The core problem: can semi-analytic models handle X-rays

Frazer Pearce

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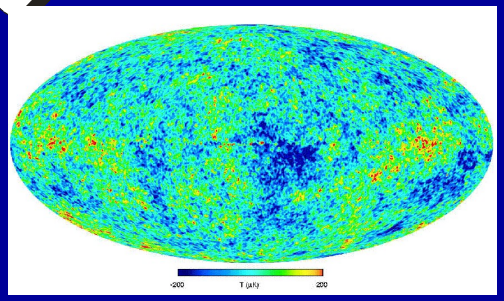
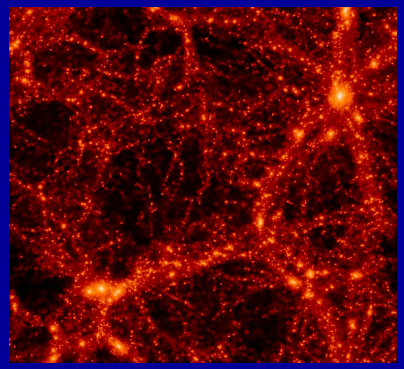




Cosmological model

(Ω_m, Ω_Λ, h); dark matter

Primordial fluctuations

$\delta\rho/\rho$ (M, t)

Well established

Dark matter halos

(N-body simulations)

Well understood

Gas processes

(cooling, star formation, feedback)

Gasdynamic simulations

Semi-analytics

Formation and evolution of galaxies

Keeping it real

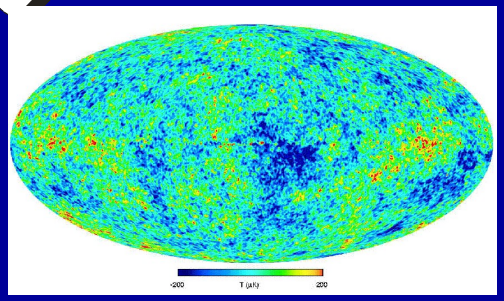
- SA models use ρ(r) and T(r) to calculate cooling rate
- Cooling must be balanced by heating (feedback) otherwise far too much gas cools

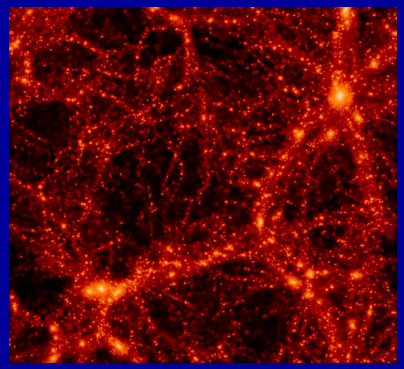
- The cooling is directly observable !

Derived quantities

- Cooling gas forms $M_\Theta(t)$
- Can get same $M_\Theta(t)$ from very different physics
- Can convert $M_\Theta(t)$ into L but this is not easy (IMF, dust, …)

