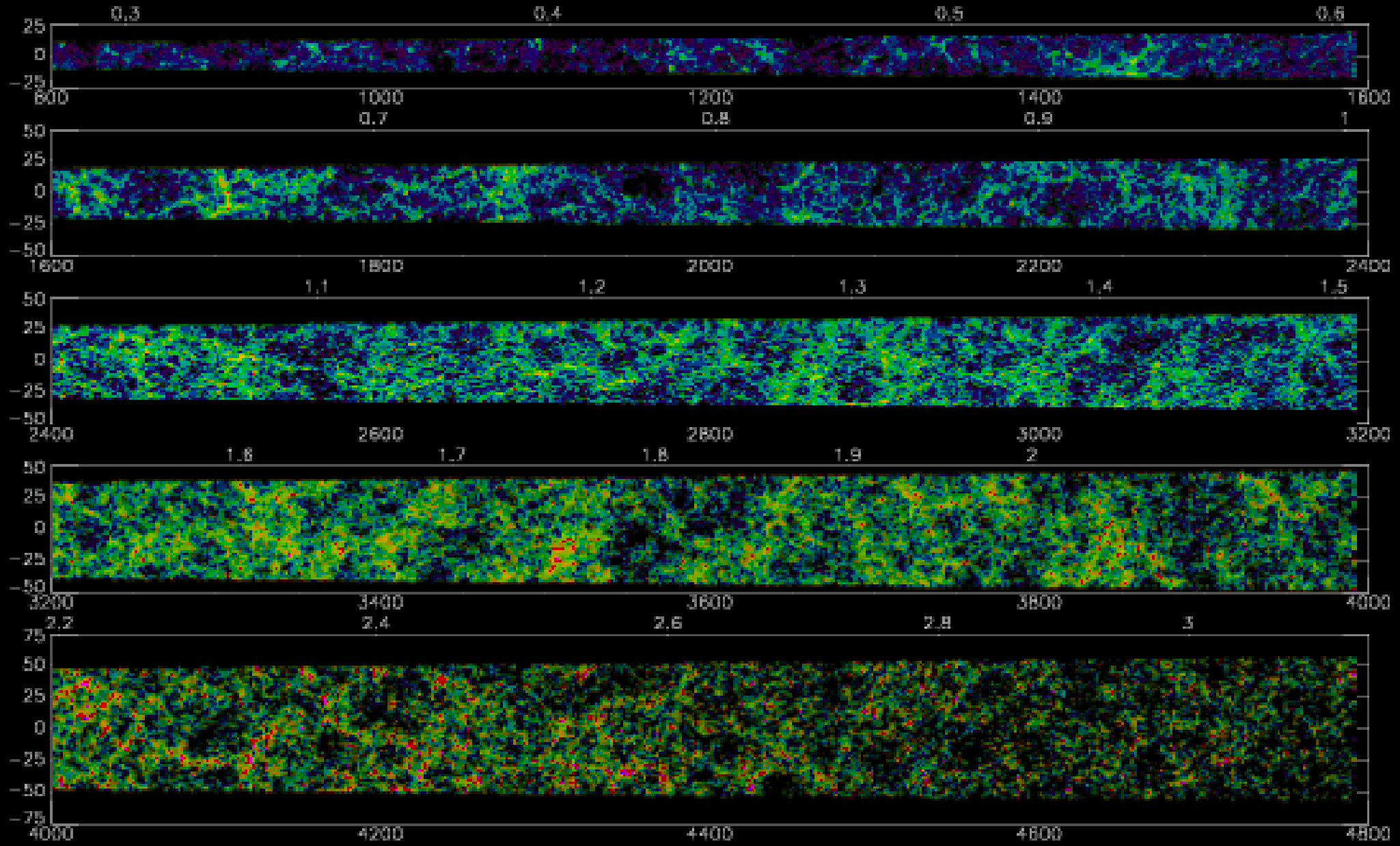
Simulations and mock catalogues

Simon White, MPA



Millennium Run Database - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

http://www.g-vo.org/MyMillennium

Virgo - Millennium Database

Documentation

CREDITS/Acknowledgments

Registration

News

Public Databases

- Durham
- MField
- millimil
- MPAGalaxies
- MPAHalotrees
- MPAMocks

Private (MyDB) Databases

- swhitedb (rw) (context)

Welcome Simon White.
Streaming queries return unlimited number of rows in CSV format and are cancelled after 420 seconds.
Browser queries return maximum of 1000 rows in HTML format and are cancelled after 30 seconds.

```
select .2*(.5+floor(mag_b/.2)) as mag,
       count(*) as num
  from millimil..DeLucia2006a
 where mag_b < -10
   and snapnum=63
 group by .2*(.5+floor(mag_b/.2))
 order by mag
```

Query (stream)

Query (browser)

Help

6 cosmos mocks in SQL database on MS site
www.mpa-garching.mpg.de/millennium
and 24 cosmos mocks accessible from team site and at
www.mpa-garching.mpg.de/PUBLICATIONS/DATA/lightcones/cosmos/v3.0

