

# *Chandra* Measurements of a Complete Sample of X-ray Luminous Clusters

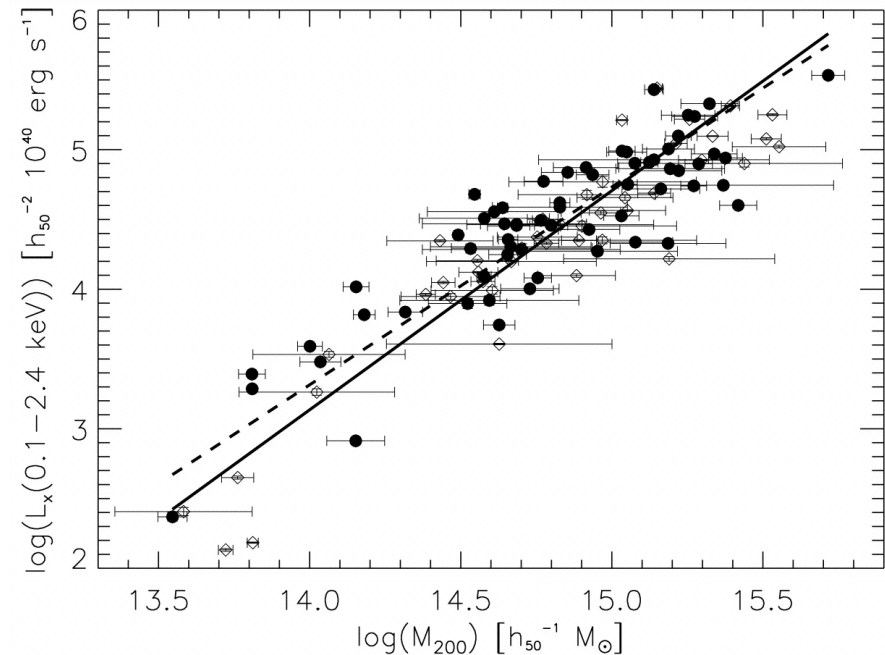
## The LM Relation

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# The Luminosity-Mass Relation

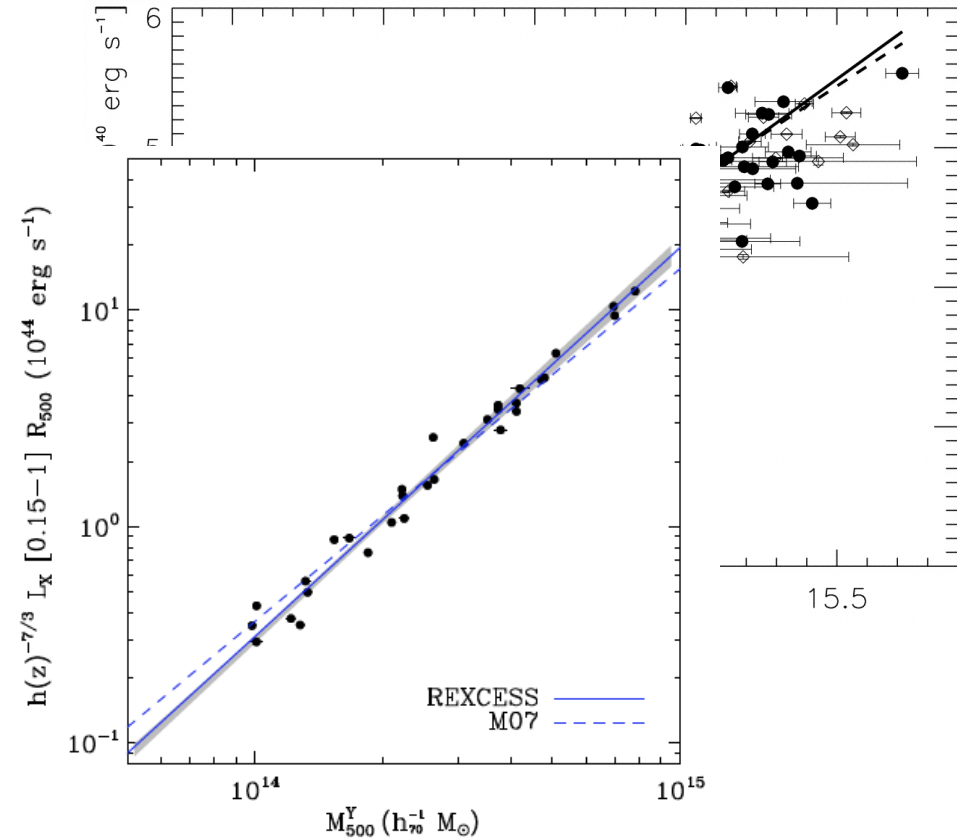
- X-ray luminosity provides a cheap way of determining cluster mass
- From self-similar assumptions, the scaling between  $L_x$  and mass has a slope of 1.33
- However, many studies have found a steeper slope
- Physical processes play an important role in departures from SS expectations. But we must also take into account **Biases**



Reiprich & Bohringer, 2002

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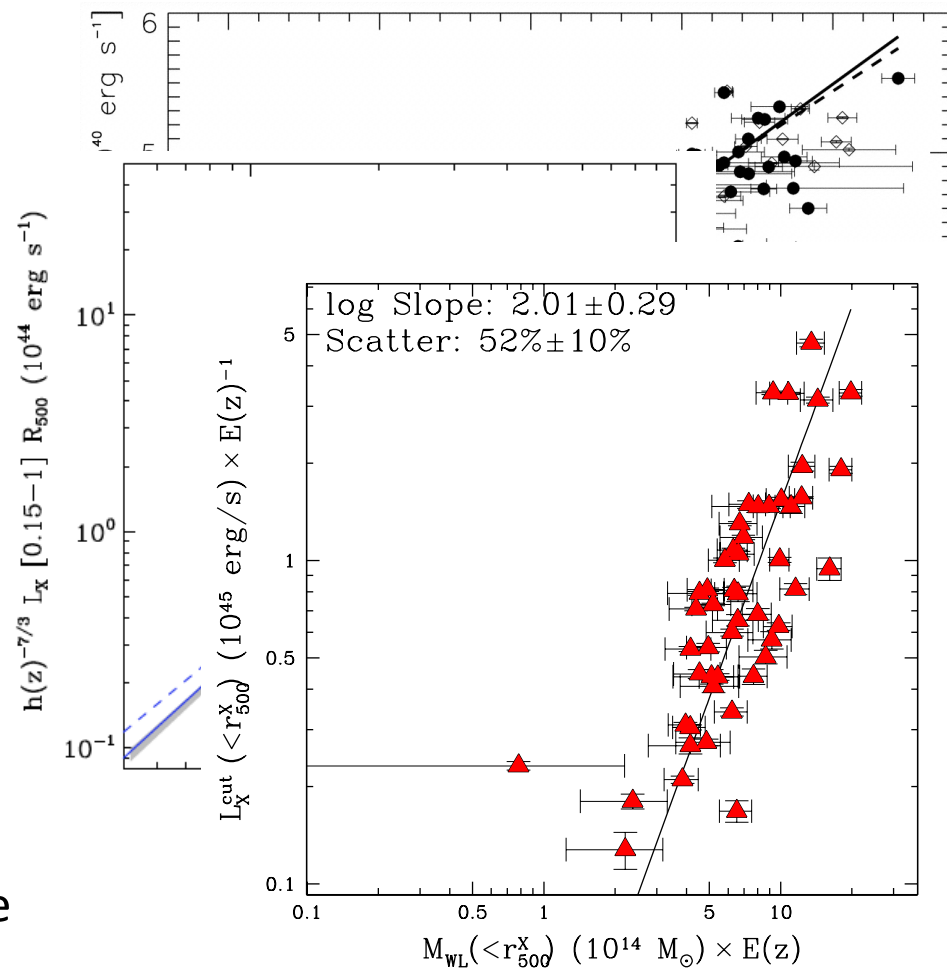
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Pratt et al, 2009