- …tertiary statistics even more dodgy





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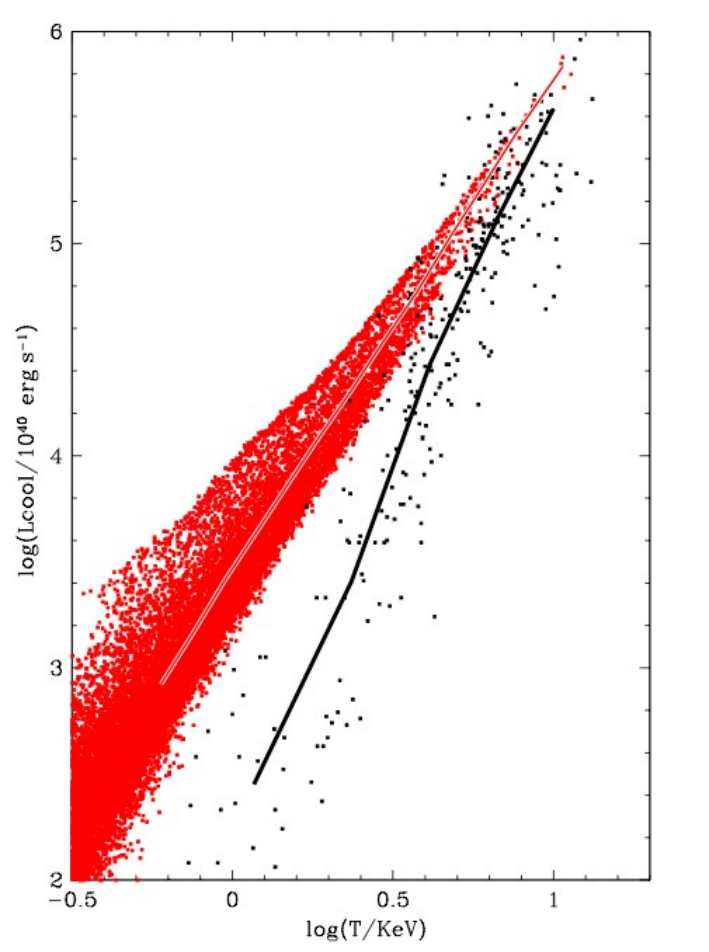
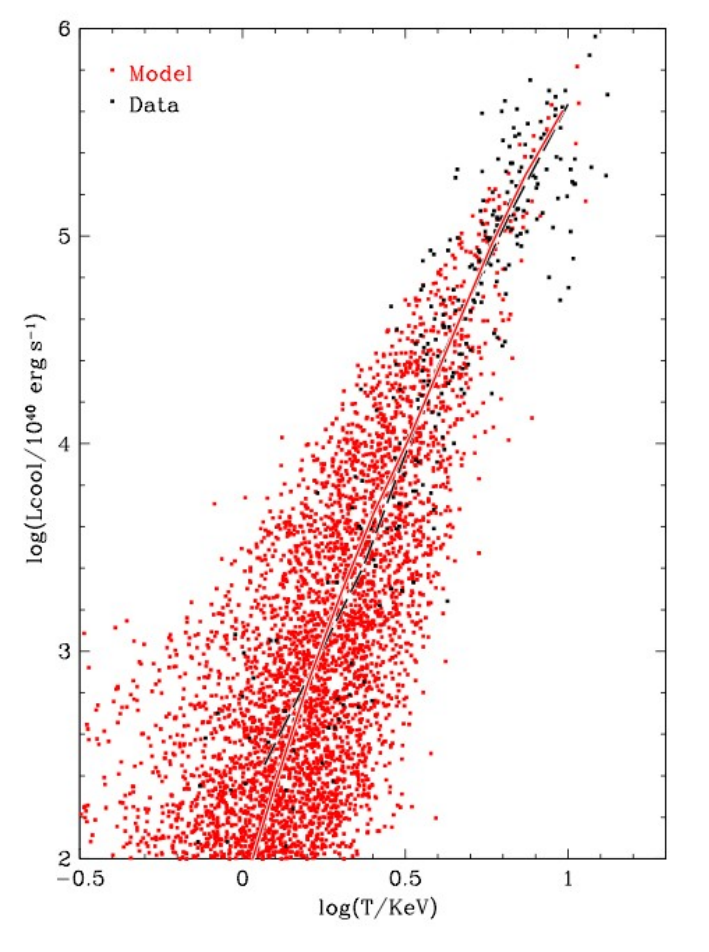
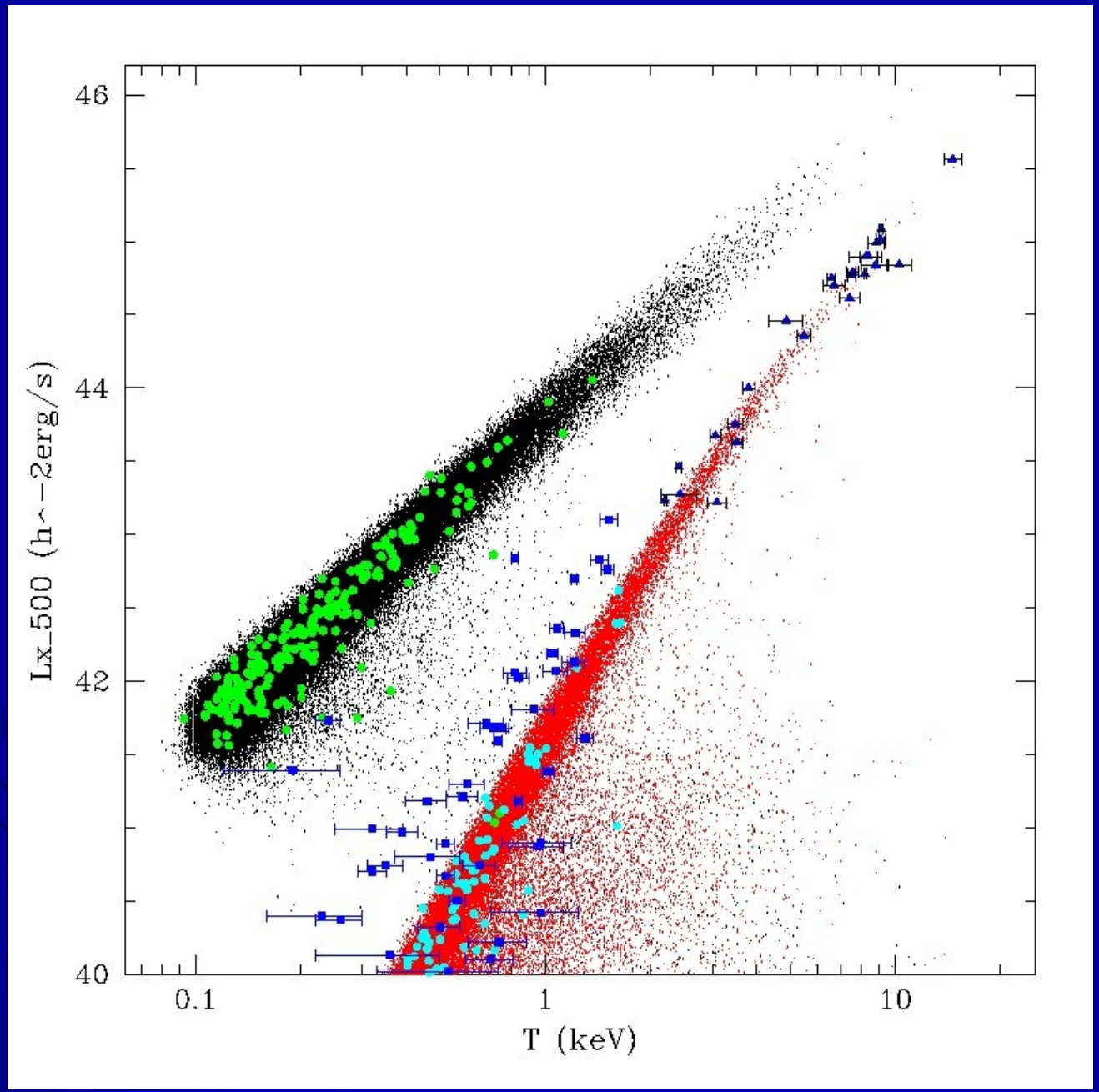
