On the power spectrum normalization

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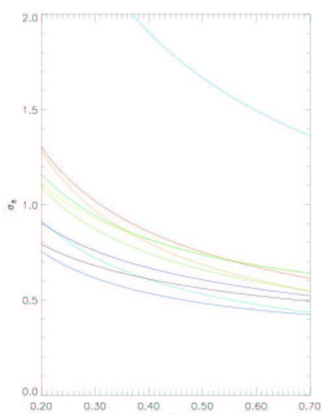
σ_8 determinations:



VanWaerbeke et al.(2001)	0.88	0.05	WL
VanWaerbeke et al.(2002)	0.98	0.06	WL
Bacon et al. (2002)	0.97	0.13	WL
Refrigier et al. (2002)	0.93	0.1	WL
Hoekstra et al. (2002)	0.87	0.03	WL
Bahcall (2002)	0.72	0.06	OC
Viana et al. (2002)	0.61	0.1	WLC
PSW (2001)	1.02	0.07	XTC
Seljak (2001)	0.75	0.06	XTC
Reiprich & Boeringer (2002)	0.68	0.13	XLC
Borgani (2001)	0.67	0.06	XLC
Zaroubi (2001)	2.26	0.11	PV
Lahav et al (2001)	0.73--0.83	0.07	2dF PS
Szalay et al (2001)	0.91	0.06	SDSS PS
Bond et al. (2002)	>1		SZ PS
Komatsu & Seljak (2002)	1.05	0.05	SZ PS

Outline:

- Method overview
- T-derived constraints
  - PSW01
  - HIFLUGCS
- L-derived constraints
  - results from REFLEX
  - REFLEX versus RDCS
  - error analysis
- Comparison L-T (PSW01 and Borgani et al 01)

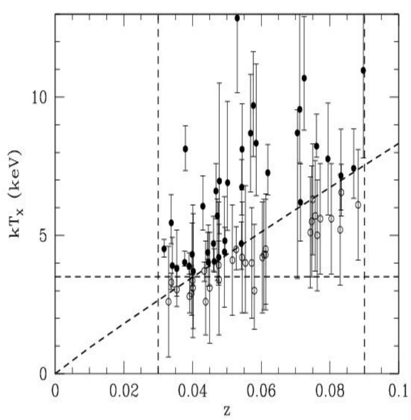
Method overview:

- Data for the observable X
- Scaling relation between X and M (therefore experimental f(M))
- theoretical f(M)
- likelihood procedure

T-derived constraints:

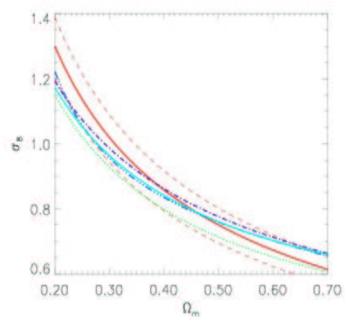
- Summary of PSW01 work:
  - ST mass function
  - wider cluster sample
  - new likelihood method [n(kT), clusters with errors…….]
  - Assume $(M/10^{15} M_{sol} h^{-1})=(T/\beta)^{3/2} (\Delta_c E^2)^{-1/2}$ with β=1.3 from simulations
  - general cosmology
  - Assessment of the errors

The cluster sample



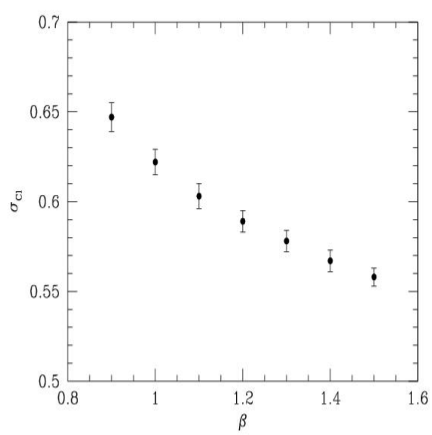
- Adapted from Markevitch 98, but using White 00 temperature when available.
- Extended in redshift
- lower flux cut to allow clusters to scatter in the sample.