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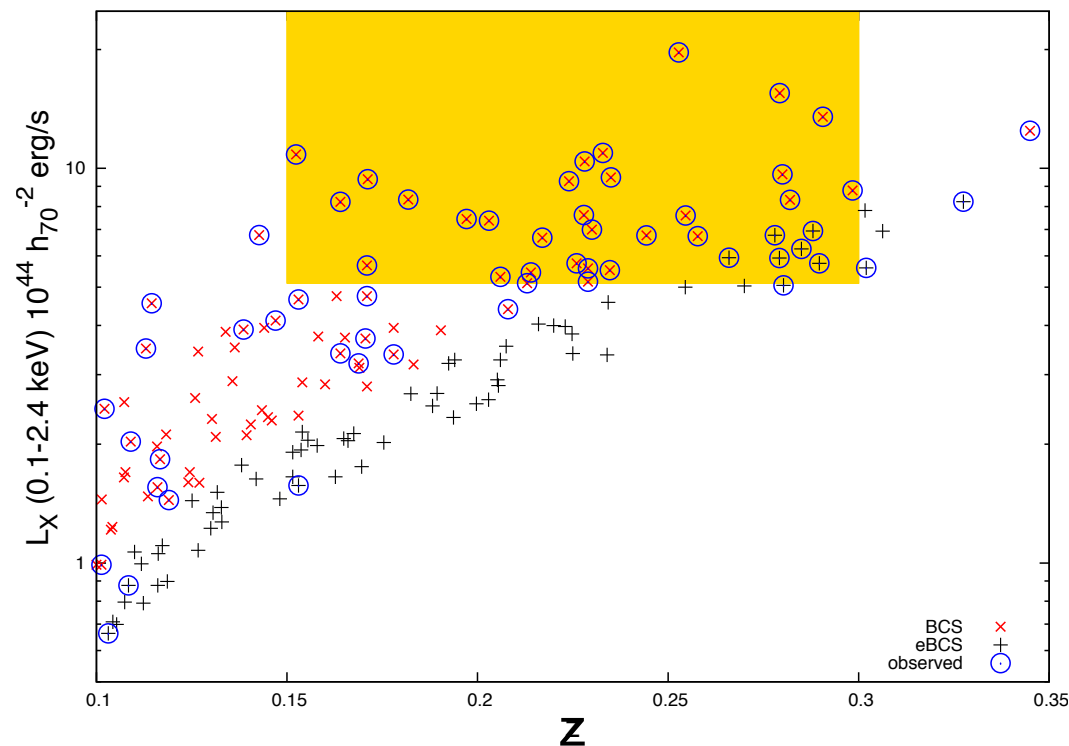
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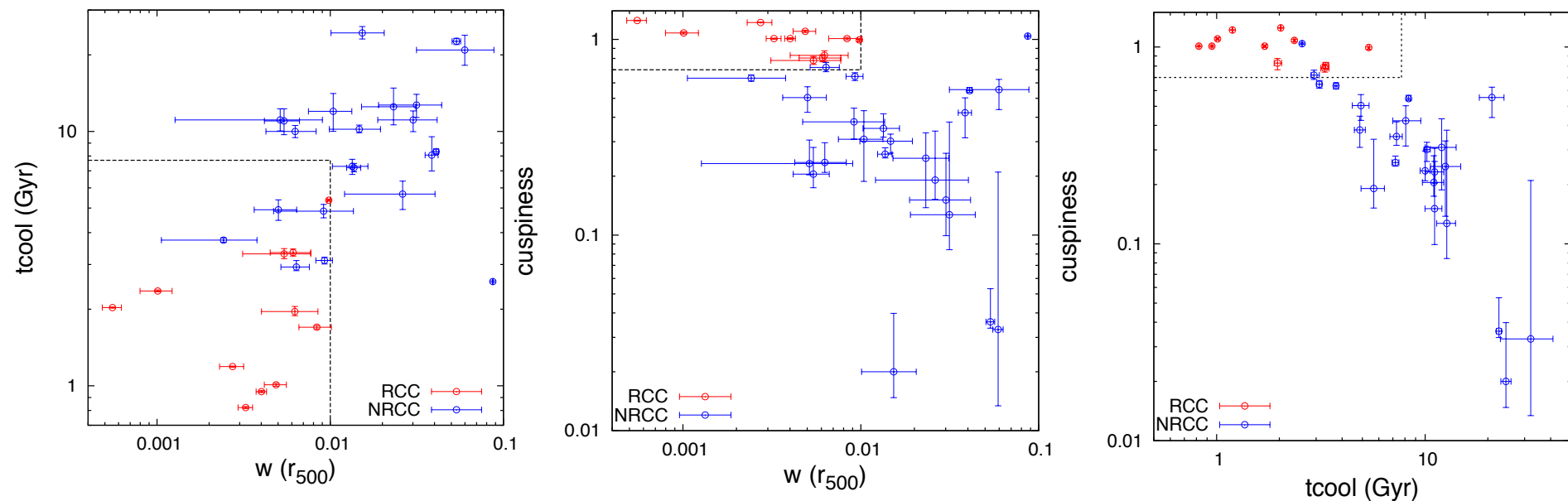
Mahdavi et al, 2013, <http://sfstar.sfsu.edu/cccp/>

# Sample Selection

- Clusters selected from the (e)BCS (Ebeling et al. 98,00)
- $0.15 \leq z \leq 0.3$
- $L_{X,0.1-2.4 \text{ keV}} = 6 \times 10^{44} \text{ erg s}^{-1}$
- 36 clusters satisfy selection
  - A689 dropped to due BL Lac contamination (see Giles et al. 2012)
  - Zw 5768 dropped due to updated  $z$