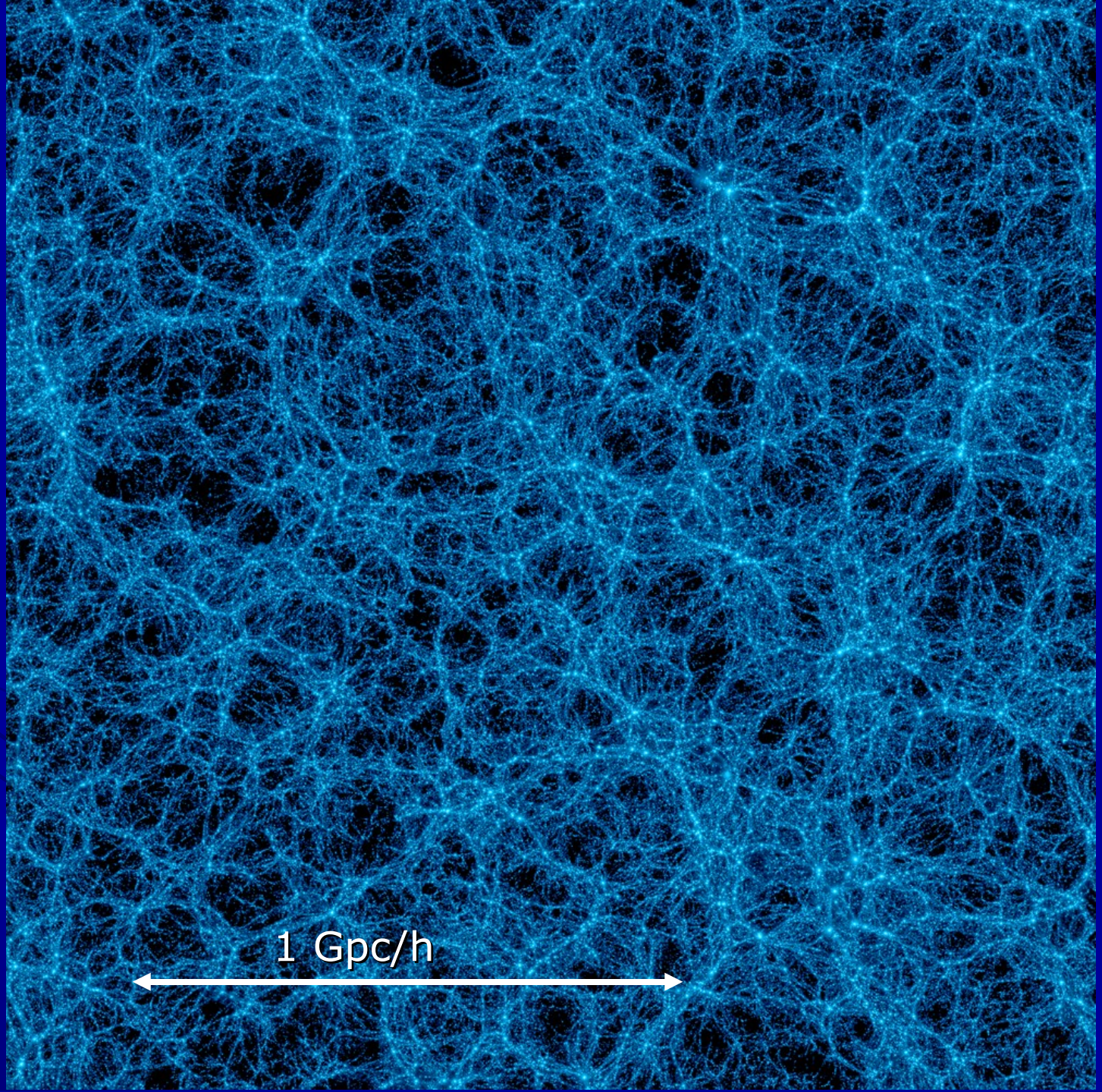
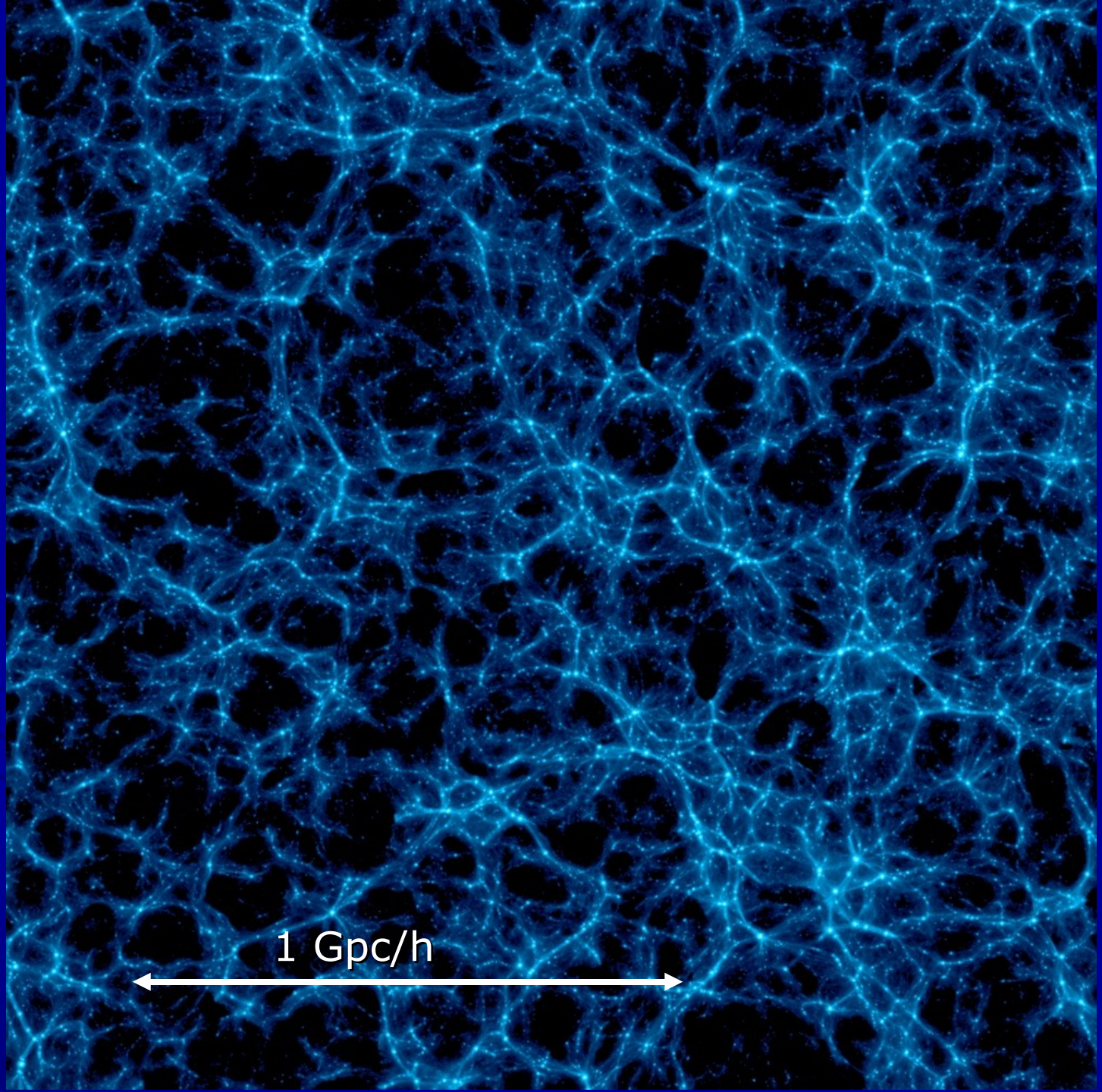
The X-ray LT relation






