How robustly can we model galaxy clustering?

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Durham University

ICC

SEVENTH FRAMEWORK PROGRAMME

MARIE CURIE ACTIONS

AIUC CENTRO DE ASTRO-INGENIERIA UC

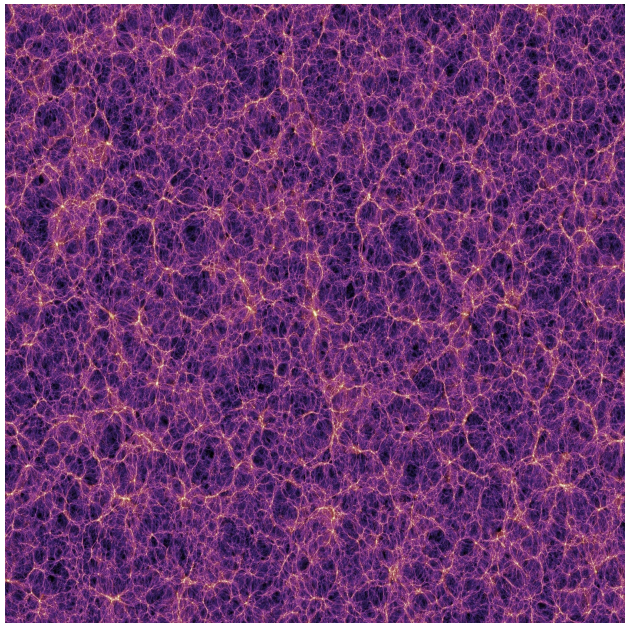
PONTIFICIA UNIVERSIDAD CATOLICA DE CHILE

Outline

- **What is a SAMs? Why comparing SAMs?**
- **How we will compare models**
- **Preparation before comparison**
- **Results**
- **Conclusion**

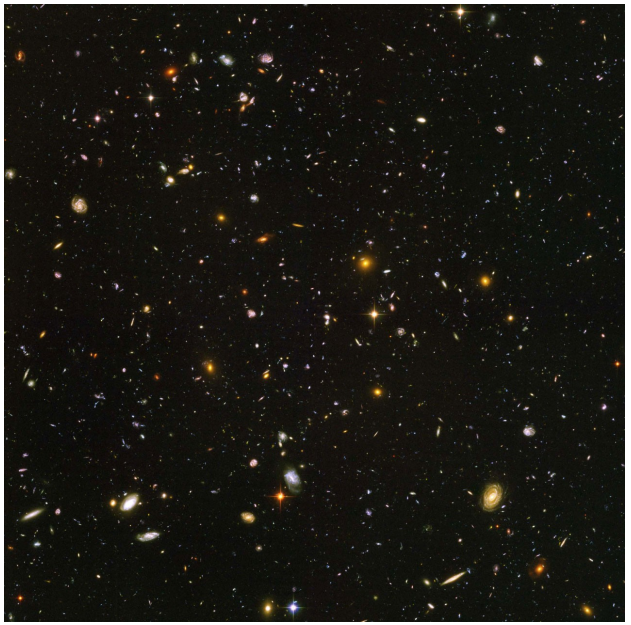
Scientific Motivation

From Dark Matter Particles



SAM

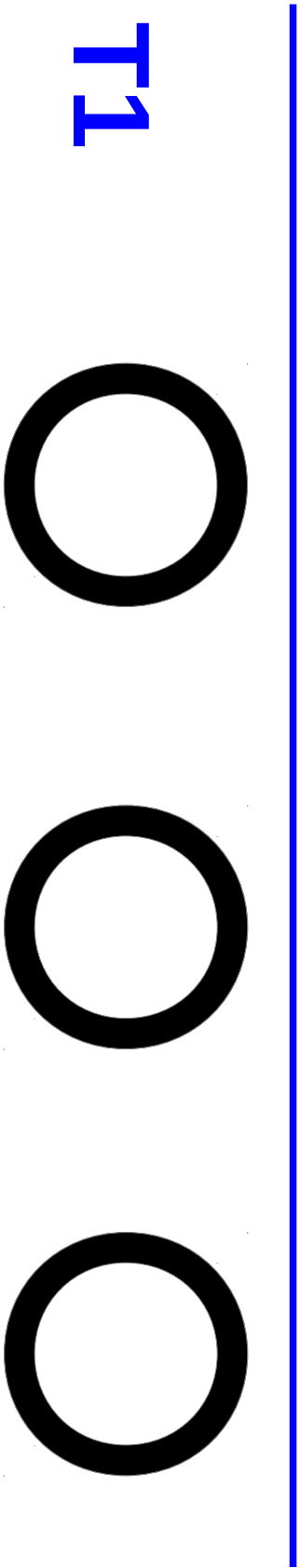
To Galaxies



Virgo - Millennium Database

German Astrophysical GAVO Virtual Observatory

What is a Semi-Analitic Model?



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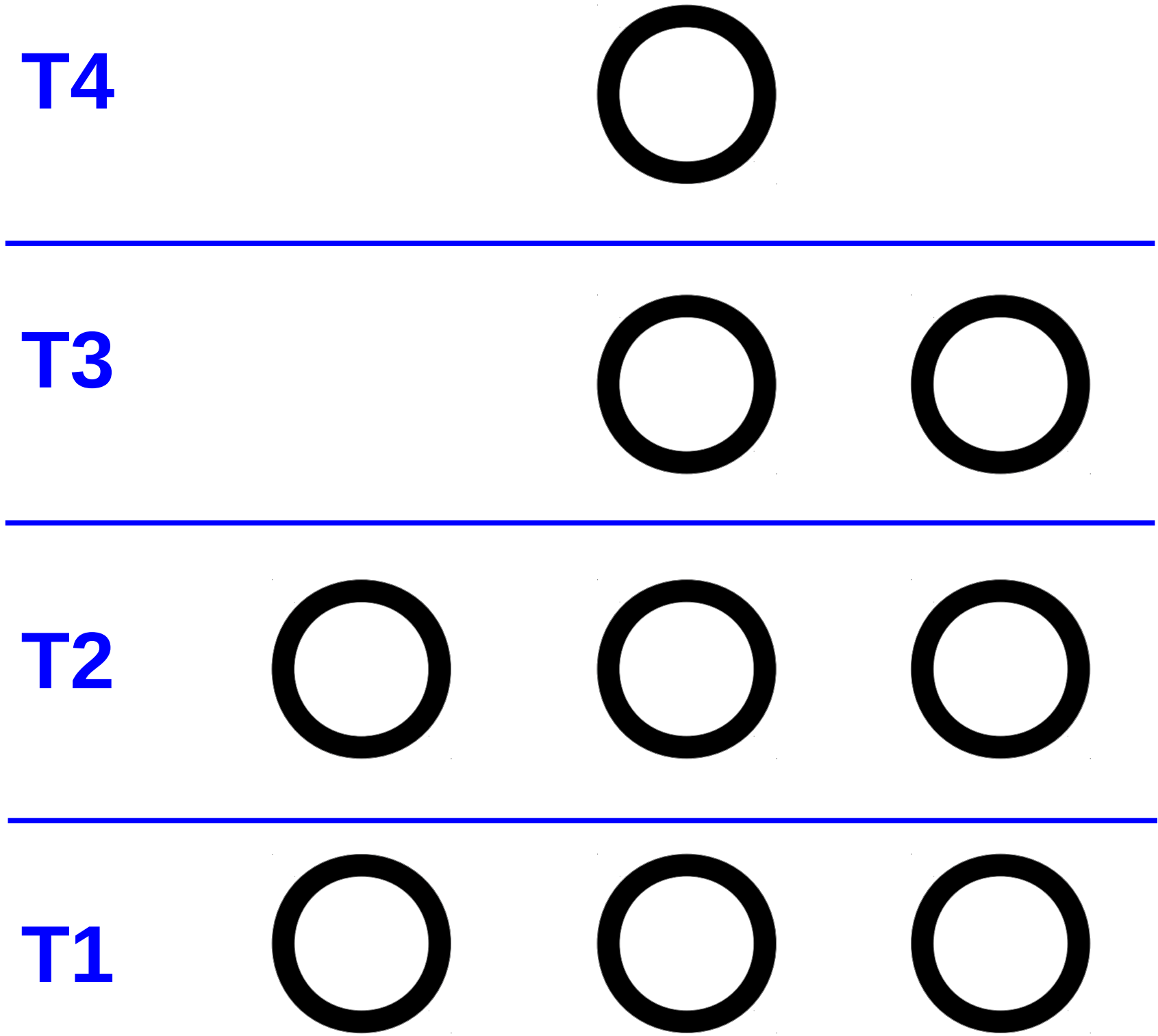

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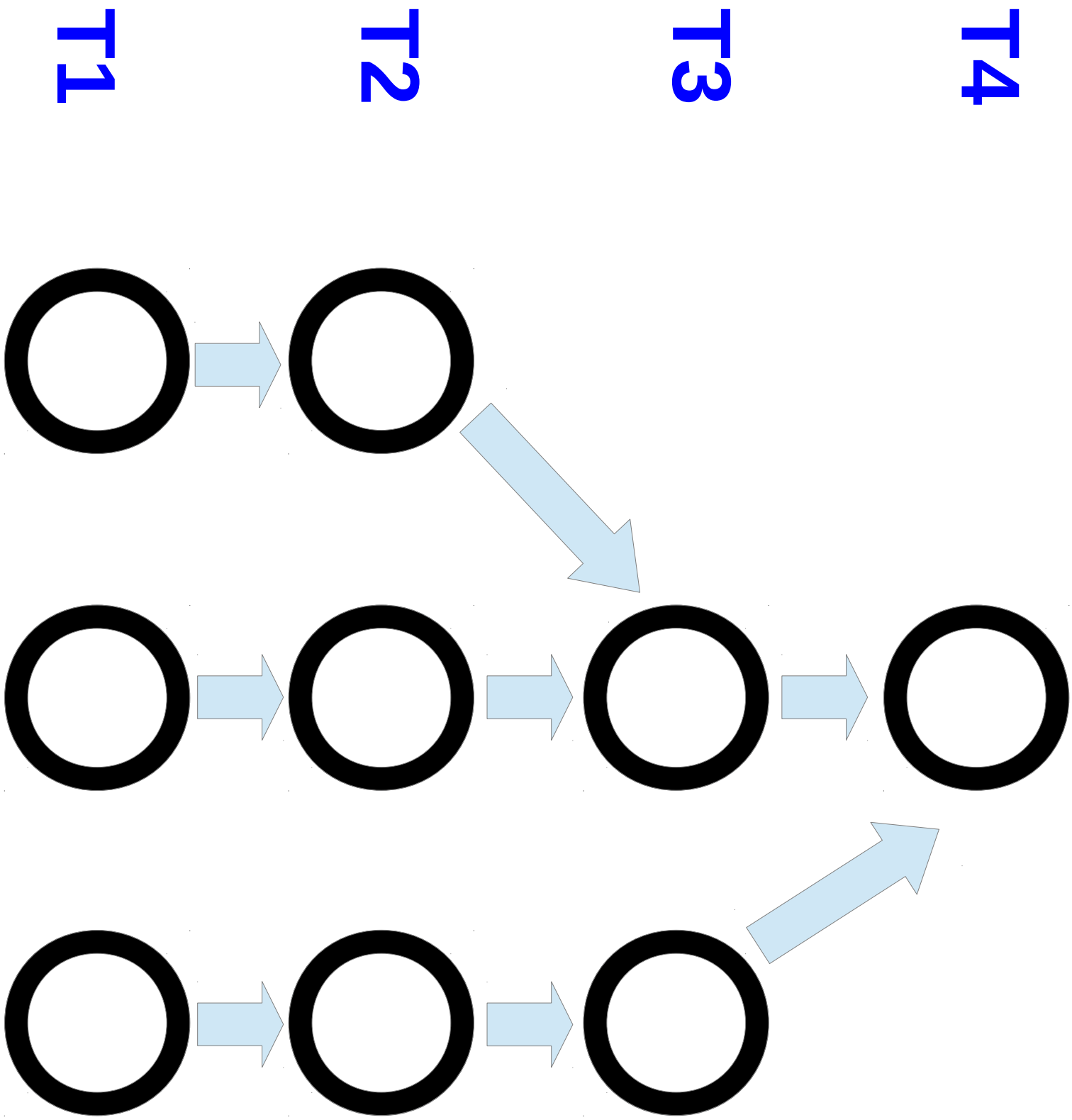
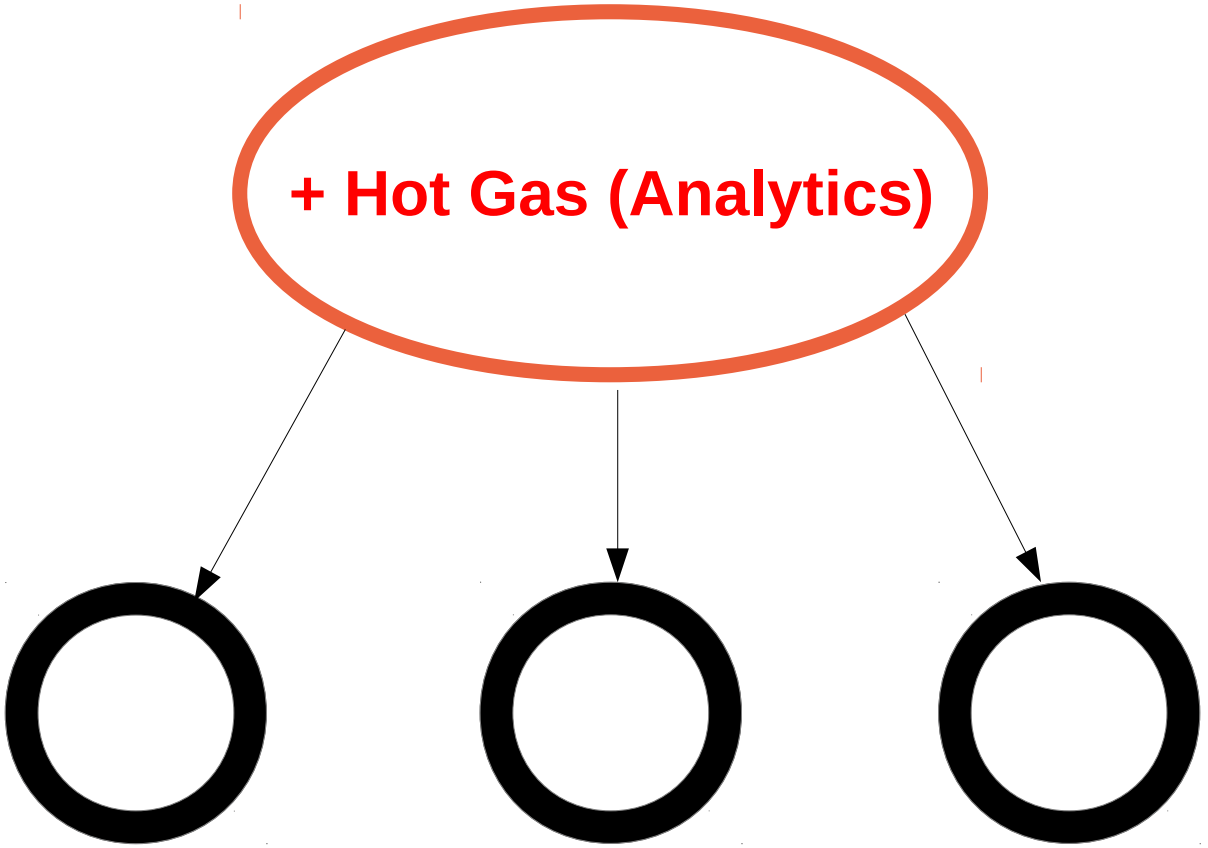


What is a Semi-Analitic Model?

