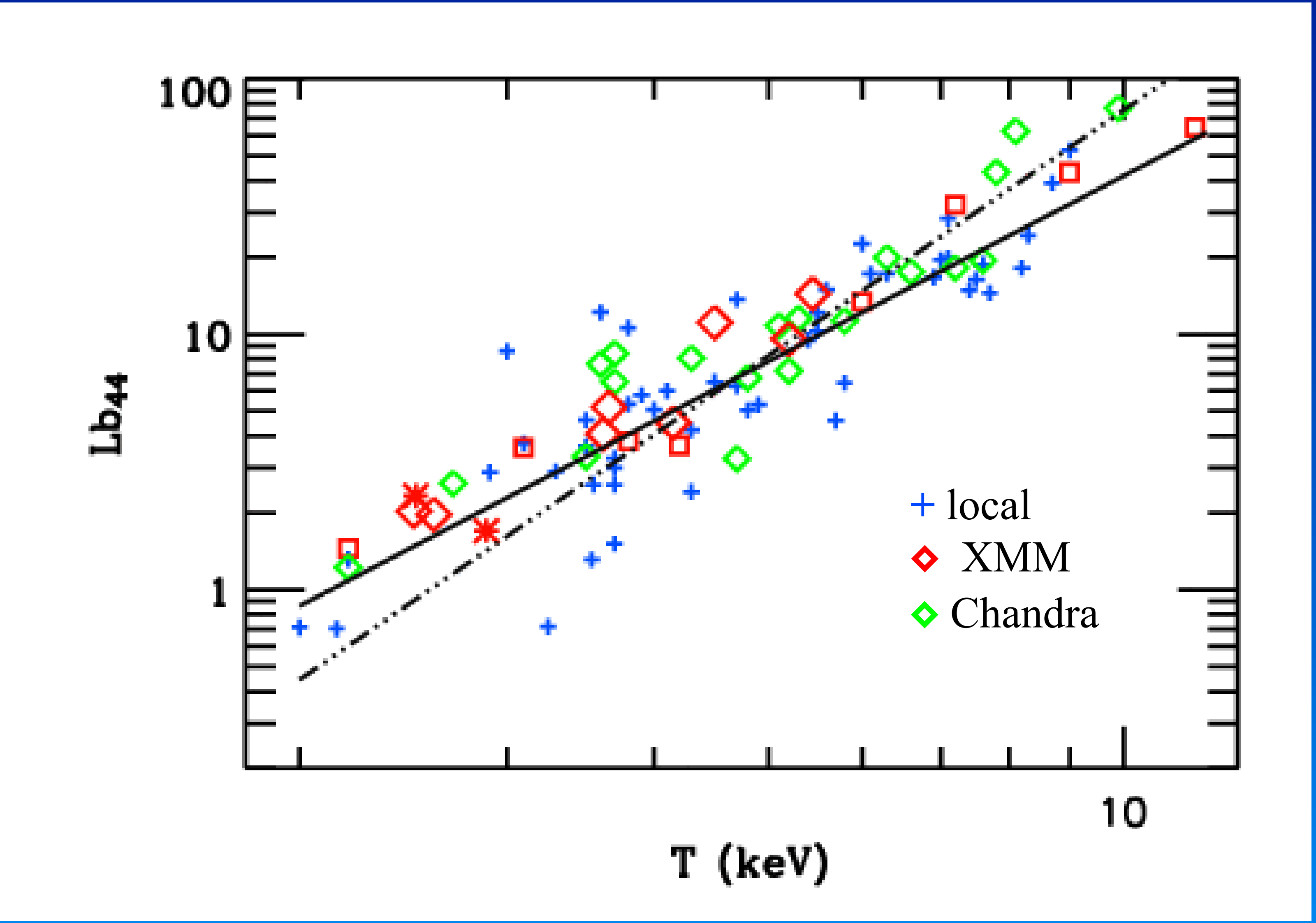
From X-ray Clusters

Vauclair et al, 2003
A&A 412, L37

Number counts:

~300 clusters
with $z > 0.3$

XMM Lx-Tx evolution



Conclusion on evolution:

- remarkable convergence

$$Lx/Tx)_z = Lx/Tx)_{z=0}(1+z)^\beta$$

with $\beta = 0.65 \pm 0.28$

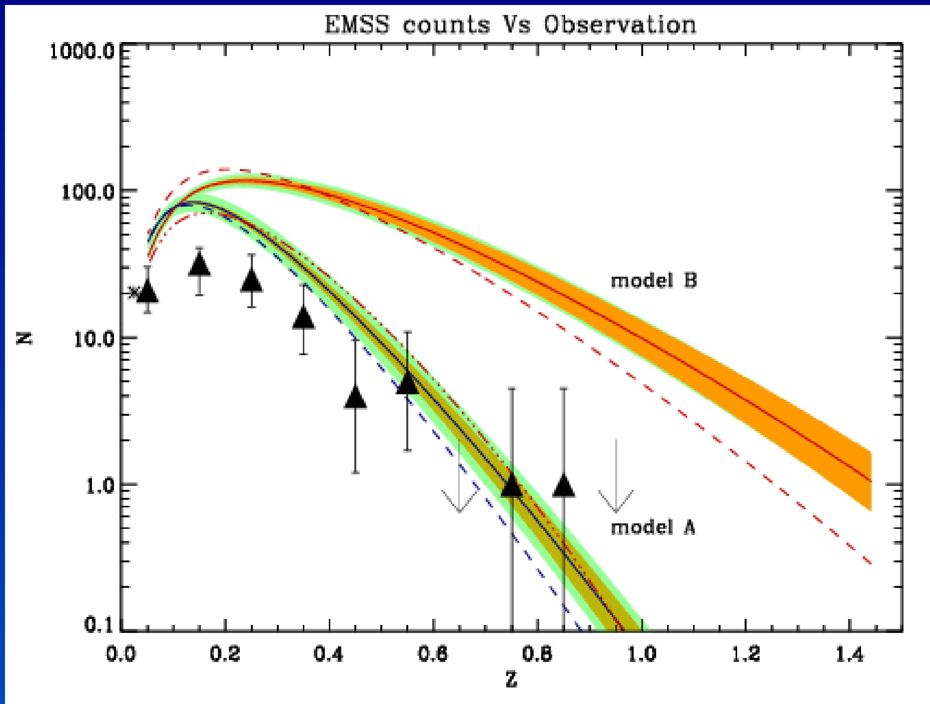
in full agreement with Chandra (Vikhlinin et al, 2002), ASCA (Sadat et al., 1998; Novicki et al., 2003....)

