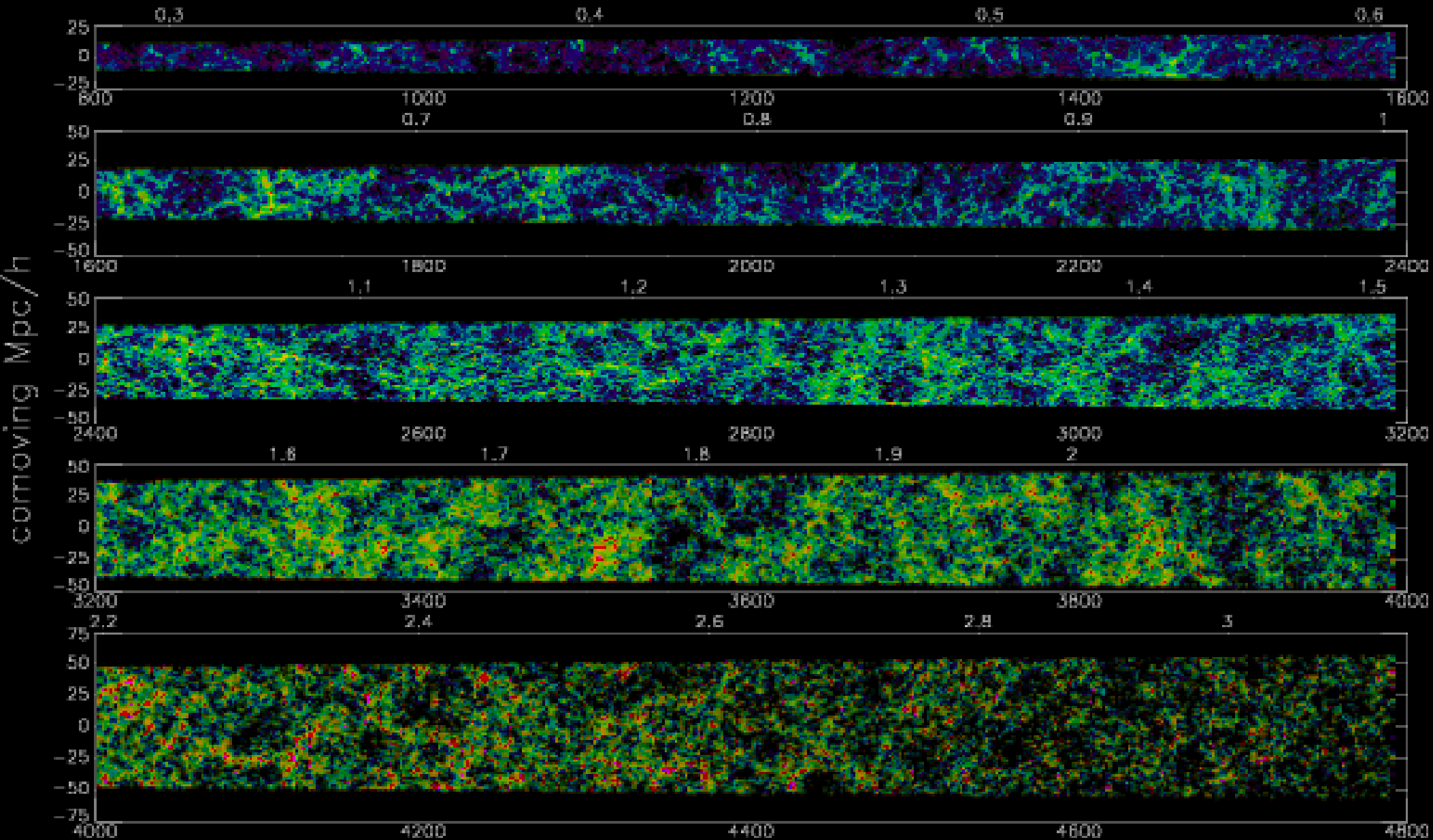


Simulations and mock catalogues

Simon White, MPA





- Documentation
- CREDITS/Acknowledgments
- Registration
- News
- Public Databases
 - [-] Durham
 - [-] MField
 - [-] millimil
 - [-] MPAGalaxies
 - [-] MPAHalotrees
 - [-] MPAMocks
- Private (MyDB) Databases
 - switedb (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

