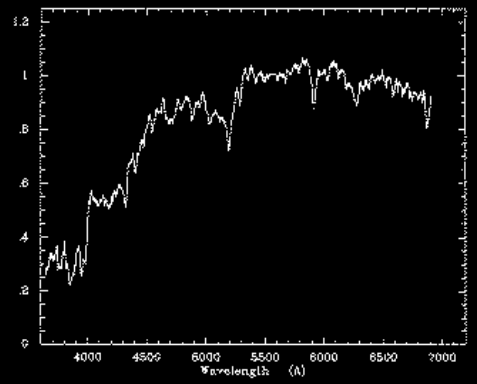
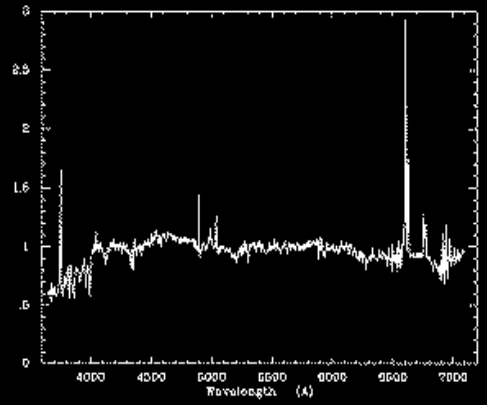
"Galassie: lavori in corso negli ultimi miliardi di anni" ... ma saro` breve!

Galaxies come in two basic types:



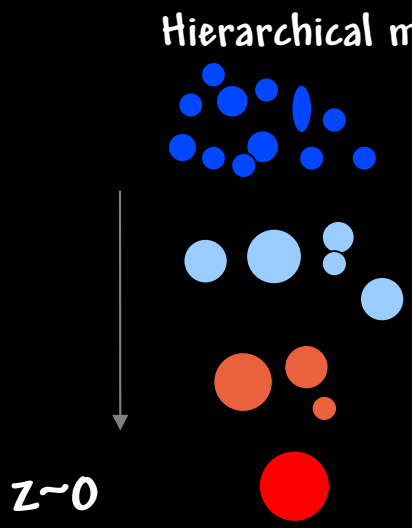
- spheroidal & dynamically hot
- red colors
- strong absorption lines
- predominantly old stars
- little or no star formation



- disk & supported by rotation
- blue colors
- strong emission lines
- broad range of stellar ages
- ongoing star formation

Galaxy evolution by deep cosmological surveys

Why these studies are important? → Interfacing theory to observations!



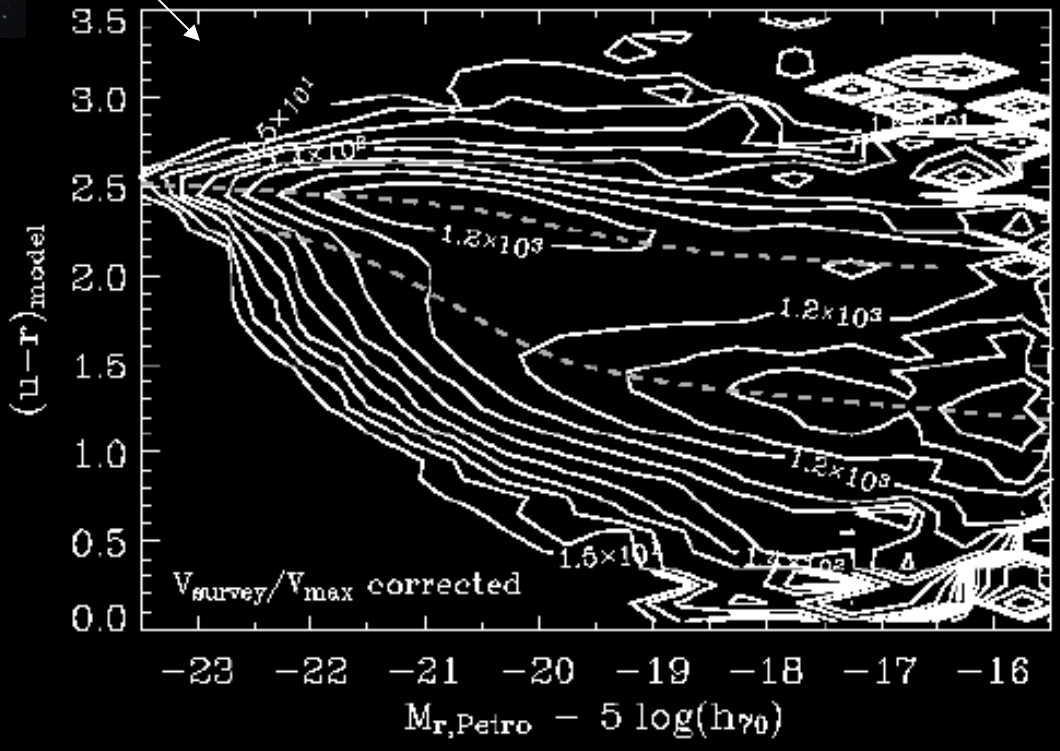
CDM-based models of galaxy formation produce a good agreement with the z=0 galaxy properties