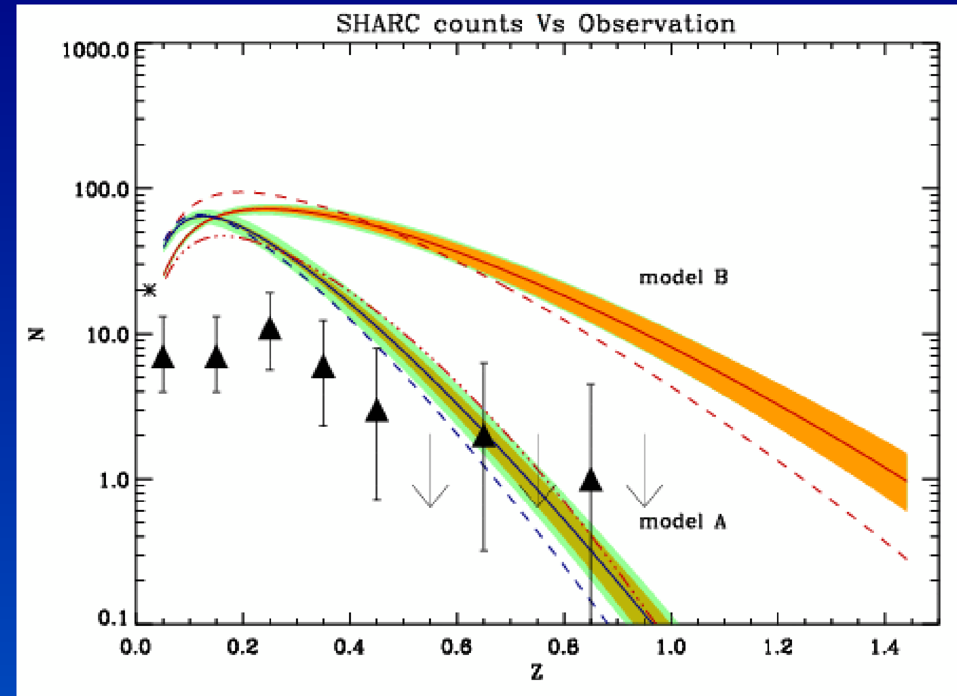
D.Lumb et al., 2003

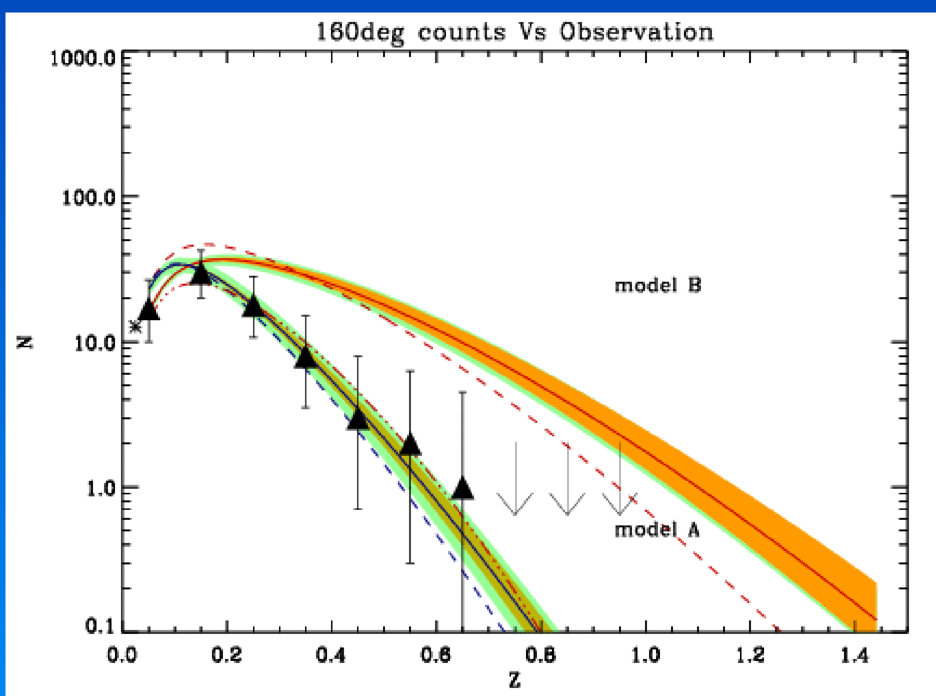
Method:

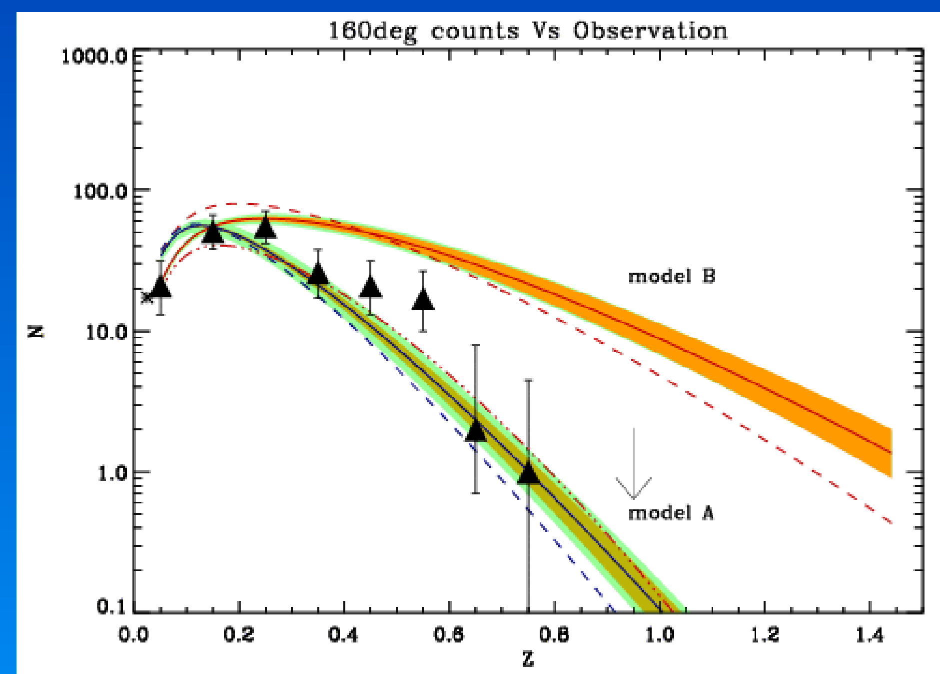
$$f_x \rightarrow L_x \rightarrow s, T_x$$

$$\begin{aligned} N(>f_x) &= \int_0^{+\infty}\int_0^{+\infty} s(T,z)N(T,z)dTdV(z) \\ &>\sim \int_0^{+\infty} N(>T(z))dV(z) \end{aligned}$$

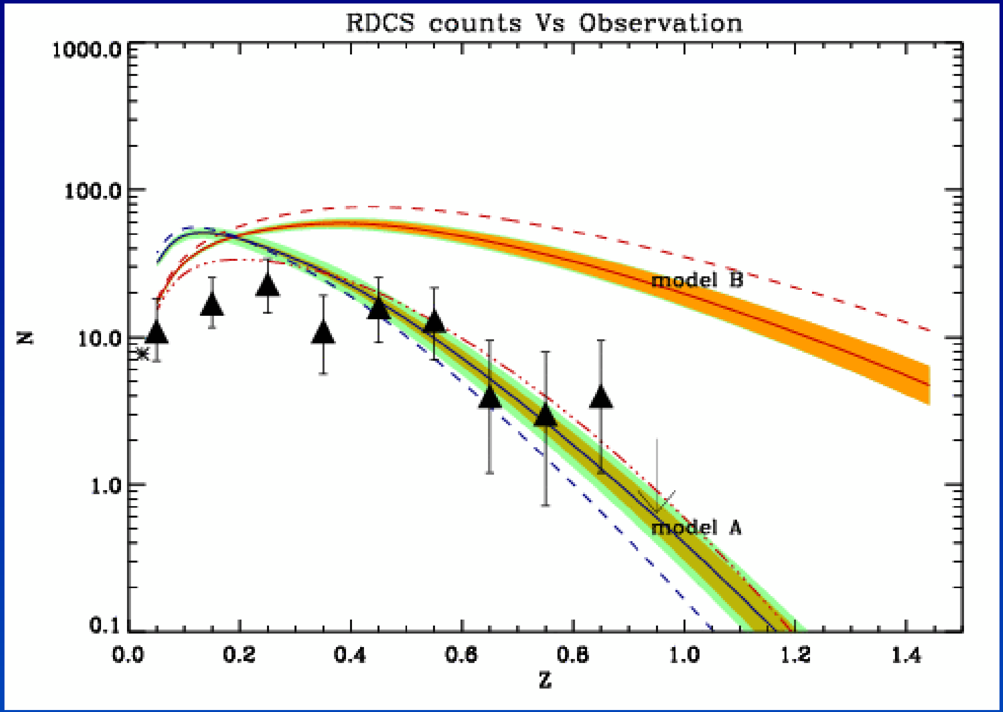






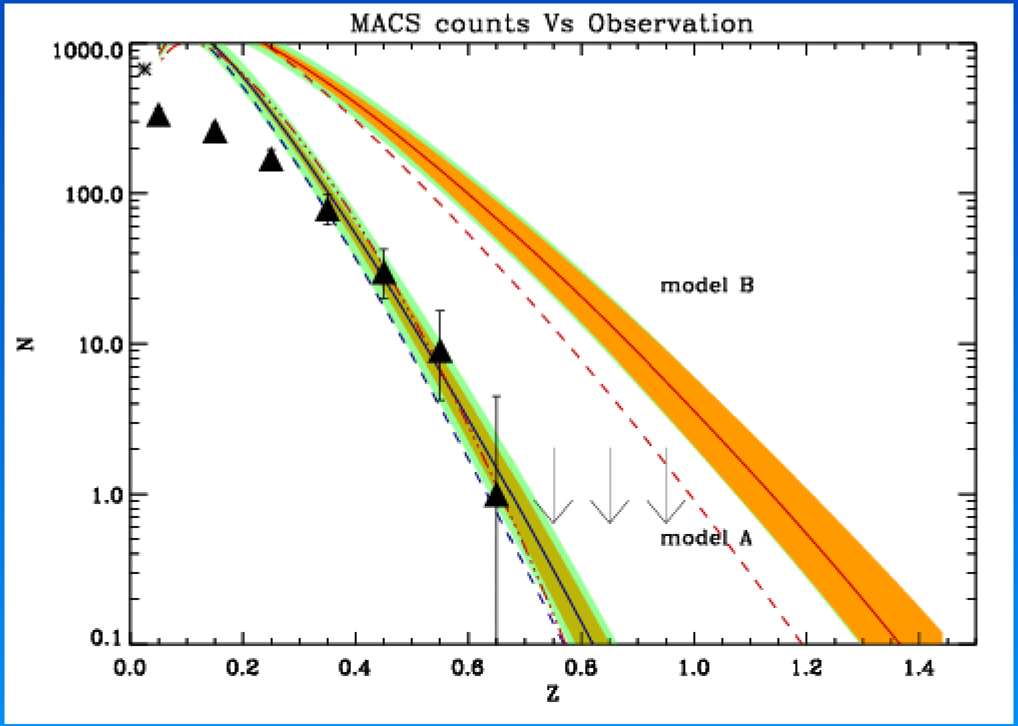


Cargèse2008.