46
44
42
40
Lx_500 (h^-2erg/s)
0.1
1
10
T (keV)


1 Gpc/h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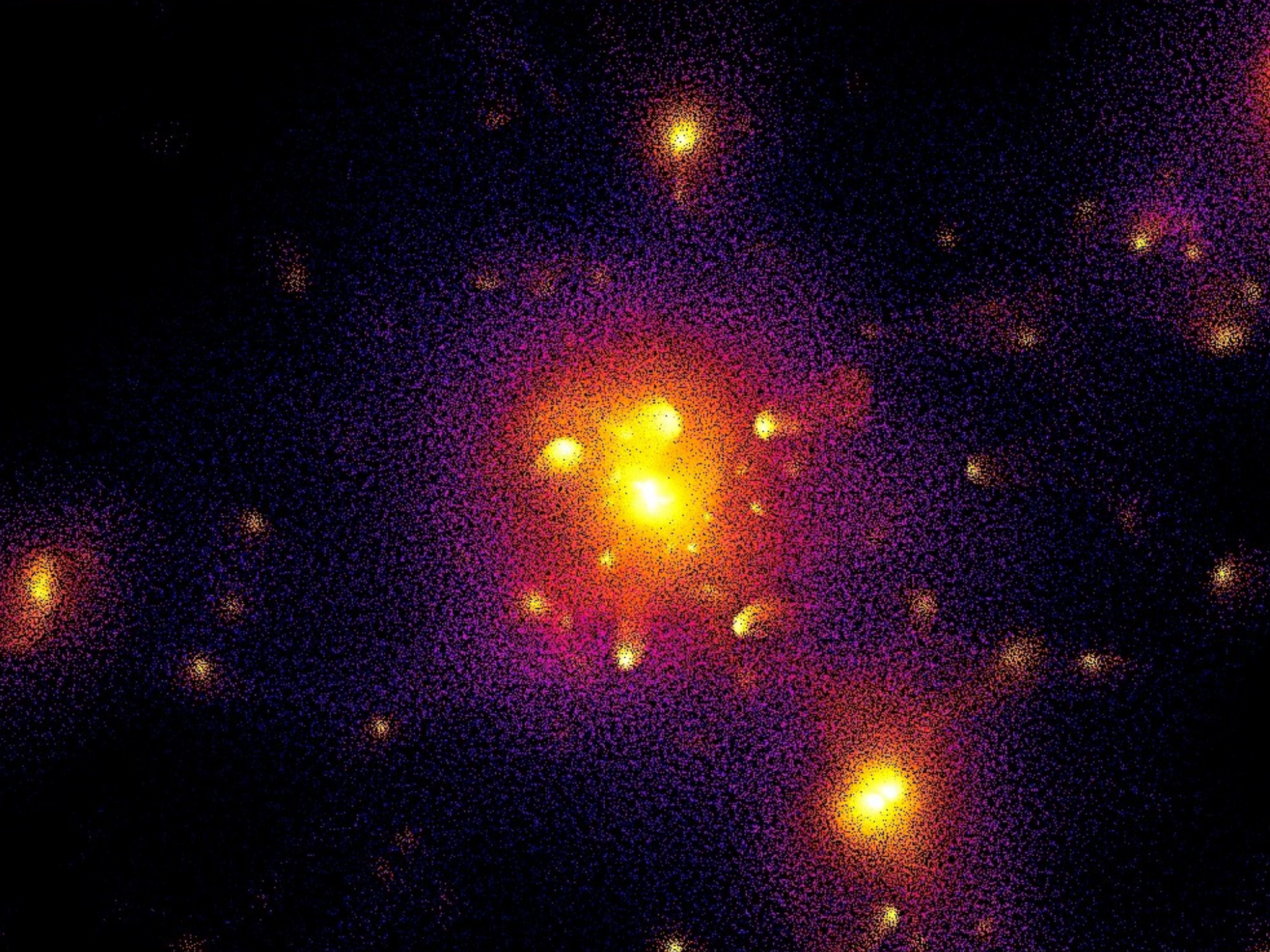