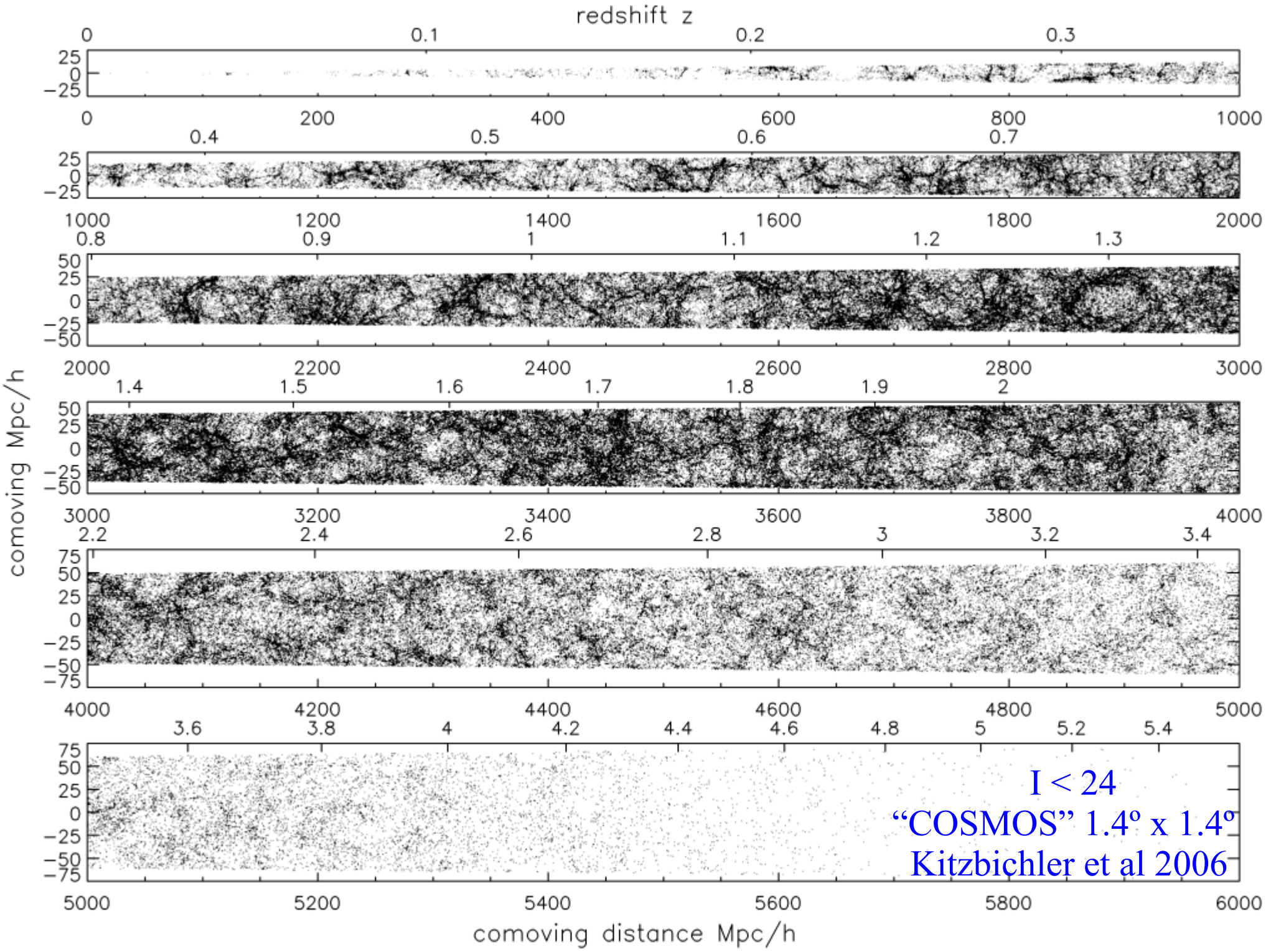
Maximum number of rows to return to the query form: 10

Demo queries: click a button and the query will show in the query window.
Holding the mouse over the button will give a short explanation of the goal of the query. These queries are also available on this page.

Mainly Halos: H 1 | H 2 | H 3 | H 4 | H 5 | HF 1 | HF 2 | HF 3

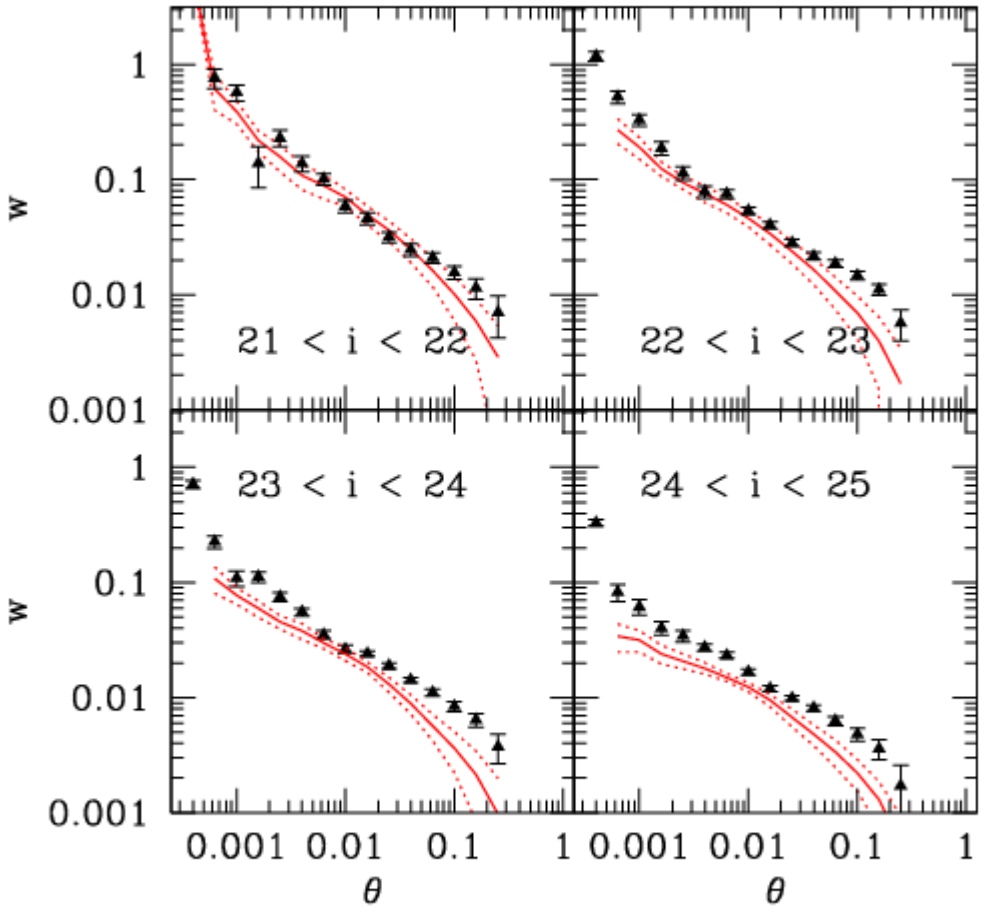
Mainly Galaxies: G 1 | G 2 | G 3 | G 4 | G 5 | G 6 | HG 1 | HG 2 | GF 2