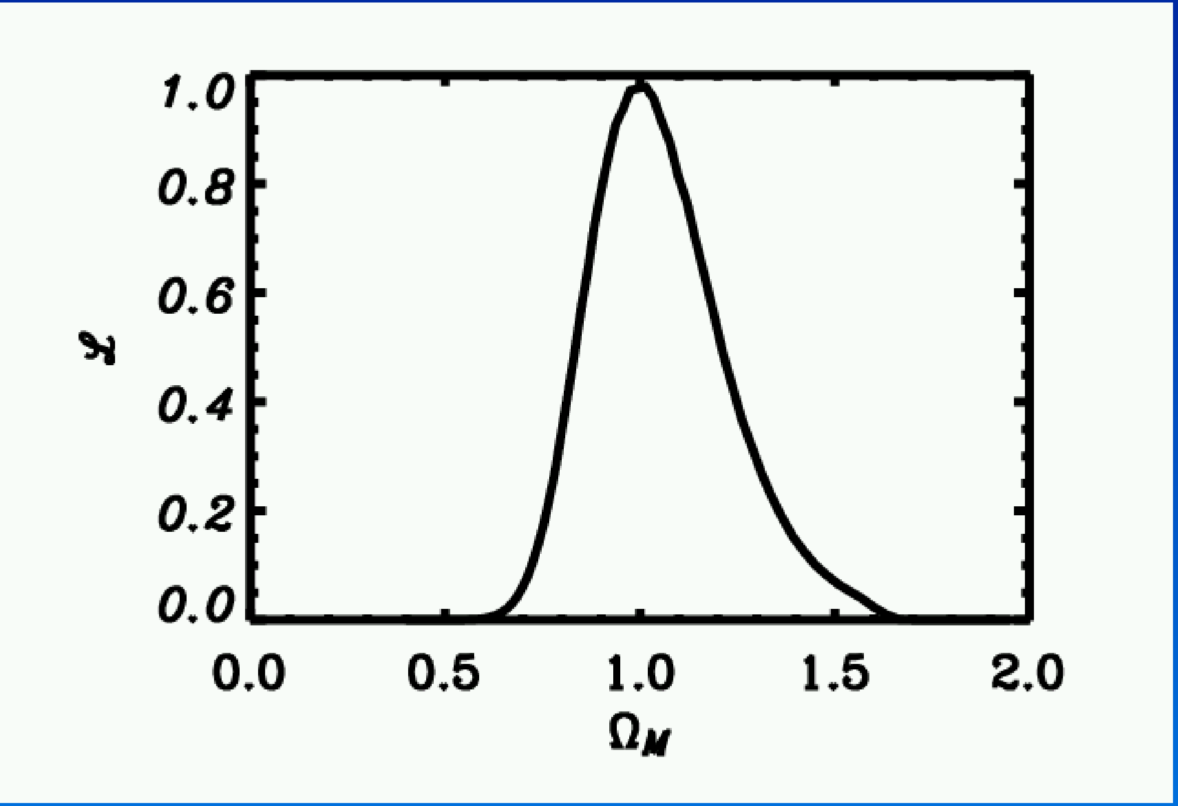
RDCS: 50 deg²
fx ≈ 3. 10^{-14} erg/s/cm²

MACS: 22 000 deg²
fx ≈ 10^{-12} erg/s/cm²



Cargèse2008.

Likelihood analysis:



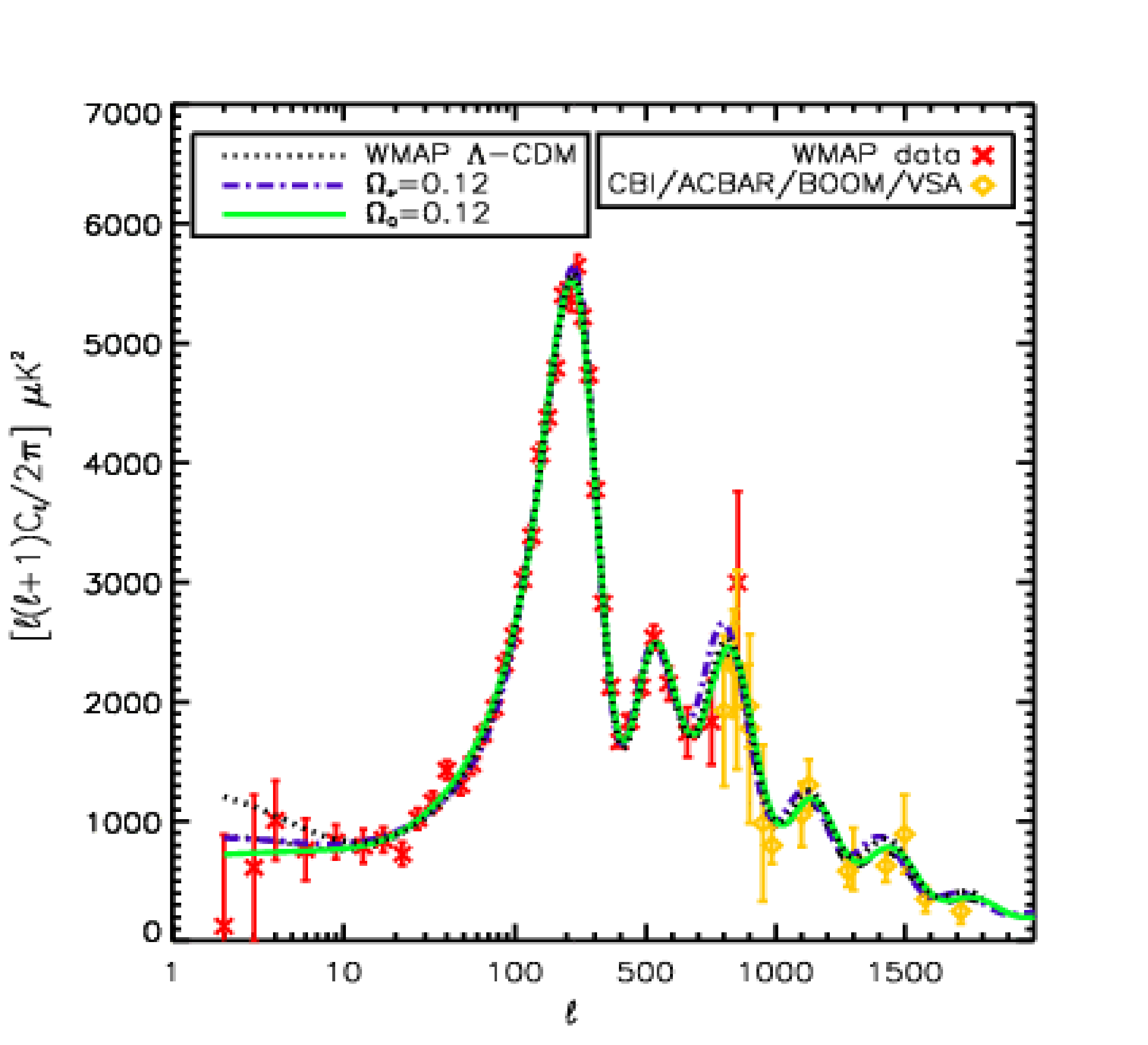
(Vauclair et al., 2005)

$\Omega_m = 0.99 \pm 0.15 \pm 0.15$

Conclusions ?

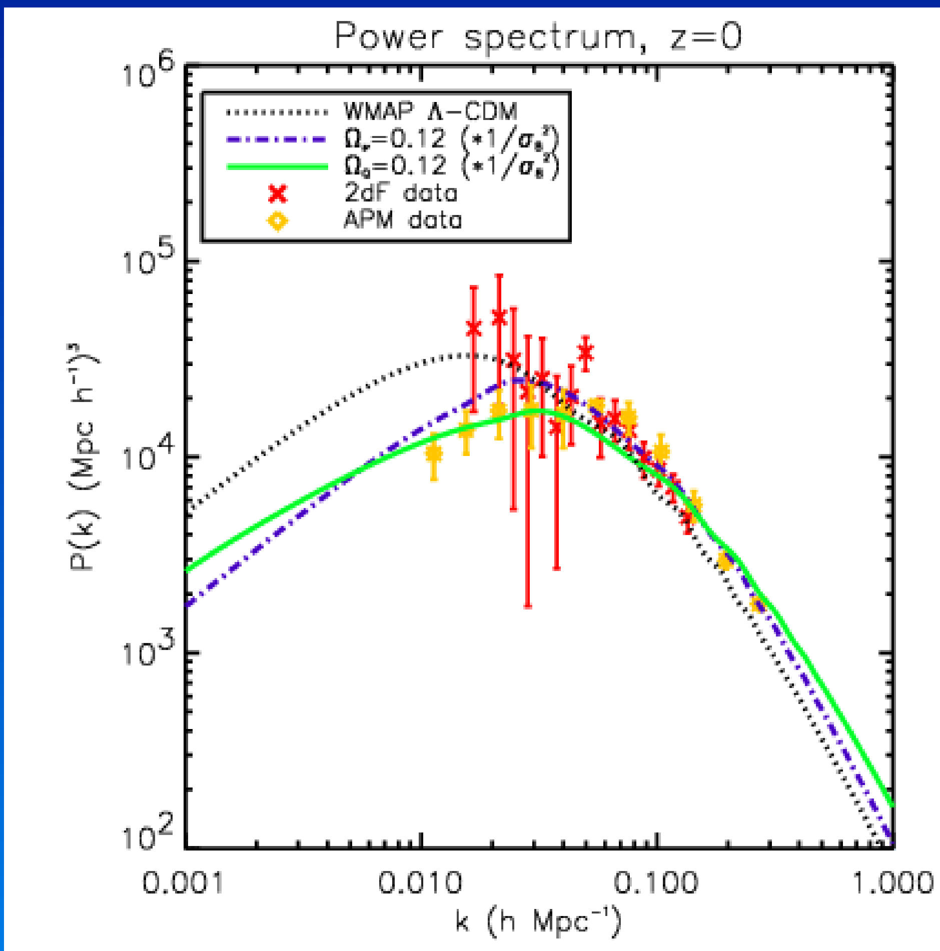
- f_b , f_b evolution uncertain ...
- Strong Evolution in the abundance of x-ray clusters appears from all existing surveys in a very consistent way.
- This would provide a strong argument in favor of a high matter density...