T1



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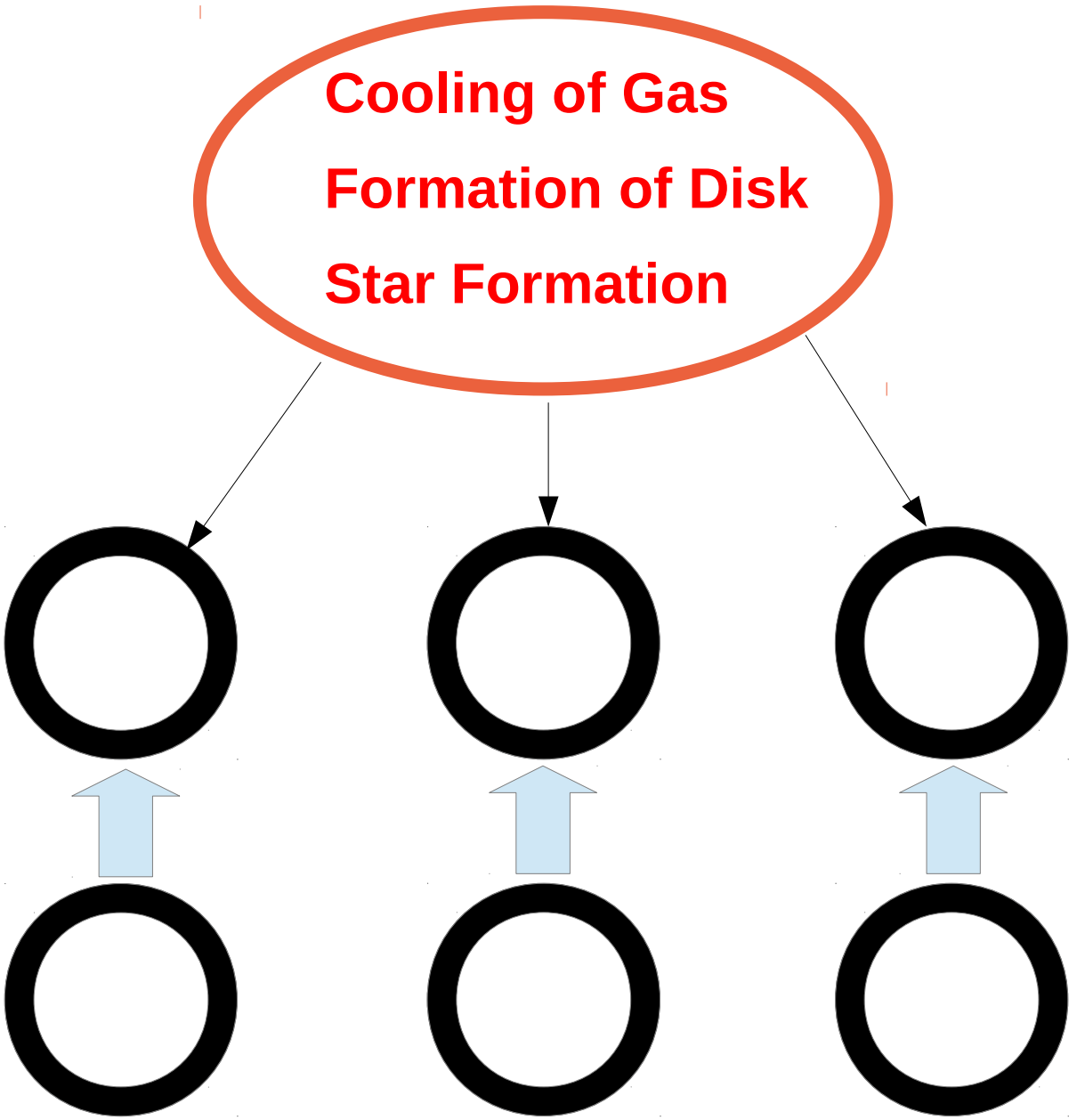
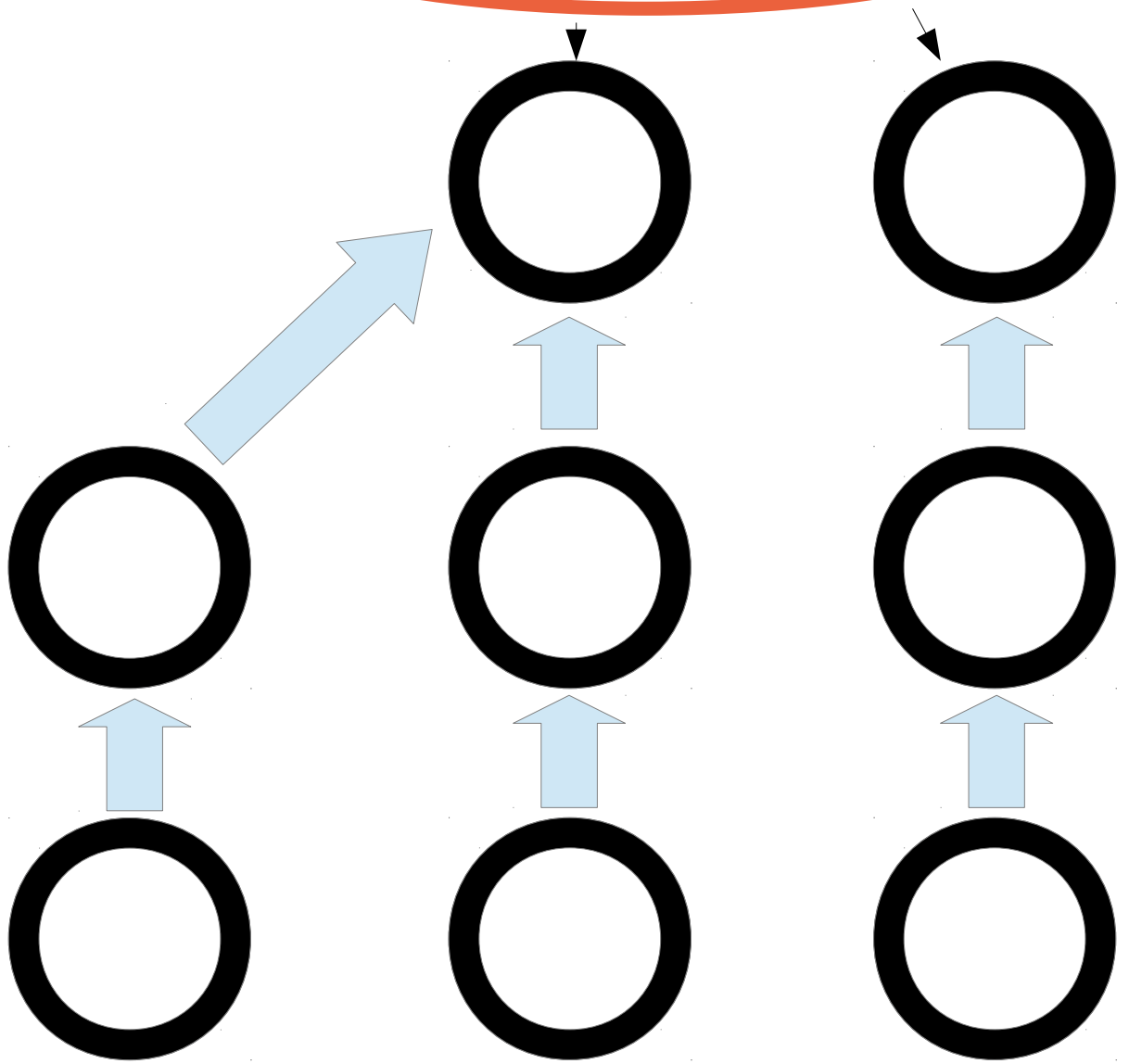


What is a Semi-Analitic Model?

Galaxy merger **Starburst**

Disk instability **SMBH creation**

Bulge formation **SN Feedback**



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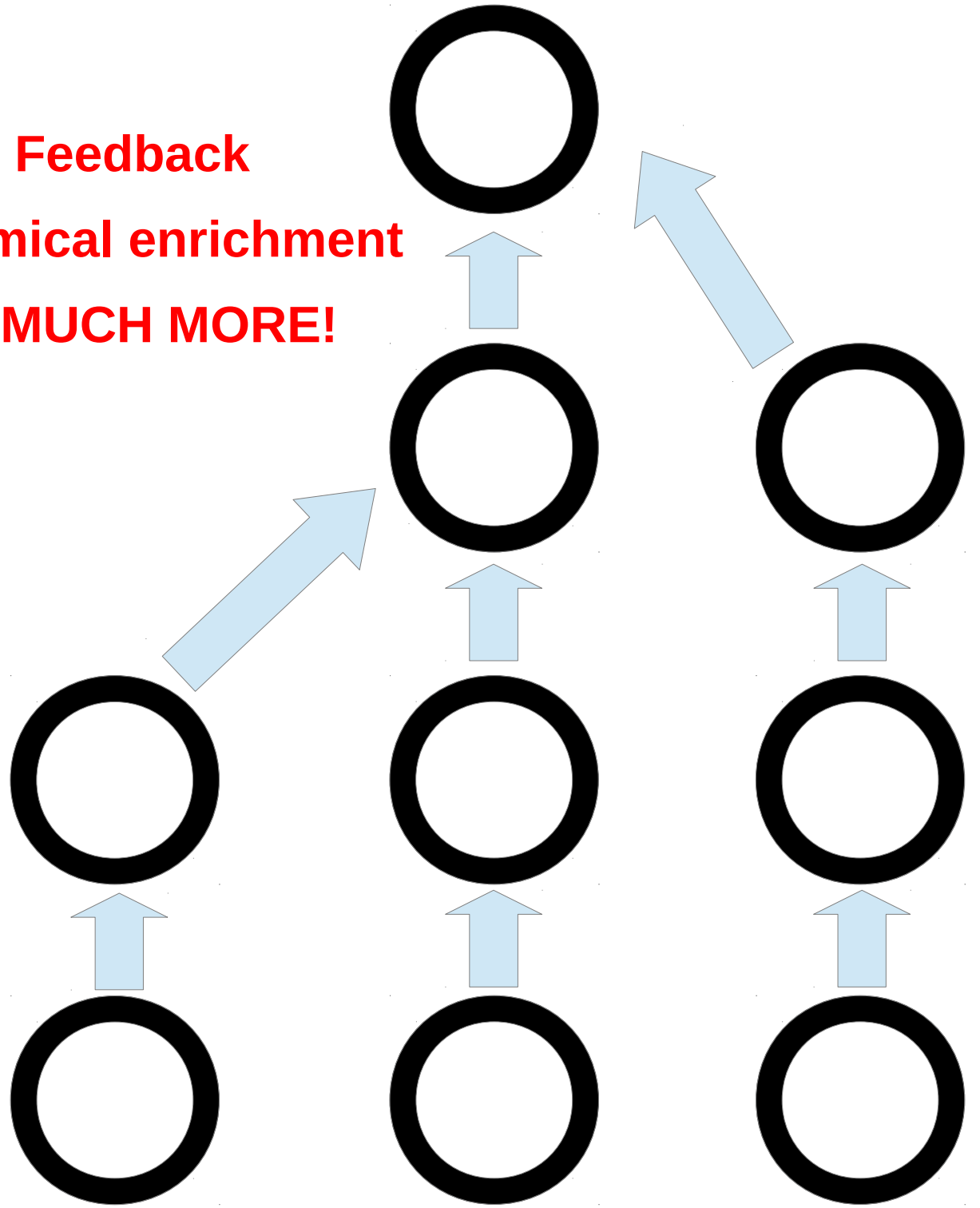

How SAMs are tested ?

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Light cones

Luminosity Function

Stellar mass function

Morfology

Evolution of star formation rate

How SAMs are tested ?

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Luminosity Function

Colour-Magnitude distribution

Stellar mass function

Halo Mass Function

Bulge-Blackhole relation

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How SAMs are tested ?

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SHAM

Tully Fisher

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HOD

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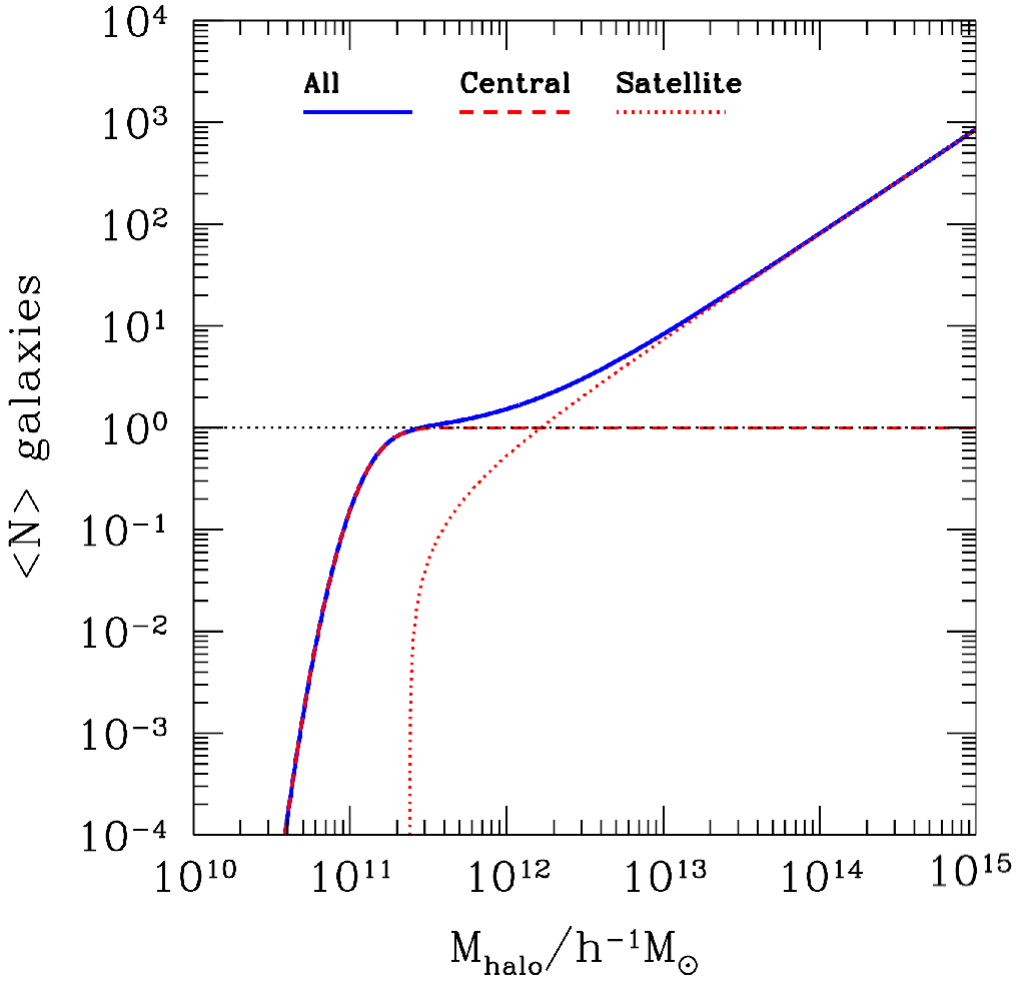
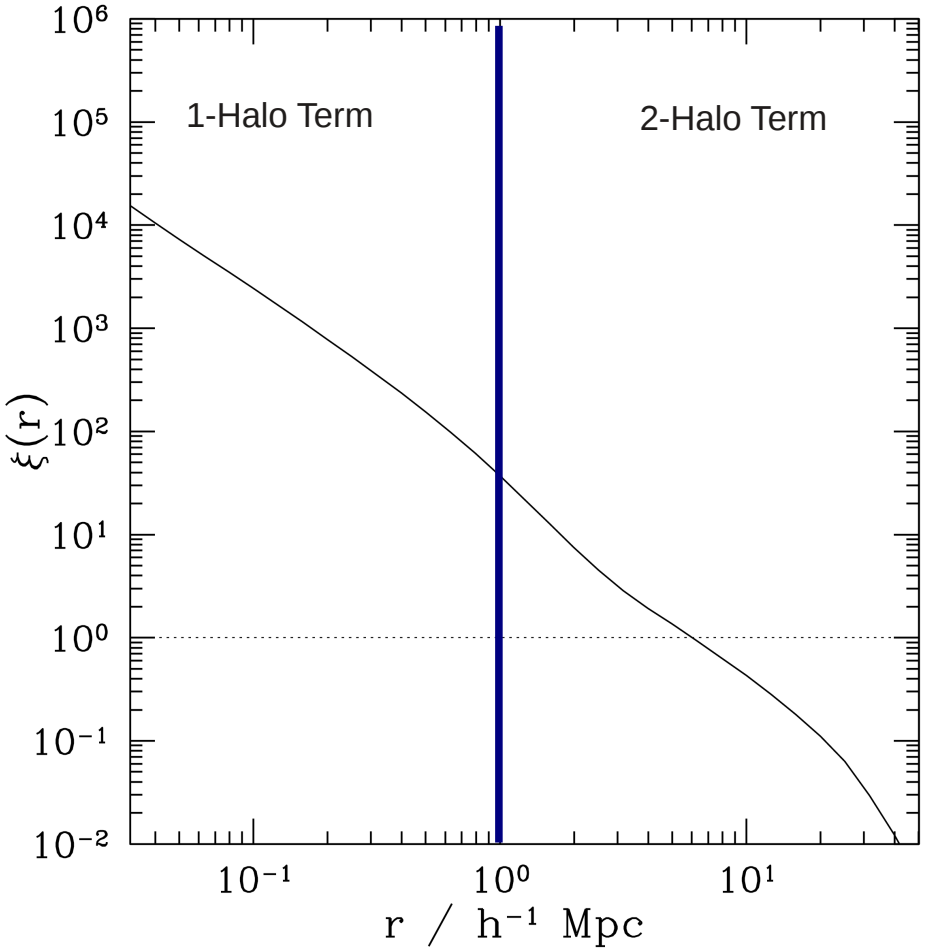
Evolution of star formation rate

How we will compare SAMs?