Metadata queries: The SQL statements under these buttons provide examples for querying and managing the state of a private database.
Holding the mouse over the button will give a short explanation of the goal of the statement.


redshift z
0
0.1
0.2
0.3
25
0
−25
0
200
400
600
800
1000
0.4
0.5
0.6
0.7
1000
1200
1400
1600
1800
2000
0.8
0.9
1
1.1
1.2
1.3
50
25
0
−25
−50
2000
2200
2400
2600
2800
3000
1.4
1.5
1.6
1.7
1.8
1.9
2
3000
3200
3400
3600
3800
4000
2.2
2.4
2.6
2.8
3
3.2
3.4
75
50
25
0
−25
−50
−75
4000
4200
4400
4600
4800
5000
3.6
3.8
4
4.2
4.4
4.6
4.8
5
5.2
5.4
5000
5200
5400
5600
5800
6000
comoving Mpc/h
comoving distance Mpc/h
I < 24
“COSMOS” 1.4º x 1.4º
Kitzbichler et al 2006

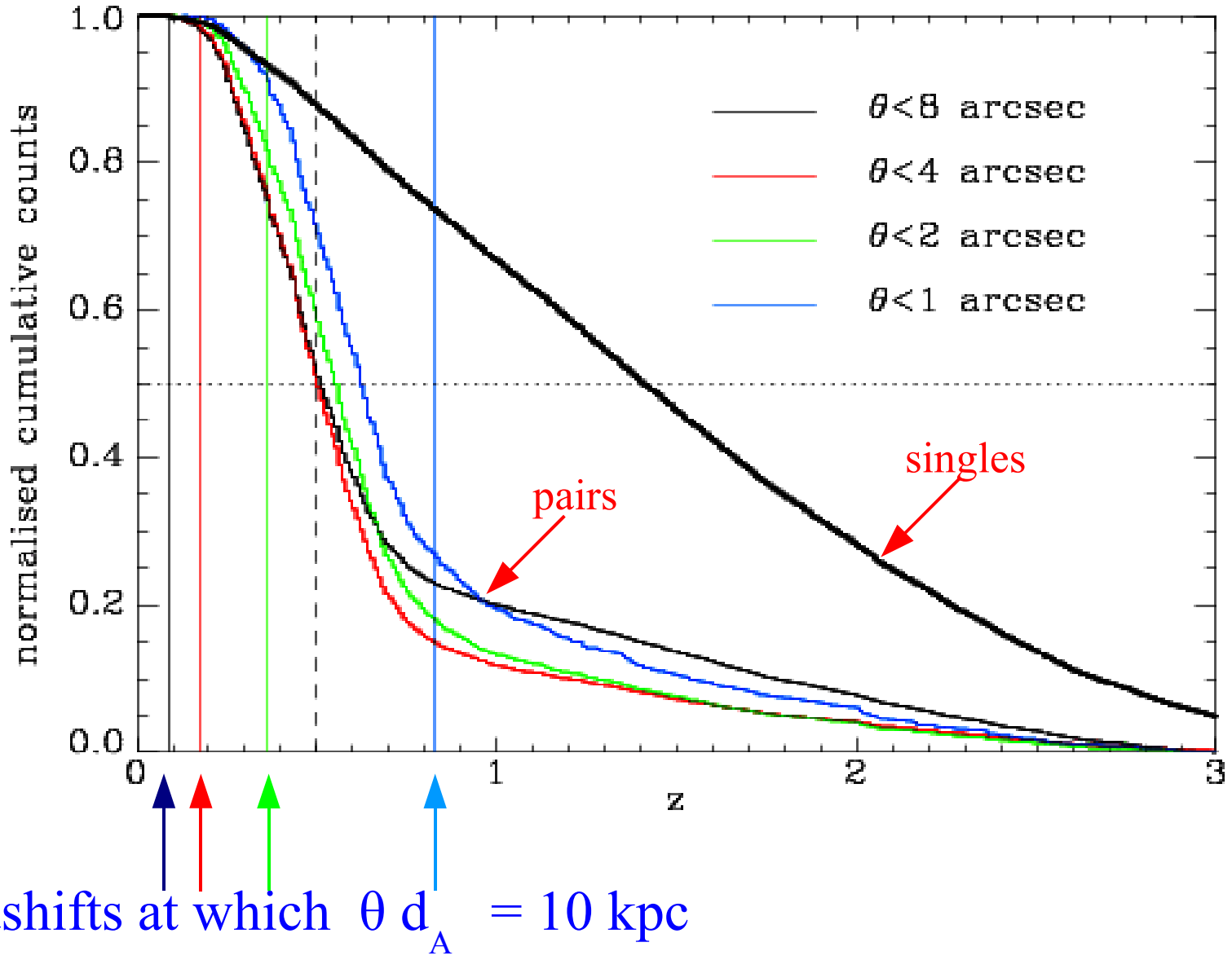
Comparison with COSMOS survey w(θ)