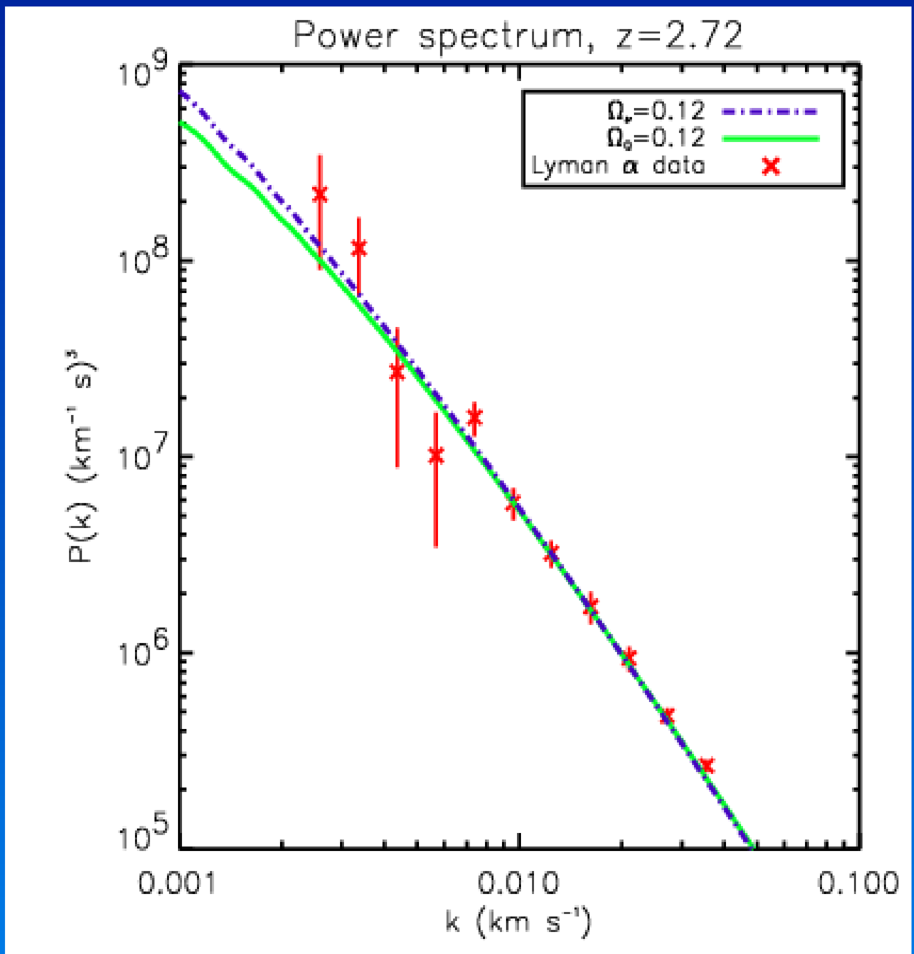
C.M.B.



Blanchard, Douspis, Rowan-Robinson, Sarkar 2003

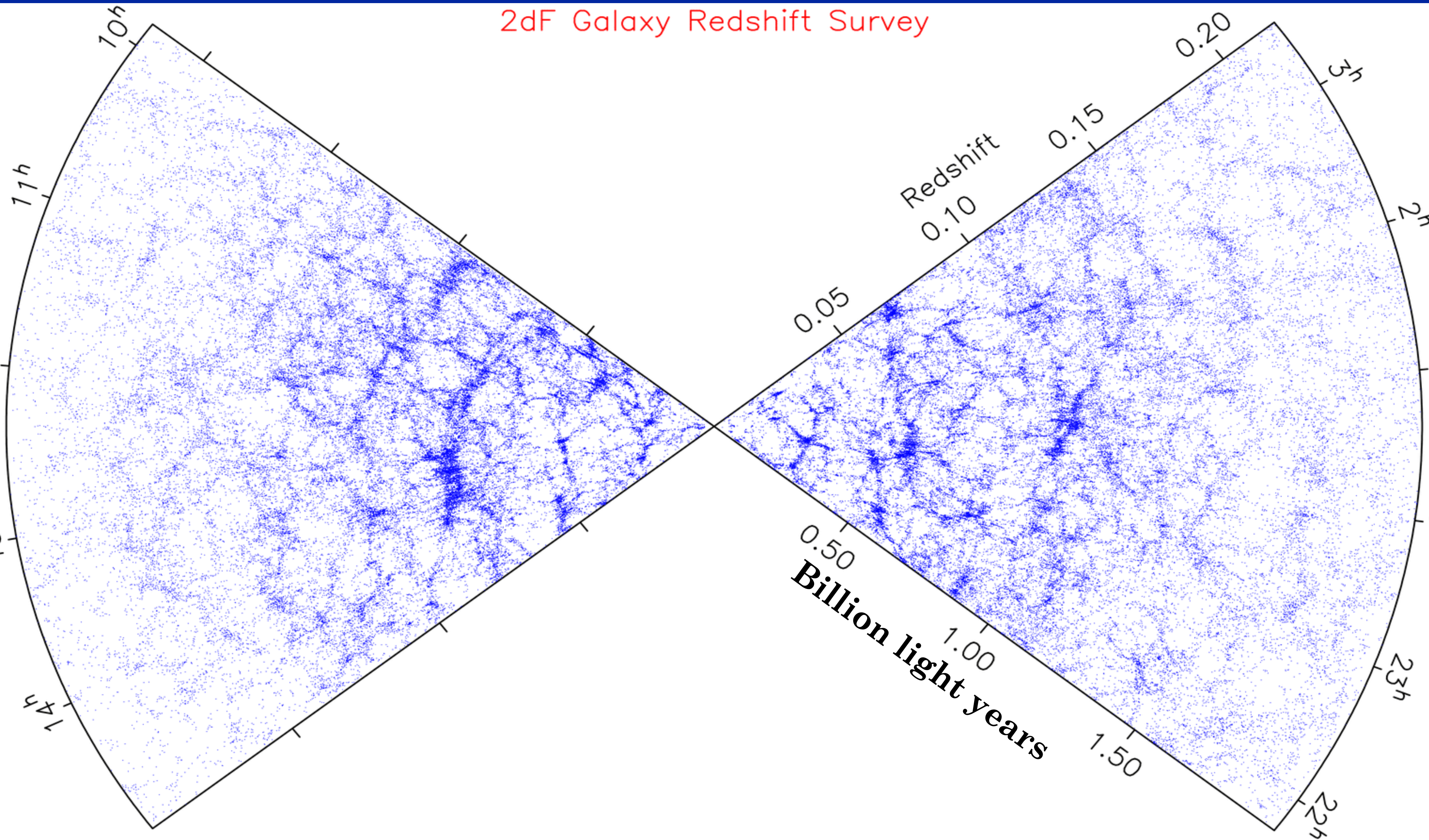
σ_8 then LSS !





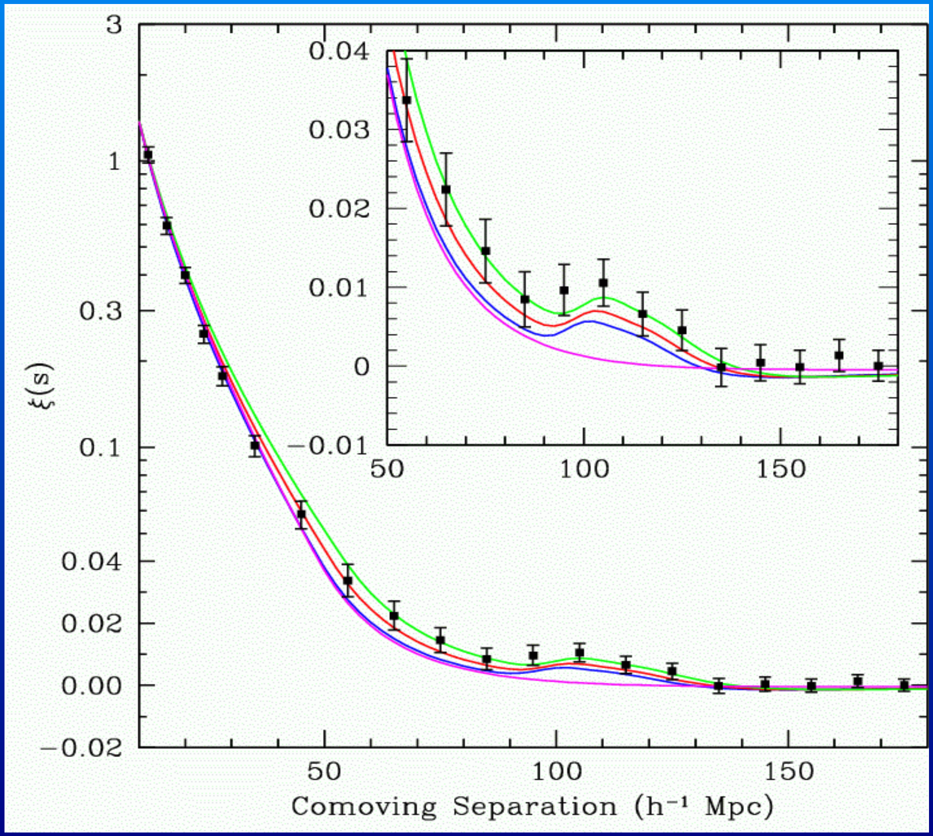
Dark energy is NOT requested by WMAP nor by LSS...