red

Color

blue

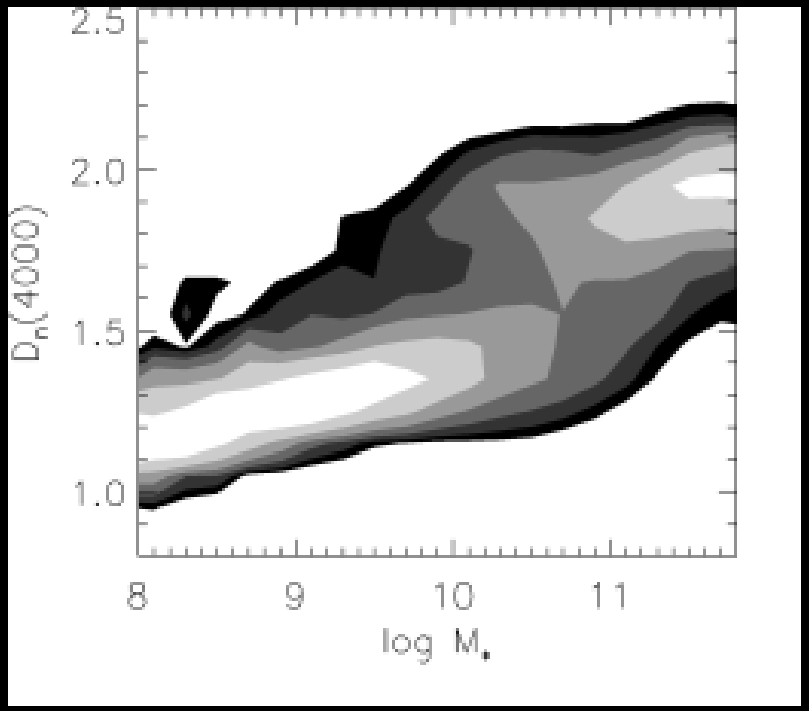
Galaxy colors are strongly bimodal (e.g. SDSS, Baldry et al. 2003)



bright Luminosity faint

CDM-based models of galaxy formation produce a good agreement with the z=0 galaxy properties

Stellar ages & masses
(e.g. Kauffmann et al. 2003)