The HOD and the Correlation Function

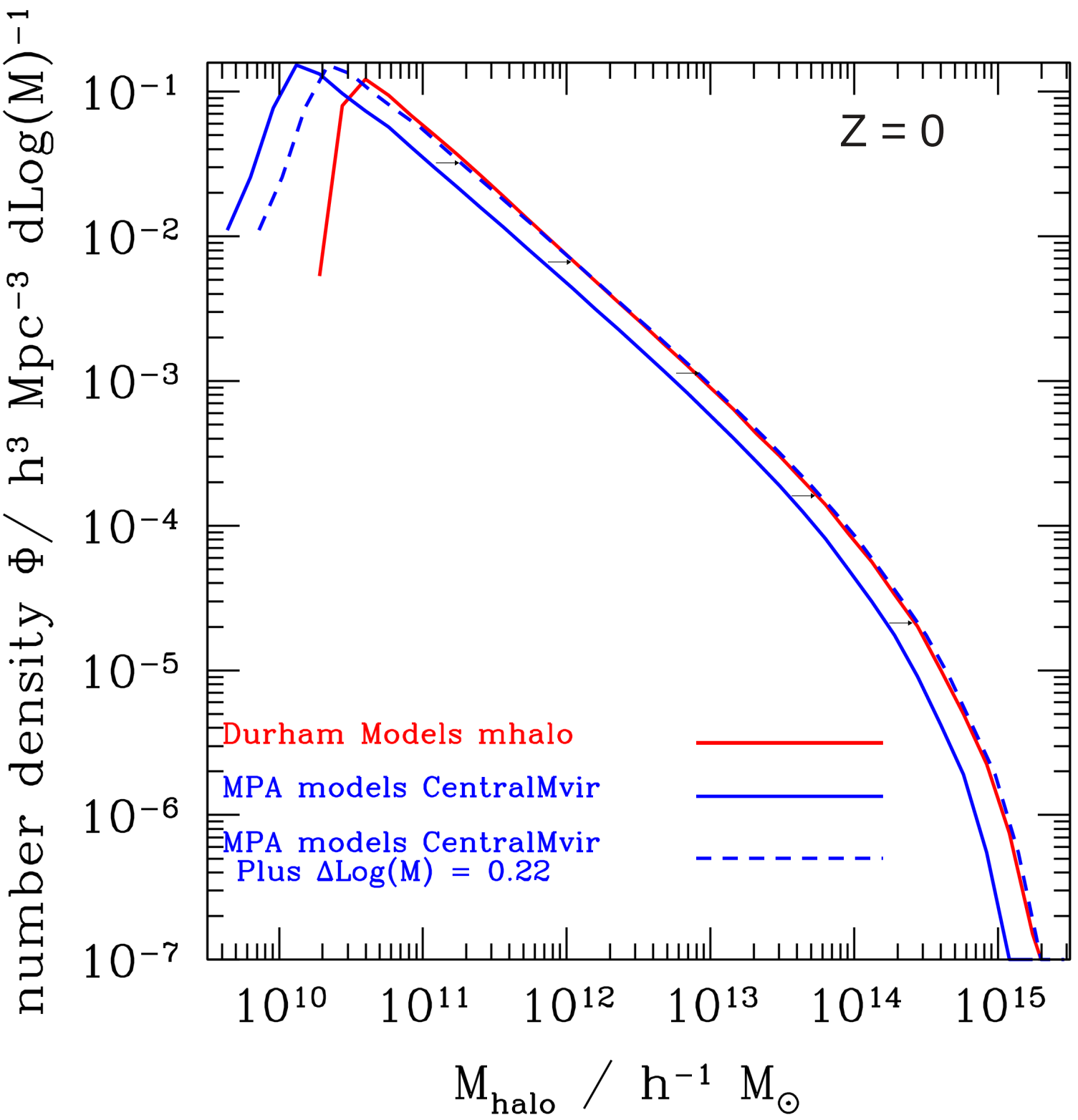




Preparations before comparison :

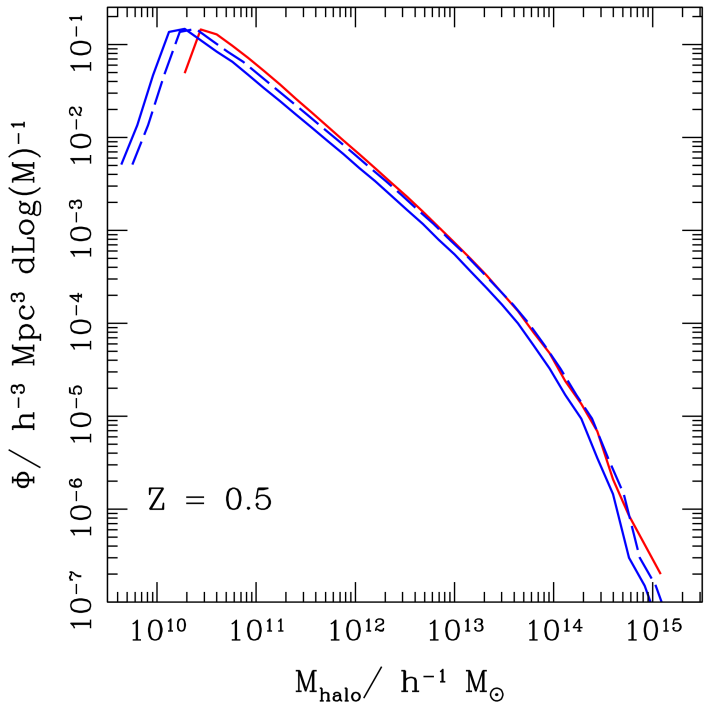
- The Halo Mass Function
- The number of galaxies in the samples
- The merger tree

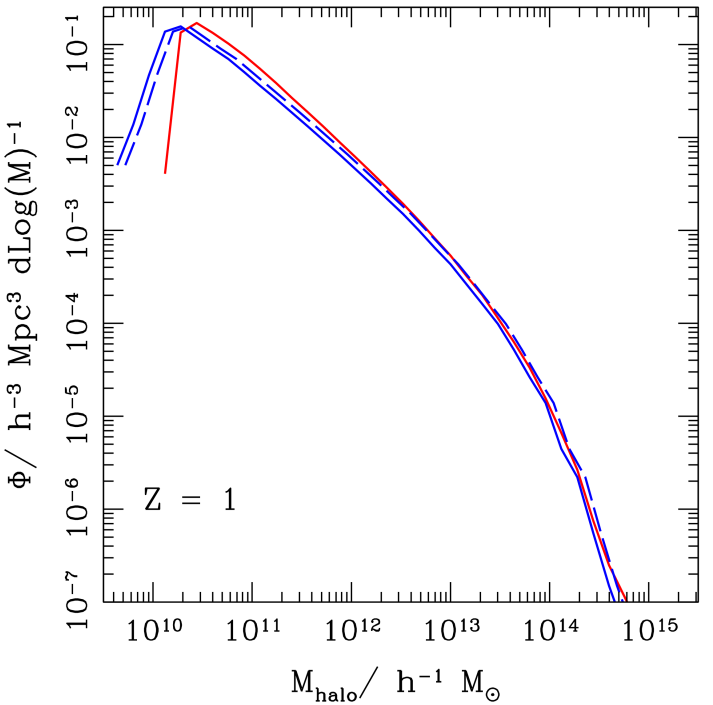
Halo Mass Function

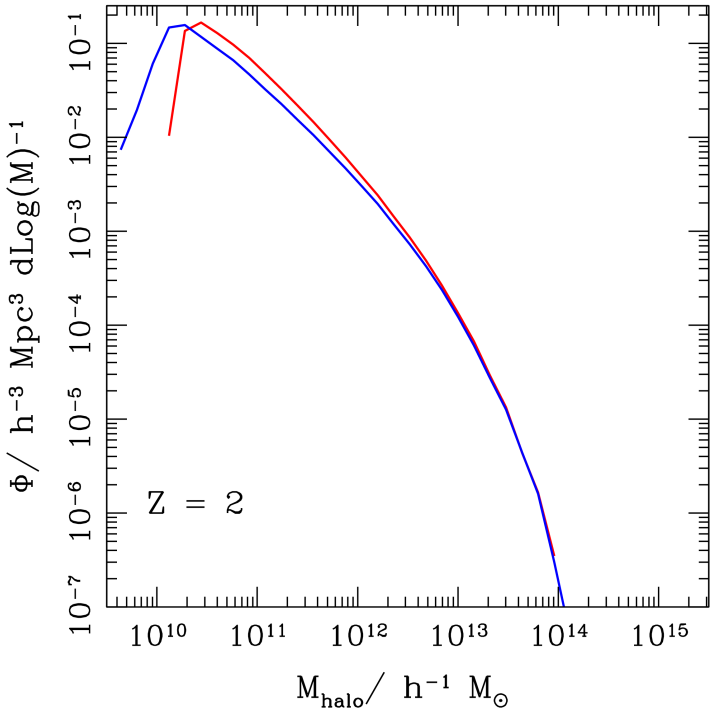


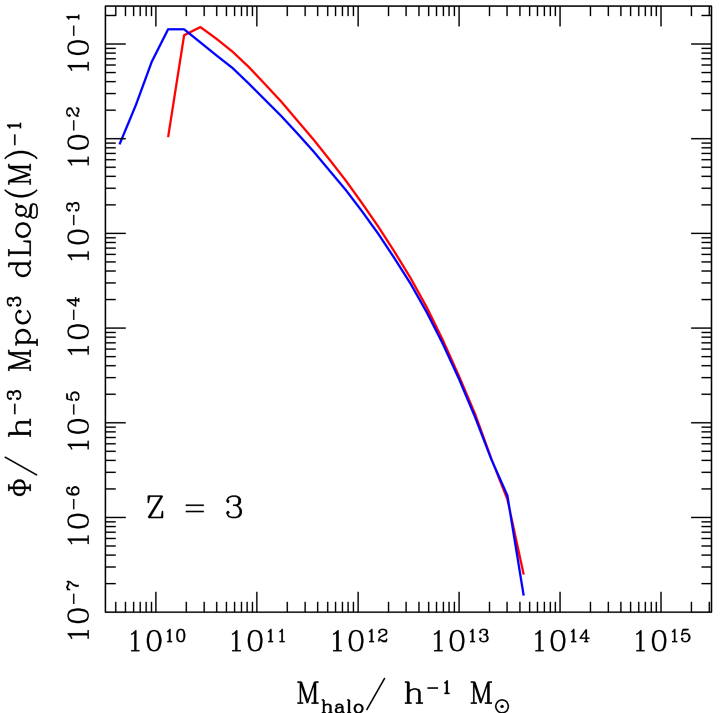
And for other redshift?