McCracken et al 2007



Redshift distributions for single galaxies and pairs to $B_{AB} = 26$

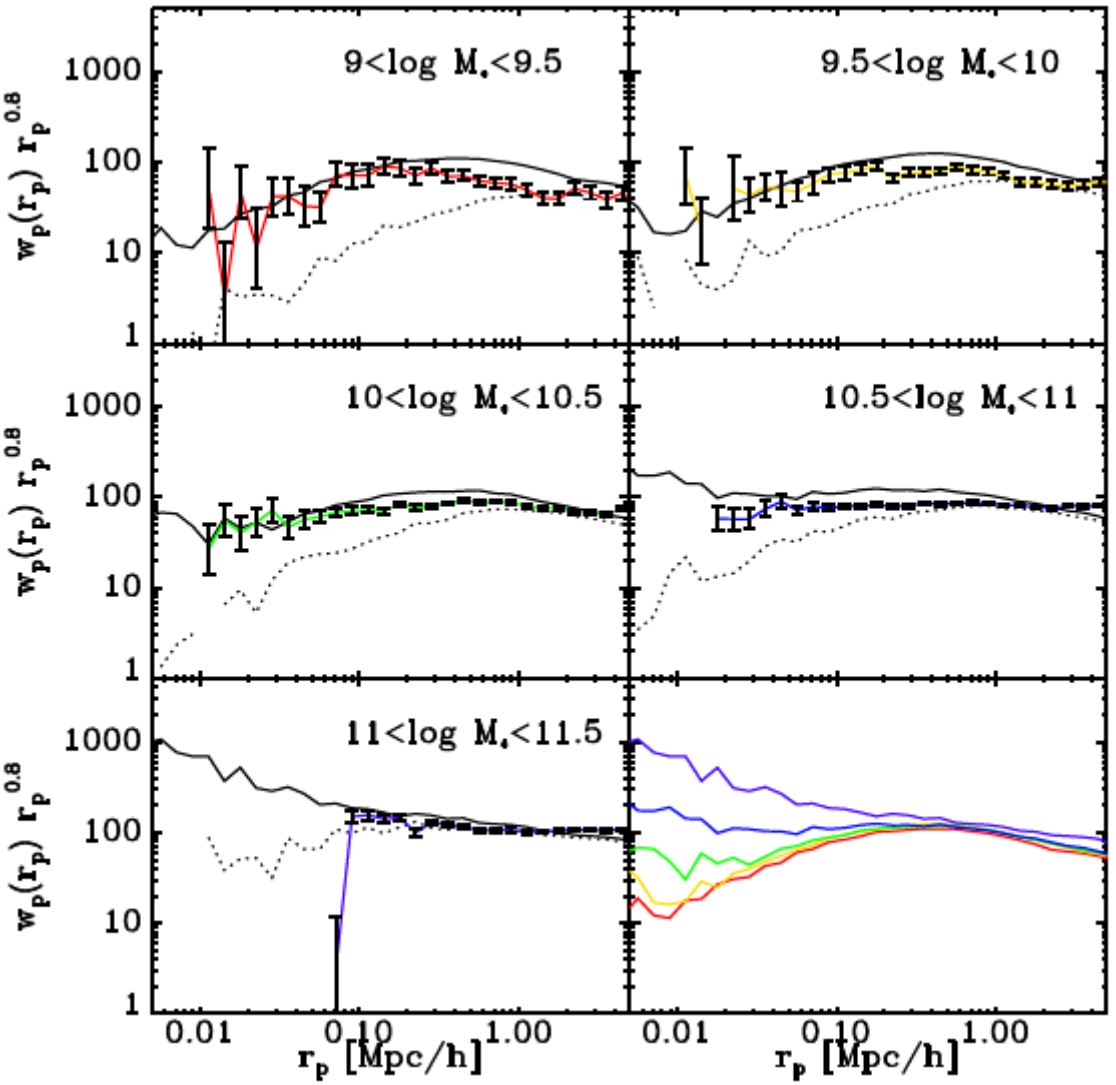
pairs with 3D physical separation $r < \theta\, d_A$