Large scale structure

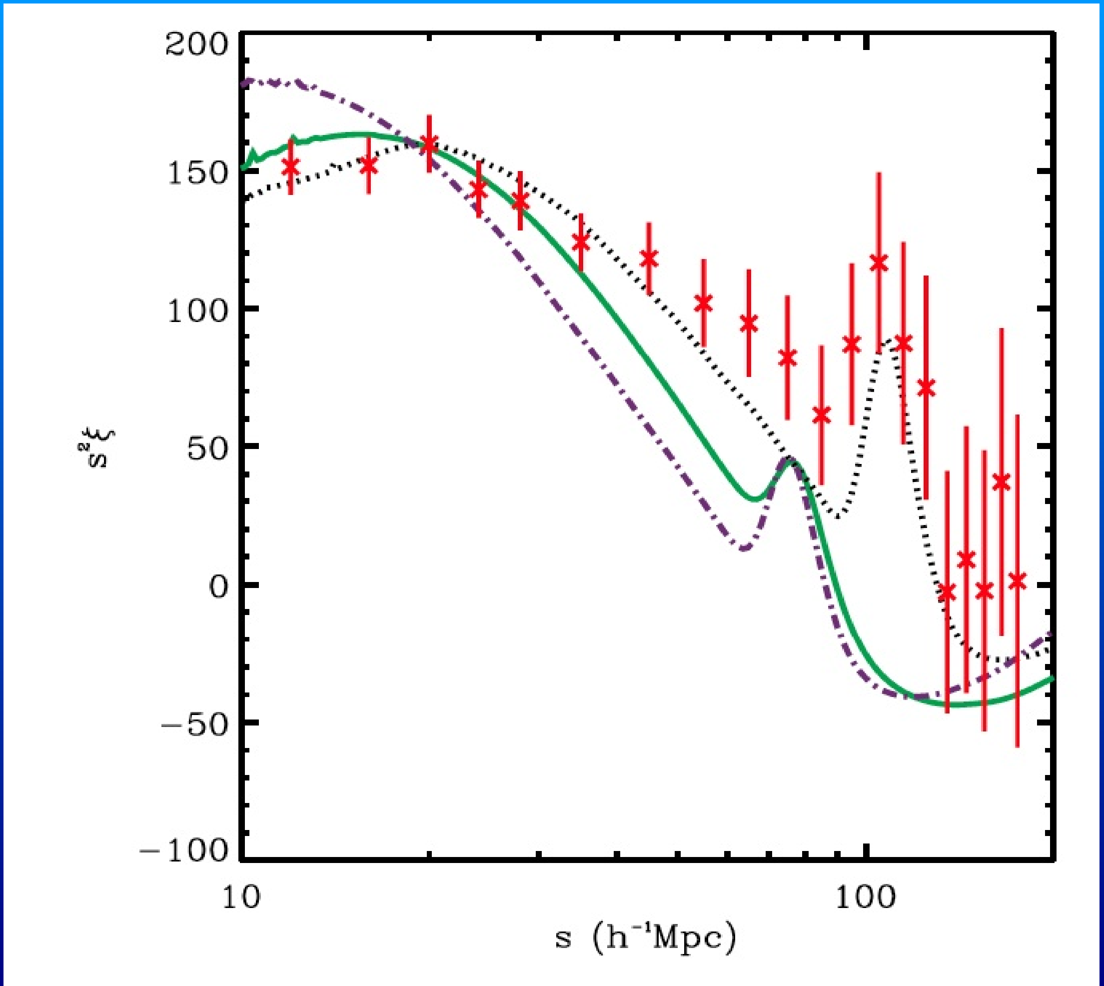


Correlation function on large scales

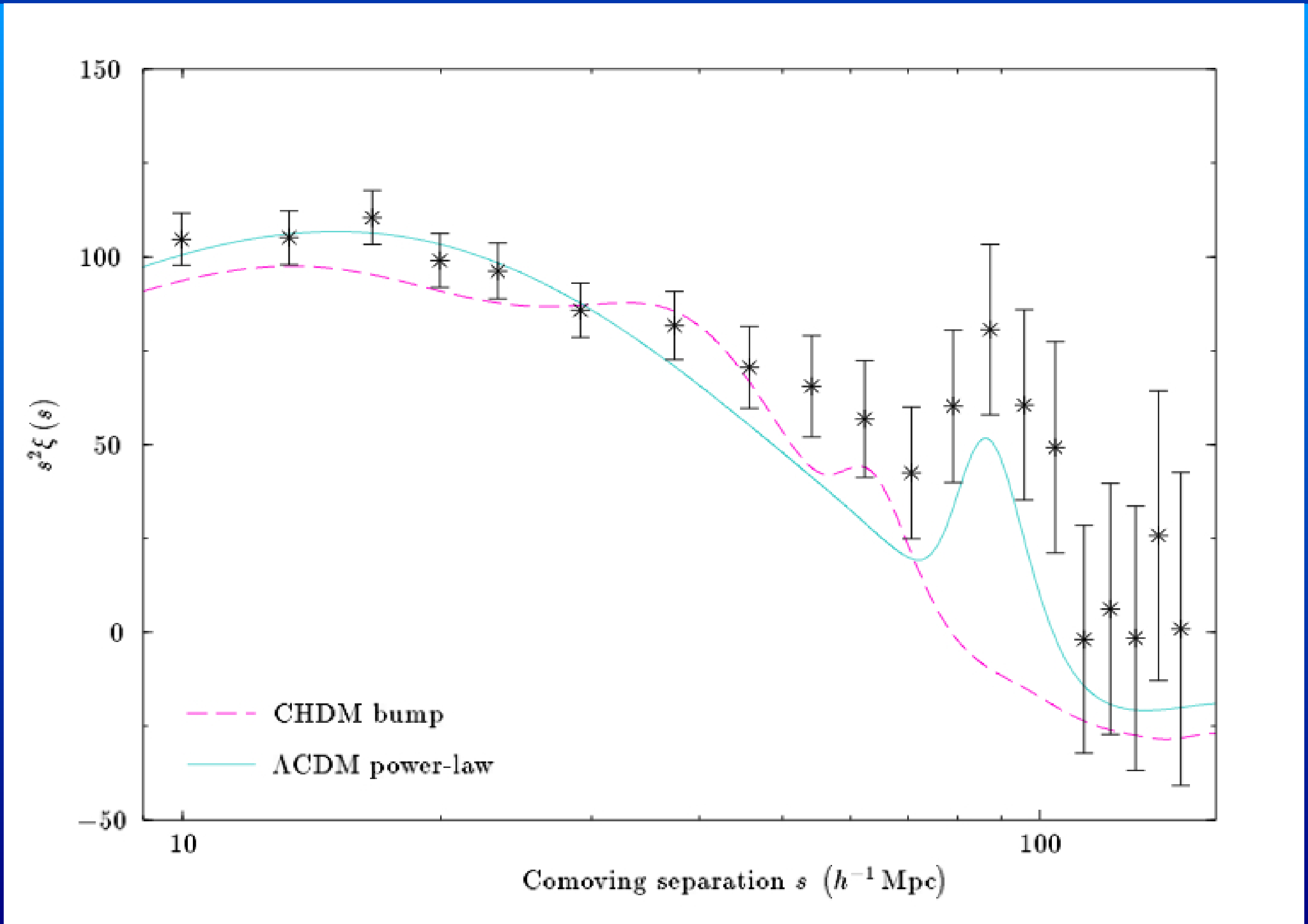
SDSS (2005)