Halo Mass Function

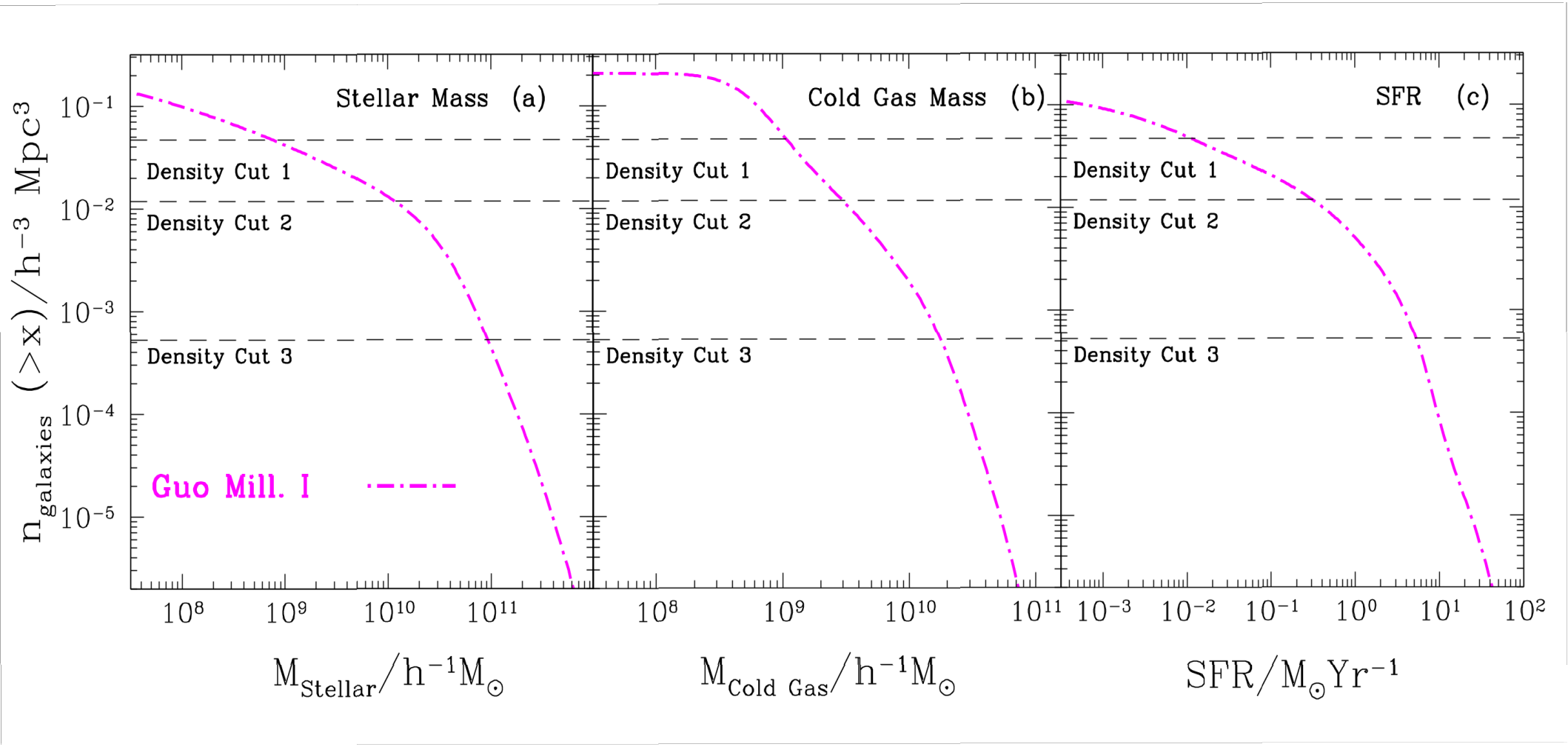




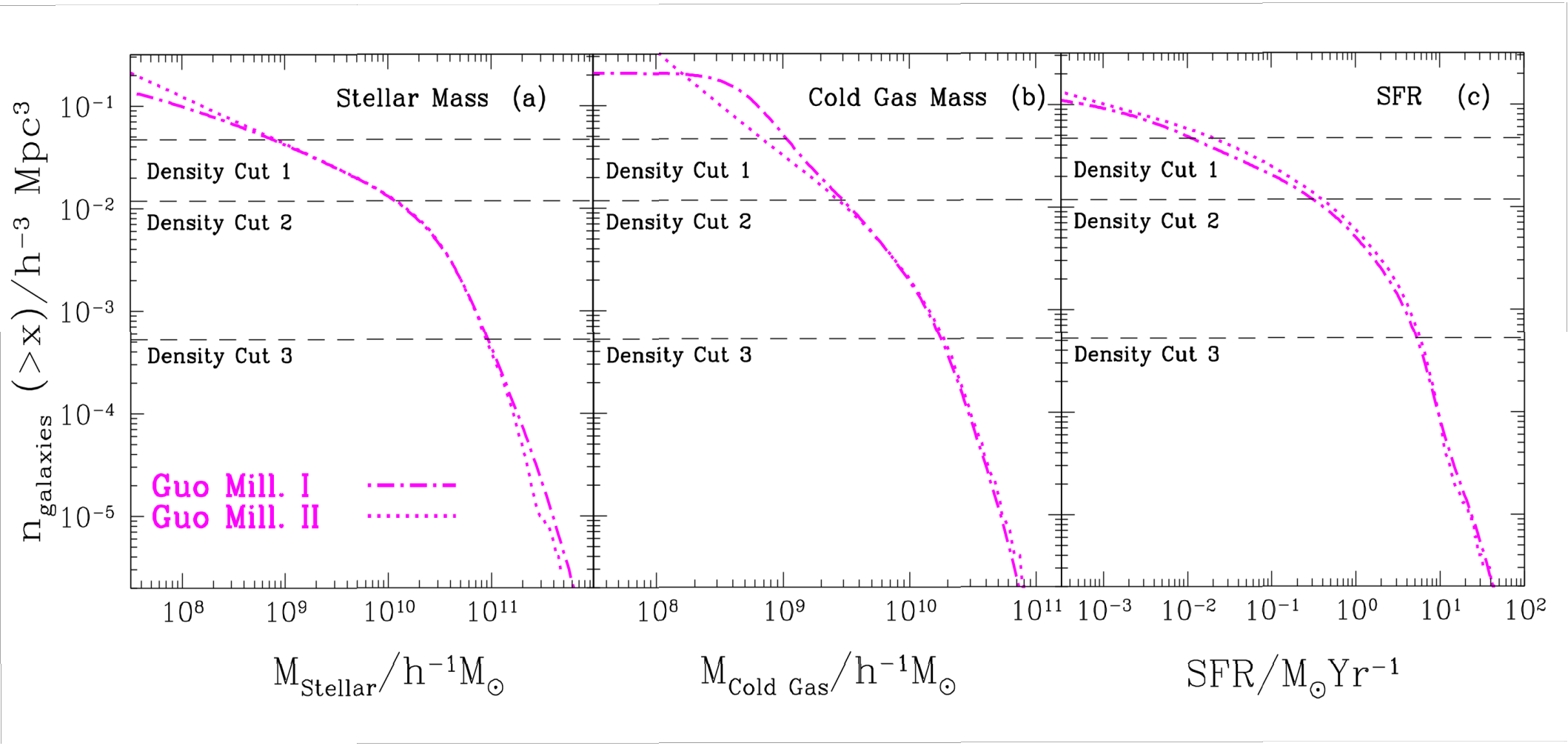




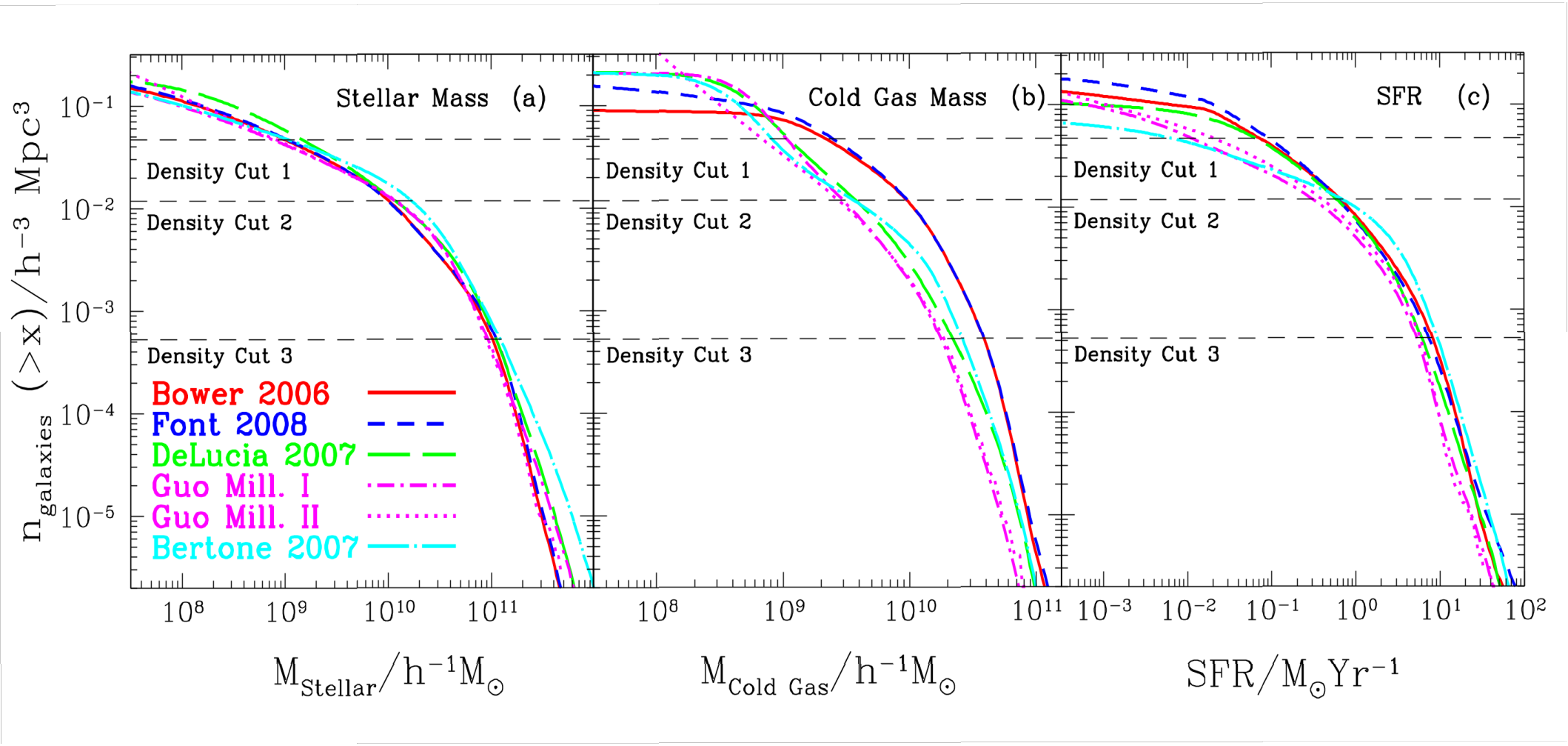
Galaxy Samples



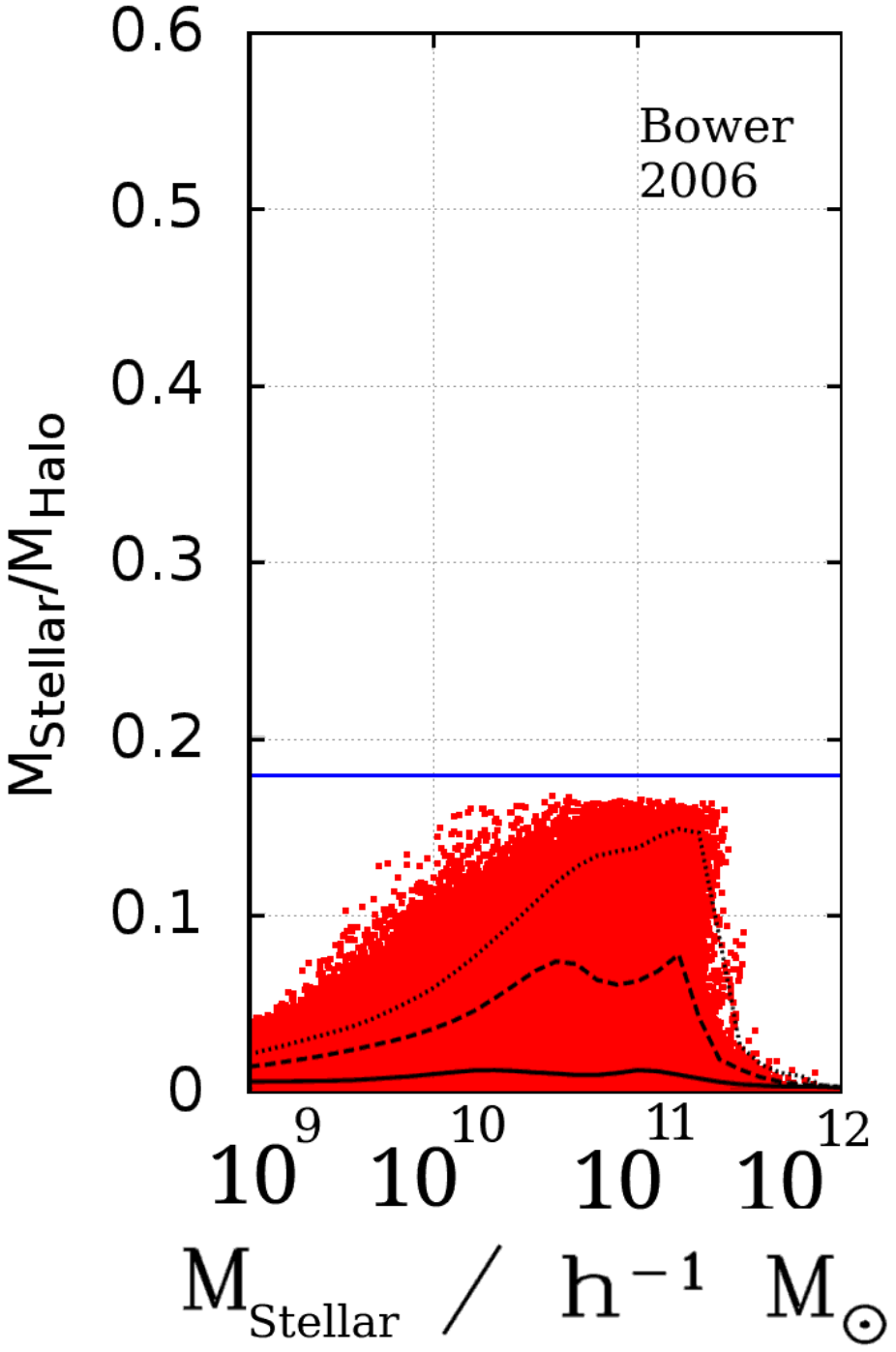
Prediction Completeness



Number of galaxies



Stellar Mass-Halo Mass Relation



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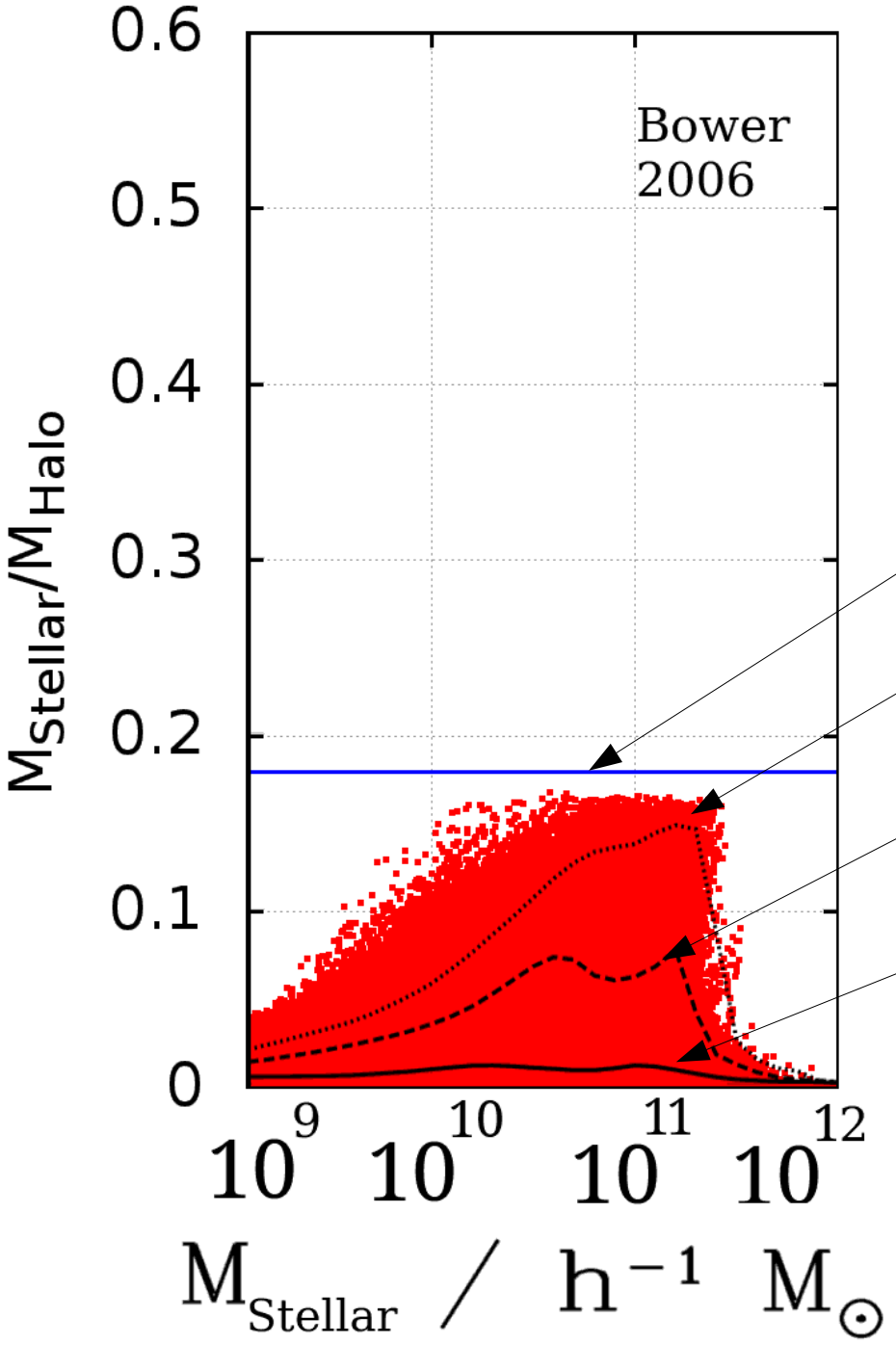


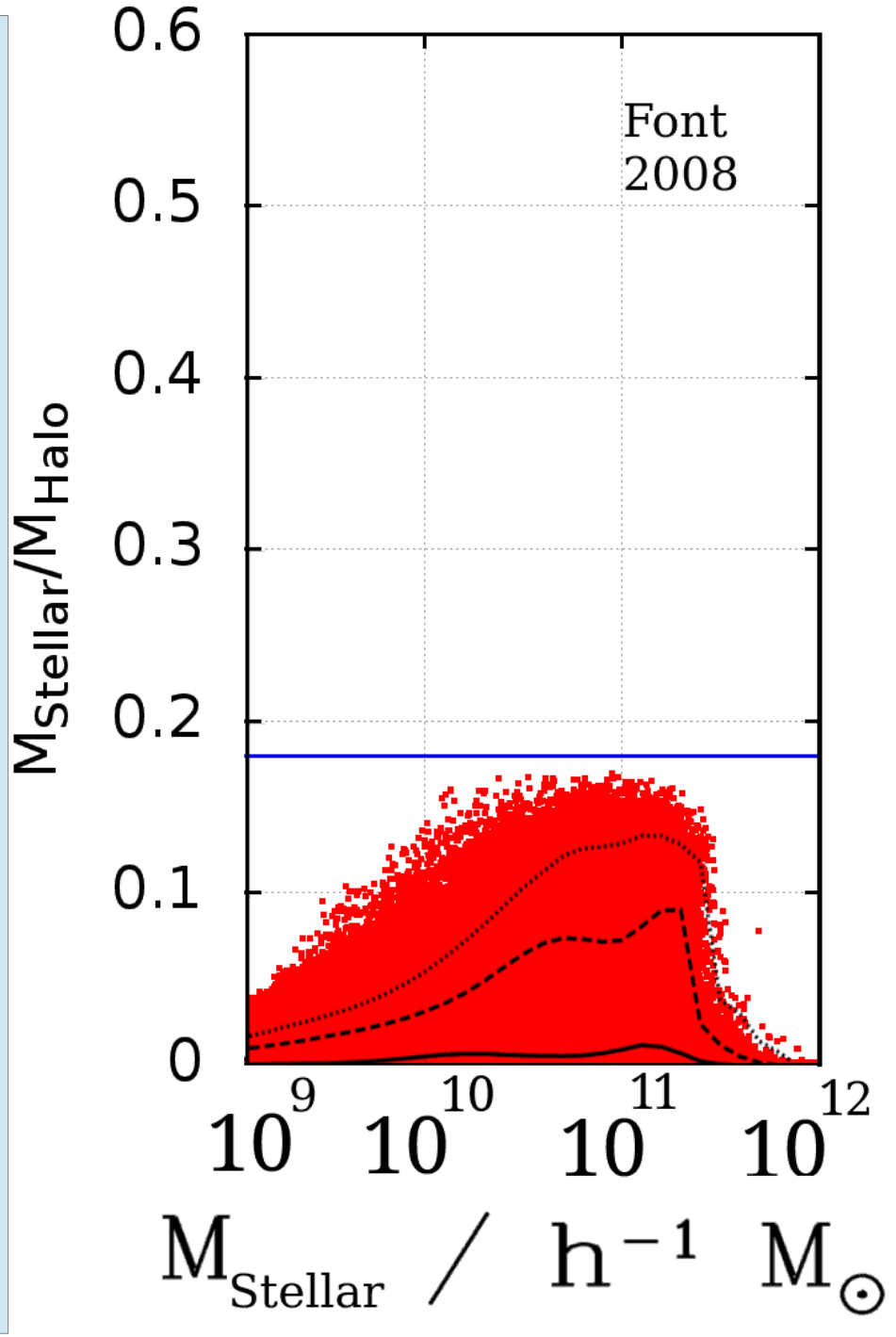
Baryon Fraction

99% Distribution

90% Distribution

50% Distribution

Stellar Mass-Halo Mass Relation



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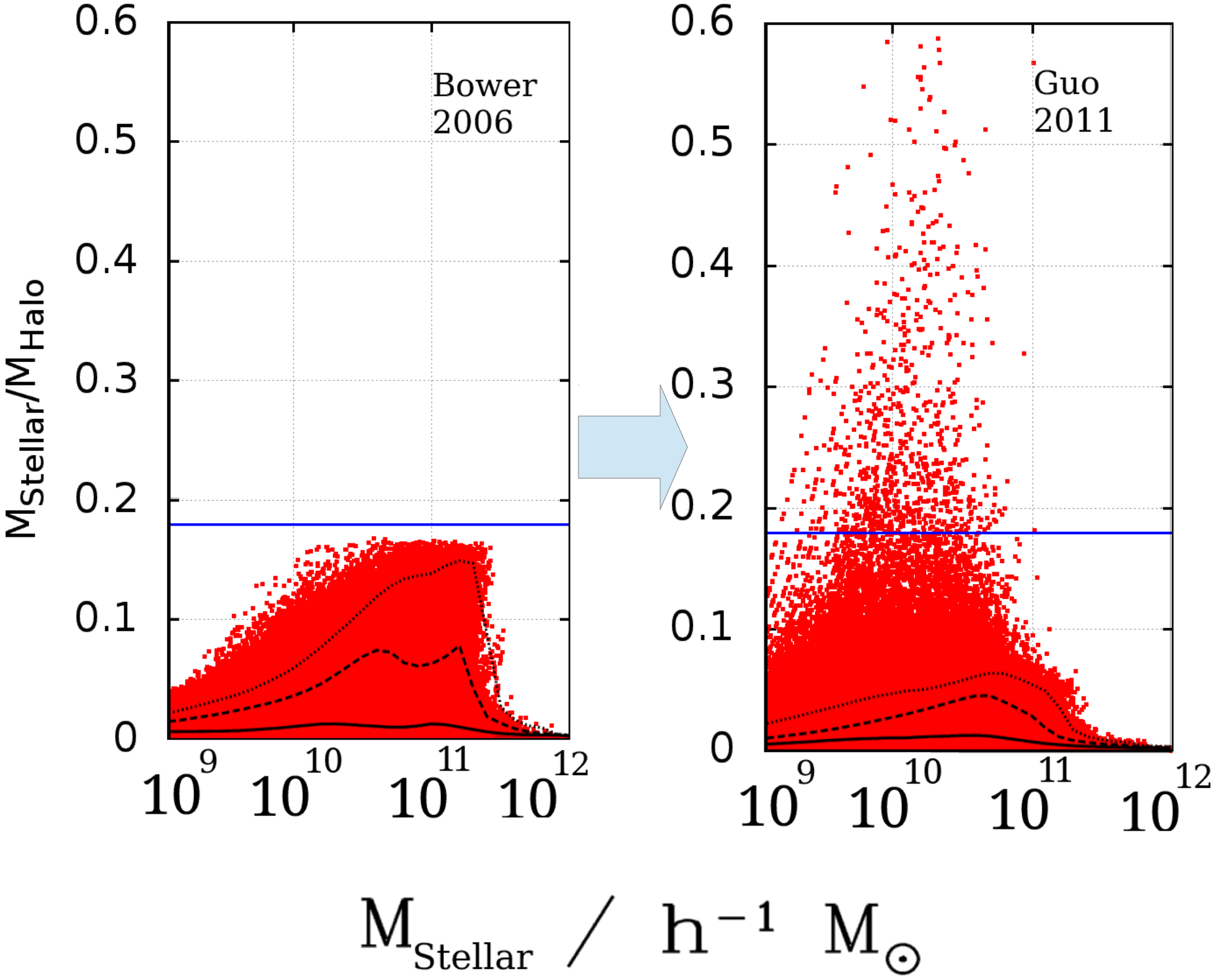