Resolution Limitations in the Millennium Simulation

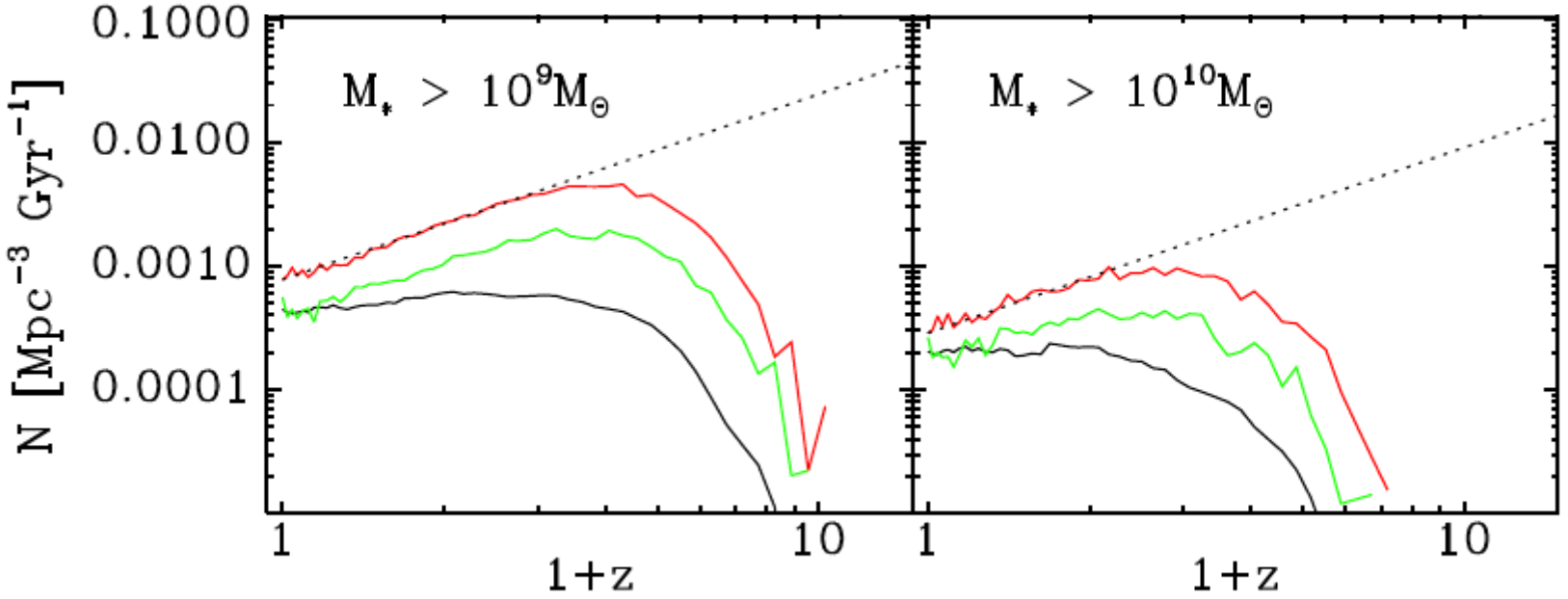
- Halo mass: $2.5\ 10^{10}\ M_{\odot}$ at all z ($N_{halo} \geq 20$ particles)
- Linear scale: 10 kpc comoving (2 x softening length)
- Stellar mass: $\sim 10^{9}\ M_{\odot}$ at all z
- Absolute magnitude: $M_B \leq -17$ at $z = 0$, brighter at high z?