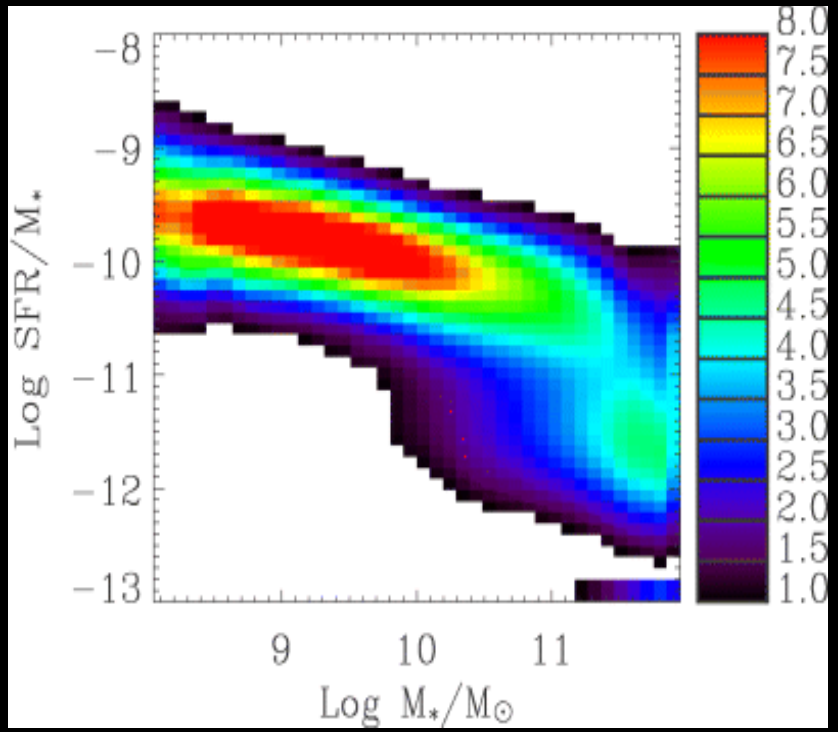


old

young

low-mass high-mass

Specific Star formation rate vrs mass
(e.g. Brinchmann et al. 2004)