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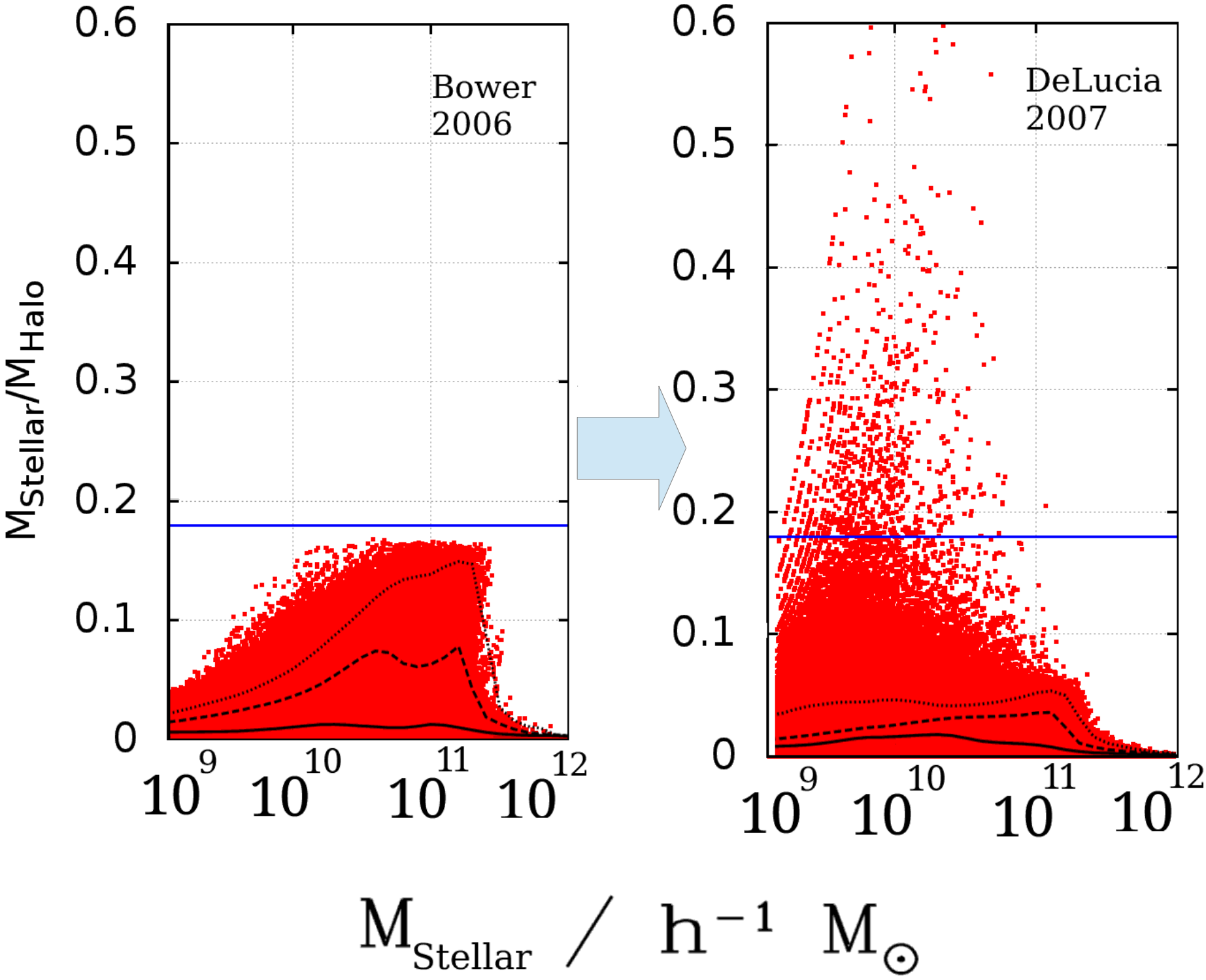

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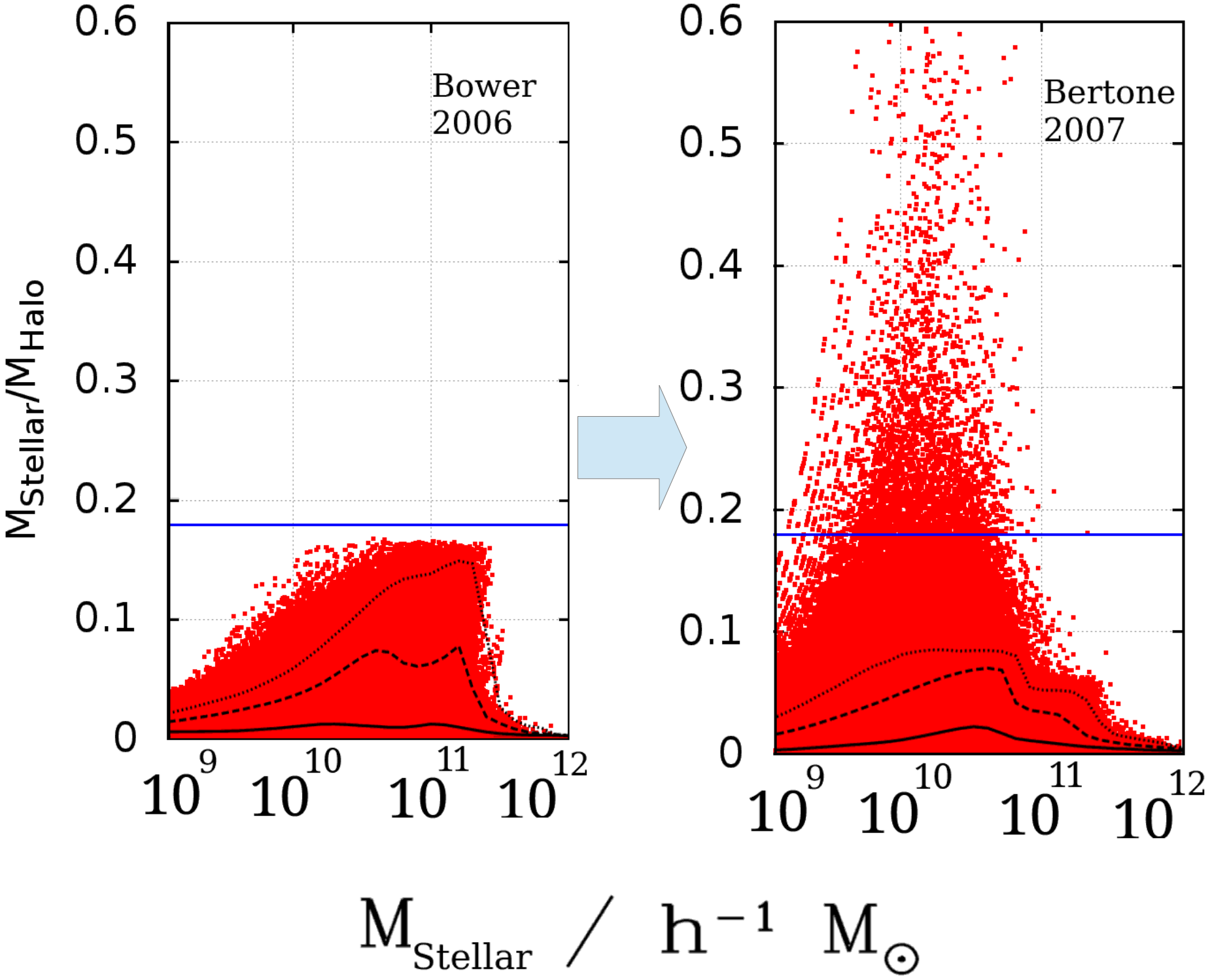
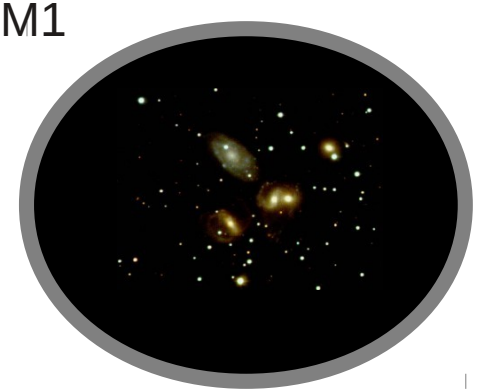
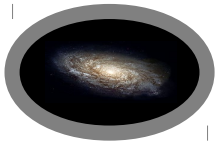


Merger Tree Comparison

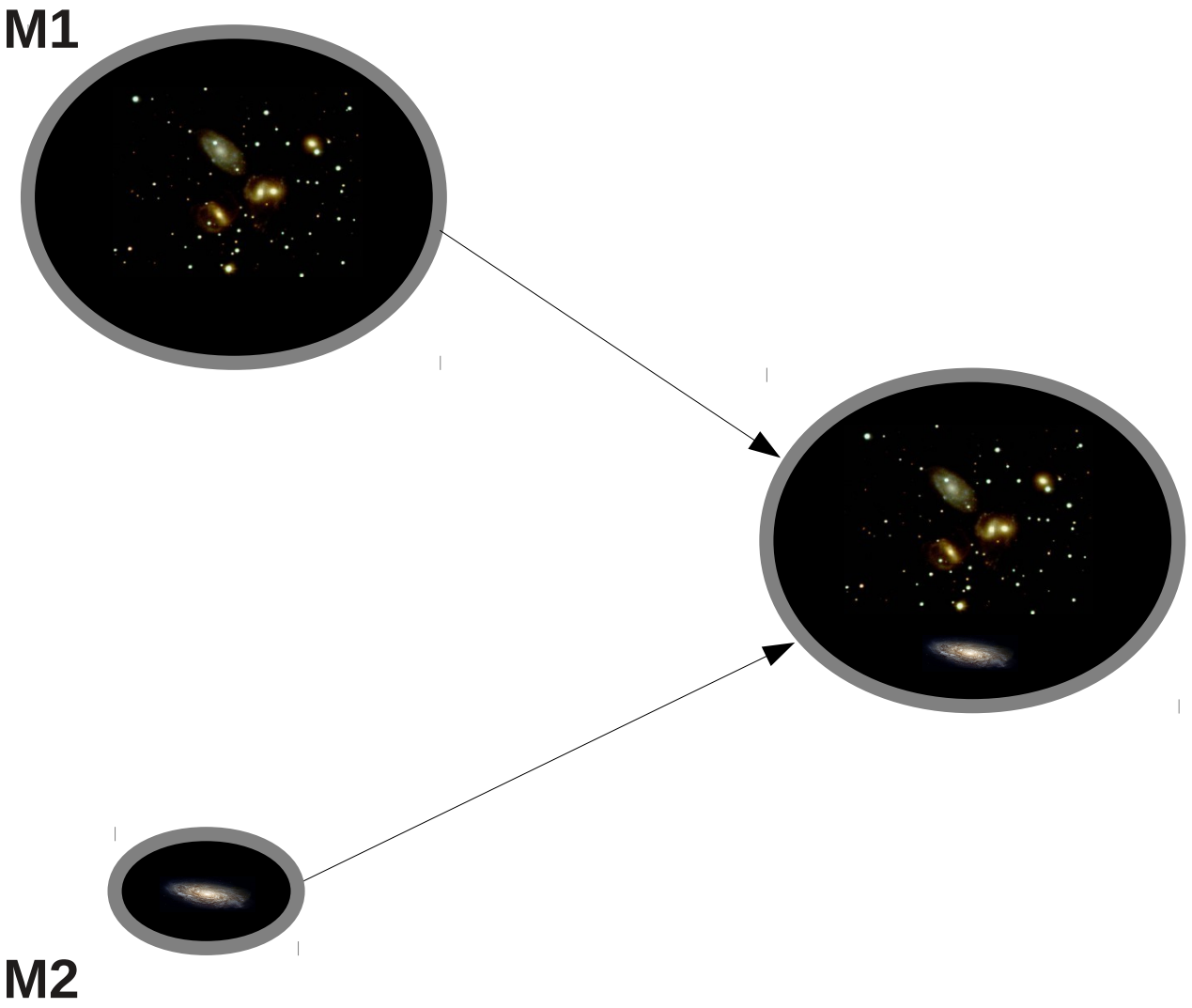
M1





M2

Merger Tree Comparison



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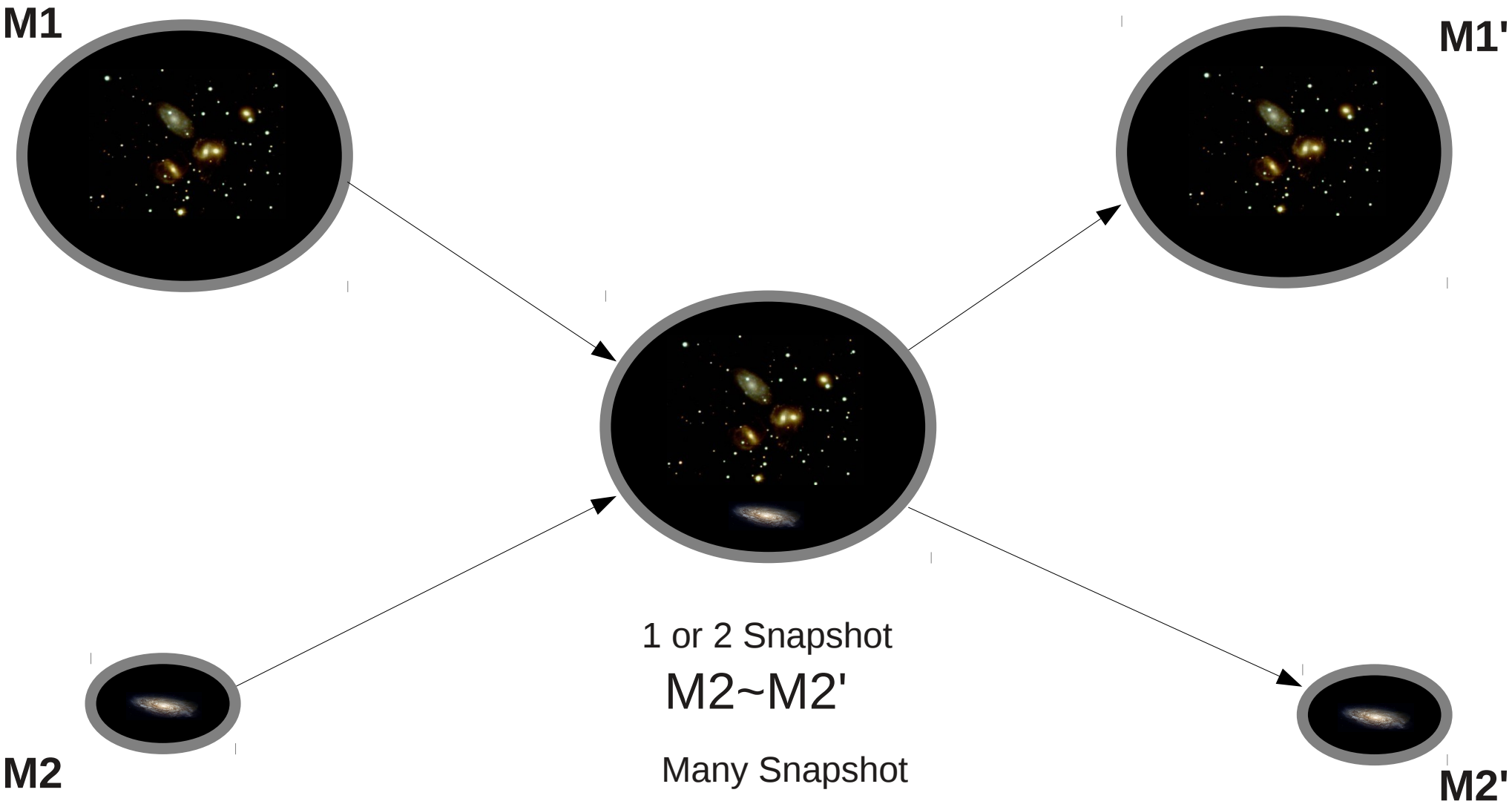

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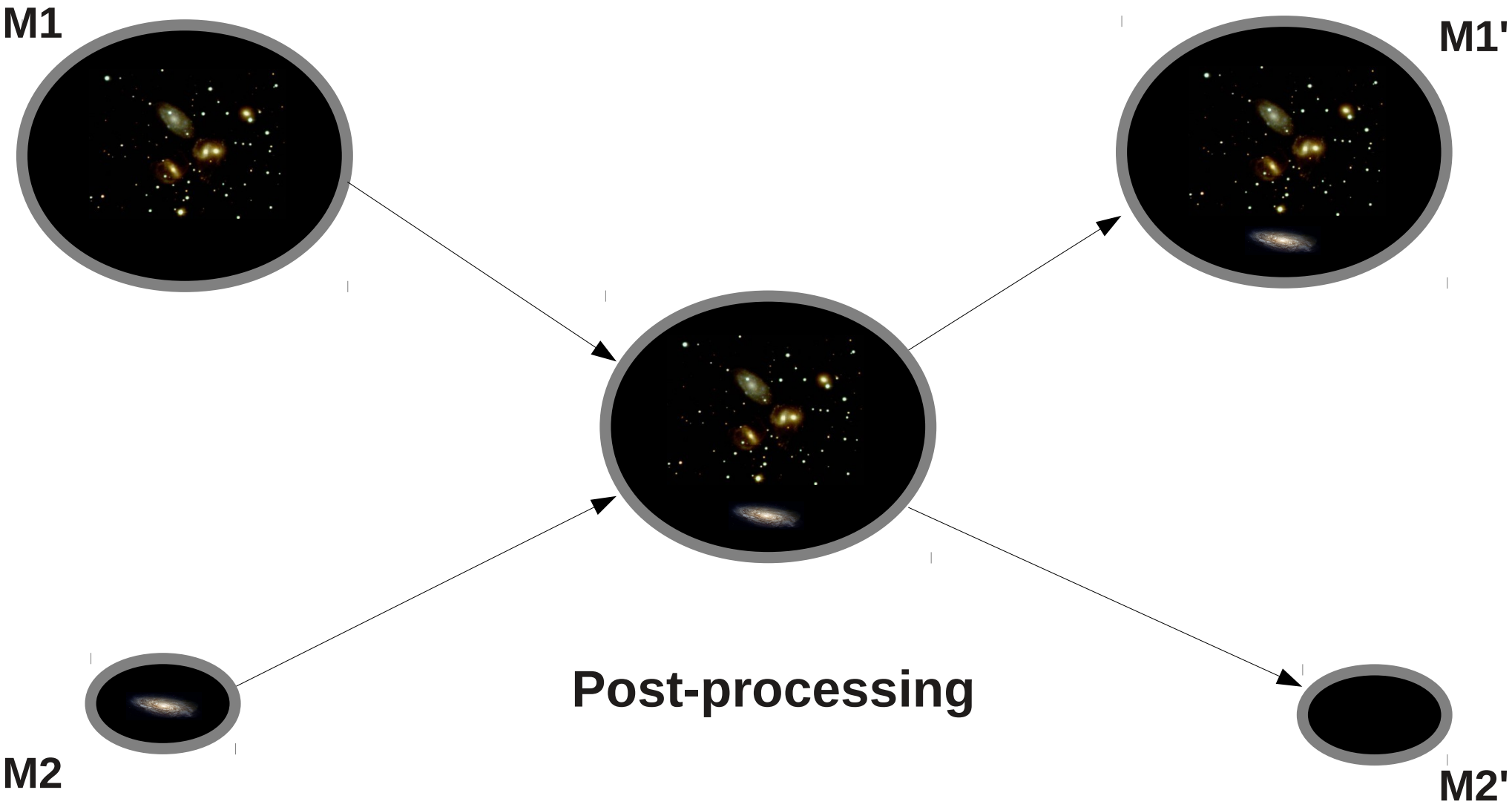

