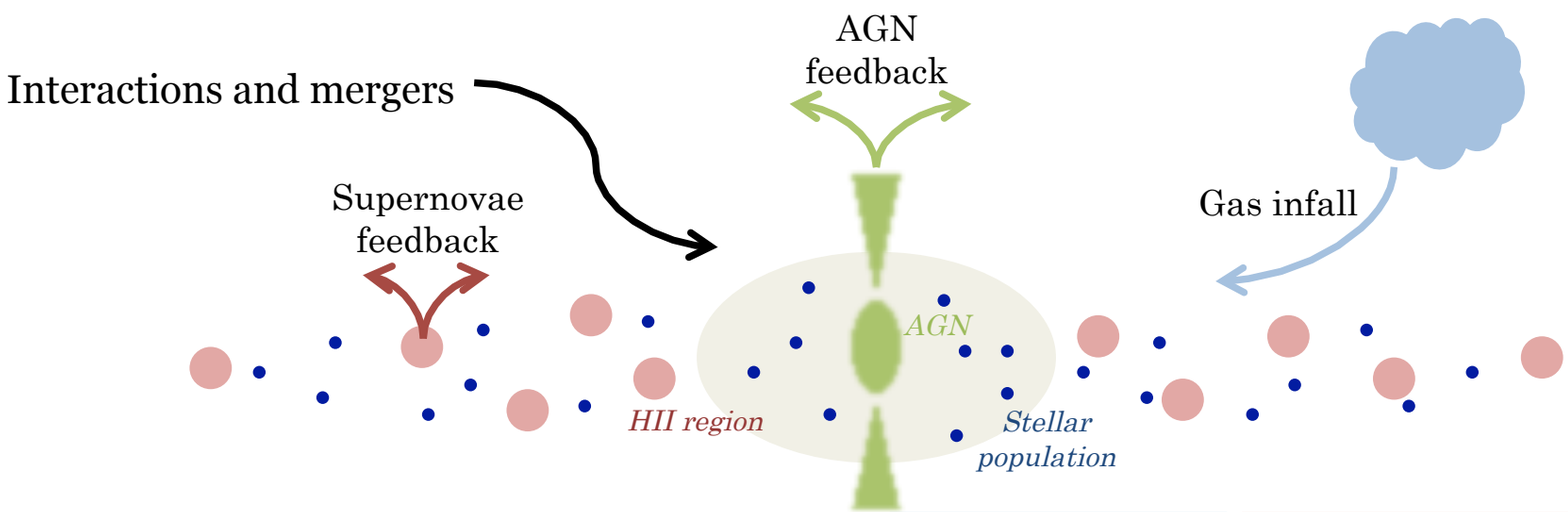
Metallicity of distant galaxies

… and low mass galaxies at intermediate redshift

SDSS - like survey @ z>1 with MOONS



Environment | Morphology | Dynamics | Stellar population | Metallicity | SFR | AGN/SF