Results



- Consistent with previous results but steeper
- Checks:
  - low-z /high-z : 2%
  - clusters with kT>6 keV only: + 3-5 in σ_{cl}
  - fit the integrated TF for kT>6keV: - 2.5-4.5%
  - ST instead of PS MF: - 4-8%

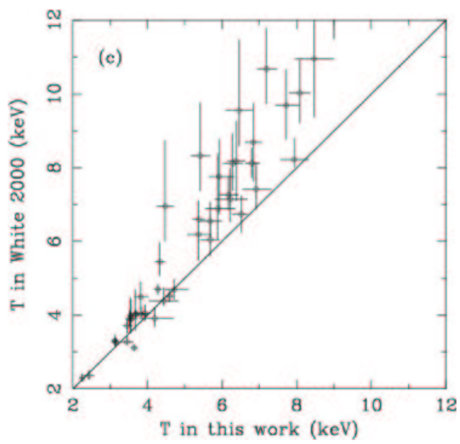
Errors



- Errors led by M-T sys.
- No significant shift in the central value

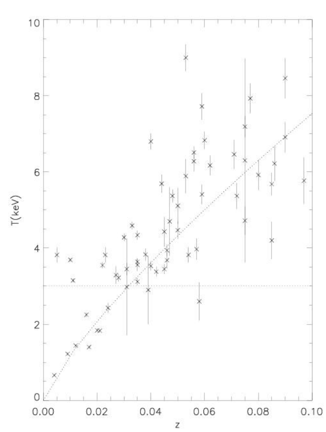
Error	σ_{cl}	$+1\sigma$	-1σ
All	0.581	0.049	0.050
M-T sys	0.575	0.047	0.047
M-T stat	0.570	0.002	0.002
T	0.586	0.005	0.018

Different T measures:



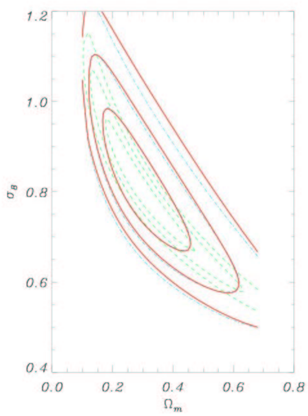
- Both ASCA observations.
- Different fitting procedures for cooling flows. (Fig. From Ikebe et al 2001)

Hiflugcs sample:



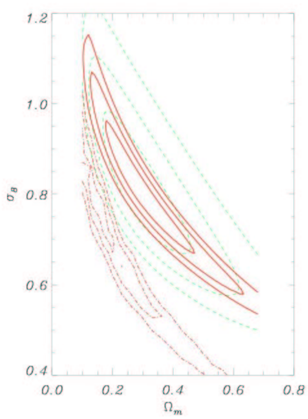
- Few clusters at low T (??)
- some clusters don't make it into the flux limit...

HIFLUGCS sample + 2T



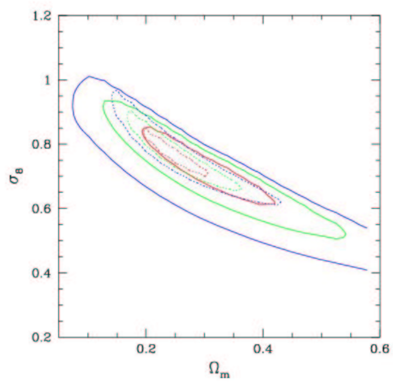
- B.f. at Ω_m=0.3 σ_8=0.83 (28.5 clusters)
- with supplementary sample: Ω_m=0.4 σ_8=0.78 (41 clusters)

M-T error and Likelihood:



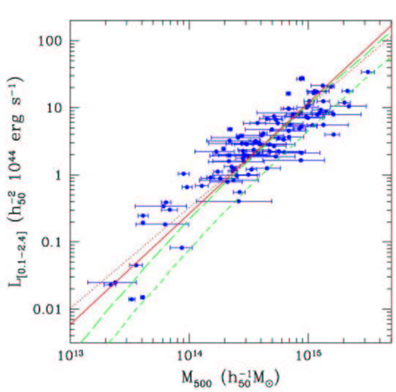
- Convolving f(M) lowers the likelihood contours
- Marginalizing broadens the contours.