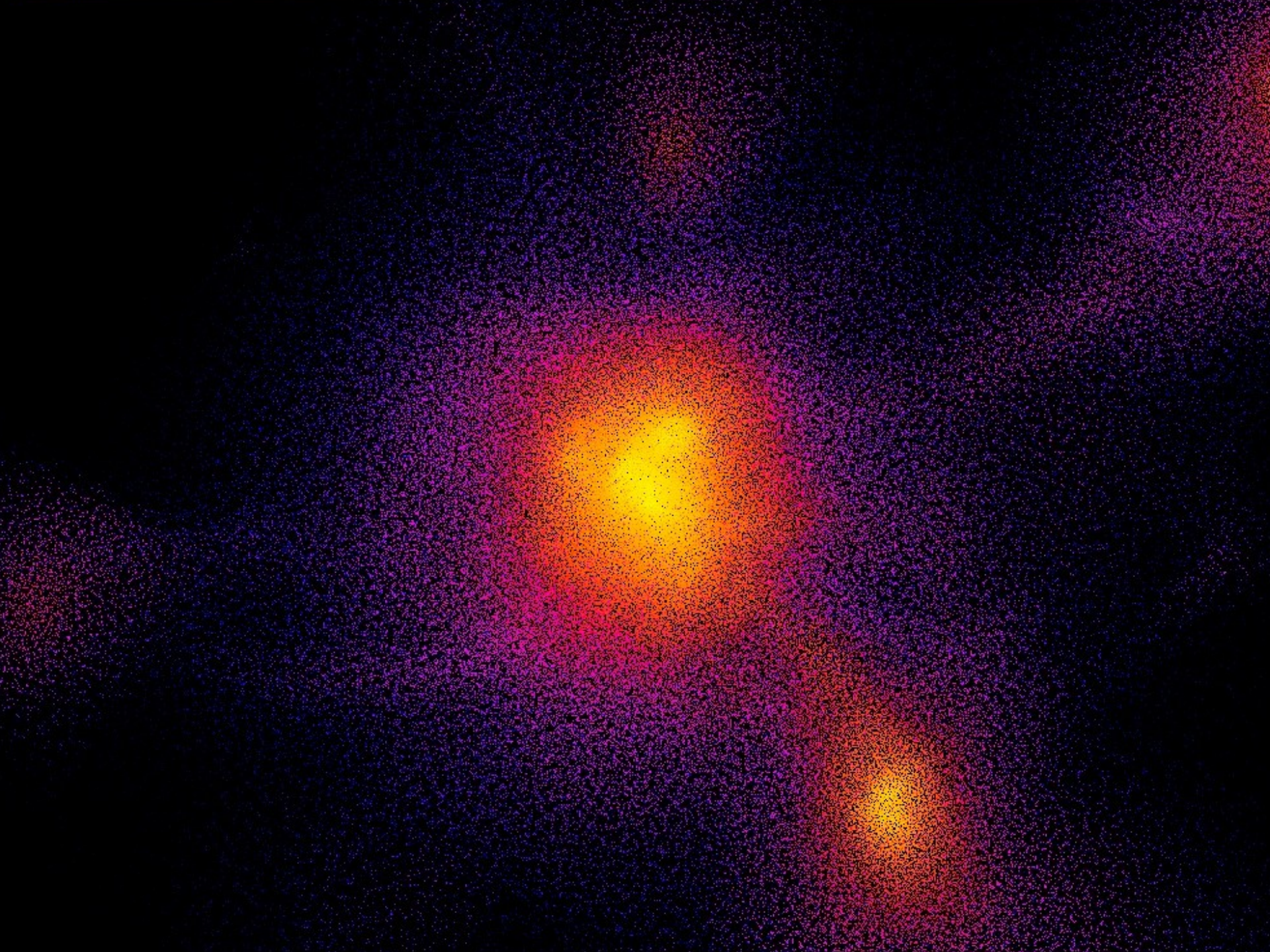
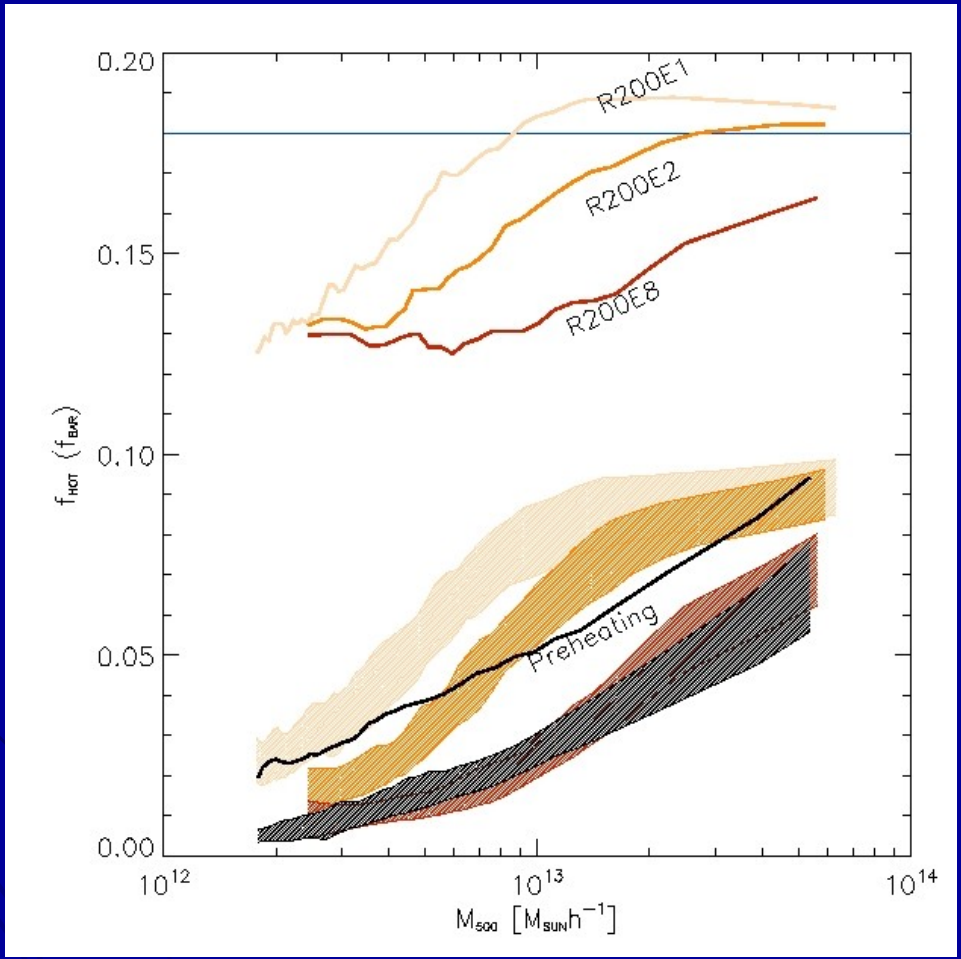
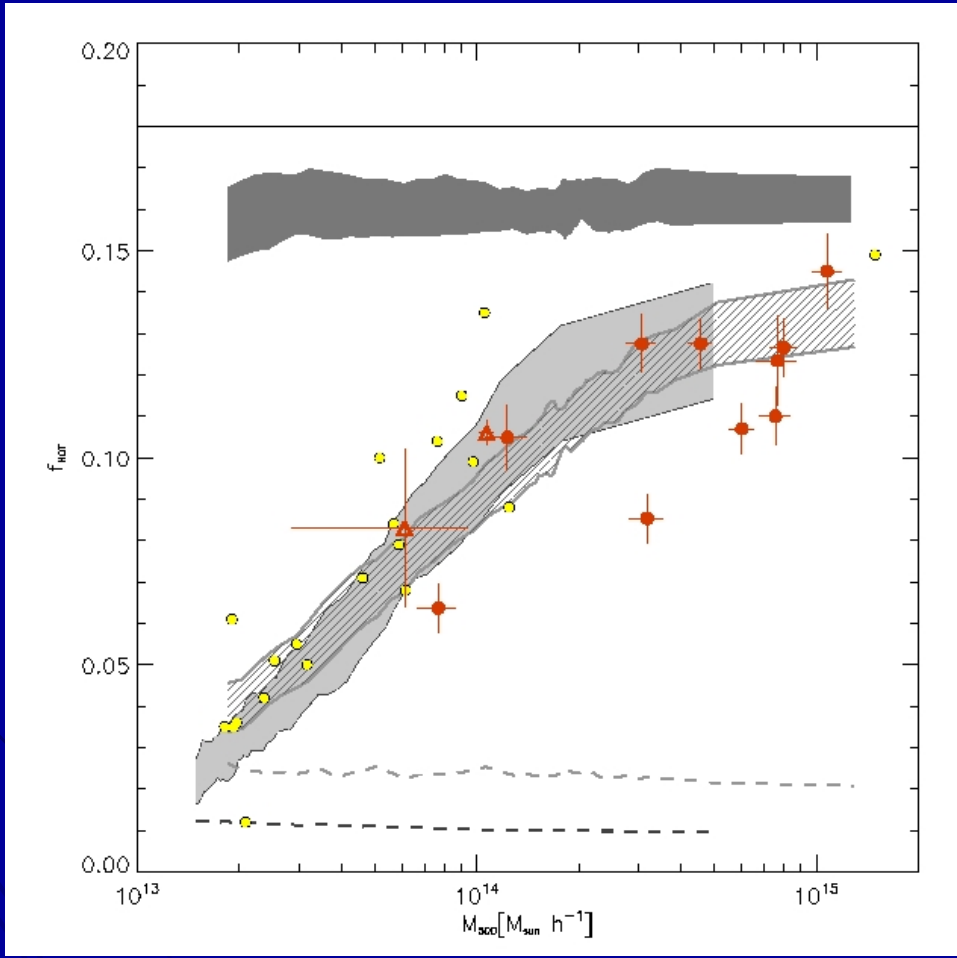