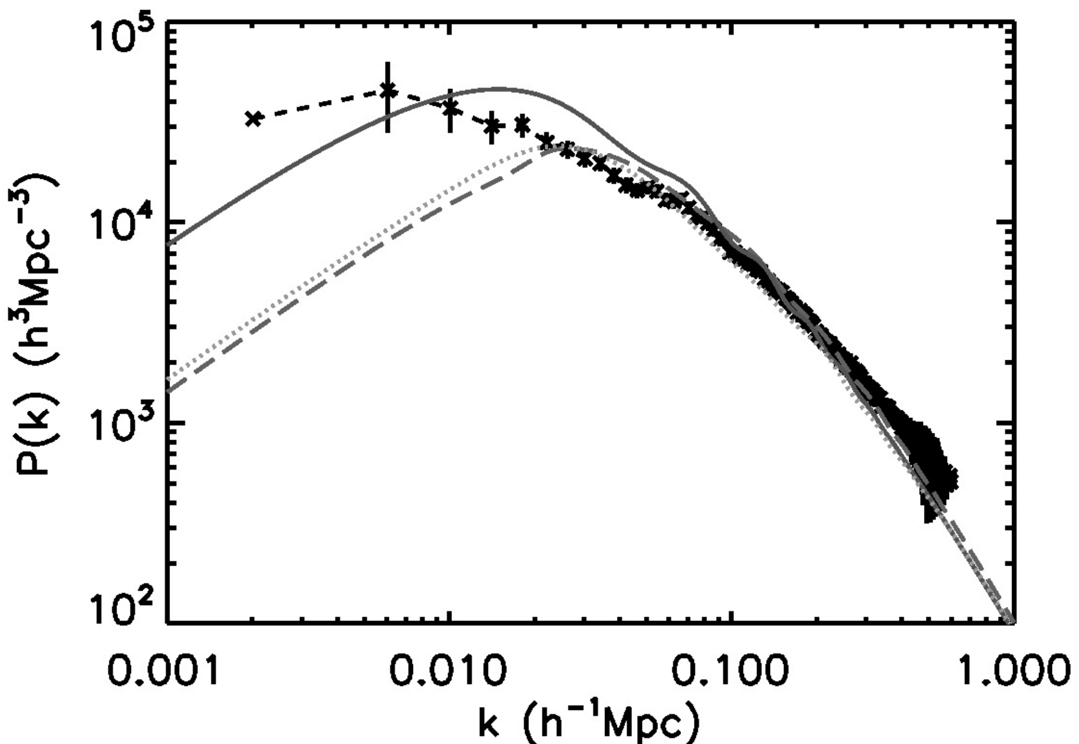
Correlation function on large scales

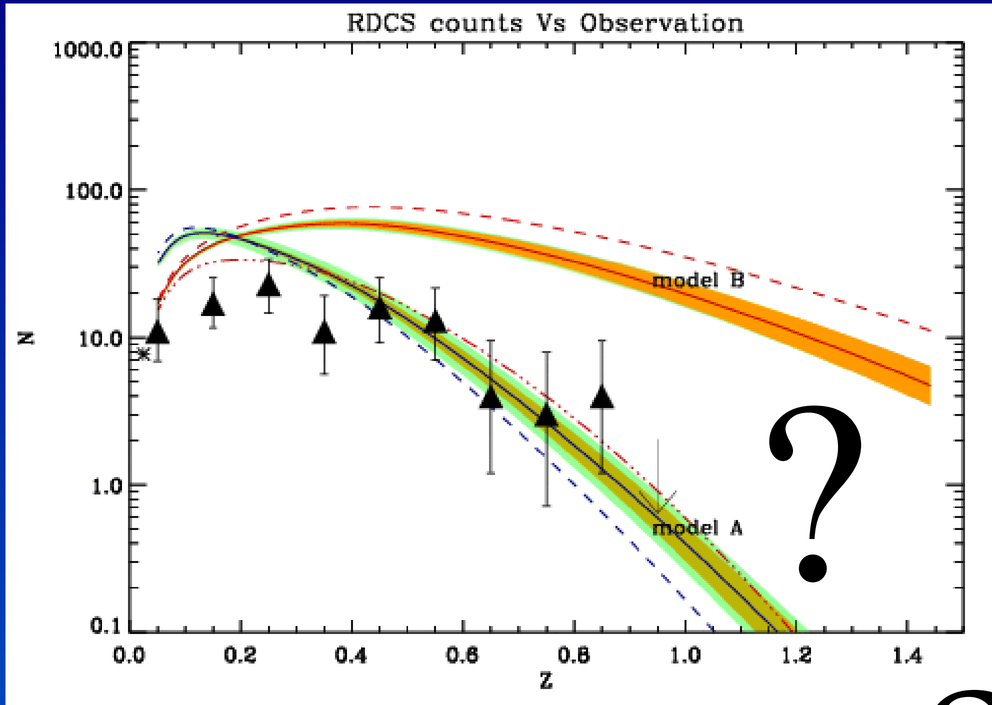


Correlation function on large scales



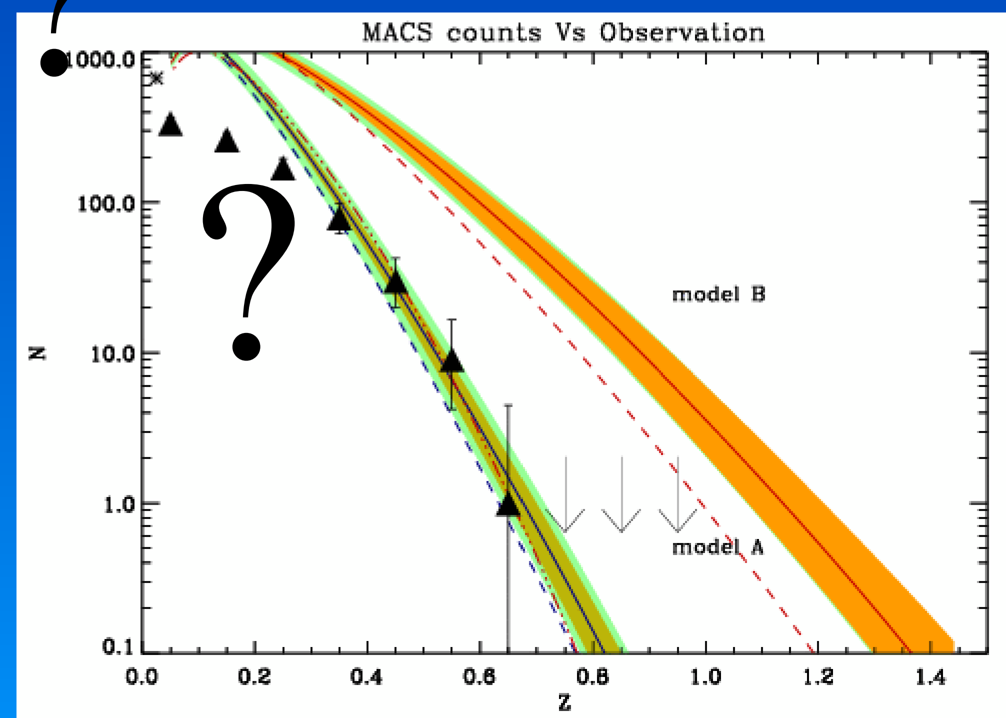
Power spectrum on large scales





RDCS: 50 deg²
fx ≈ 3. 10^{-14} erg/s/cm²

?



MACS: 22 000 deg²
fx ≈ 10^{-12} erg/s/cm²

Cargèse2008.

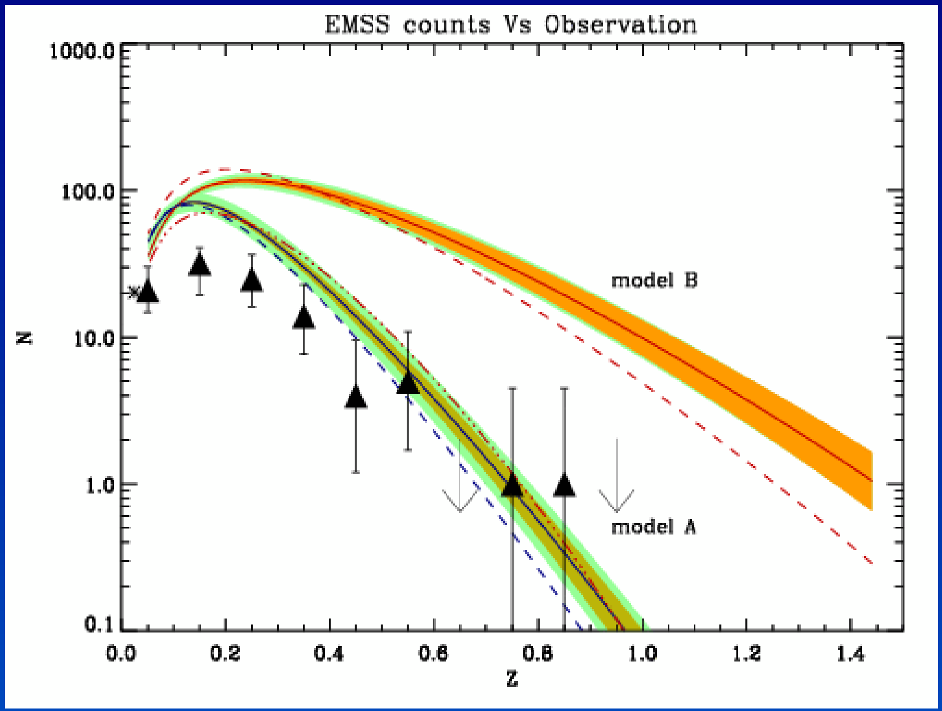
Yet an other degeneracy?