Small-scale correlations in the MS versus SDSS



Kitzbichler & White 2007

Major merger rate in the Millennium Simulation



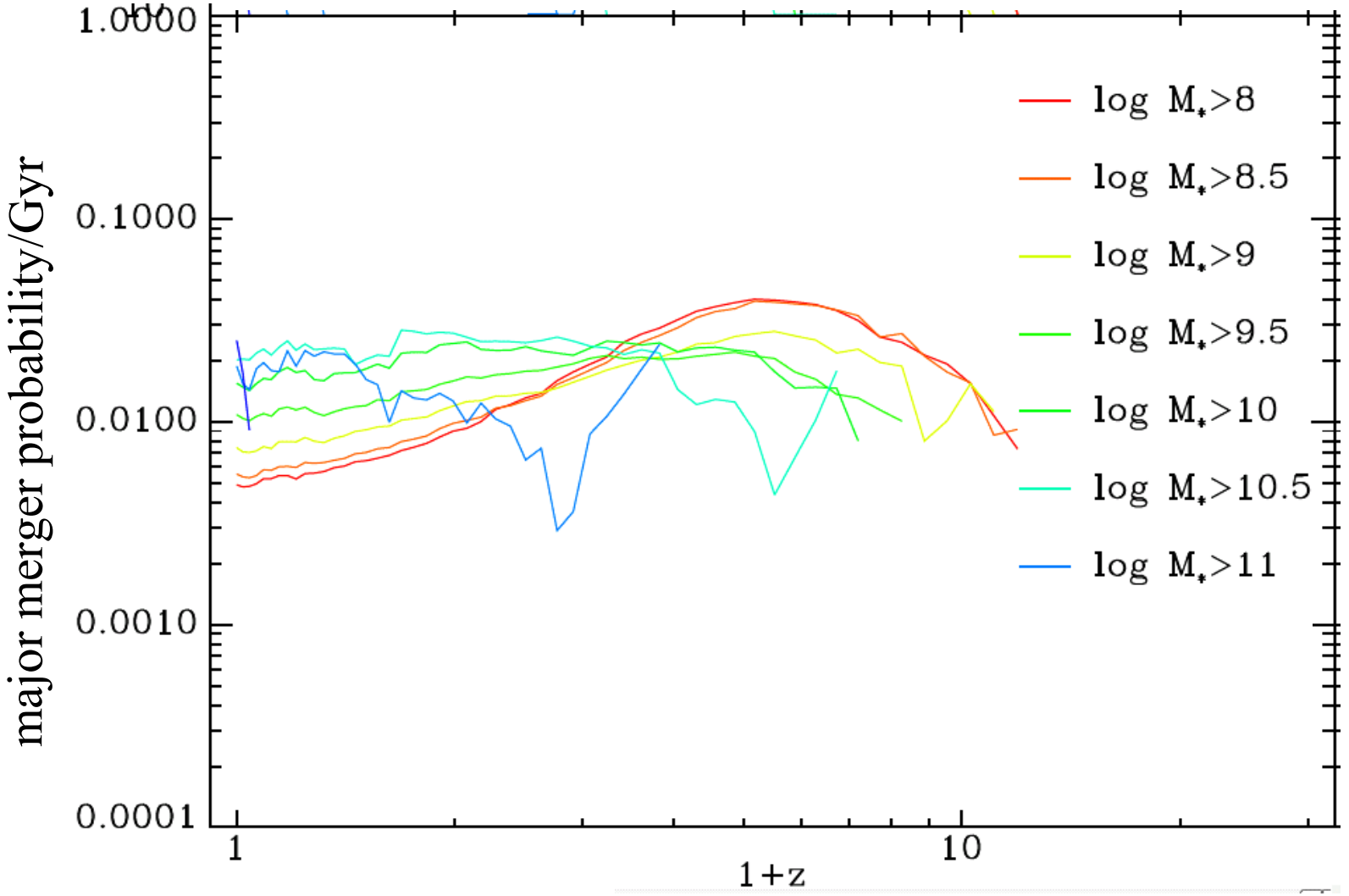
galaxy merger rate

halo merger rate

halo accretion rate

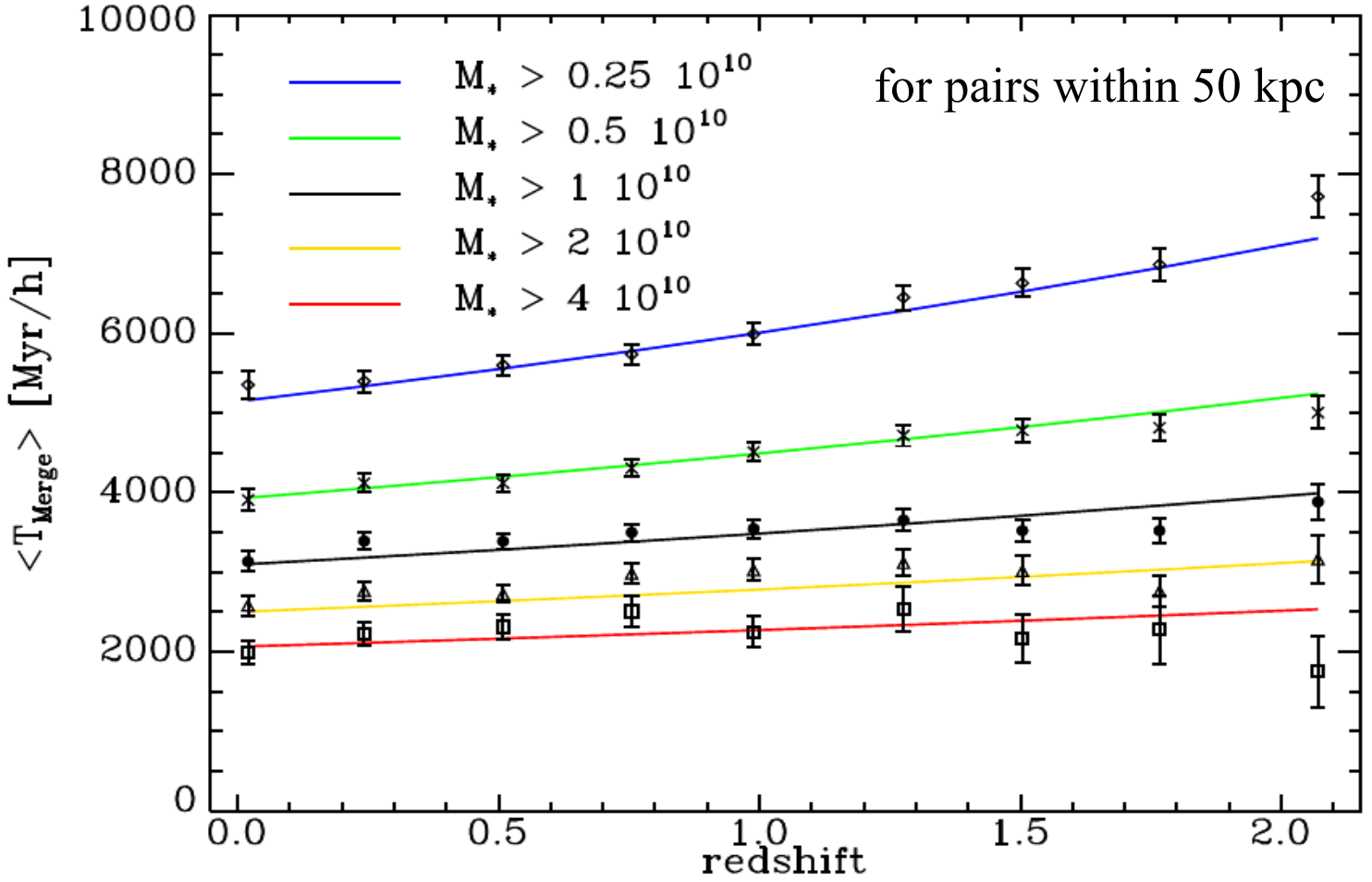
Kitzbichler & White 2007

Major merger probability as function of mass and redshift



Kitzbichler & White 2007

Timescale for converting close pair counts into merger rates



T_{merge} = (Abundance of projected close pairs) / (Merger rate of such pairs)