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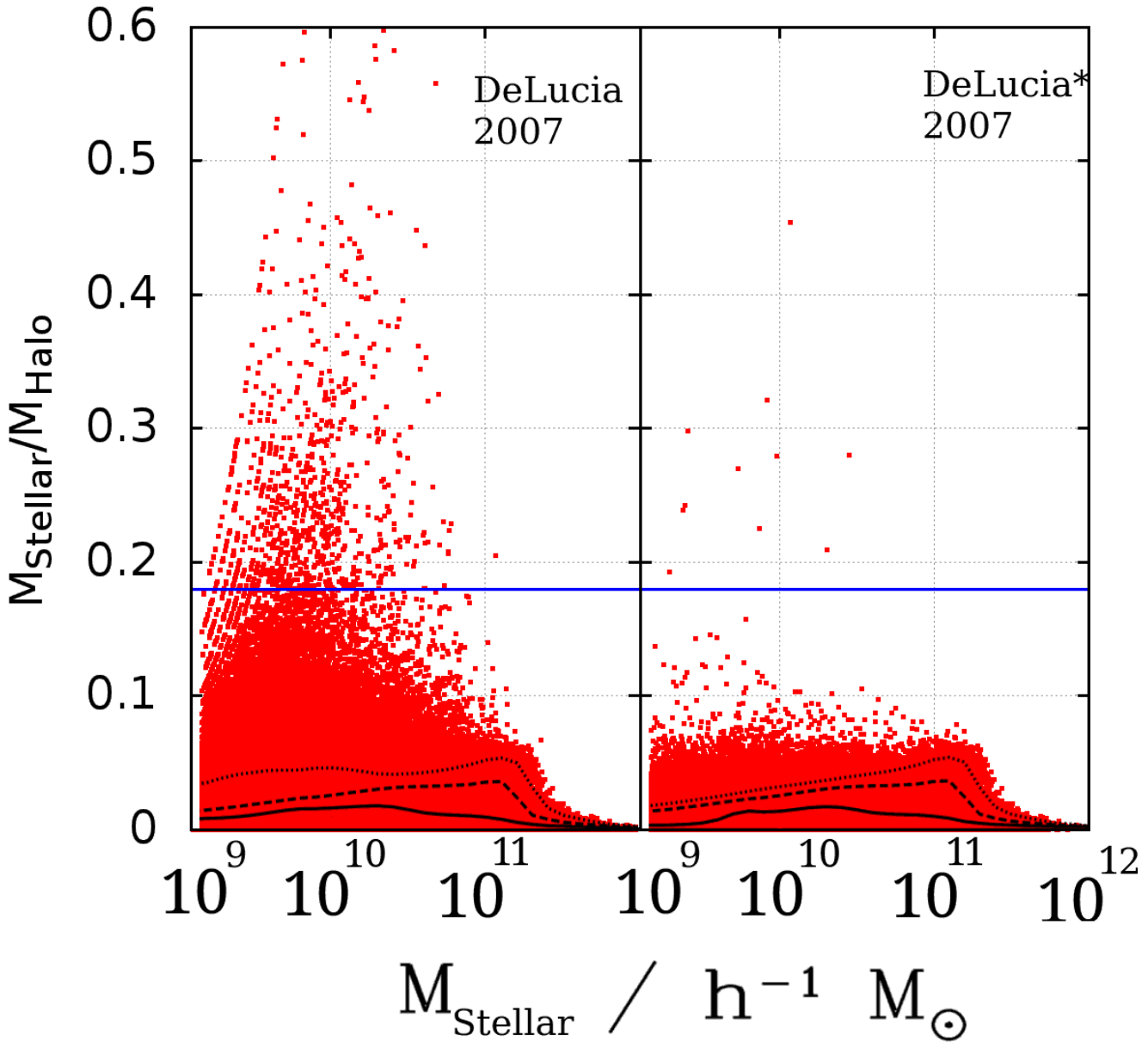
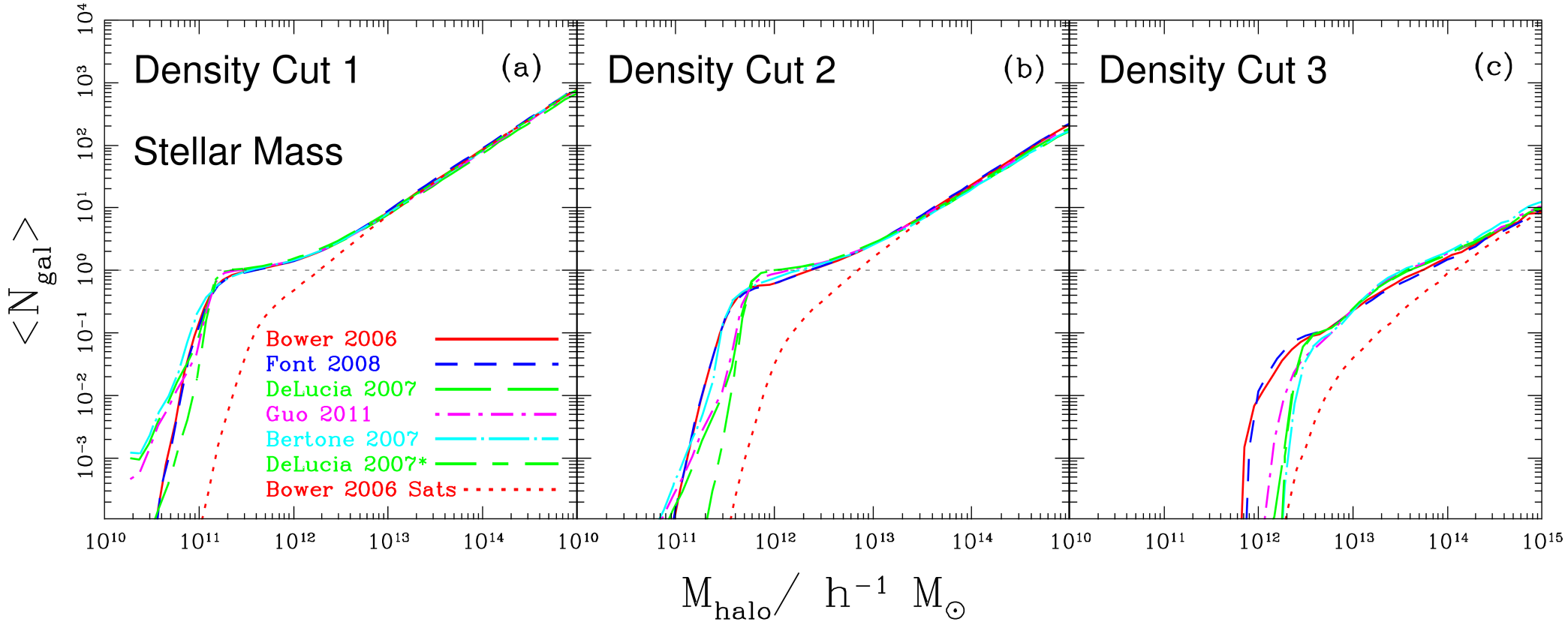


Stellar Mass Samples: HOD



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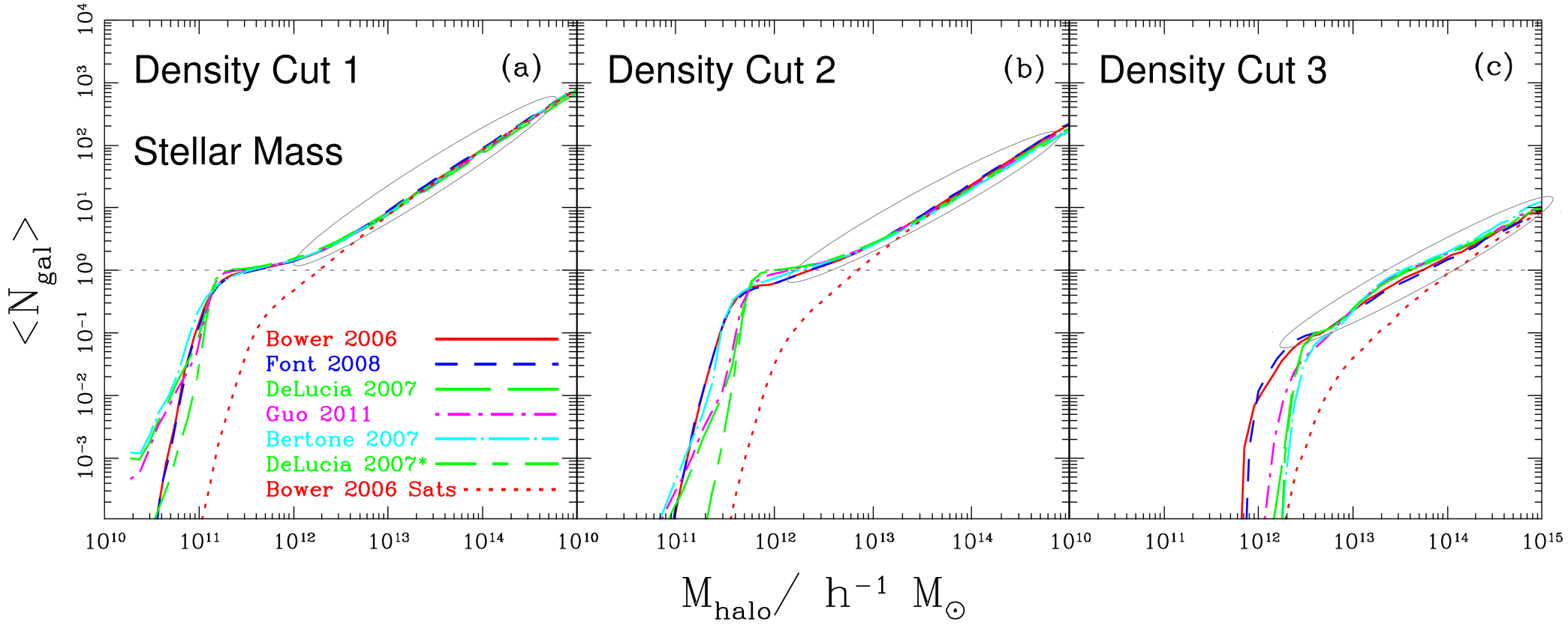
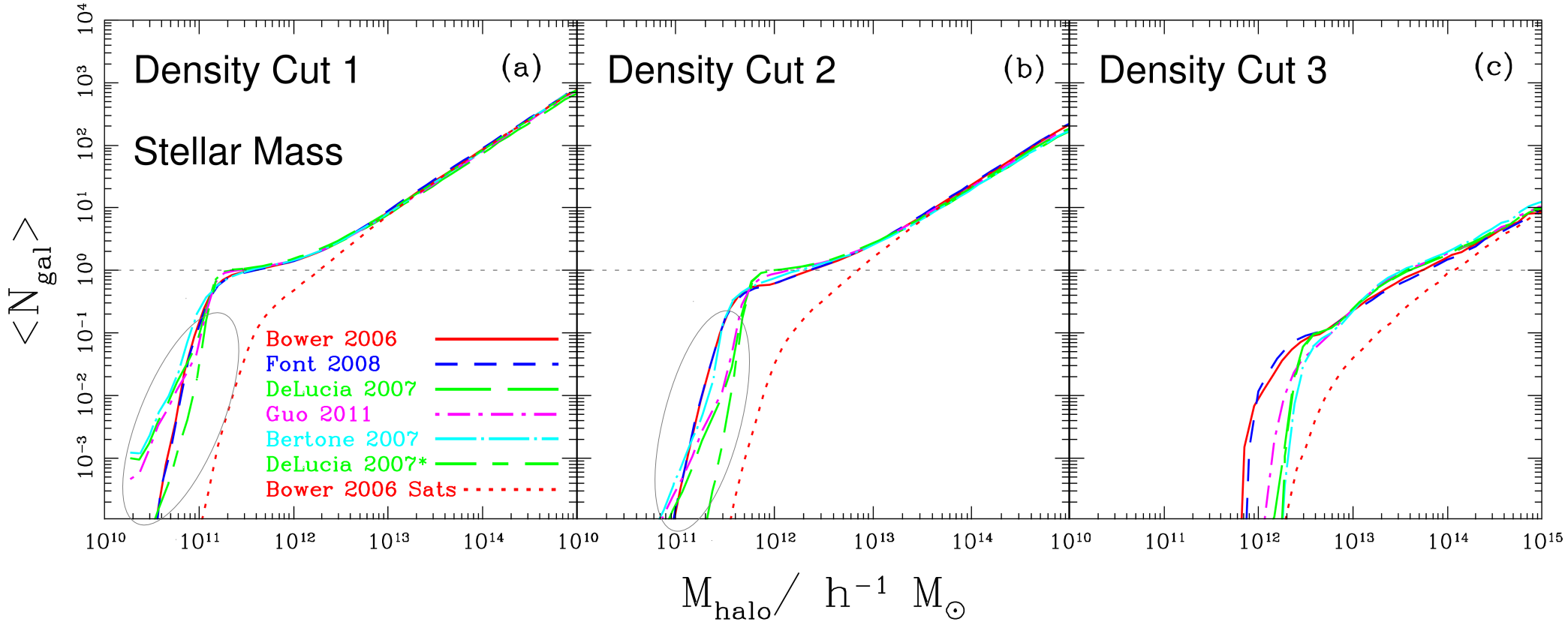
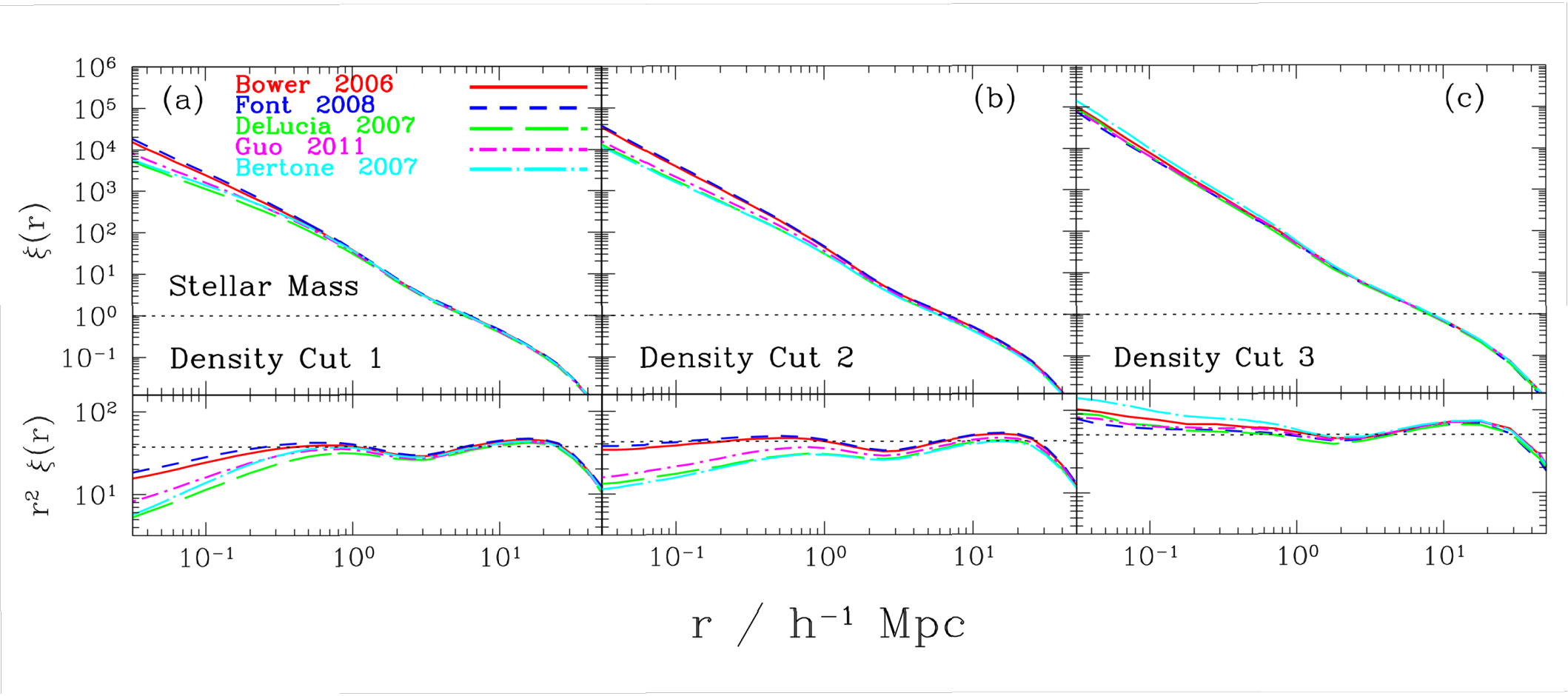