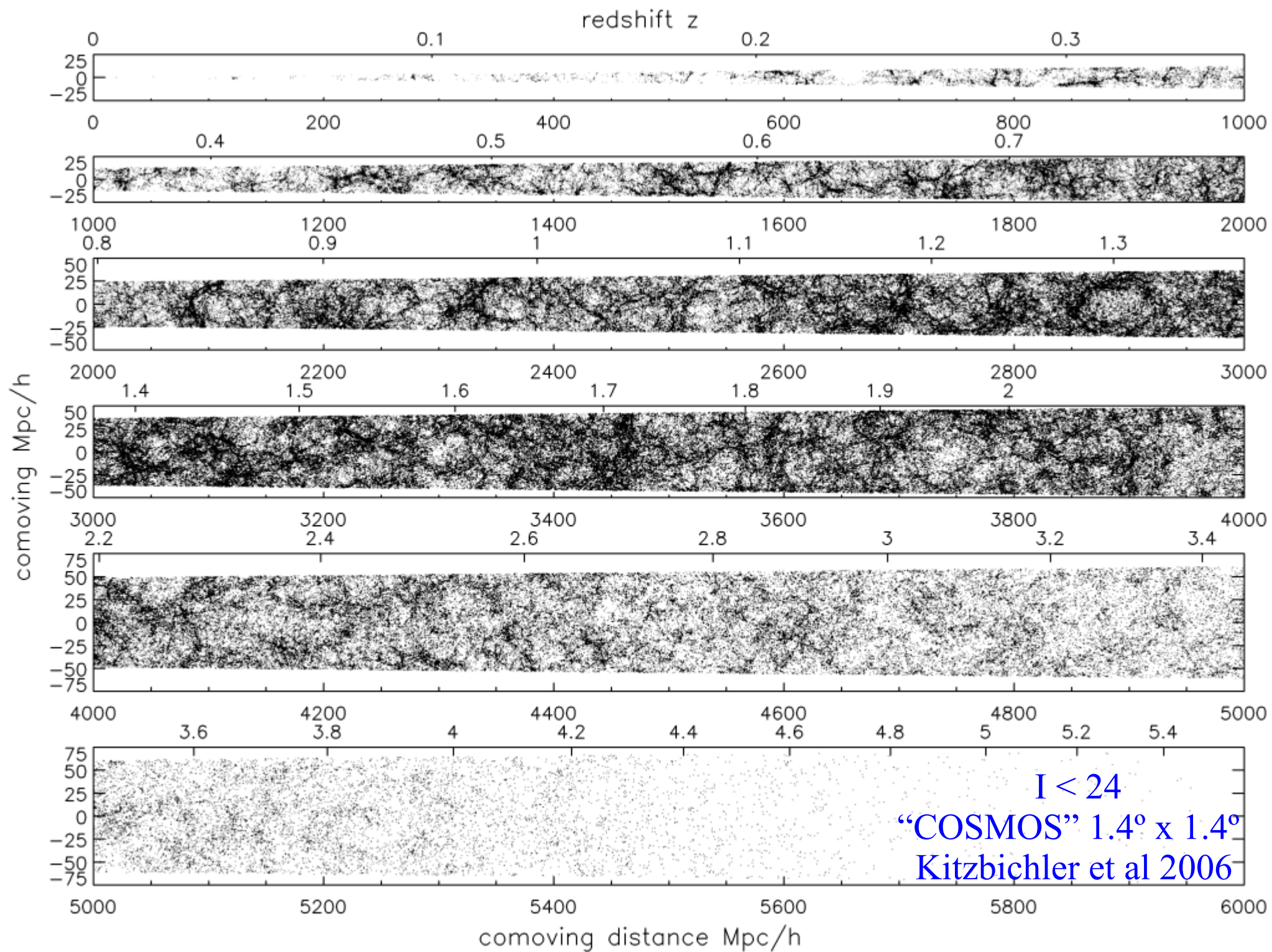
Maximum number of rows to return to the query form:

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:
- Mainly Galaxies:

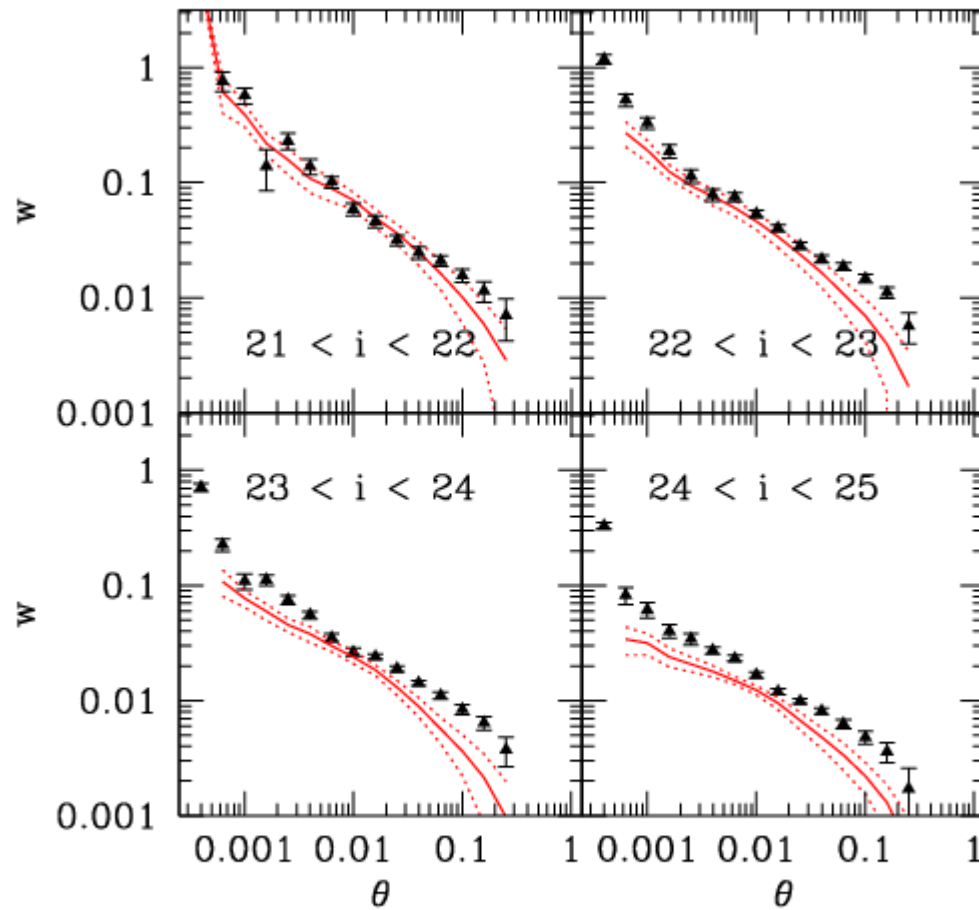
Metadata queries: The SQL statements under these buttons provide examples for querying and managing the state of a private database.
 Holding the mouse over the button will give a short explanation of the goal of the statement.