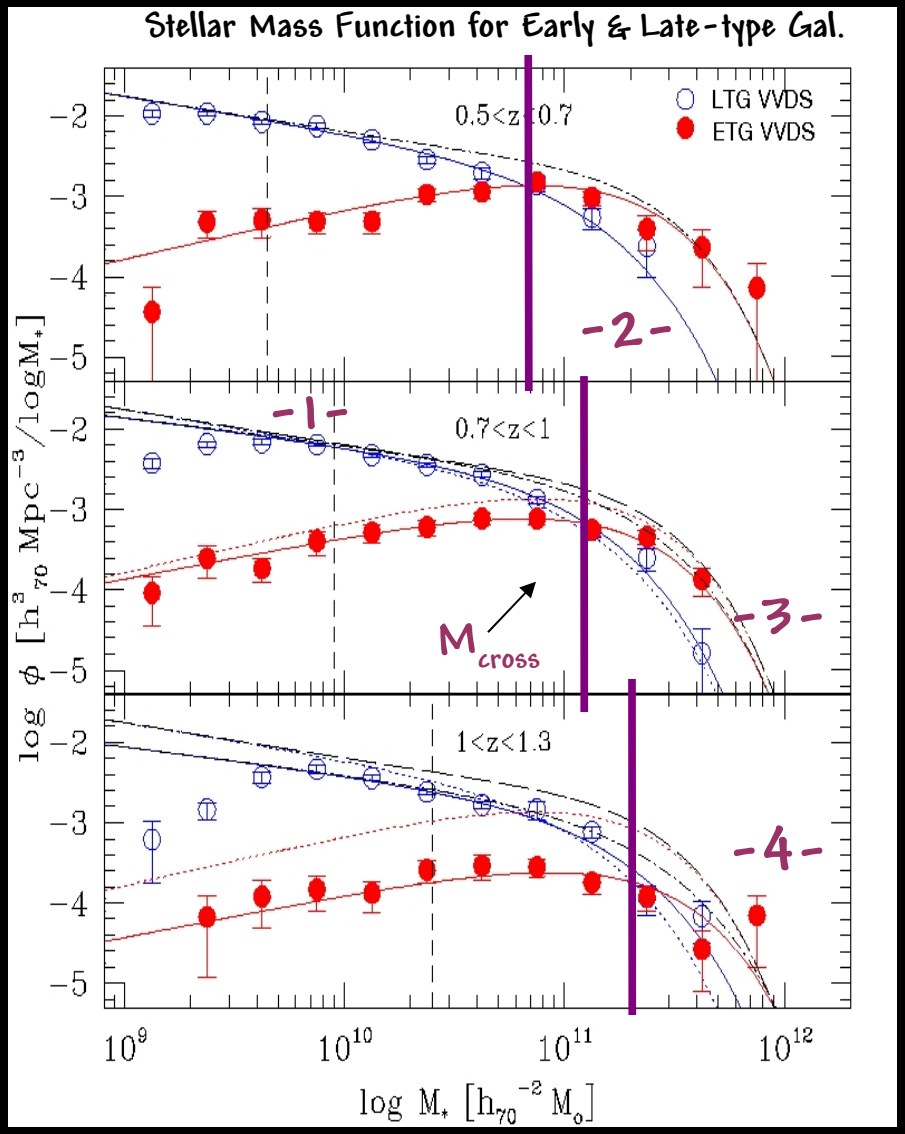
low-mass high-mass

There is a critical stellar mass at ~3×10^{10} M_{sun}

CDM-based models of galaxy formation produce a good agreement with the z=0 galaxy properties

... but they suffer with z>0 galaxy properties

Dash line= MF @ z=0.5-0.7
Dot-Dash line= Total MF



(VVDS, Vergani et al. 2007, astro-ph 0705.3018)

A test case: Stellar mass Function

partitioned by the 4000Å Balmer break into blue (active) and red (quiescent) populations.

Late-type gal:

-1- dominate at low-masses at all t

-2- decrease at high-mass with t

Early-type gal:

-3- Increase of intermediate/high-mass with t

-4- Massive tail present up to z=1.3

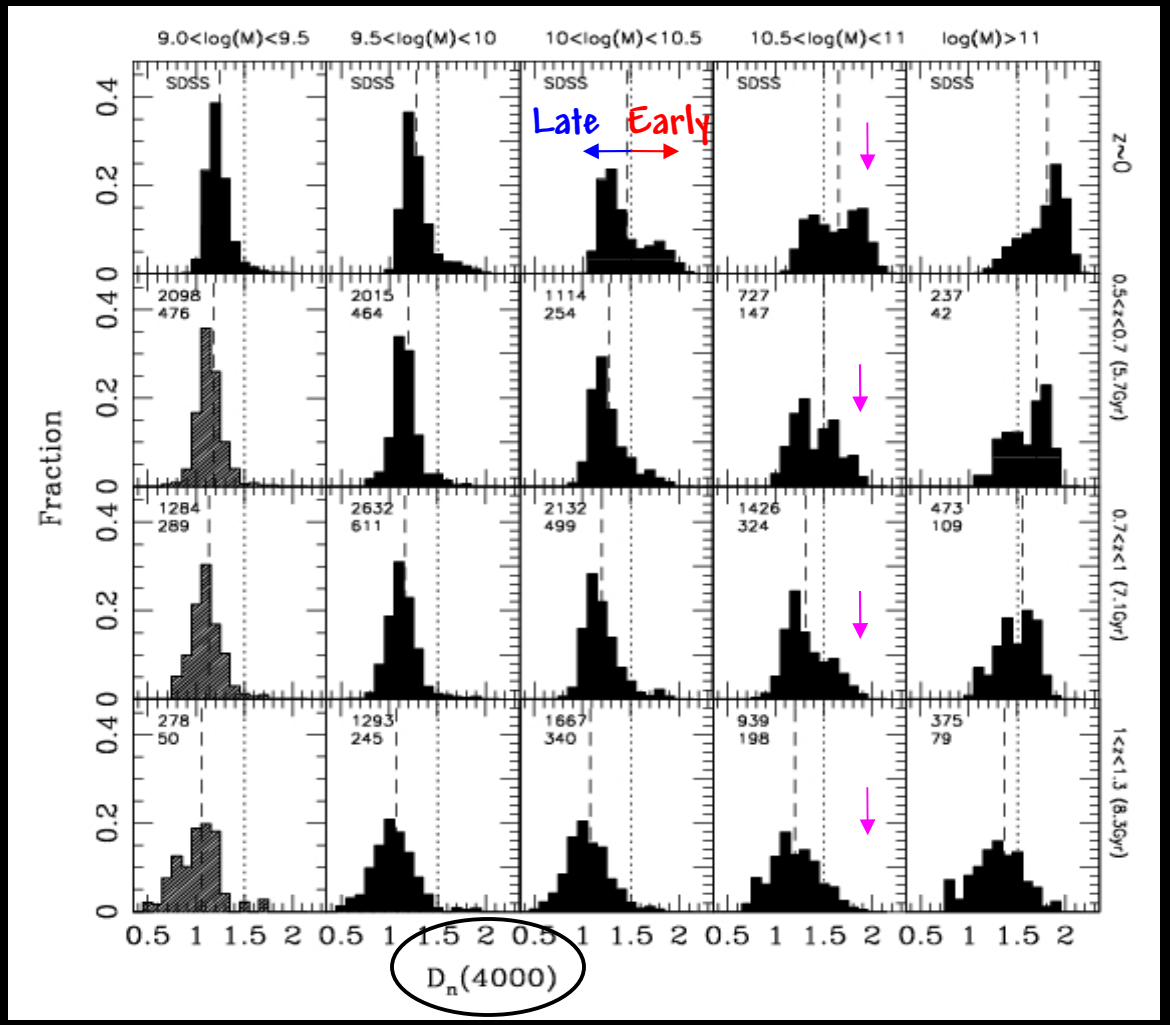
M_{cross} evolves with redshift

Transformation with cosmic time from active to passive galaxies & opposite evolution of massive active and passive galaxies

Downsizing is a fundamental and recurring theme everywhere.