Where is gas going?



Observational data

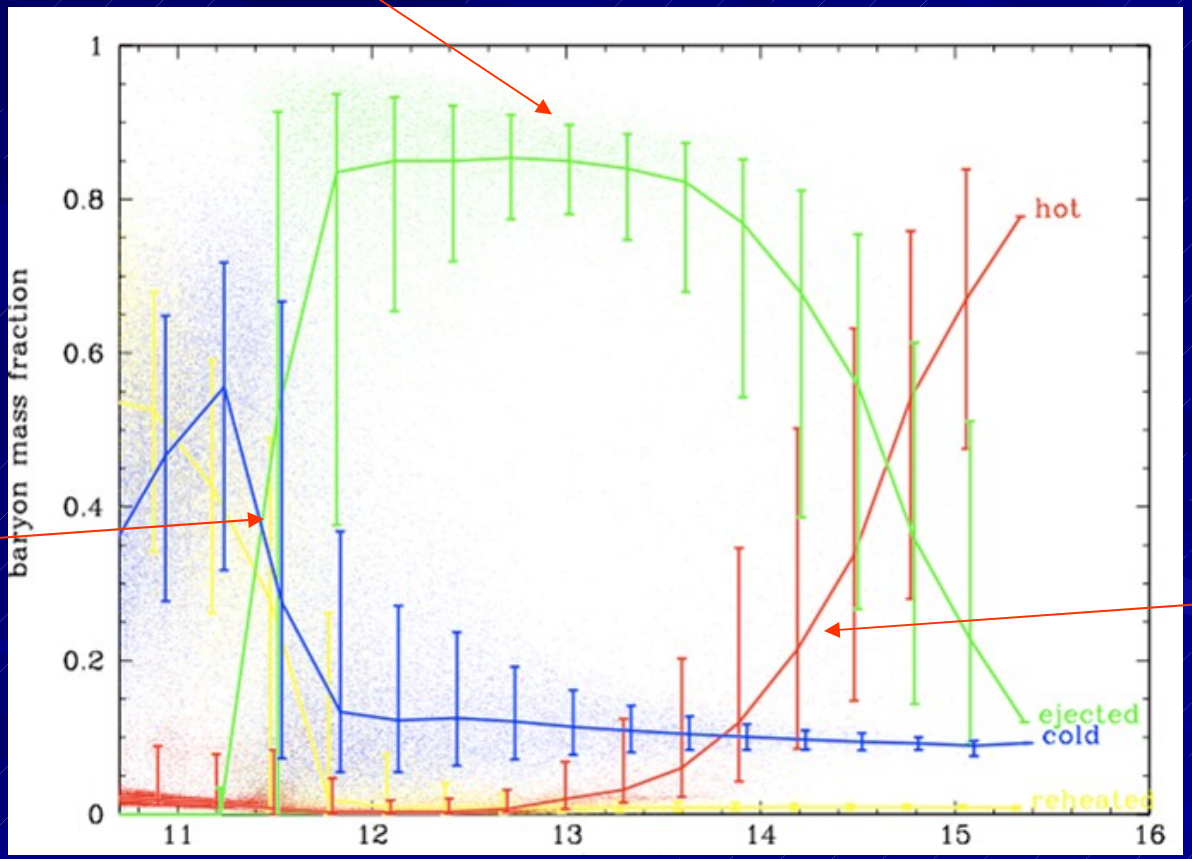


Data: Vikhlinen etal 2006 (red), Gastaldello etal 2006 (yellow)

University of Durham

The baryon content of haloes - where are all those baryons?