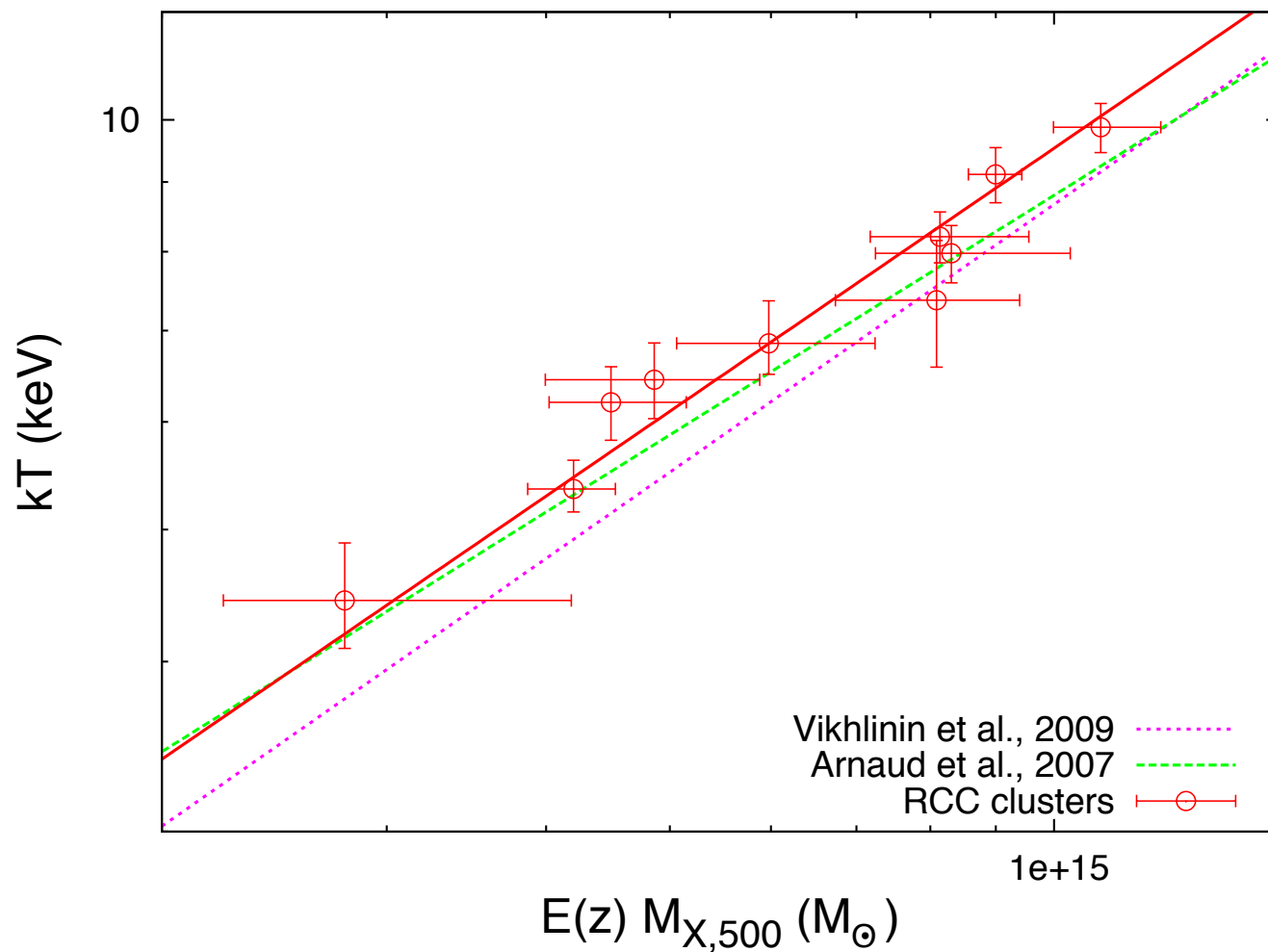


# Separating between RCC/NRCC

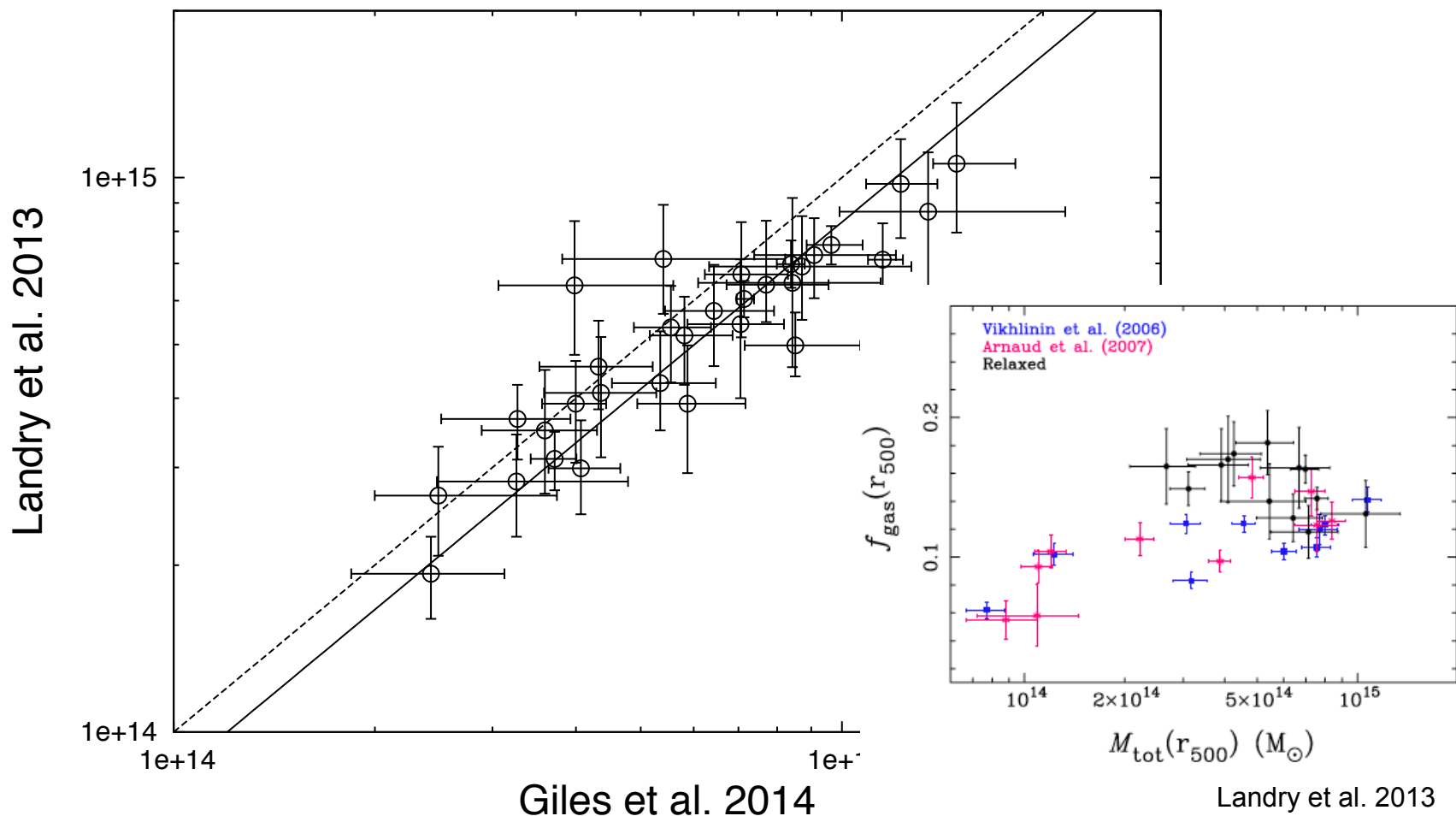


- RCC clusters must satisfy  $t_{\text{cool}} < 7.7$  Gyr, cuspsiness  $> 0.7$  and centroid shift ( $\langle w \rangle < 0.009$ )
- RCC = 10/24, NRCC = 24/34