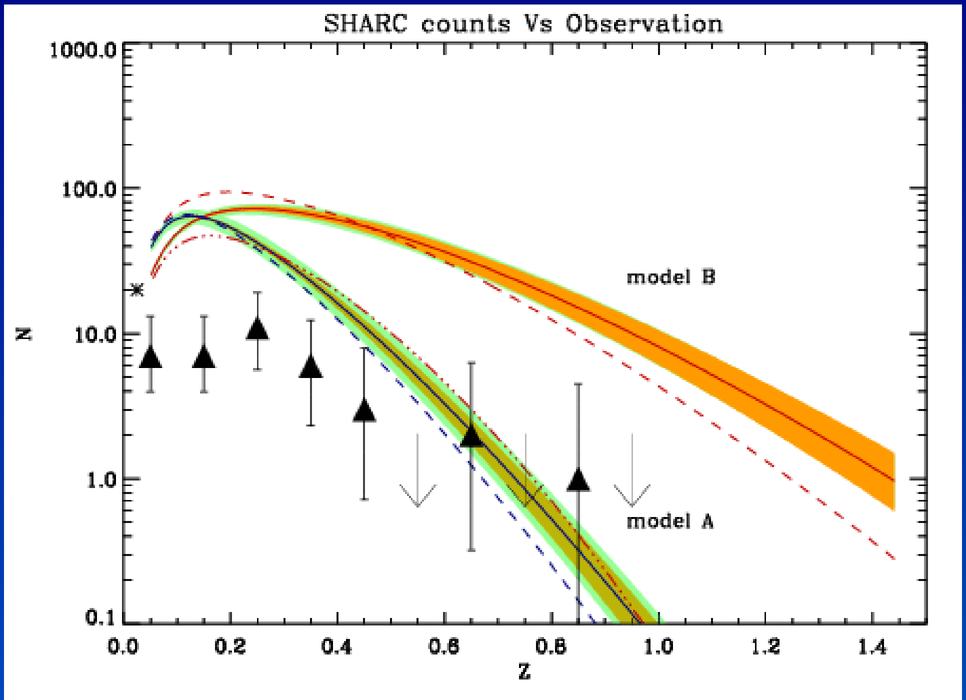
Kill the Mass-Temperature Relation :

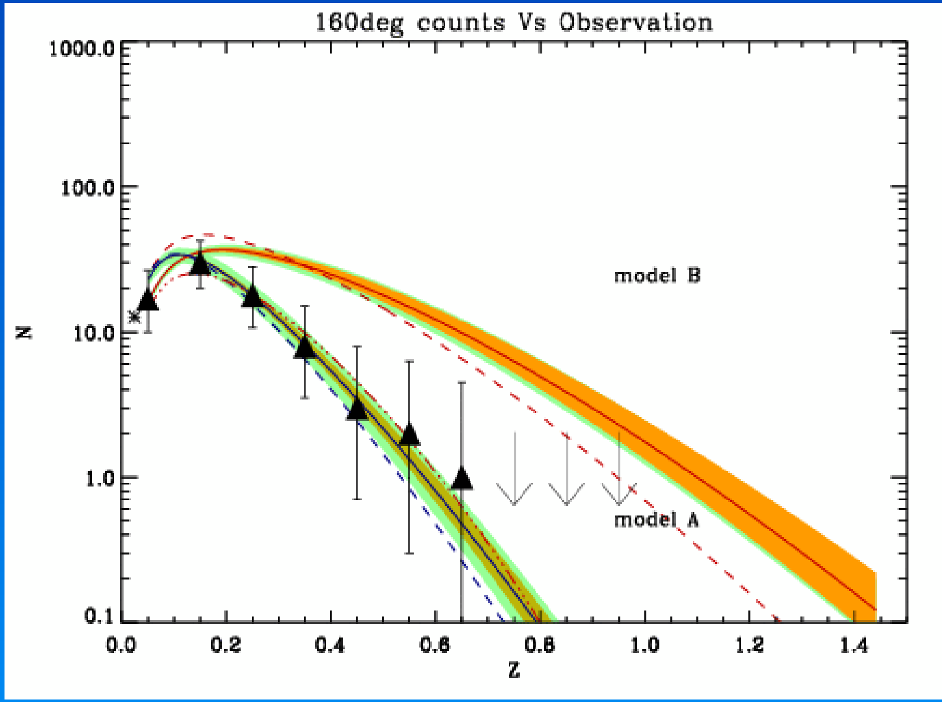
$T \propto GM/r + ... \propto GM/r /(1+z)$

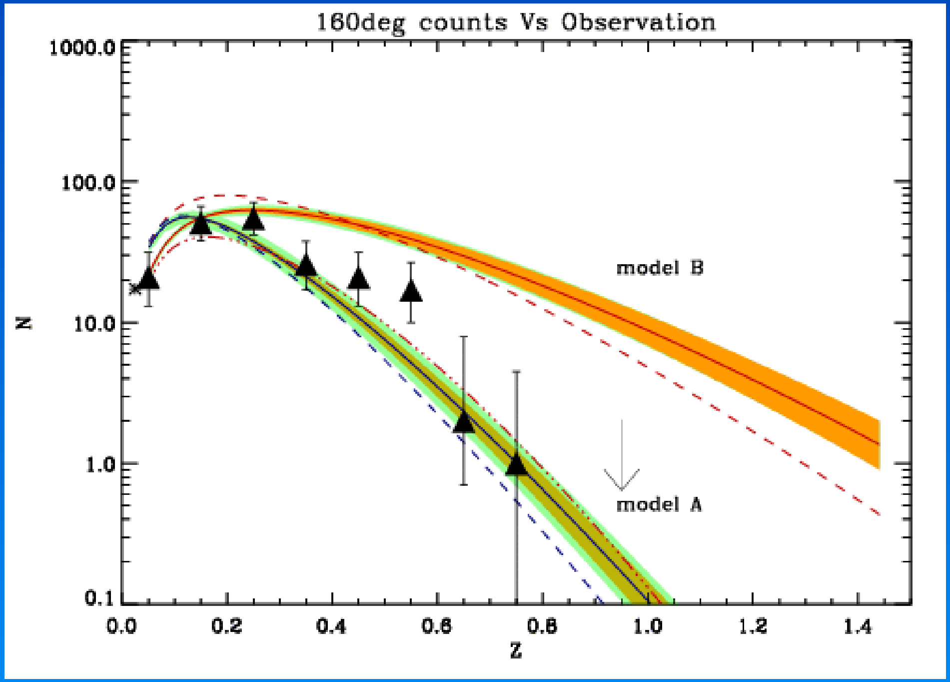
i.e. ~ forget gravity...

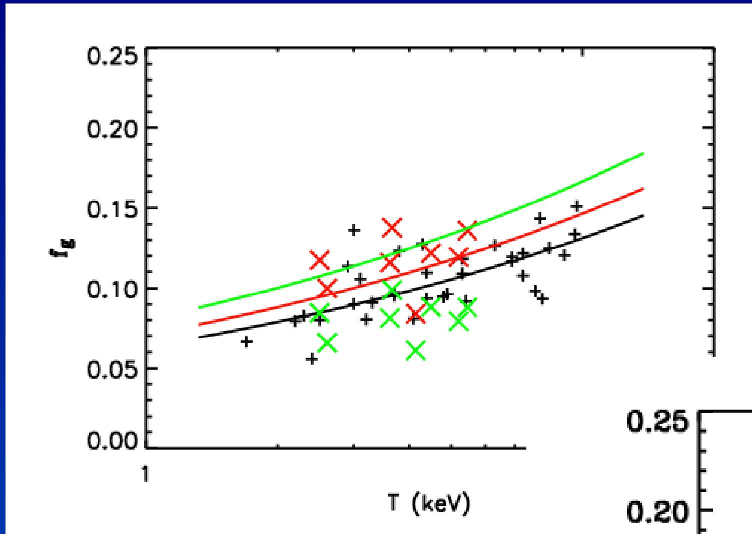
$T_x \propto M^{2/3}$

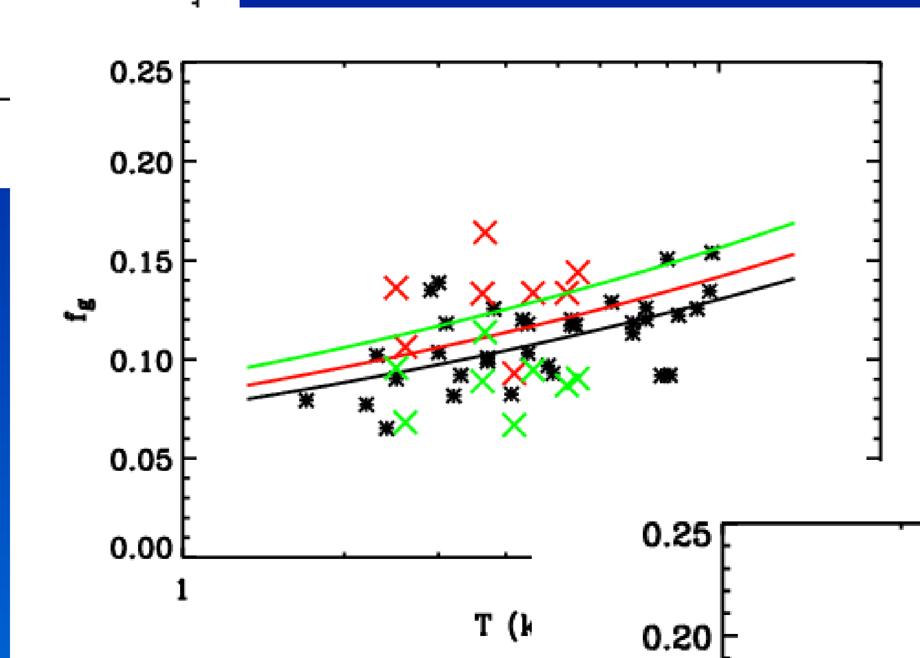

EMSS counts Vs Observation
N
Z
model B
model A
1000.0
100.0
10.0
1.0
0.1
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4