$\propto r_p M^{-0.3} (8 + z)$

Kitzbichler & White 2007

How to estimate merger rates from pair counts

1 Count close pairs (r_p < 50 *or* 30 kpc) with well defined criteria on magnitude difference, stellar mass, etc.

2 Make completeness and background corrections to estimate abundance of pairs of chosen type at known z

3 Divide close pair abundance by the merger timescale to get merger rate (per unit volume) of the chosen pair type

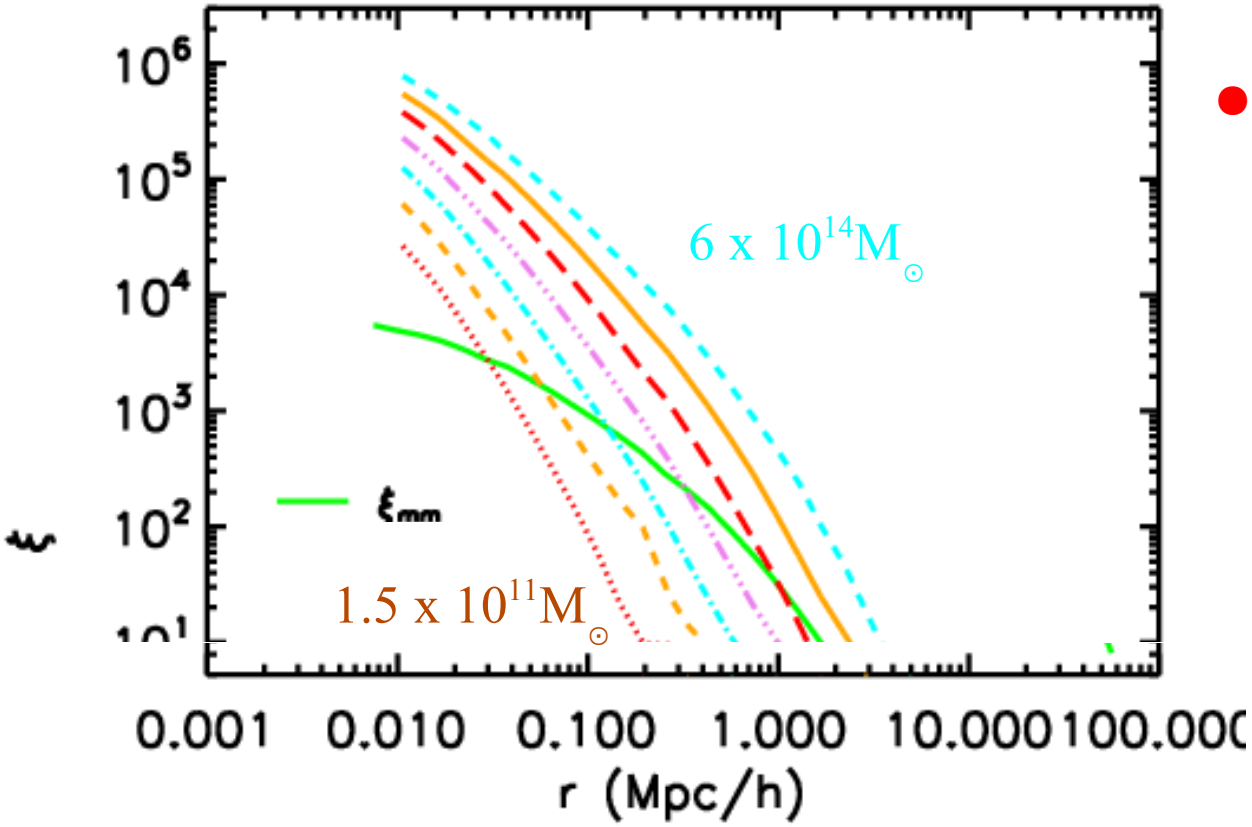
e.g. for pairs of $\sim 10^{10}\ M_\odot$ galaxies at $z \sim 1$ with

$$r_p \leq 30 \text{ kpc/h (physical) and } \Delta v < 300 \text{ km/s}$$

$$T_{merge} = 2.0 \text{ Gyr/h}$$

Density profile shapes at large radii

Hayashi & White 2007



- Mean density profiles of halos of given M_{200} are well fit down to overdensities of 10 by the fitting formula of Navarro et al (2004)