# The MT Relation

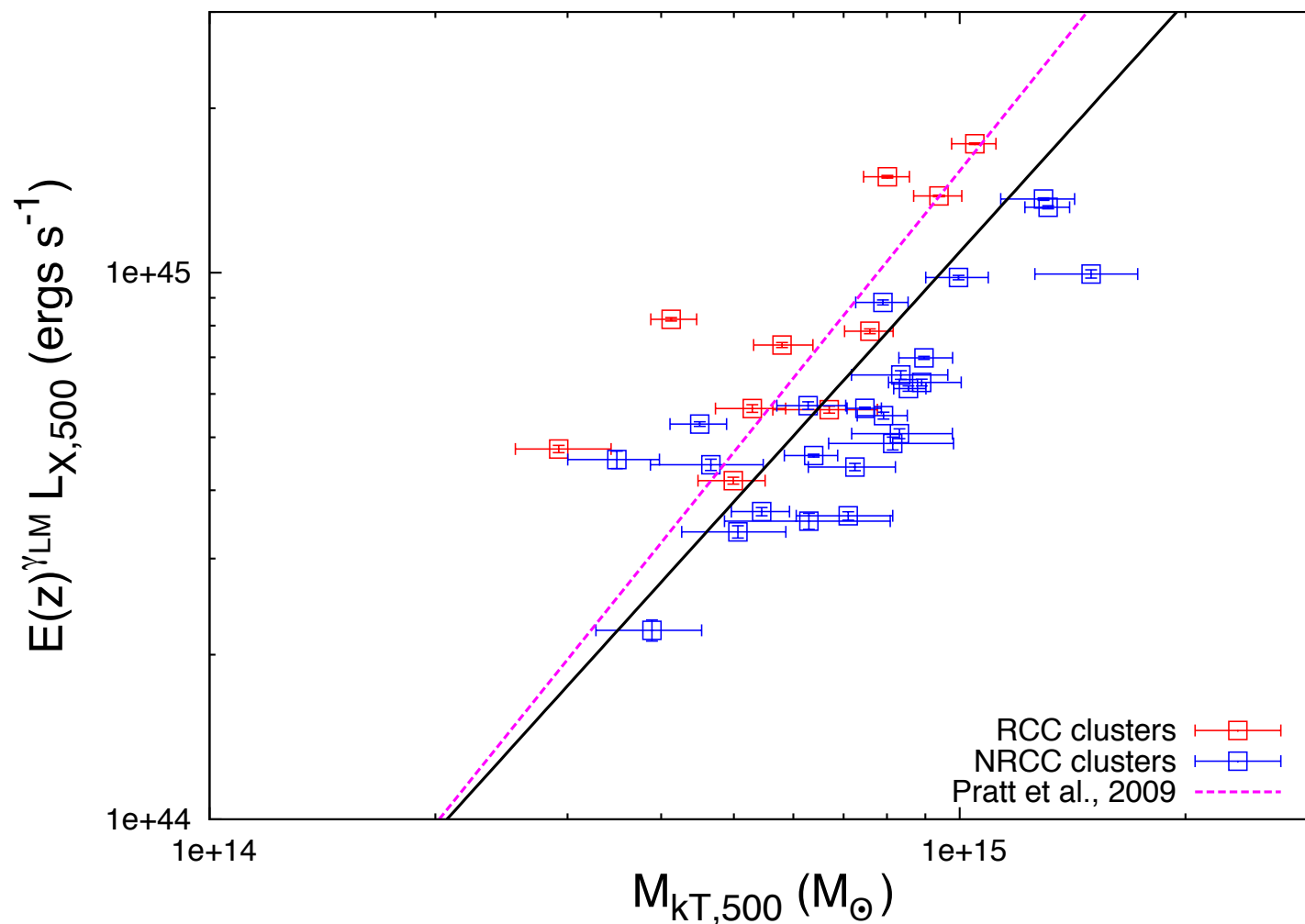


# A quick aside.....



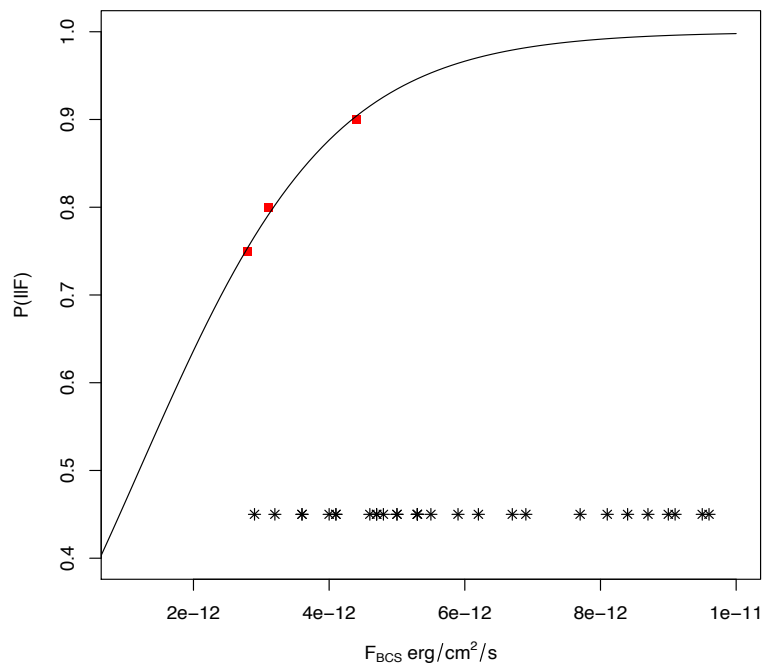


# The Sample LM Relation