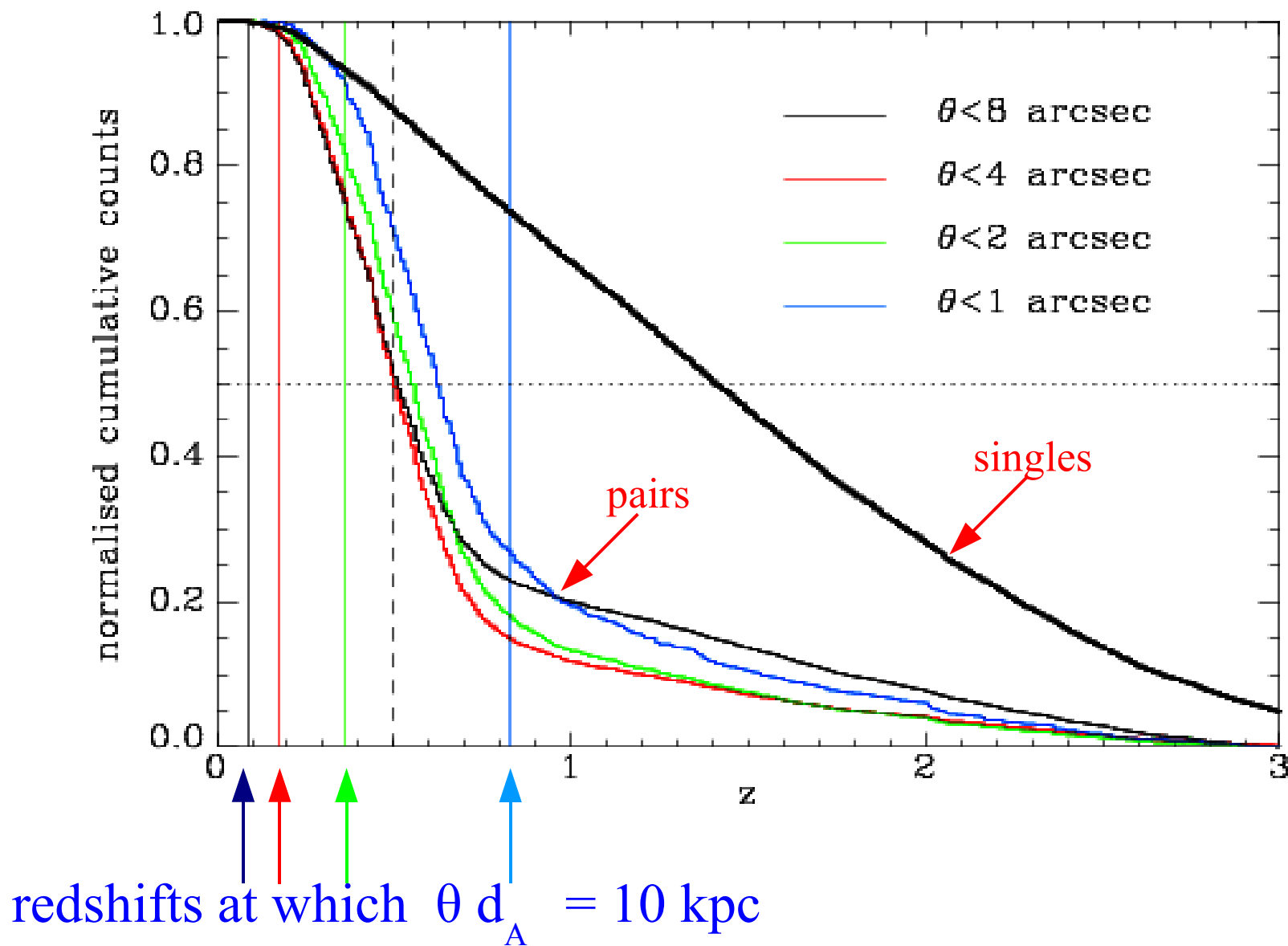
Comparison with COSMOS survey $w(\theta)$

McCracken et al 2007



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

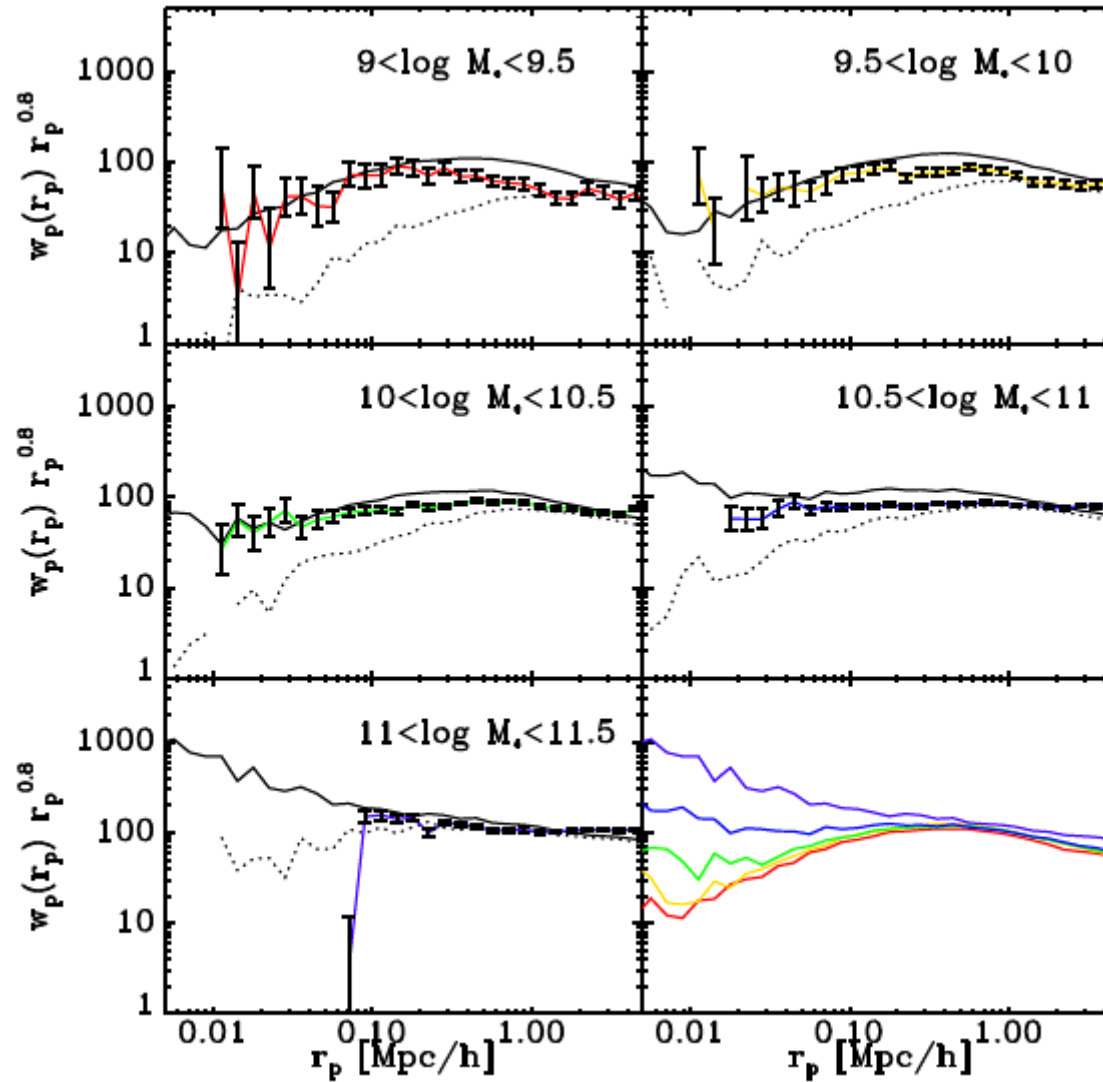
pairs with 3D physical separation $r < \theta d_A$



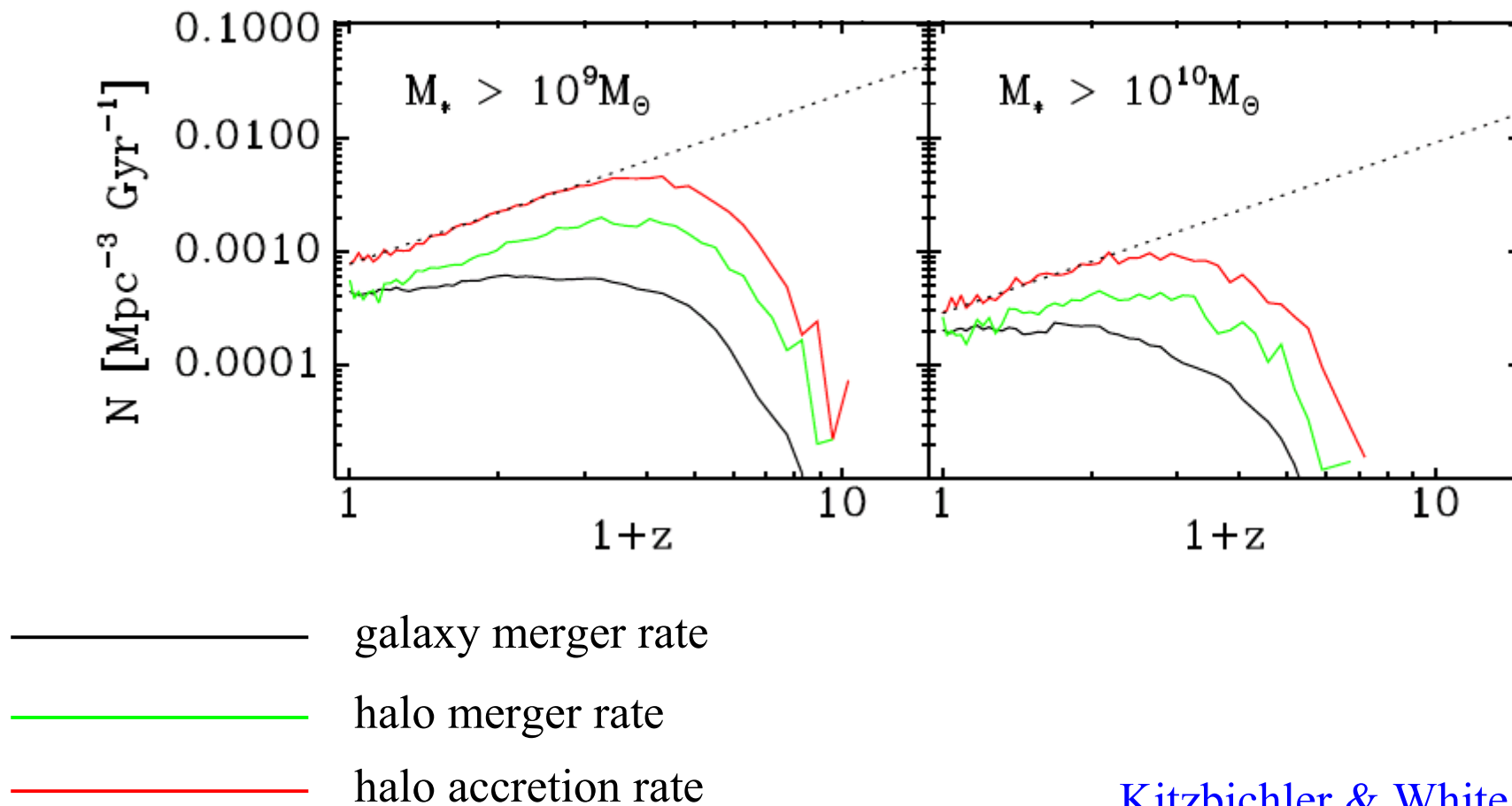
Resolution Limitations in the Millennium Simulation

- Halo mass: $2.5 \cdot 10^{10} M_{\odot}$ at all z ($N_{\text{halo}} \geq 20$ 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 ?

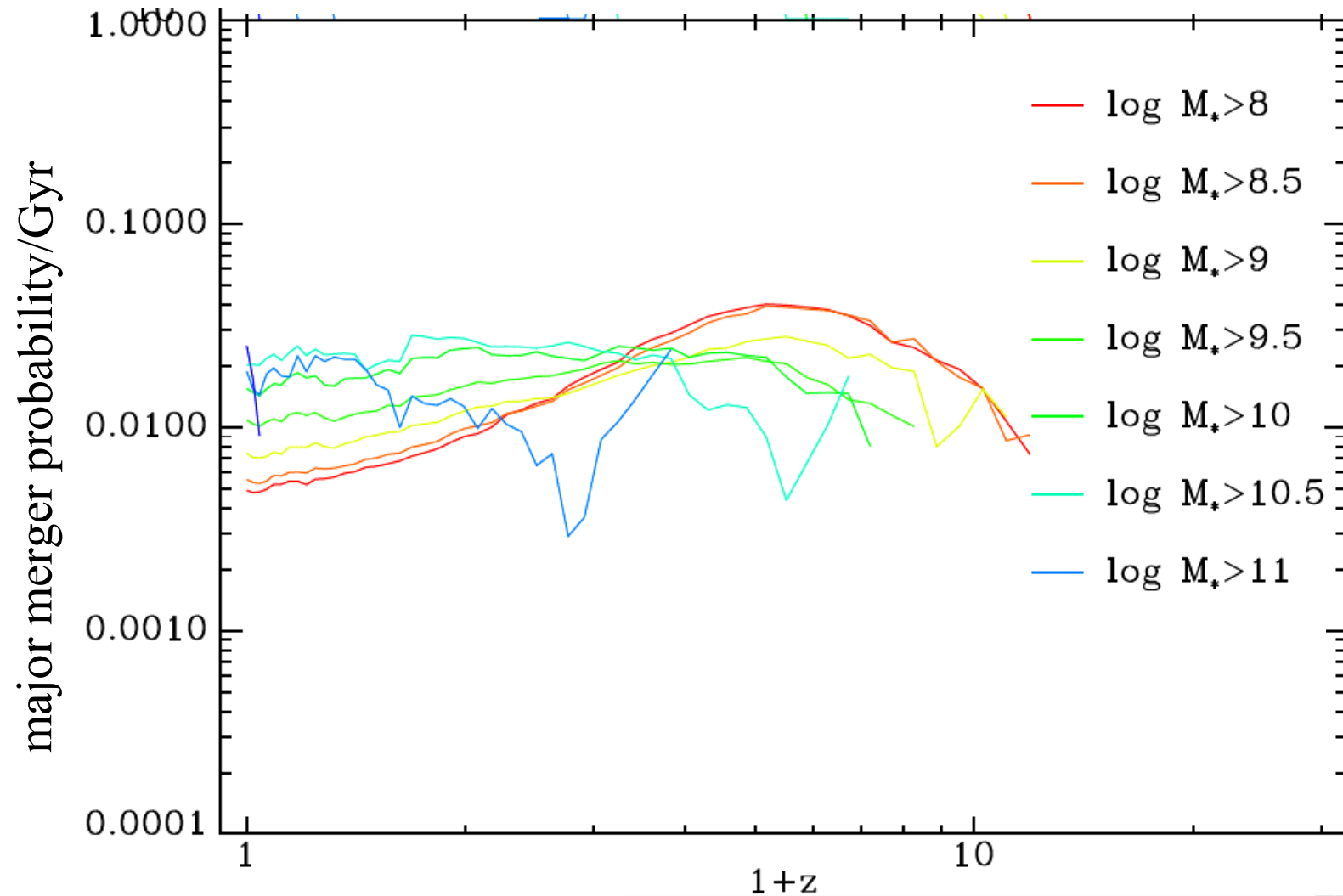
Small-scale correlations in the MS versus SDSS



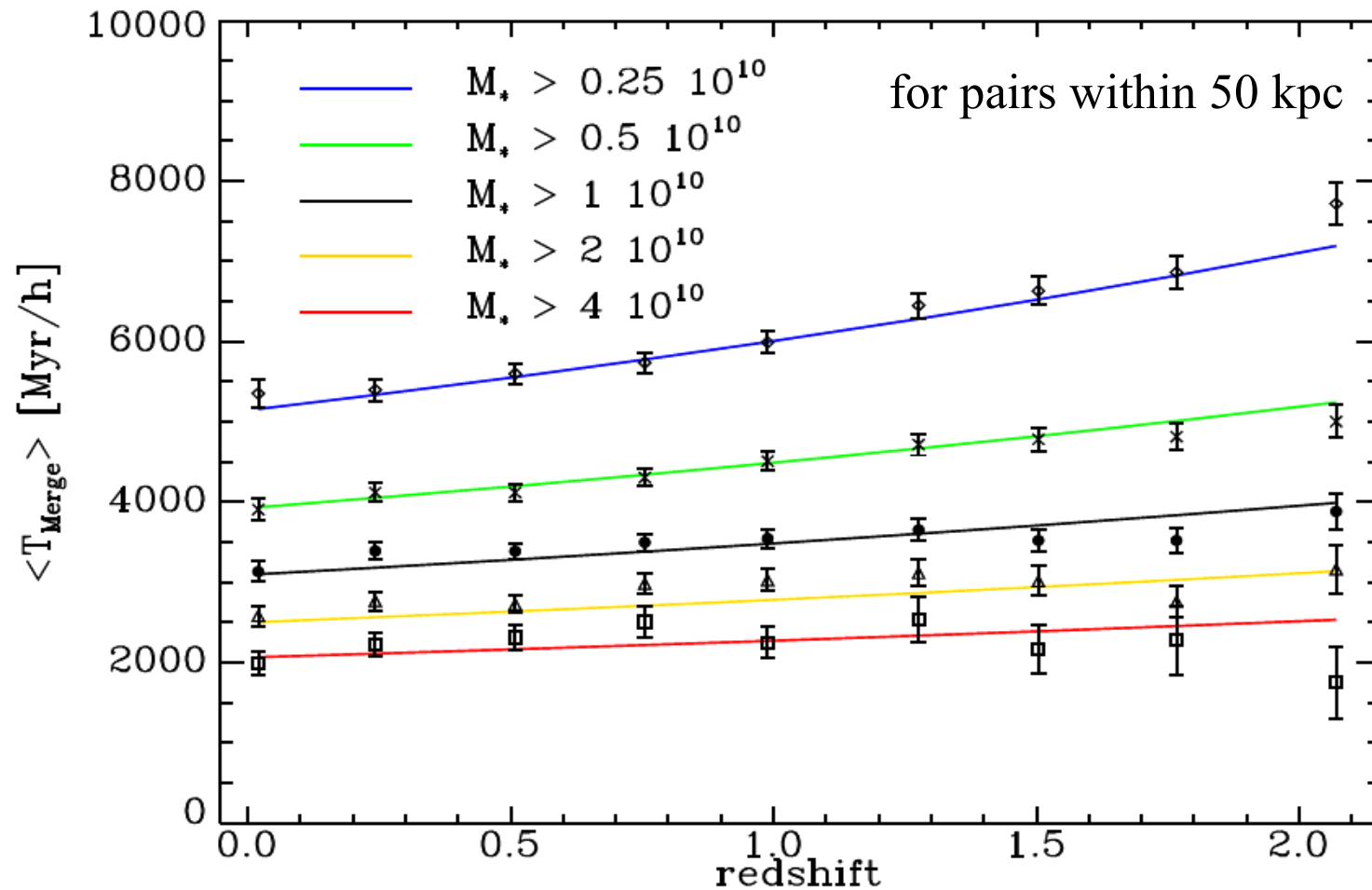
Major merger rate in the Millennium Simulation



Major merger probability as function of mass and redshift



Timescale for converting close pair counts into merger rates



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

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

How to estimate merger rates from pair counts

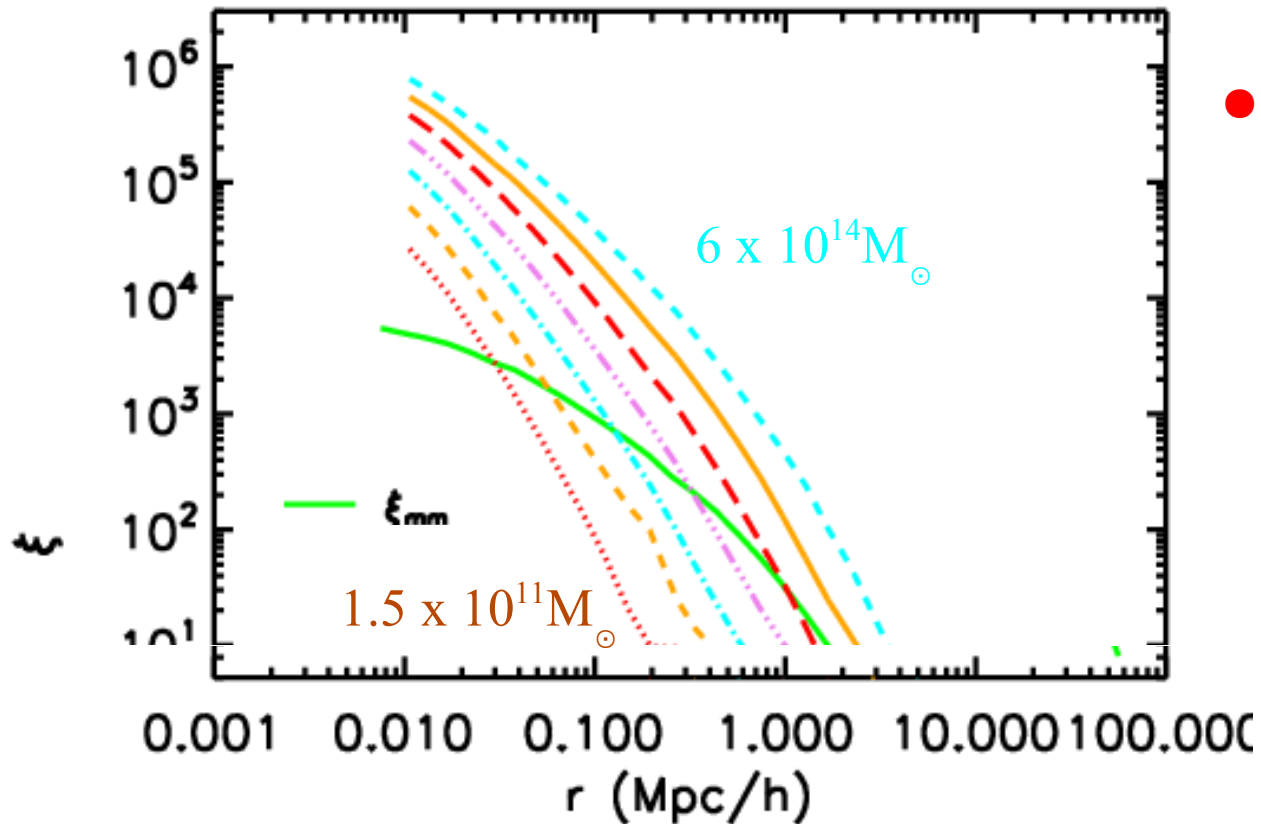
- 1 Count close pairs ($r_p < 50$ or 30 kpc) with well defined criteria on magnitude difference, stellar mass, etc.
- 2 Make completeness and background corrections to estimate abundance of pairs of chosen type at known z
- 3 Divide close pair abundance by the merger timescale to get merger rate (per unit volume) of the chosen pair type
e.g. for pairs of $\sim 10^{10} M_\odot$ galaxies at $z \sim 1$ with

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

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

Density profile shapes at large radii

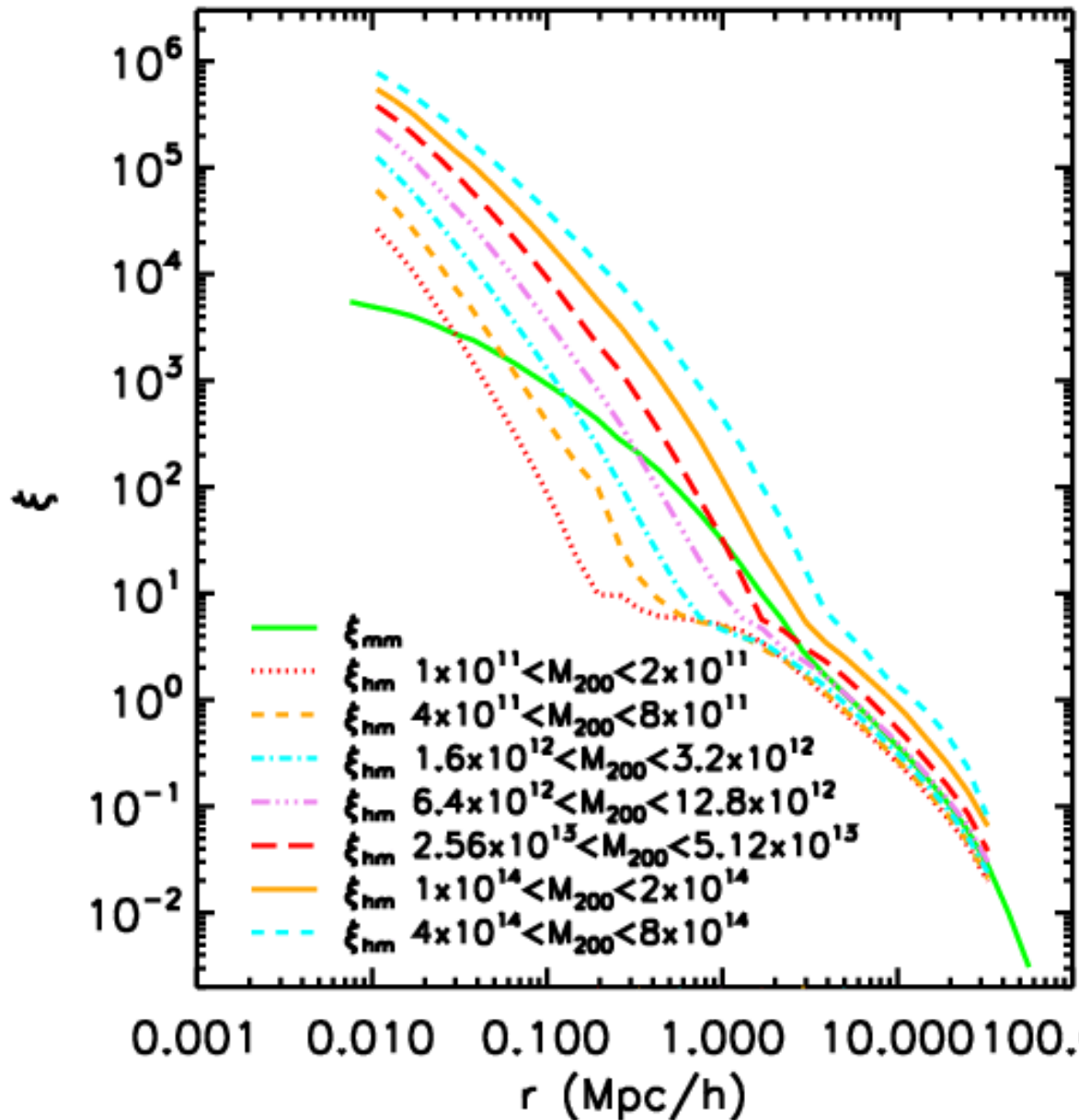
Hayashi & White 2007



- 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)

Density profile shapes at large radii

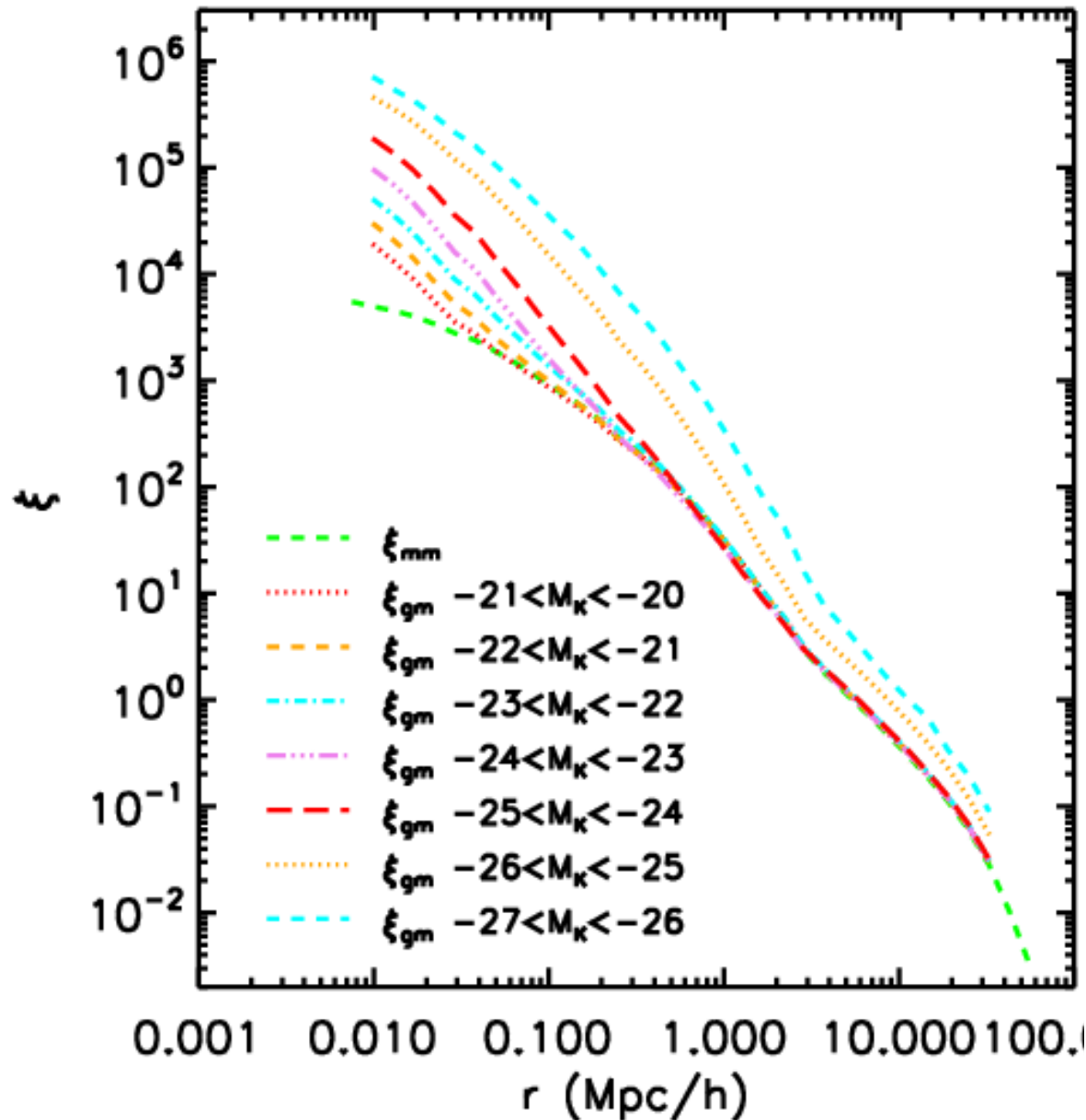
Hayashi & White 2007



- 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)
- 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}