Agreement in satellite part

Stellar Mass Samples: HOD



Stellar Mass Samples: Correlation



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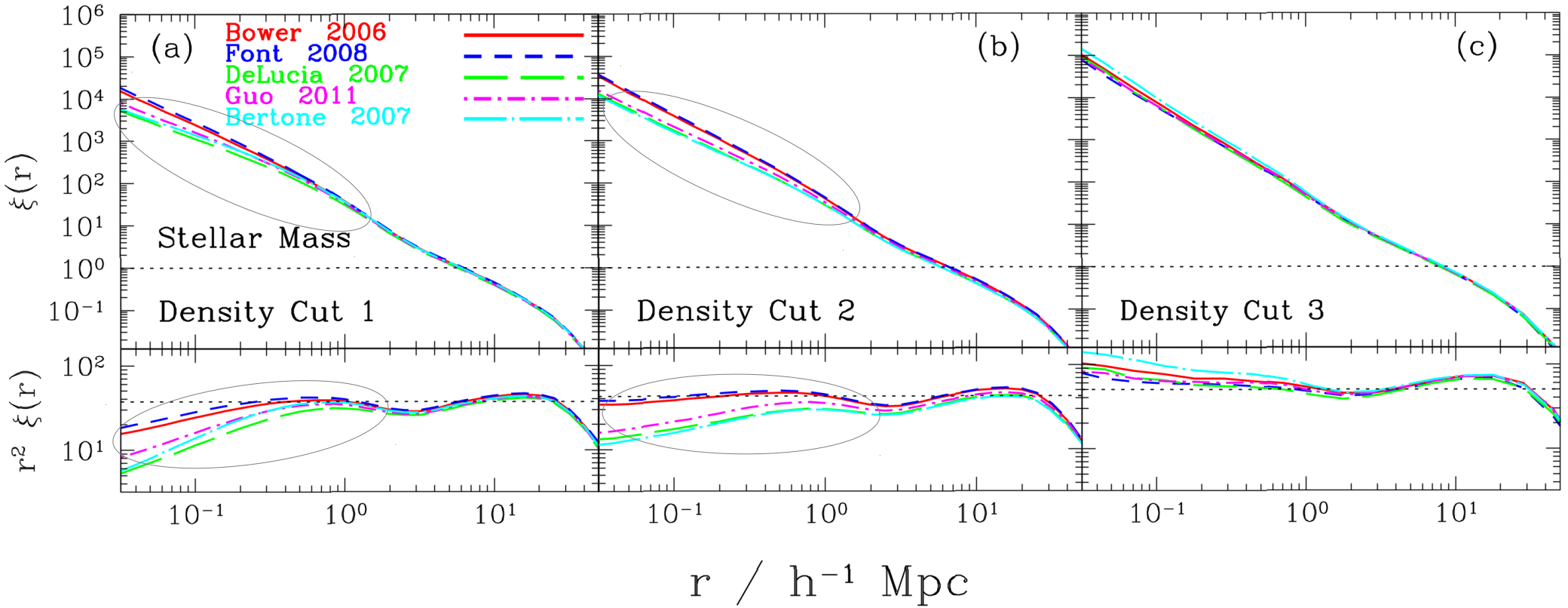
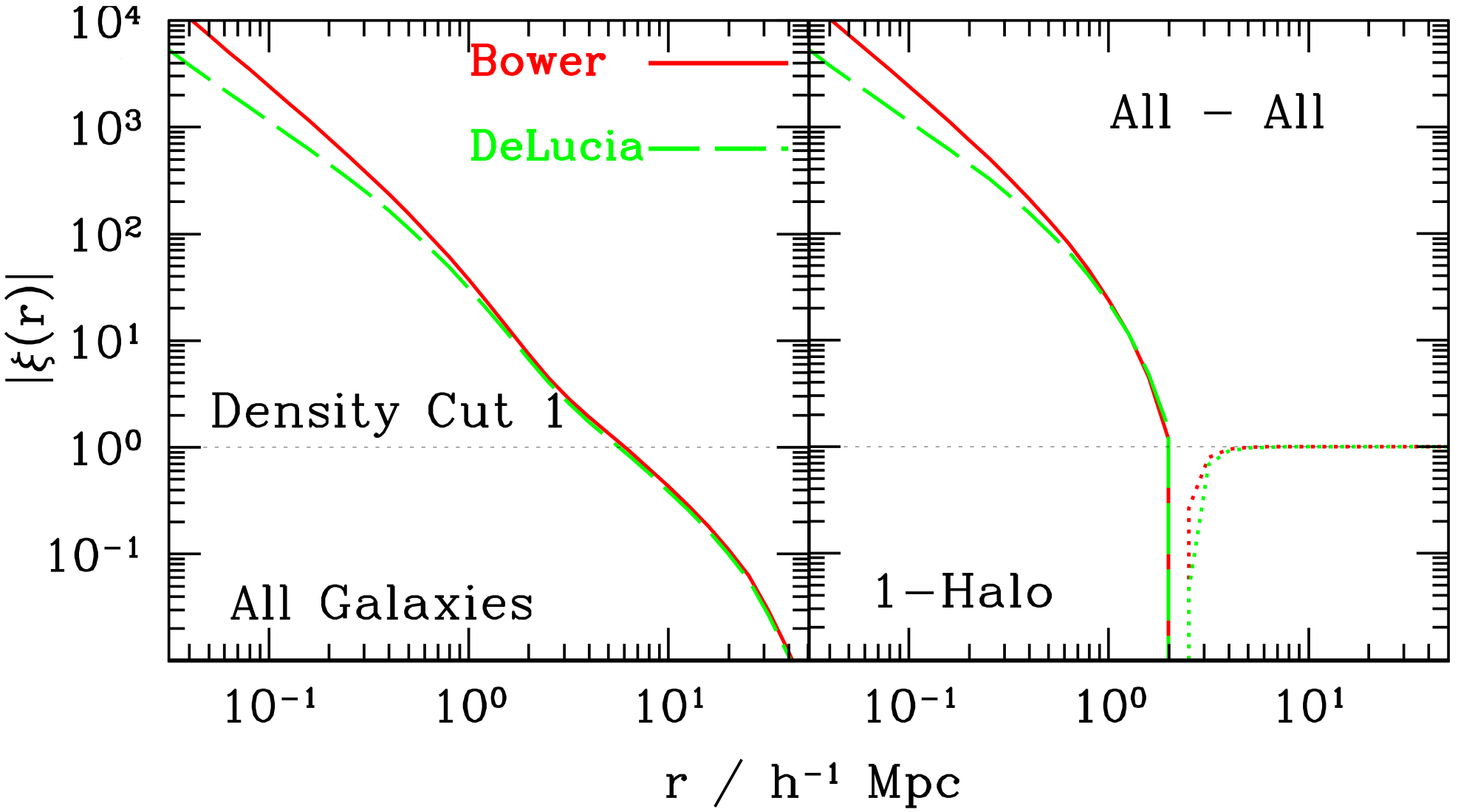
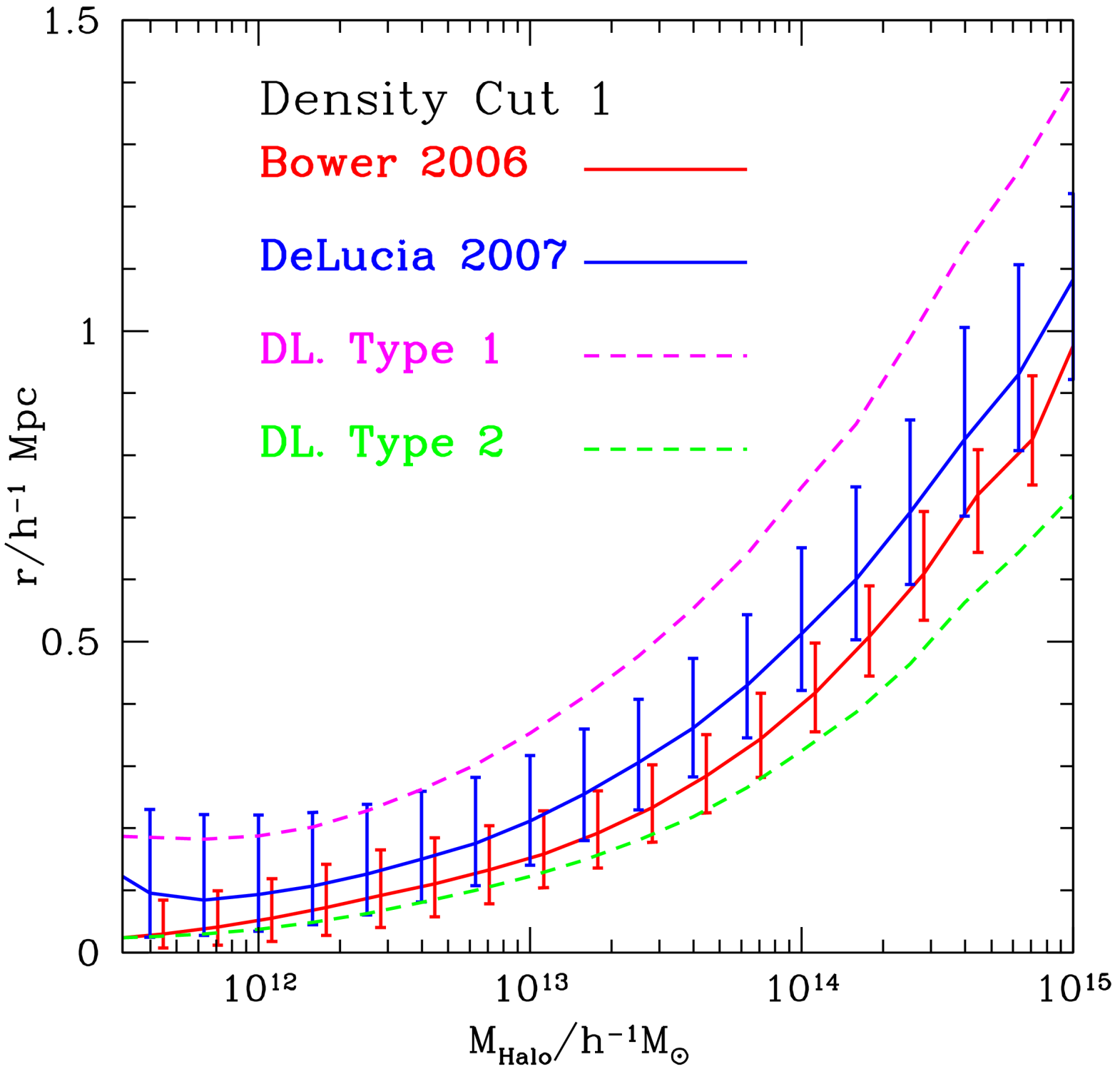