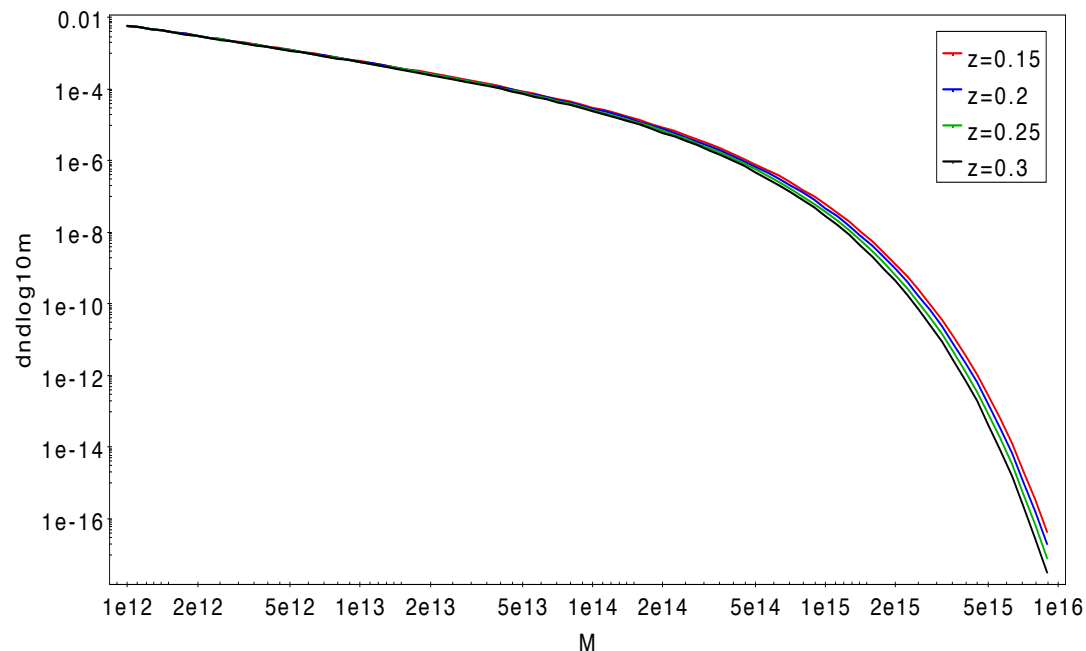


# Modeling Biases using Bayesian Statistics

Selection function



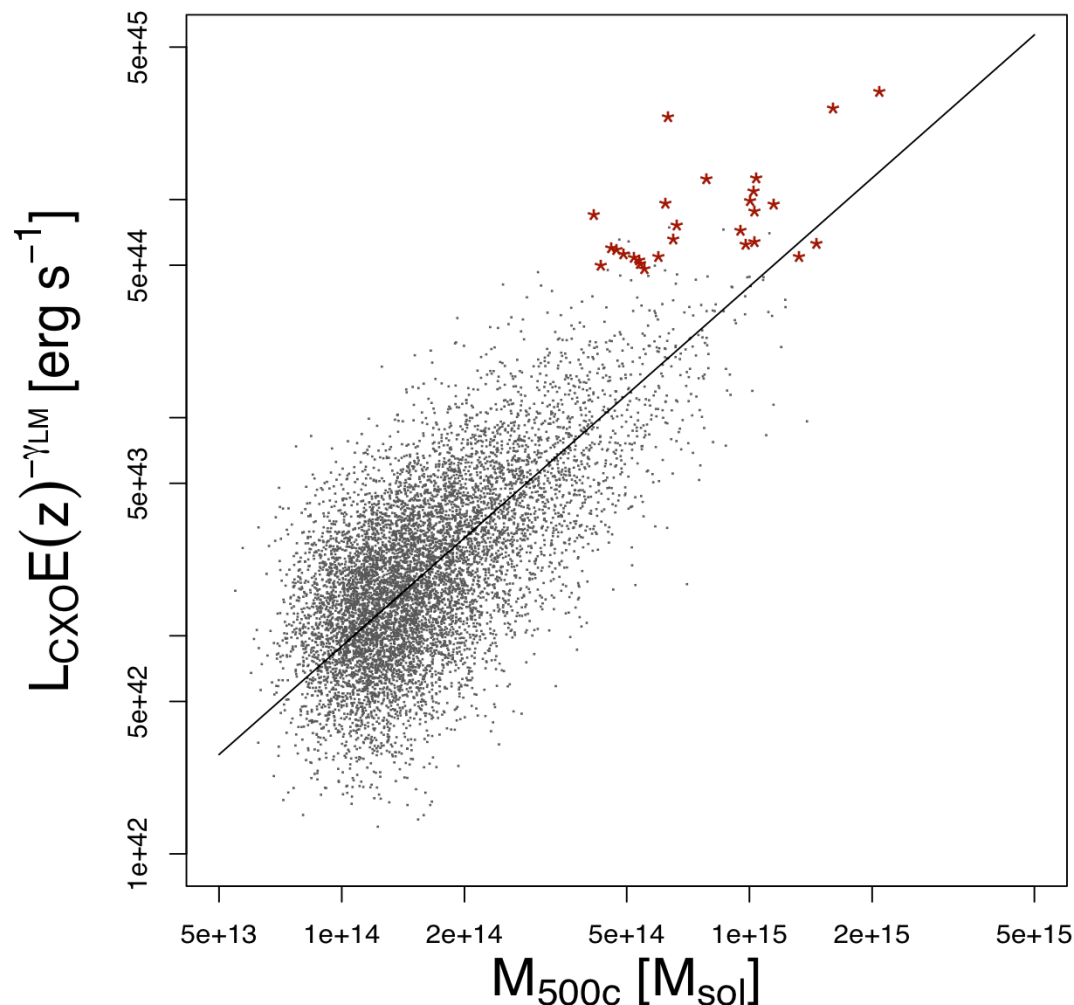
Mass function



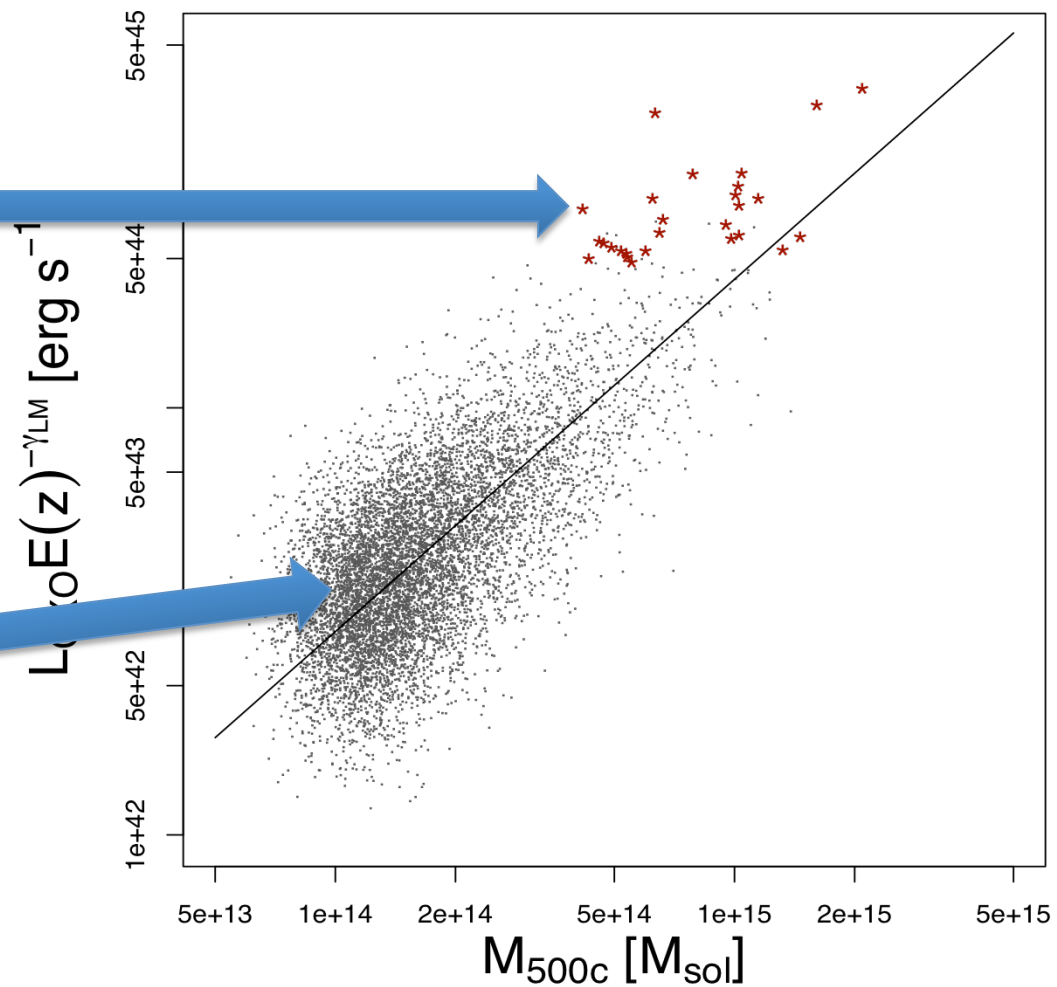
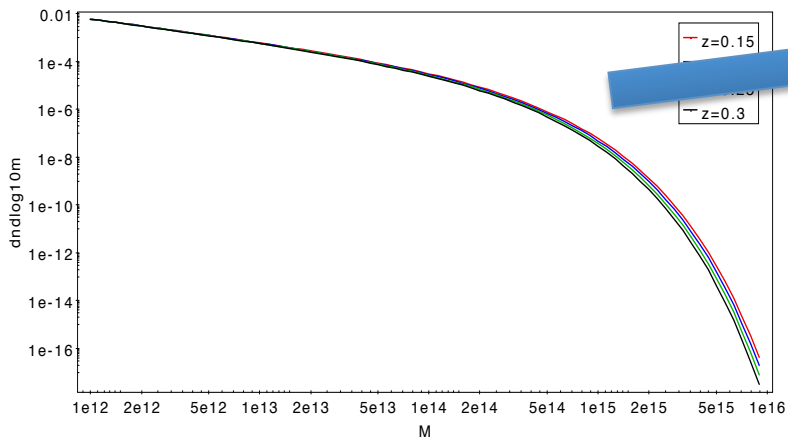
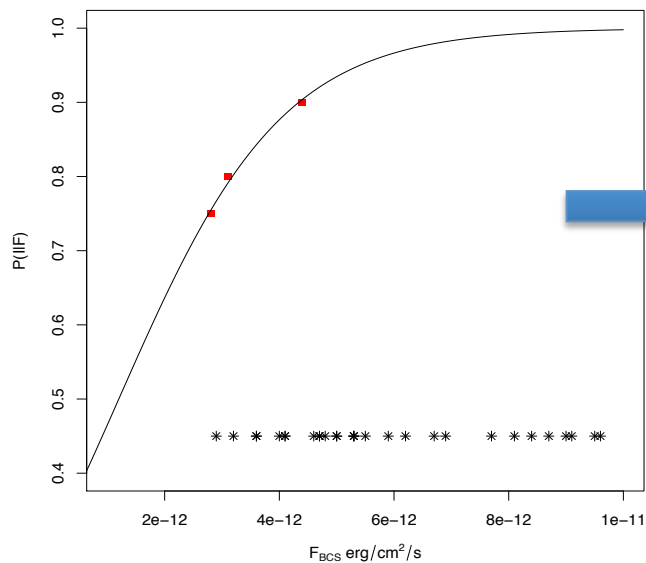
A method based on Mantz et al. 2010