How do we characterize it?

Stellar masses



red shift

Stellar ages

(NDS, Vergani et al. 2007, astro-ph 0705.3018)

A stellar age dependence on stellar mass following the behaviour observed in the local Universe:

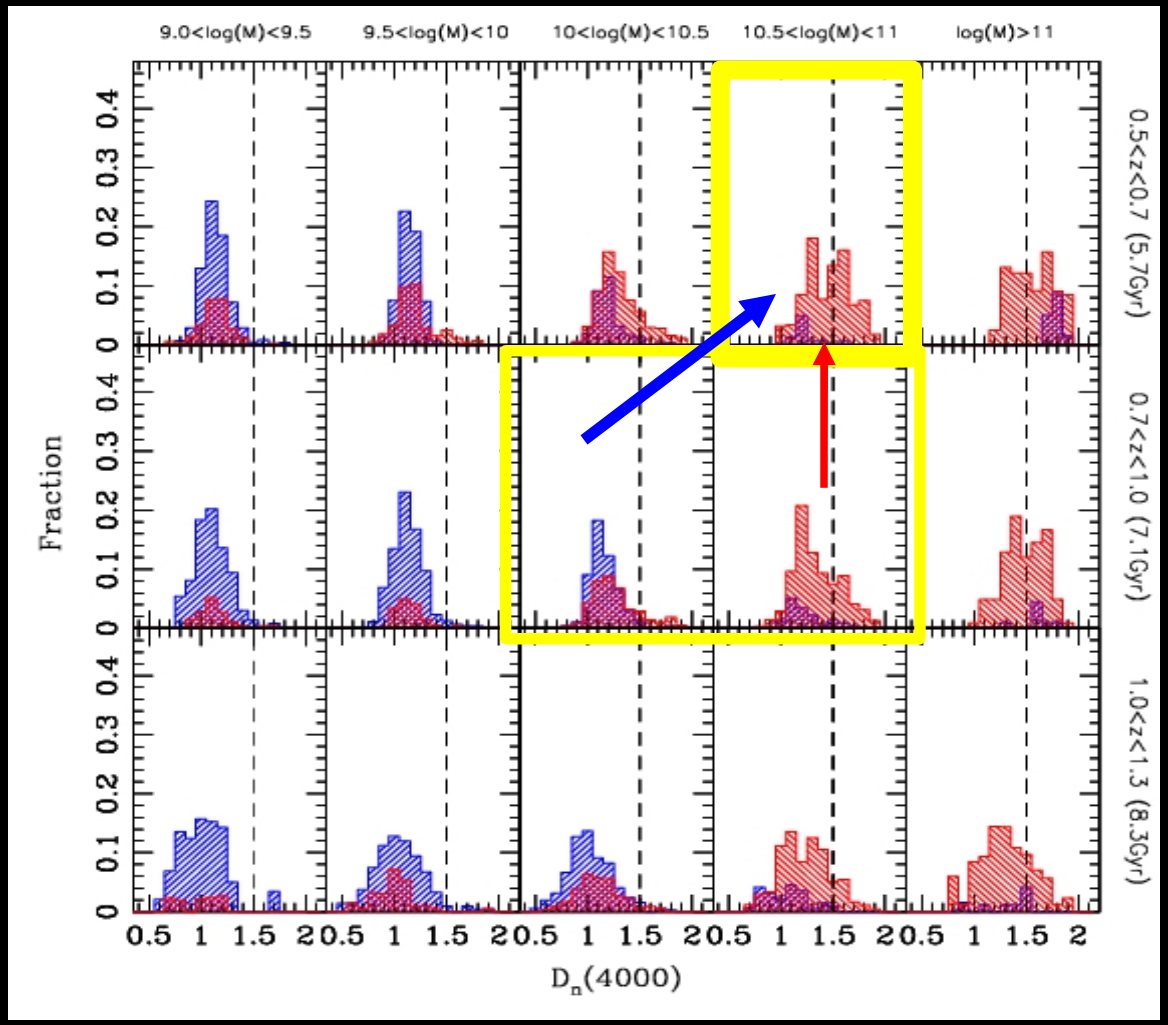
Low-mass gal: young stellar ages, as mass increases stars are older