"Ejected" gas

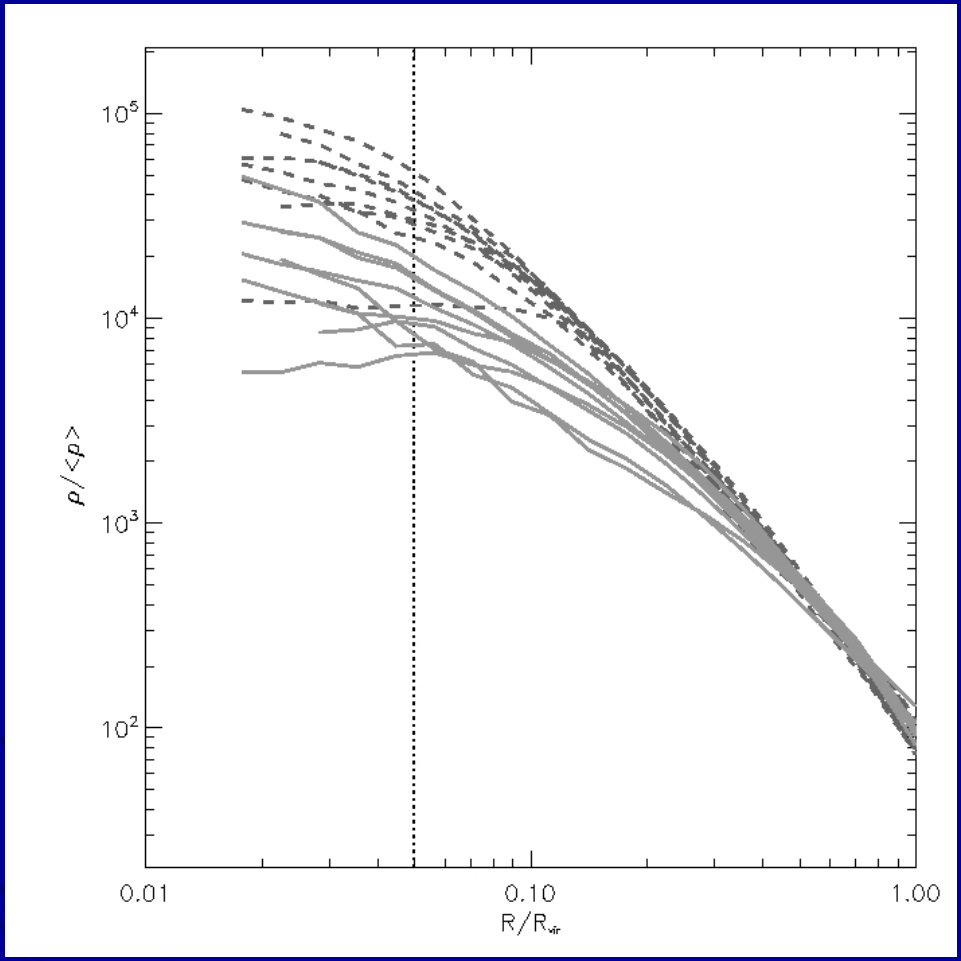


Stars and cold gas

Hot X-ray emitting gas

Halo mass

Radial gas density



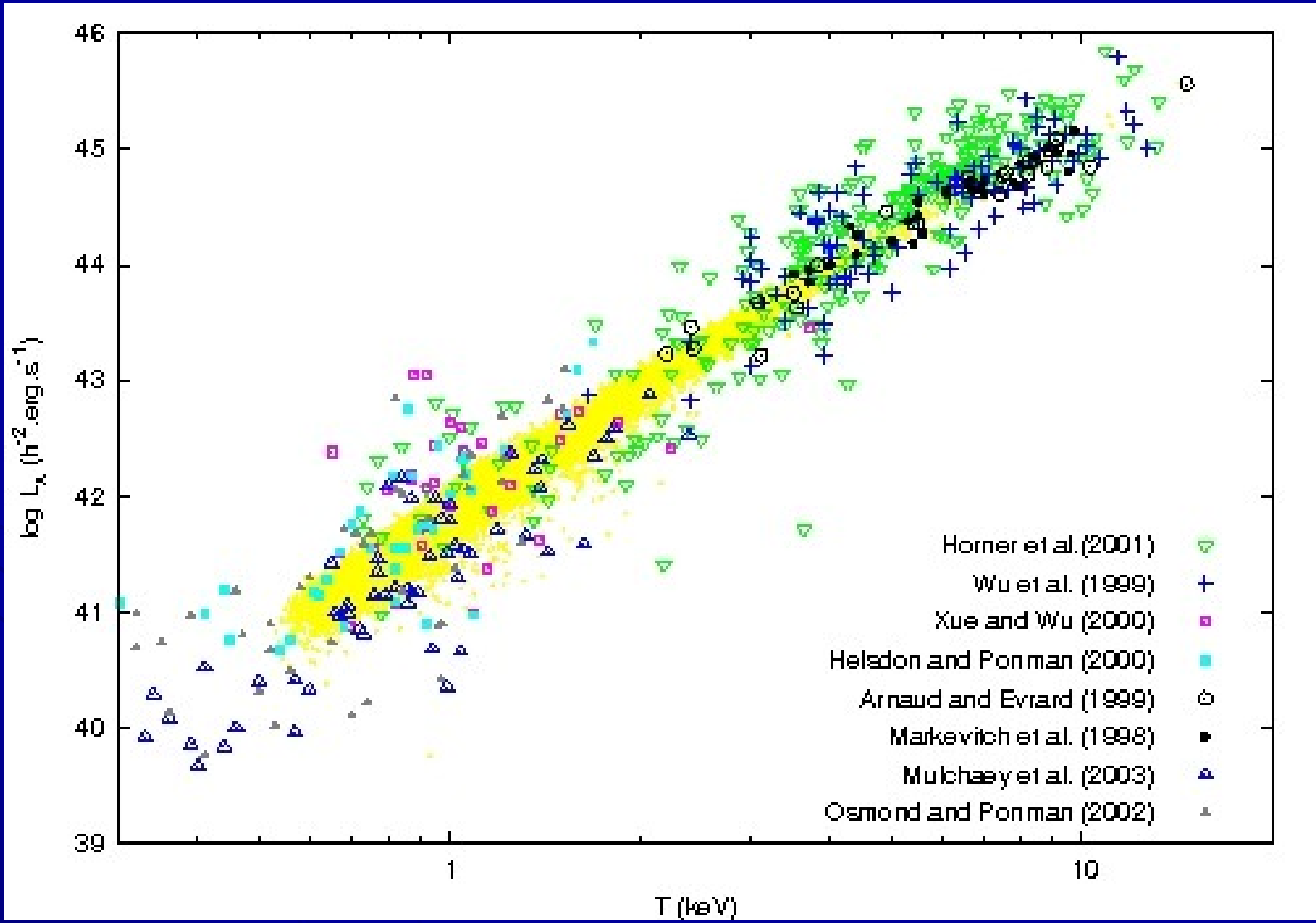
Methodology

- SA plan is to add lots of physical processes, each with own parameters
  - Sensible to get basic physics right first
- Which observational dataset to use ?
  - Directly observable quantities close to basic assumptions

What needs to be done?

- No published SA model fits LT relation
- Re-appraise fundamental SA assumptions about ρ(r) and T(r)
- Fit LT relation as a priority (also true for simulations)
- Assess what this does to other SA parameters

Observational compilation



Hartley etal 2007

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