Disagreement in satellite part

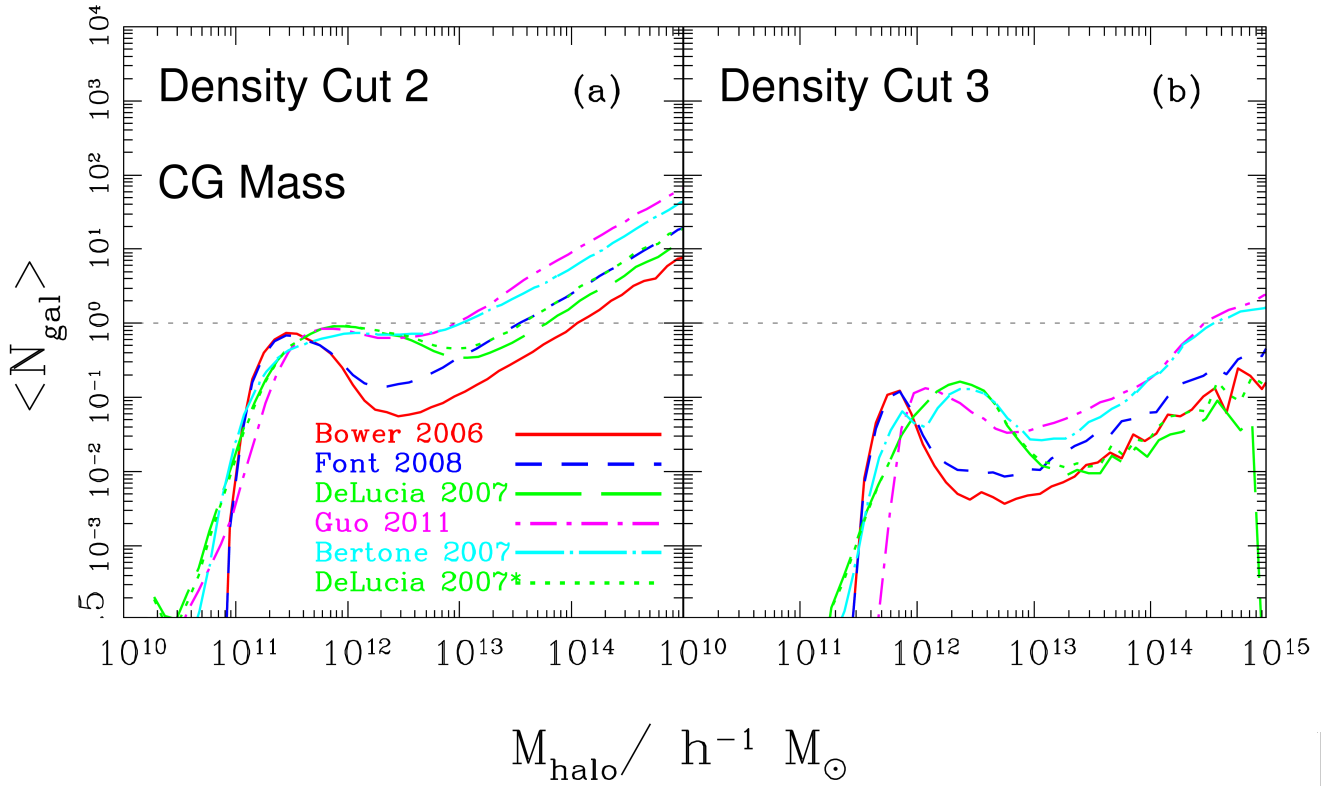
Stellar Mass Samples: Correlation

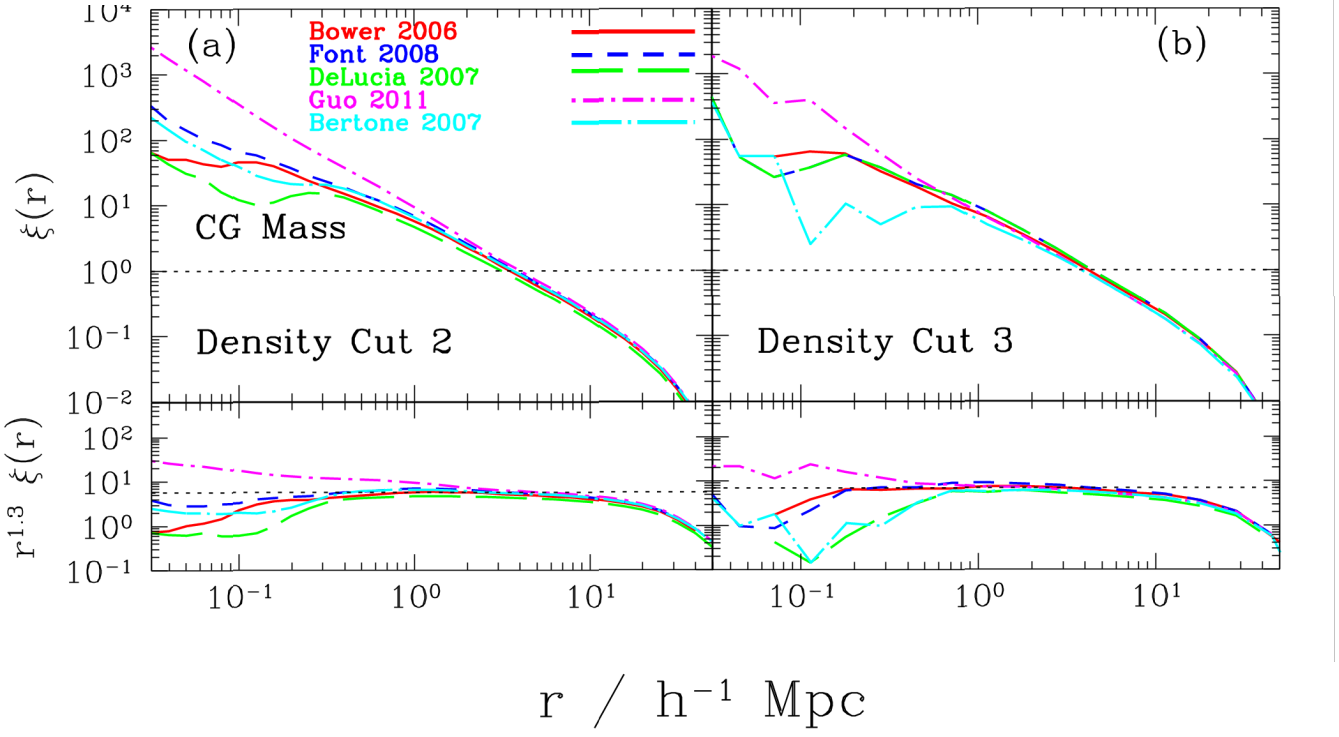


Stellar Mass Samples: Radius

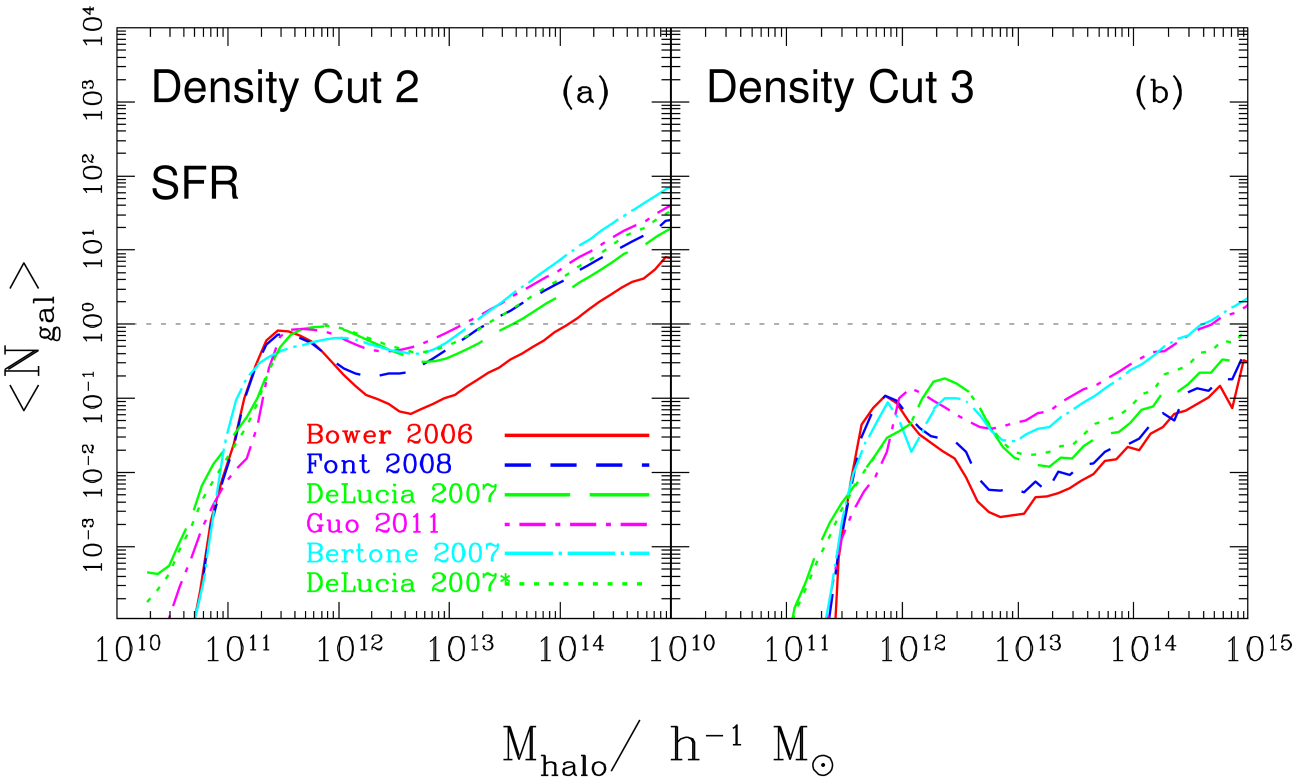


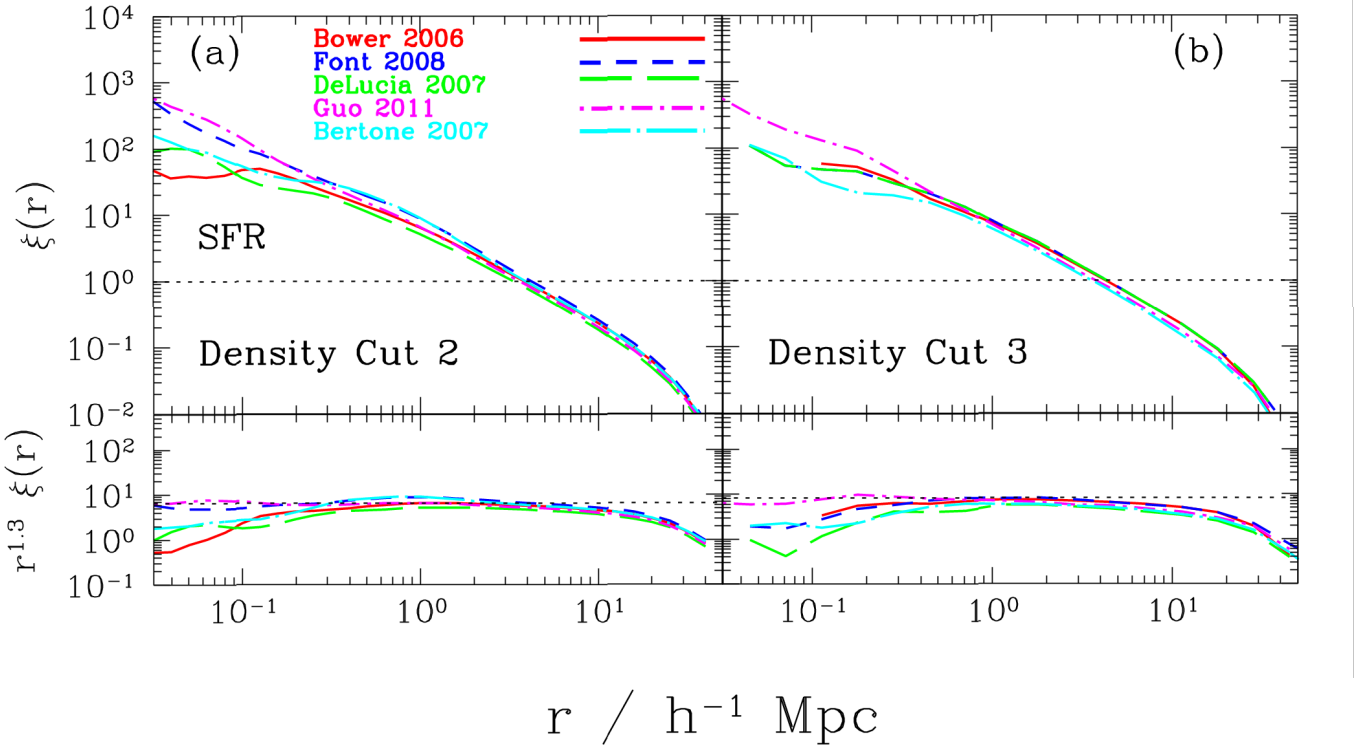
Cold Gas Mass Sample





Star Formation Rate Samples





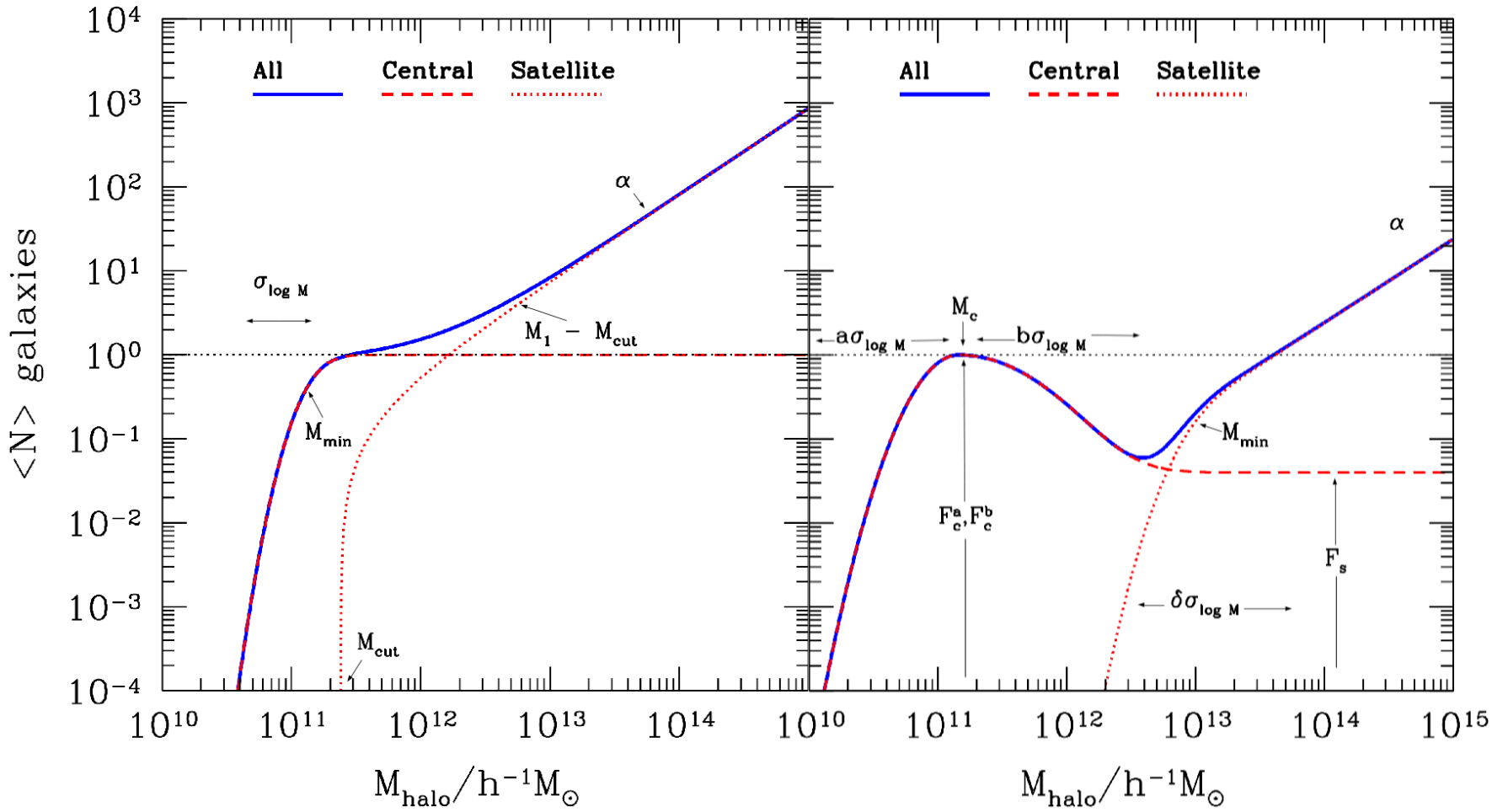
Results

Cold Gas Mass and SFR

Number of satellite galaxies for the different Density Cuts, the different phisical properties and the different models

Density Cut 2	Stell. Mass	Cold Gass Mass	SFR	Stell. Mass	Cold Gass Mass	SFR	Density Cut 3
Bower et al. 2006	40%	3%	3%	27%	2%	1%	Bower et al. 2006
Font et al. 2008	42%	8%	10%	26%	6%	2%	Font et al. 2008
DeLucia et, 2007	38%	6%	8%	24%	2%	4%	DeLucia et, 2007
Bertone et al. 2007	37%	9%	14%	27%	3%	6%	Bertone et al. 2007
Guo et al. 2011	41%	24%	19%	26%	15%	16%	Guo et al. 2011

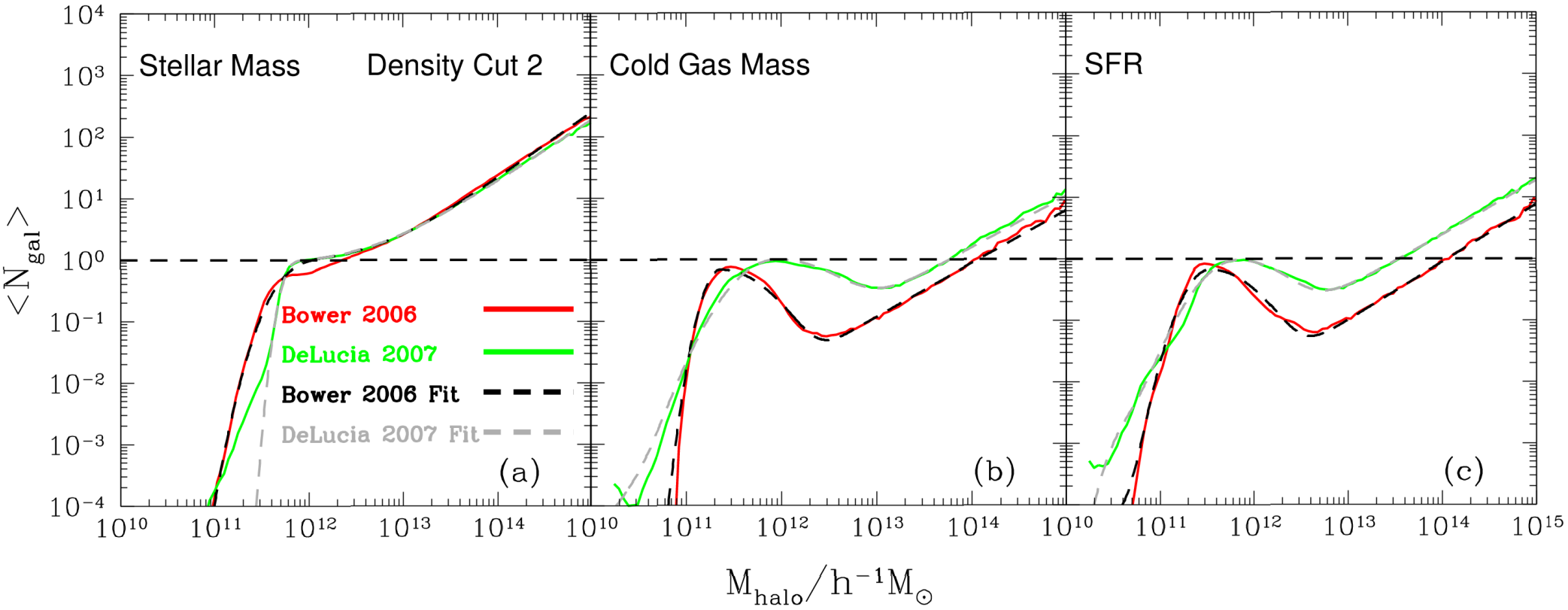
HOD Form



5 parameters fit presented in Zehavi et al. 2005

9 parameter fit modified of the model presented By Geach et al. 2012 and Zheng et al. 2007

HOD Fitting



5 parameters fit presented in Zehavi et al. 2005

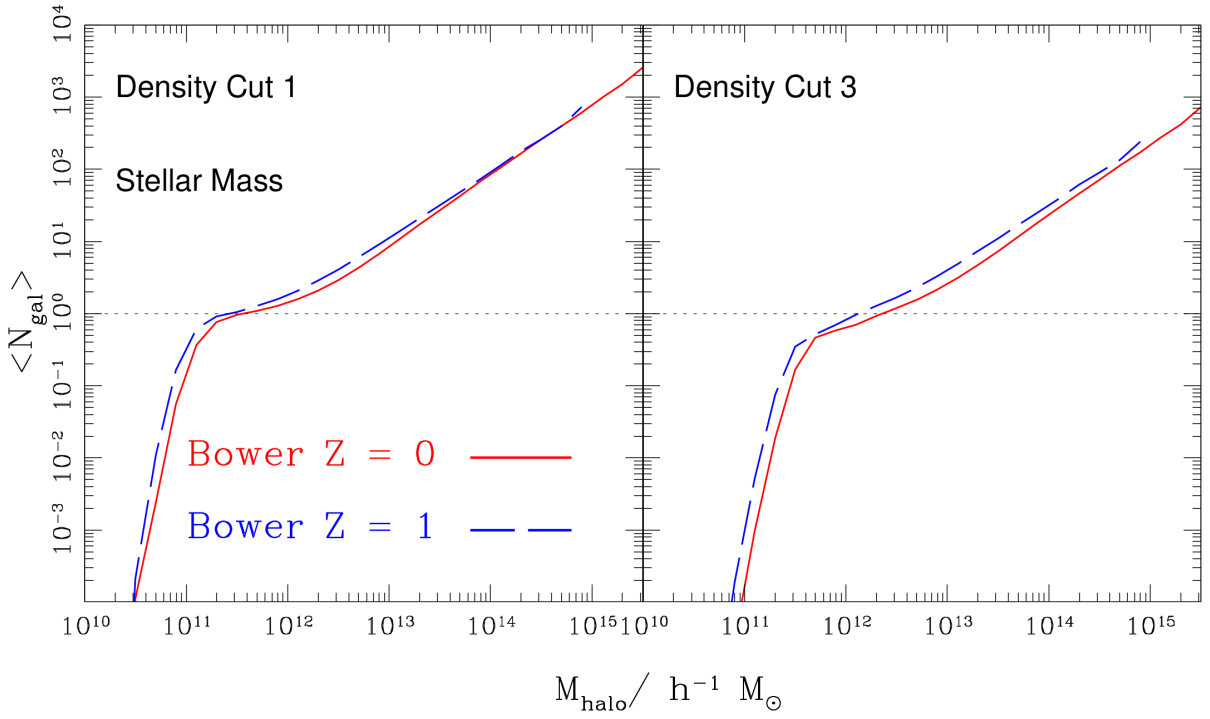
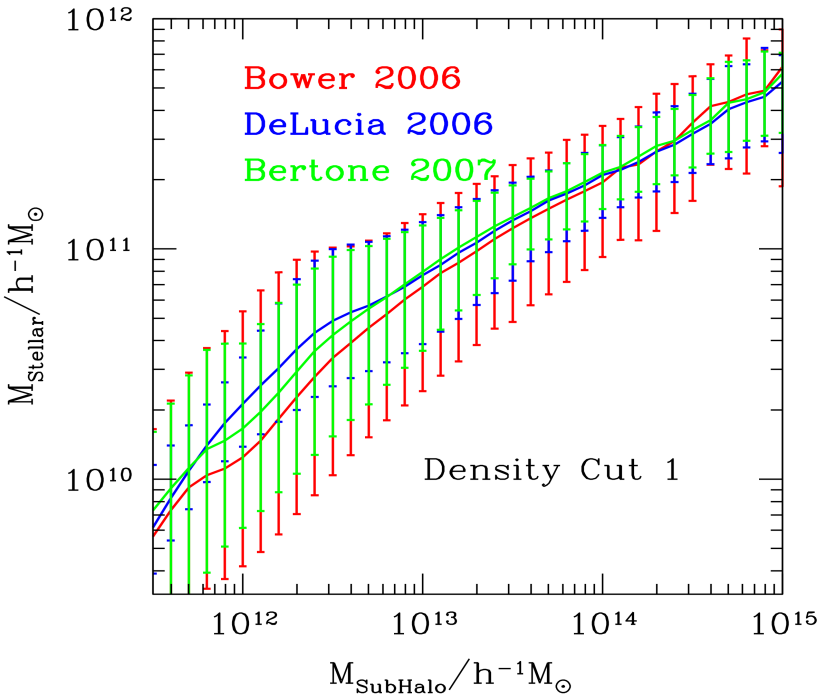
9 parameter fit modified of the model presented By Geach et al. 2012 and Zheng et al. 2007

Conclusion

- Predicted HOD similar for Stellar Mass
- Different satellite distribution in small scales
- Predicted HOD, qualitatively similar in CG mass and SFR but different in detail
- Predicted HOD have different form: Stellar Mass, CG mass and SFR

Questions and Comments

Future Work

More HOD, SHAM and Millennium II

More modern models, SHAM, other redshift and Millennium I & II results: