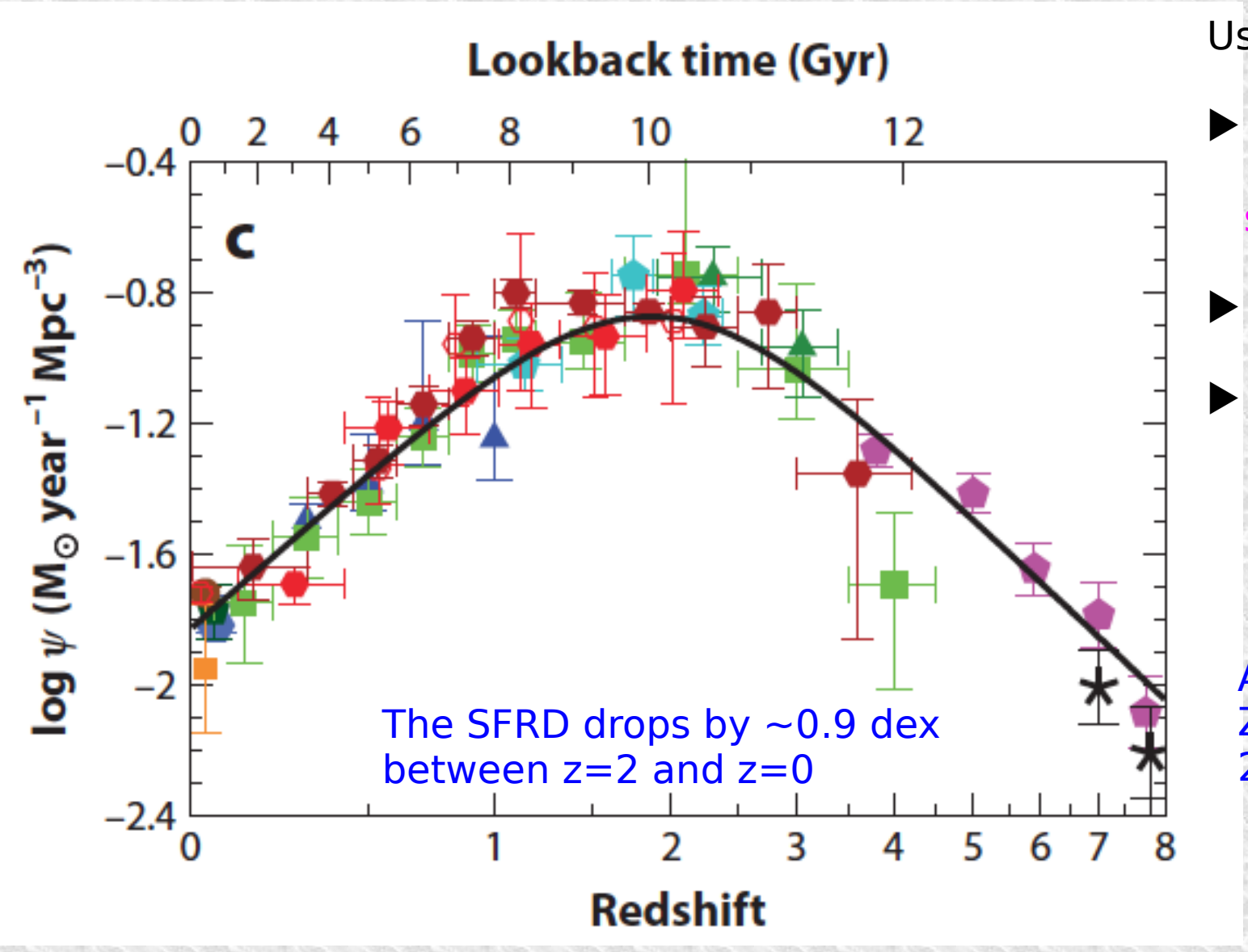
Aim: demonstrate that the rise & fall of the cosmic SFR is fully accounted by the evolution of the main sequence + quenching

Madau & Dickinson 2014



Using:

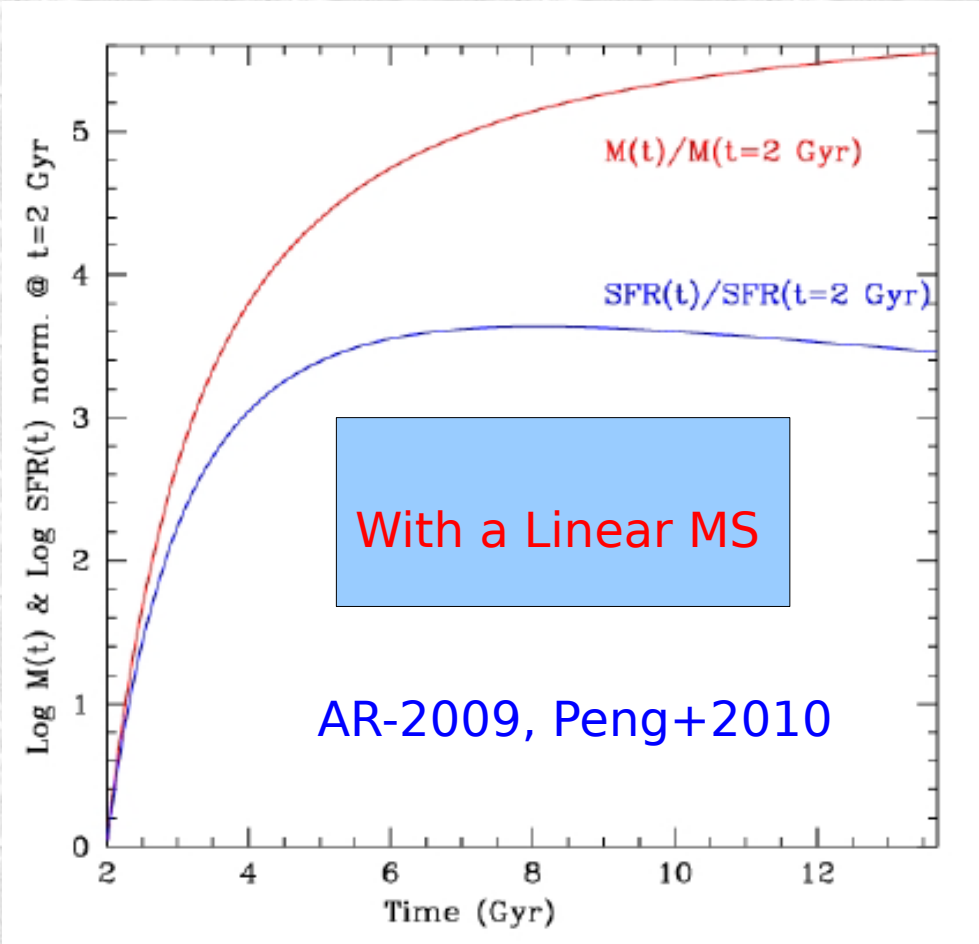
- The Evolution of the Main Sequence of star-forming galaxies
- Quenching
- The Evolution of the Mass Function of star-forming galaxies

Alvio Renzini
Zwicky Symposium
2015

The Rise and Fall of the SFRD

1) The rise is due to the quasi-exponential growth of SFR and Mass of all galaxies at early times:

The Main Sequence: $SFR(t,M) \approx 270\ M_{11}\ (t/3.4)^{-2.5}$ ($M_\odot$ /yr)



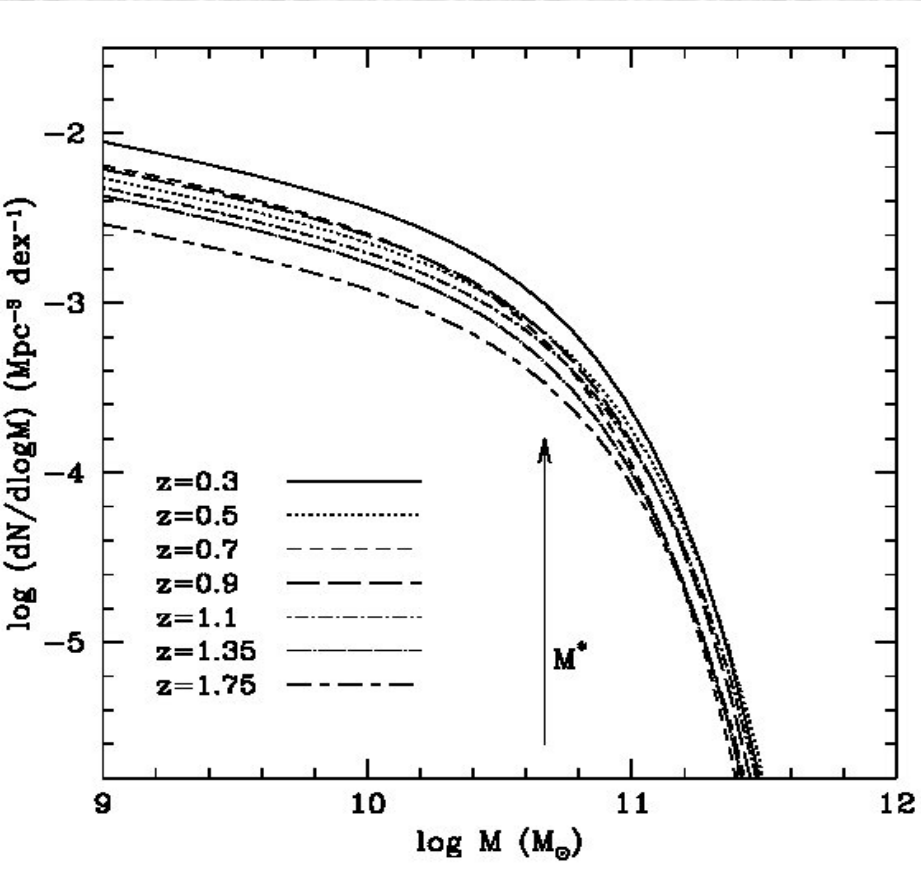
If beyond z~3 the sSFR remains constant

$dM/dt \propto M$

and both Mass and SFR increase exponentially with time.
If the sSFR keeps increasing the growth of individual galaxies will still be quasi-exponential

2) The Fall by ~1 dex of the SFRD from z~2 to z ~ 0 is due (almost) entirely to quenching!

Ilbert et al. 2010



From the Main Sequence evolution: the sSFR of SF galaxies falls by a factor of ~30

But the mass function of SF galaxies increases by a factor ~3

Hence the SDRD falls by a factor ~10

Is this due to the decrease of the sSFR of individual SF galaxies? Or to quenching?

If the MS is Linear, SFR $\propto$ M, then the SFR of z~0 SF galaxies was nearly constant over the last ~10 Gyr

➔All the SFRD fall since z~2 would be due to quenching!!

But the MS slope may not be = 1, actually it look more

like ~0.8 ➔ part of the fall due to MS "fading"

Still: the slope is ~1 for the disk component at z~0 (Abramson+14, also Selmi+11 at z~1)

Conclusion: Eventually, the fall of the SFRD may all be due to quanching, when combining fully quenched galaxies with the quenched bulges of SF galaxies.

.... several caveats ...