L-derived constraints:

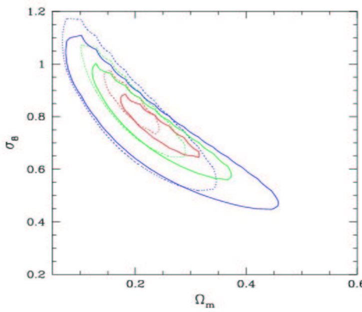


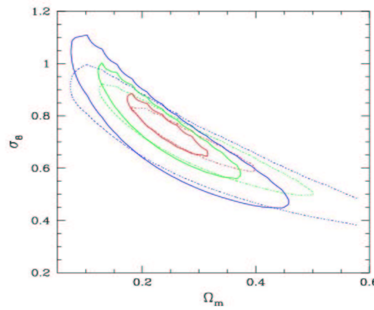
- RDCS vs REFLEX:
  - same error budget (L-T-M with 45% total error, β=1.2)
  - different statistical method
  - different survey characteristics

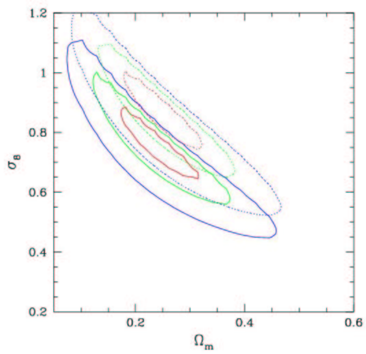
Using L-M:



- Fig. From Reiprich & Boheringer 2002.
- L-M is well fit by β=1.7 (value suggested by experimental M-T)





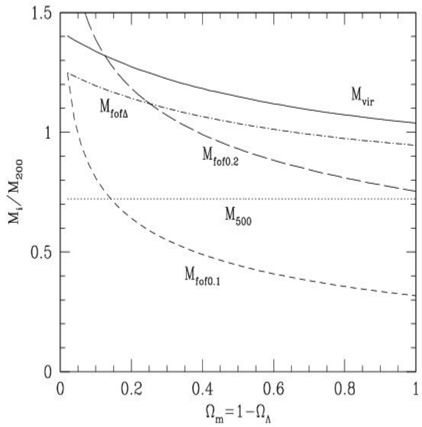


- Different scaling shift the contour of a marginal amount
- shrinking the errorbars boosts σ_8.

Conclusions

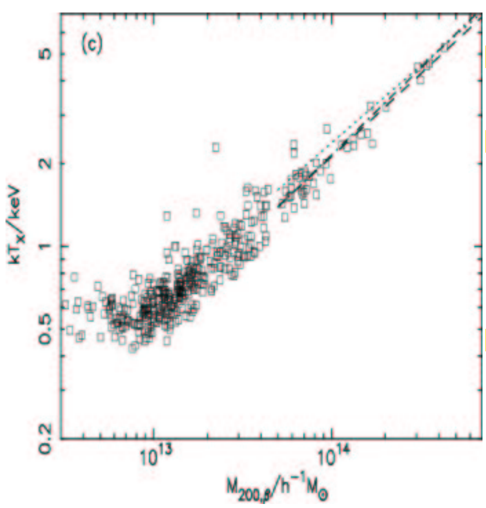
- Physical explanations for the L and T derived constraint due to
  - way M-T error is introduced
  - big L-M uncertainties
- L-derived constraints are consistent when same analysis approach is applied.
- T-derived constraints need a better definition of quantities involved.
- Cluster abundance is ever going to be precision cosmology? Improvements in the definition of quantities involved, theory and comparison method are still possible.

What is mass:



- From simulations: FOF or FOFΔ.
- From observations: isothermal β model (implicit use of the temperature)

Is there a problem?



- New physics in the simulations
- When the same observational strategy is applied, there is no discrepancy (Muangwong et al 2002).
- β profile tends to underestimate the mass

T vs L-derived constraint:

- L-T-M method (Borgani et al 2001):
  - Scatter in the L-T is dominant.
  - Essential how the errors are treated.
- L-M (Reiprich & Boheringer 2002):
  - Is the mass determined accurately with β?
- L-WLM (Viana, Nichol & Liddle 2002):
  - different subsamples lead to barely consistent results. Possible biases.

Perspective work

- What causes the discrepancy between L and T derived results?
  - Outline a method for M and T determination which can be pursued by both observation and simulation people.
  - Give guidelines to observers to derive scaling relations
  - Refine the observation-theory comparison method and suggest a standard.

Preliminary results

- Errors:
  - Shape of the normalization distribution is essential.
  - The way the error is introduced is important
- masses and mass functions:
  - M_{500} from observations, rescaled to $M_{180\Omega}$ to use f(M) from simulations. (ST mass function ok)
- Other details:
  - don't forget baryons in the T(k)! Improve BBKS.....

Future useful X-results

- Better temperature profiles (from XMM?)
  - different mass determinations
  - better understanding of the physics
- Unified analysis of,e.g. Chandra clusters
- More sophisticated derivation of scaling relations
  - redshift dependent relations
  - different fittings