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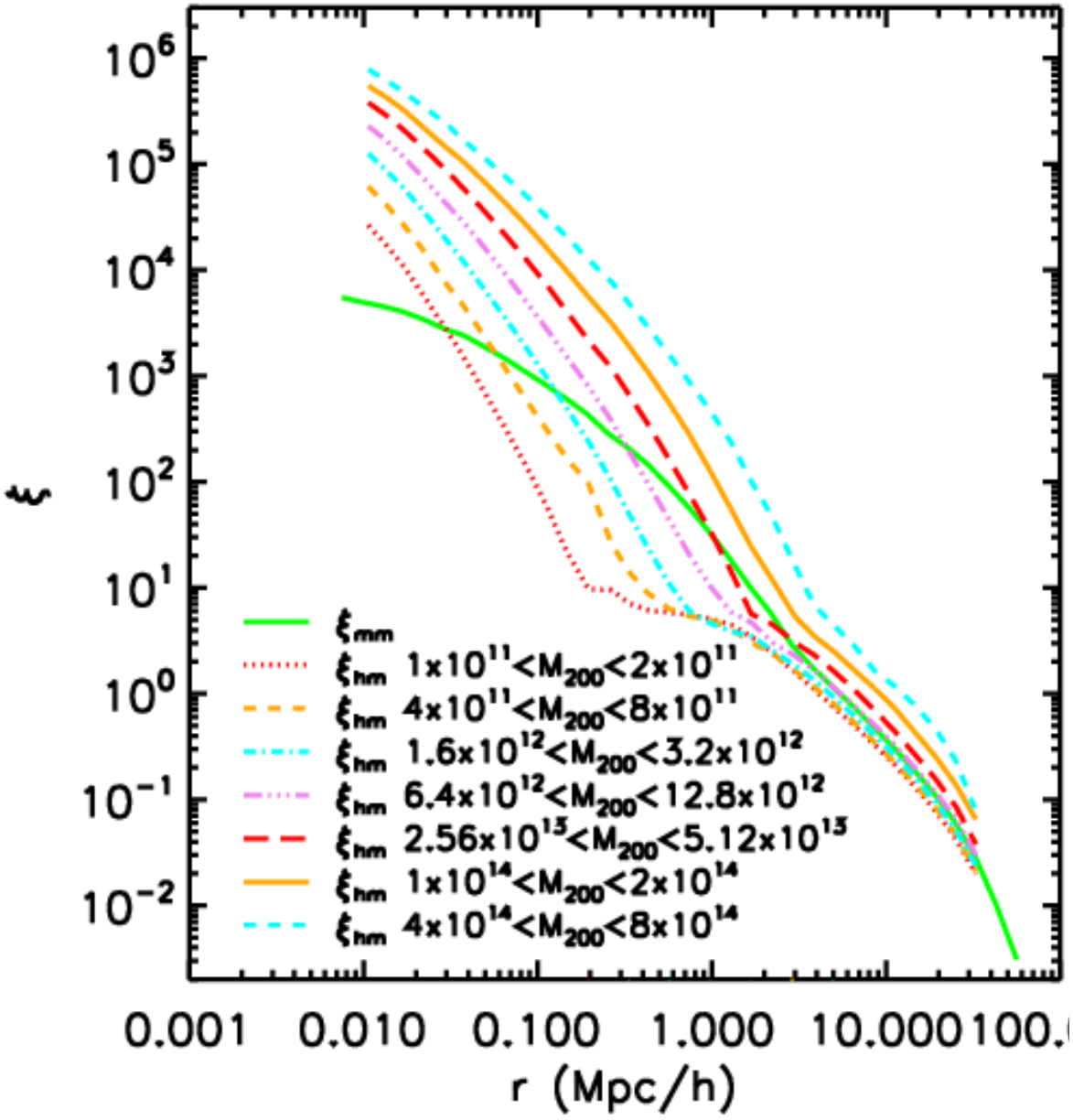
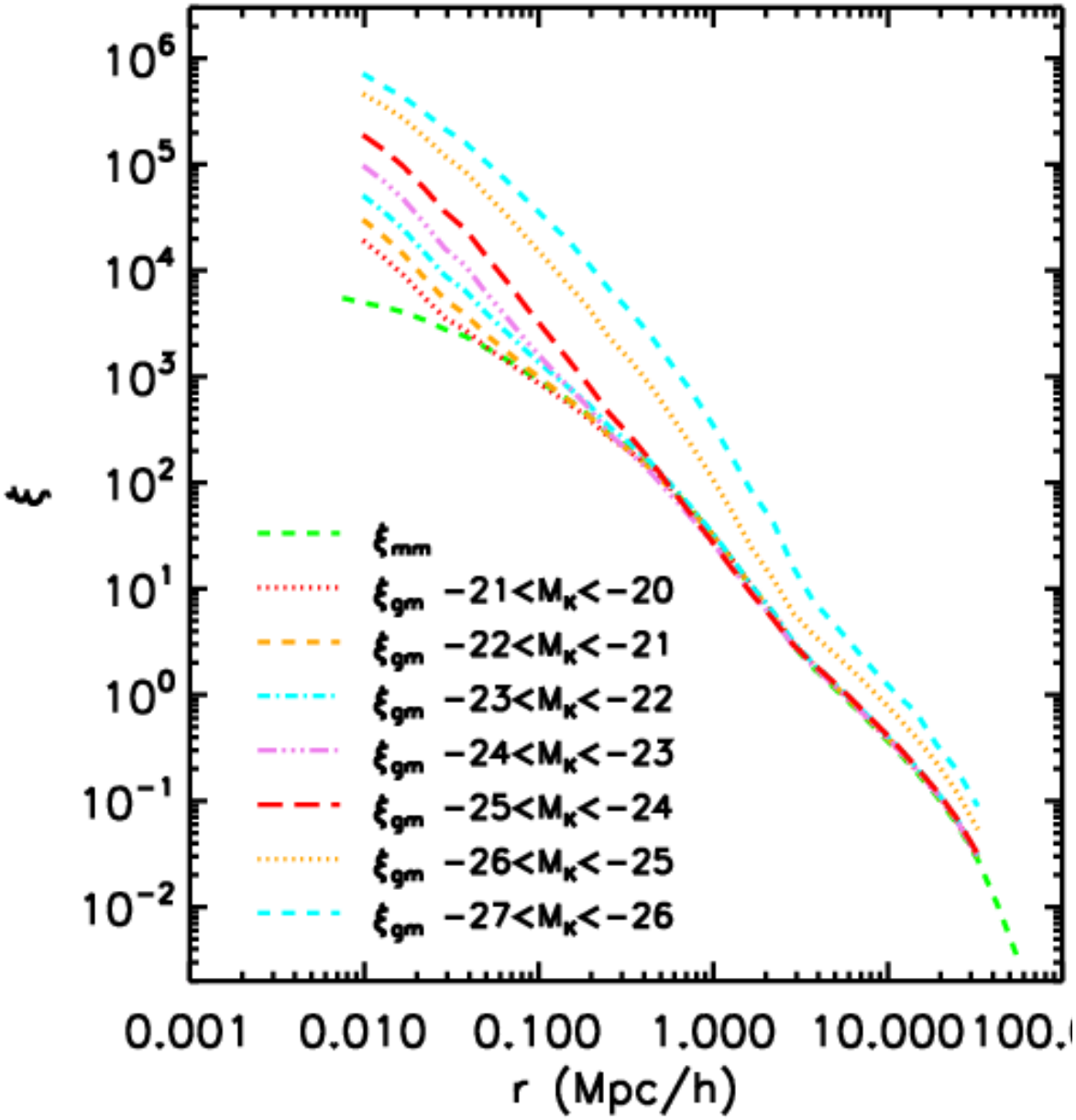
Hayashi & White 2007



- Mean density profiles of halos of given M_{200} are well fit down to overdensities of 10 by the fitting formula of Navarro et al (2004)
- At lower overdensities they are well fit by the *linear* mass correlation function with bias from Sheth, Mo, Tormen (2001)

Galaxy-mass cross-correlations to large radii

Hayashi & White 2007



- Galaxy mass cross-correlations are directly measurable through galaxy-galaxy lensing
- They can be predicted from an HOD model and mean halo mass profiles
- Here they are predicted with the Croton et al gal. formation simulation
- On large scale they follow the *nonlinear* ξ_{mm}