HMFcalc

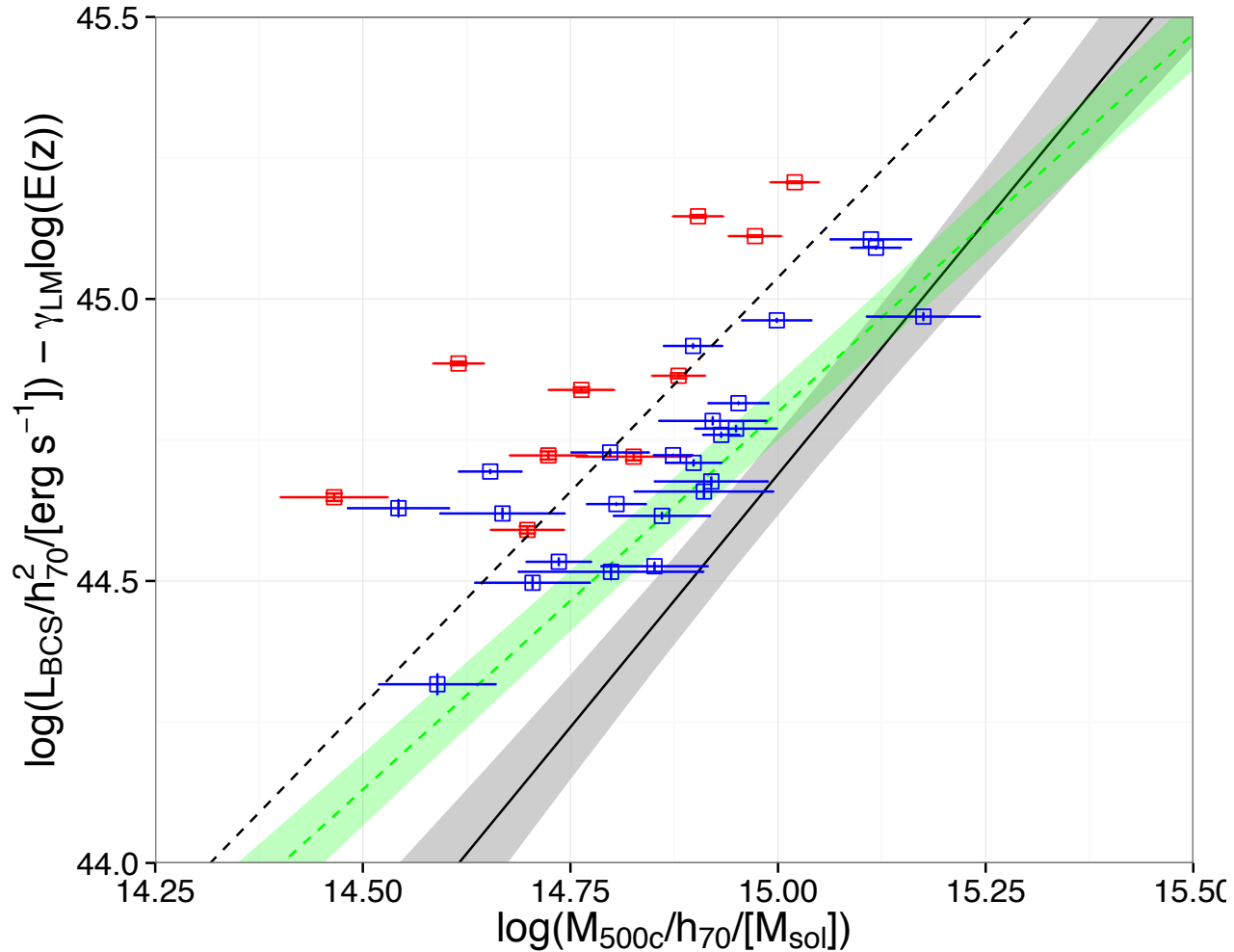
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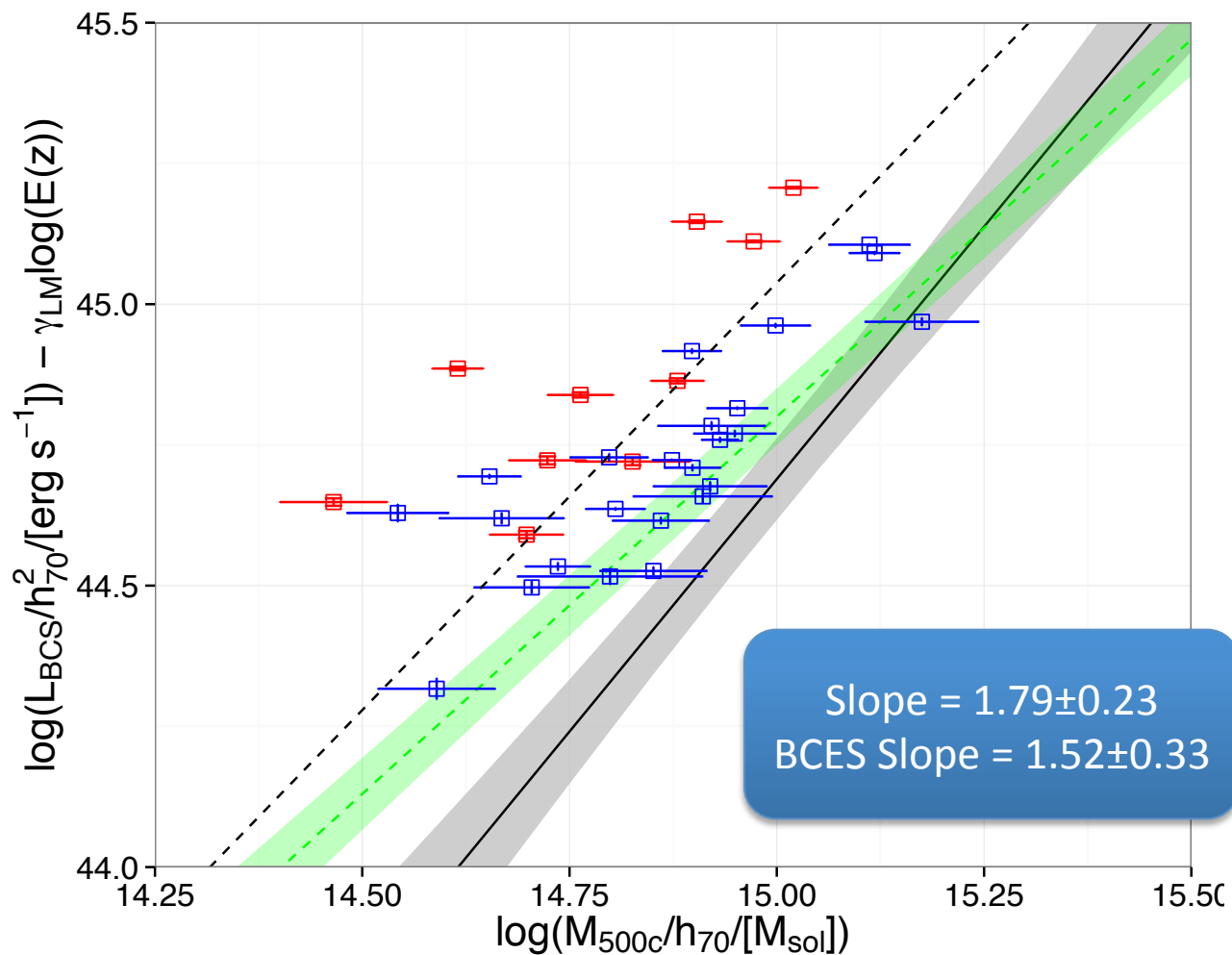
# Modeling Biases using Bayesian Statistics