A progressive accumulation of galaxies with older stellar ages

At z<1 no evolution of Dn4000 median distribution (dashed line) at the low- and high mass in stellar ages

Downsizing is a fundamental and recurring theme everywhere.

How do we characterize it?



(VIDS, Vergani et al. 2007, astro-ph 0705.3018)

Blue histogram: galaxies with SFR high enough to move to next mass bin in next z bin

Red histogram: galaxies with low SFR

Efficiency in mass assembly

Can progenitors justify assembled mass without dry mergers?

-> The lower the mass, more and more galaxies can efficiently assemble mass. At high mass: quenching in star formation activity

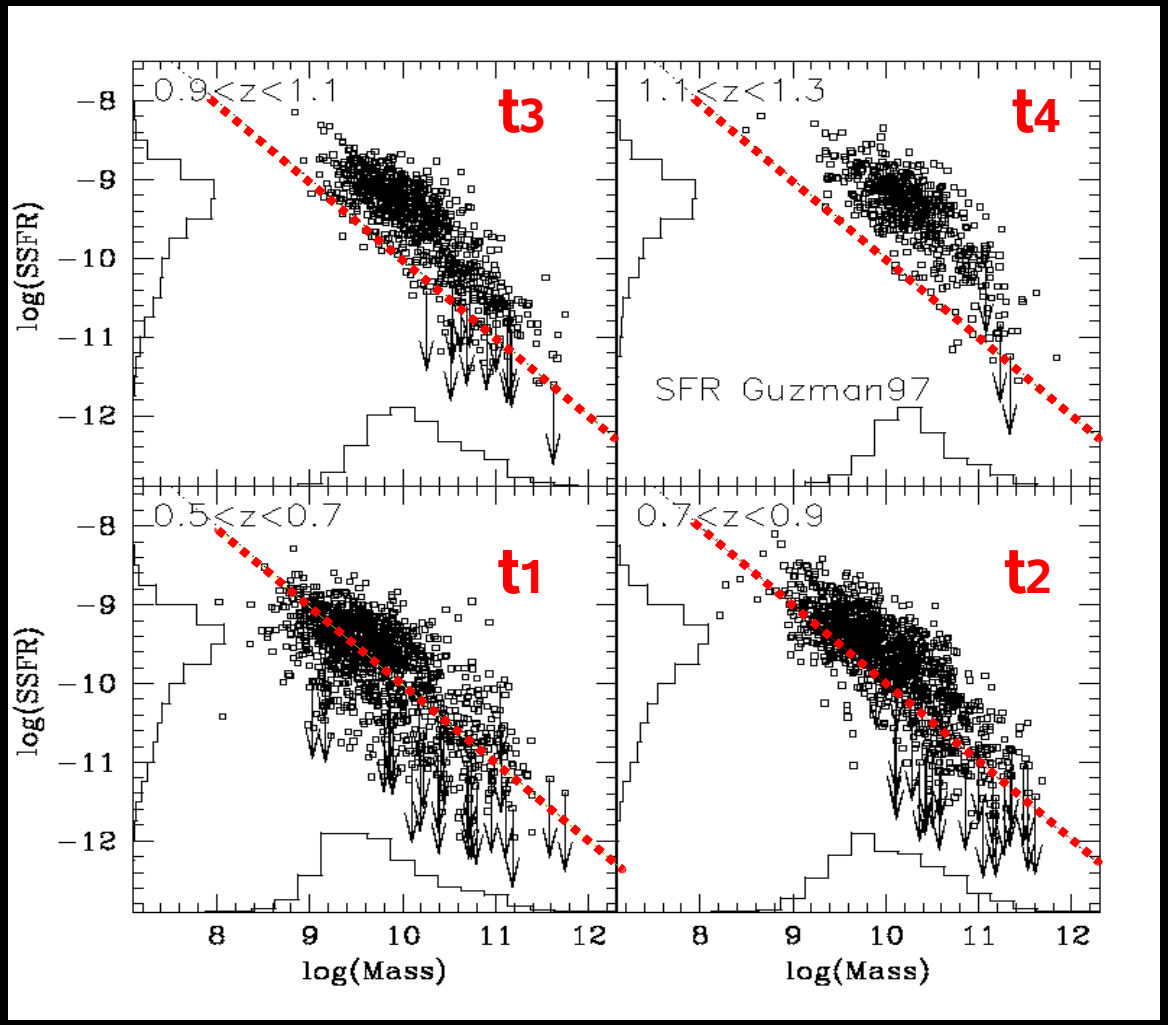
-> Number of progenitors can account for 80% of galaxies, almost 100% for high mass galaxies

No big need for mergers at z<1

Passive evolution can justify mass assembly

Downsizing is a fundamental and recurring theme everywhere.

How do we characterize it?



(VVDS, Vergani et al. in prep.)

SSFR = SFR/M(stars)

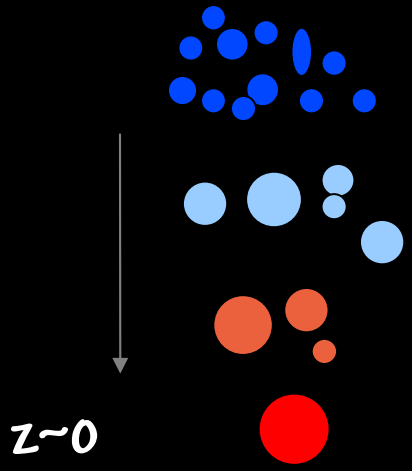
Higher in lower mass gal at all redshifts, and lowest in higher mass gal at all redshifts

Galaxy envelope moves to higher SFRs with redshift

Galaxy evolution by deep cosmological surveys

Why these studies are important? → Interfacing theory to observations!

Hierarchical models



& Downsizing concept

Cowie et al. '96: The sites of star formation appear to shift from including high-mass galaxies at early epochs (z~1-2) to only lower-mass galaxies at later epochs.

Downsizing is a fundamental and recurring observational theme everywhere.

Still an observational fact that puts stringent constraints to models