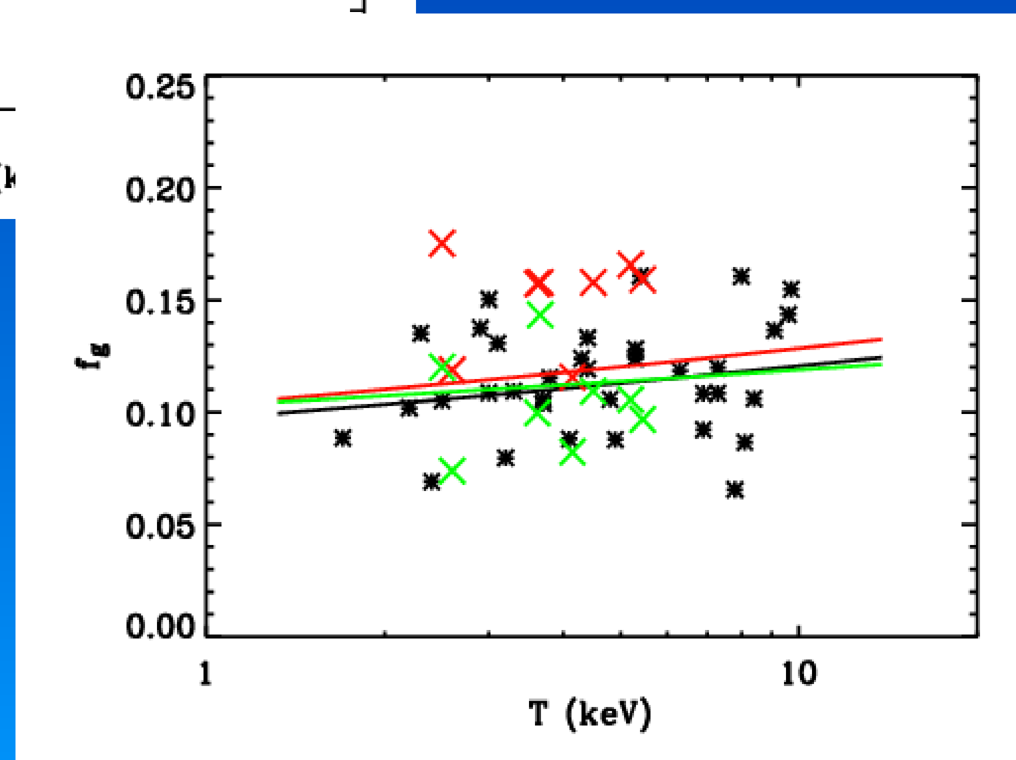

SHARC counts Vs Observation
N
Z
model B
model A
1000.0
100.0
10.0
1.0
0.1
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4


160deg counts Vs Observation
N
Z
model B
model A
1000.0
100.0
10.0
1.0
0.1
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4


160deg counts Vs Observation
N
Z
model B
model A
1000.0
100.0
10.0
1.0
0.1
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4







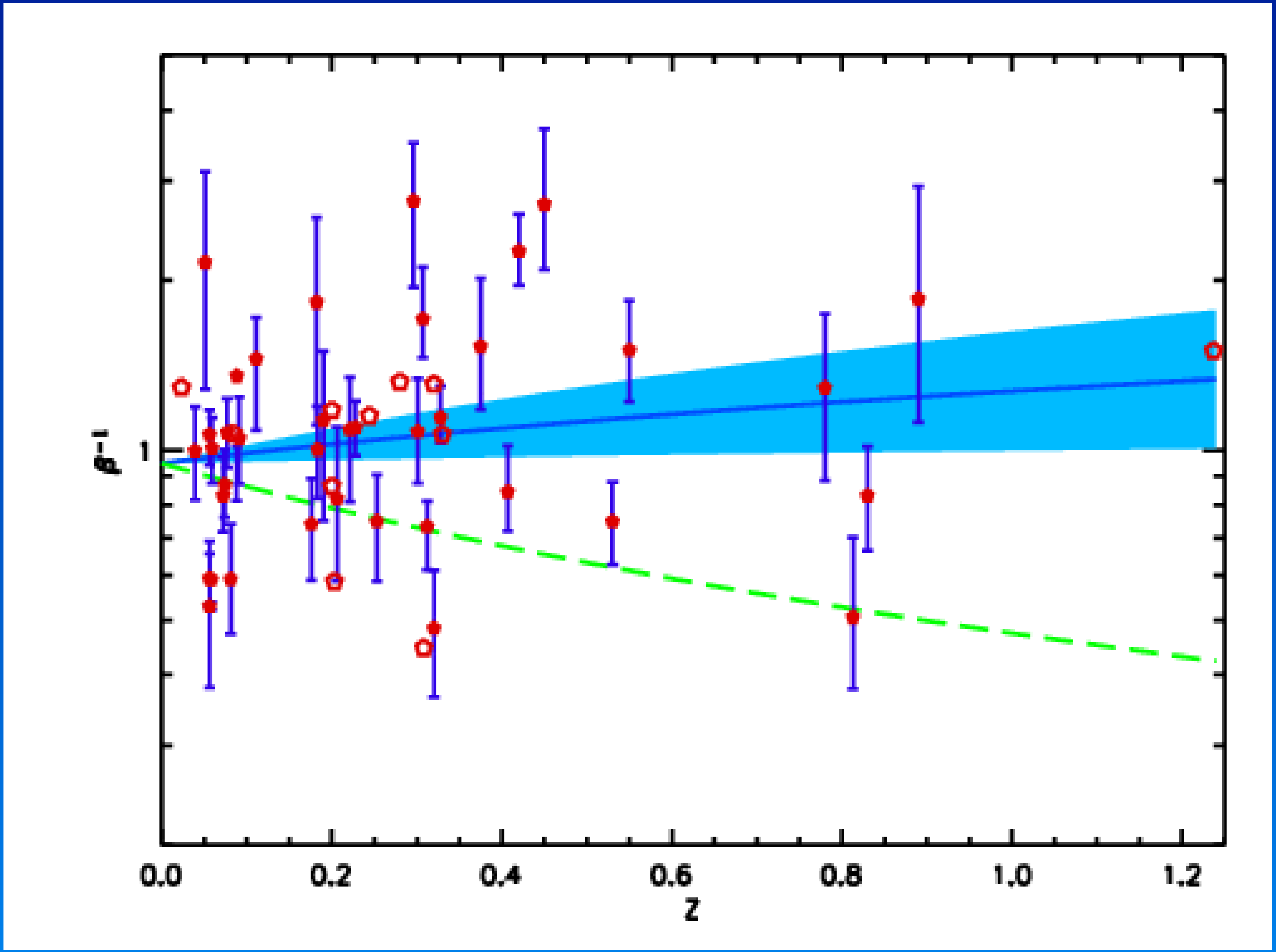
Concordance works !

Breaking the degenracy...

$$T \propto GM/r\,/(1+z) \propto \sigma^2\,/(1+z)$$

- **Testable... i.e.**

$$\beta^{-1} \propto T/\sigma^2 \propto 1/(1+z)$$



1
β^{-1}
0.0
0.2
0.4
0.6
0.8
1.0
1.2
z

Conclusions

- **Acceleration seems to be demonstrated!**
- **No competitors to the concordance...**
- **Precision cosmology is already possible!**
- **Astrophysical systematics is a serious limitation**

Precision Cosmology...

Parameter	Vanilla	Vanilla + Ω_k	Vanilla + w	Vanilla + Ω_k + w
$\Omega_b h^2$	0.0228 ± 0.0006	0.0227 ± 0.0005	0.0227 ± 0.0006	0.0226 ± 0.0006
$\Omega_c h^2$	0.110 ± 0.004	0.109 ± 0.005	0.113 ± 0.005	0.111 ± 0.005
θ	1.042 ± 0.003	1.042 ± 0.003	1.042 ± 0.003	1.042 ± 0.003
τ	0.088 ± 0.017	0.087 ± 0.017	0.085 ± 0.017	0.085 ± 0.016
n_s	0.968 ± 0.013	0.965 ± 0.013	0.963 ± 0.014	0.960 ± 0.014
$log(10^{10} A_s)$	3.07 ± 0.04	3.06 ± 0.04	3.07 ± 0.04	3.06 ± 0.04
Ω_k	0	-0.002 ± 0.007	0	-0.017 ± 0.013
w	-1	-1	-1.112 ± 0.148	-1.33 ± 0.242
K	-0.006 ± 0.006	-0.005 ± 0.006	-0.015 ± 0.013	-0.019 ± 0.011
Ω_Λ	0.747 ± 0.017	0.745 ± 0.020	0.756 ± 0.022	0.744 ± 0.022
Age	13.6 ± 0.1	13.7 ± 0.4	13.6 ± 0.1	14.5 ± 0.7
Ω_m	0.253 ± 0.017	0.257 ± 0.025	0.244 ± 0.022	0.272 ± 0.029
σ_8	0.801 ± 0.026	0.794 ± 0.029	0.846 ± 0.068	0.867 ± 0.060
z_{re}	11.1 ± 1.5	11.0 ± 1.4	10.9 ± 1.5	10.8 ± 1.4
h	0.725 ± 0.017	0.720 ± 0.036	0.748 ± 0.038	0.703 ± 0.042

Vanilla
0.0227 ± 0.0005
0.112 ± 0.003
1.042 ± 0.003
0.085 ± 0.017
0.963 ± 0.012
3.07 ± 0.04
0
-1
0.738 ± 0.015
13.7 ± 0.1
0.262 ± 0.015
0.806 ± 0.023
10.9 ± 1.4
0.716 ± 0.014

Ferramacho, L., B.A., Zolnierowski, Y. (2008)

Typical precision: 2%...