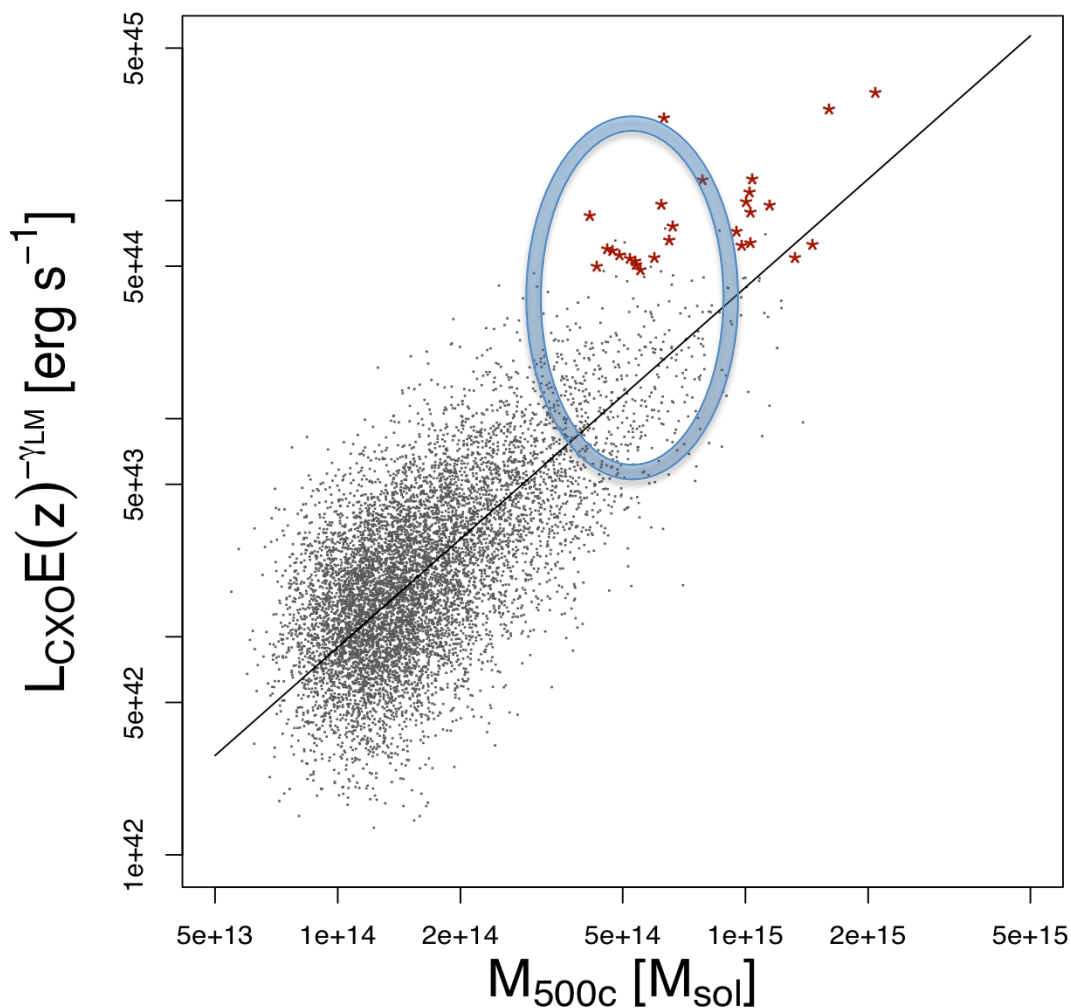
# The Bias-Corrected LM Relation



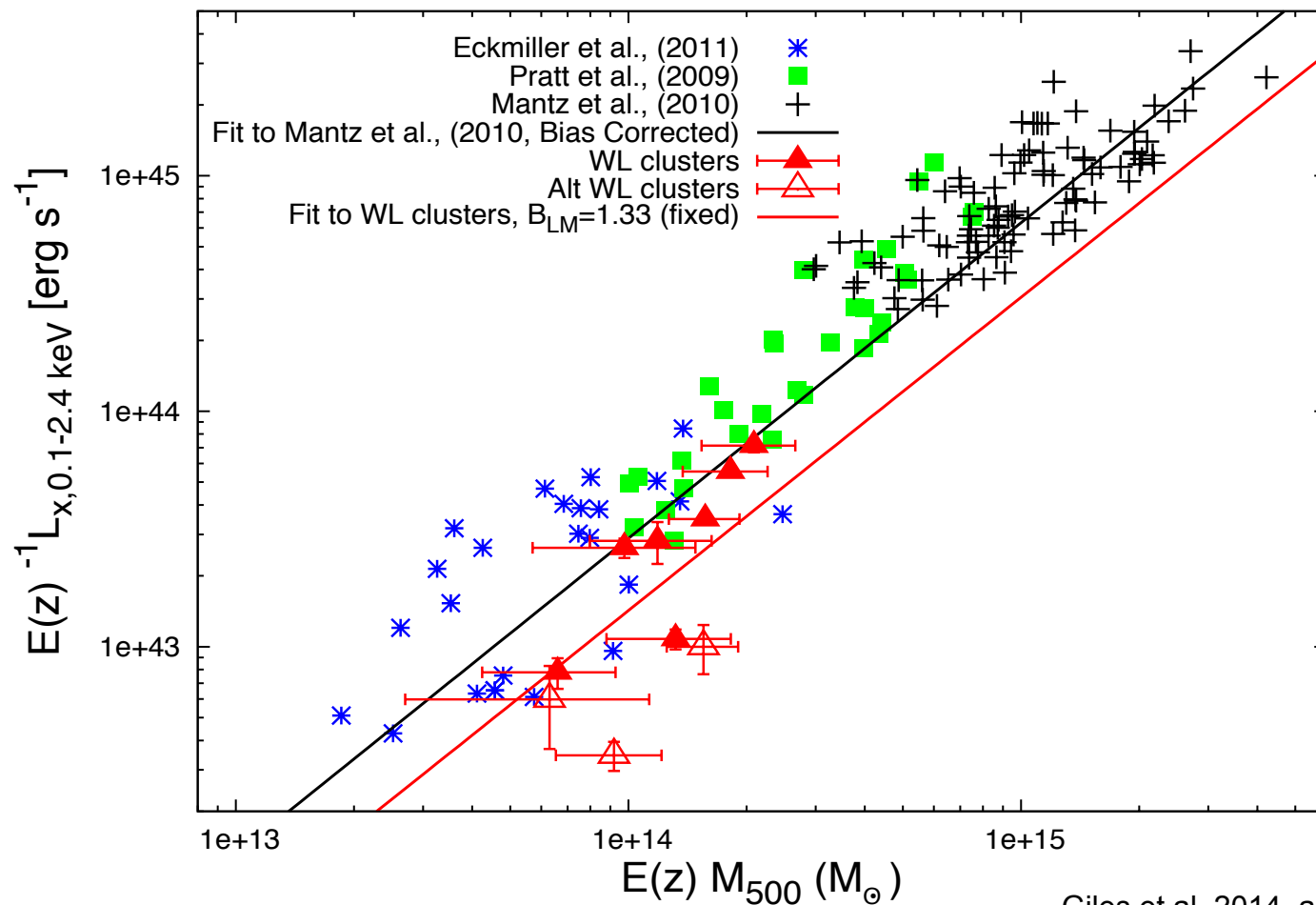
# The Bias-Corrected LM Relation



# Extreme Low-Mass Clusters



# The LM Relation of WL Selected Clusters



Giles et al. 2014, arXiv:1402.4484



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# Summary

- Studied a sample of the most luminous 34 clusters in the (e)BCS
- Separated between RCC (10) and NRCC (24)
- Used the derived MT relation of the RCC sample as a mass proxy
- Used a Bayesian analysis to take into account bias and fit the observed LM relation
- The slope is steeper than SS even for these high mass systems, but bias correction is important (with the caveat that we are looking at an extreme sub-population)