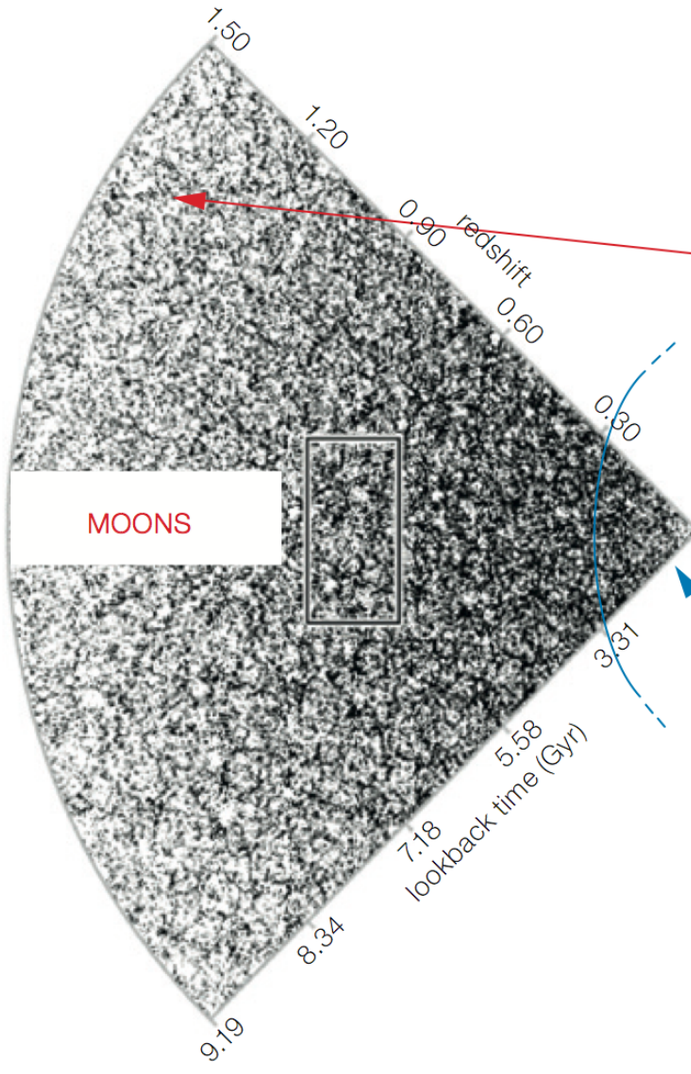
spectroscopic redshift in large volumes

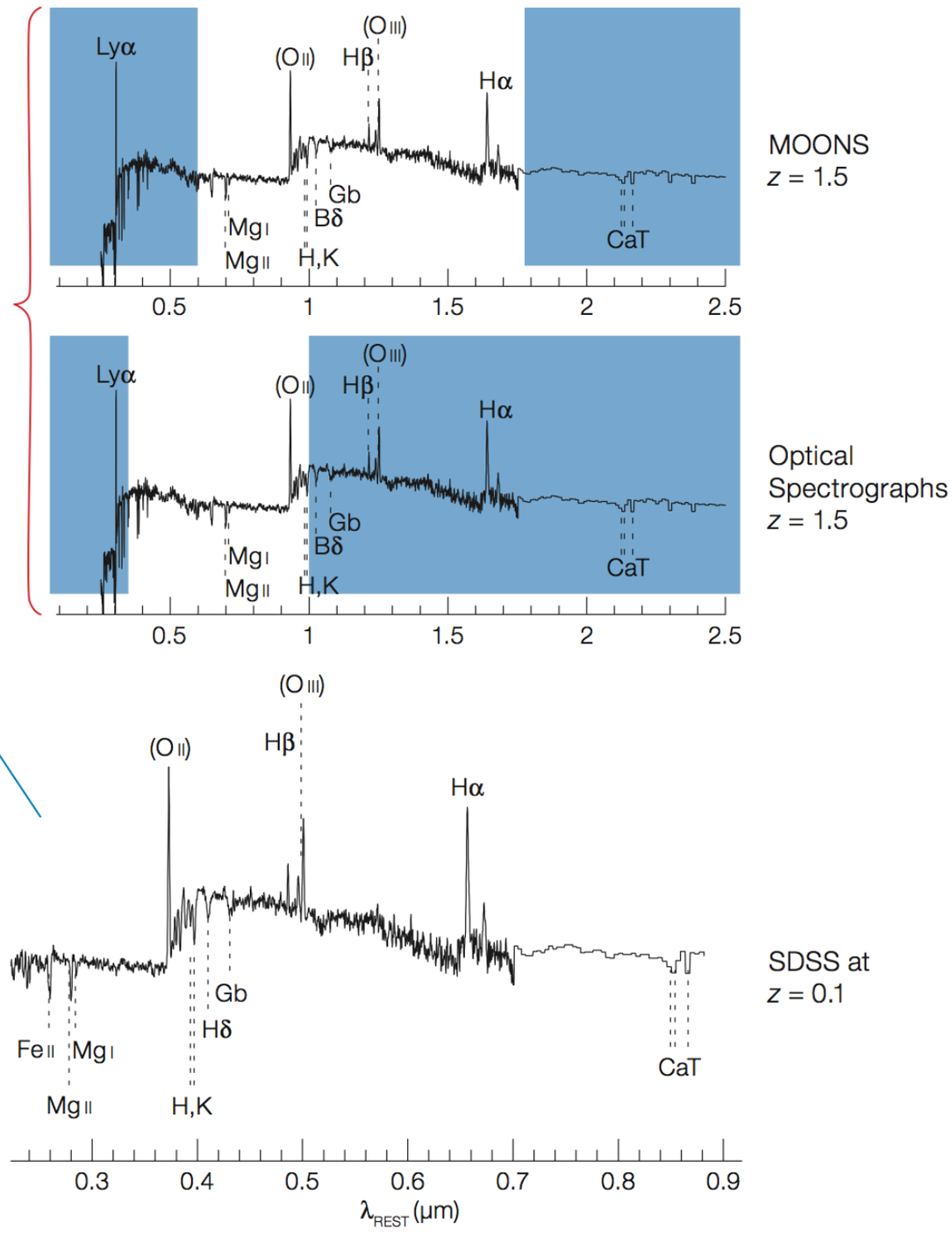
Presence of gas flows from Mg II

Extended λ-coverage for full-spectral fitting

Main emission lines diagnostics

SDSS - like survey @ z>1 with MOONS

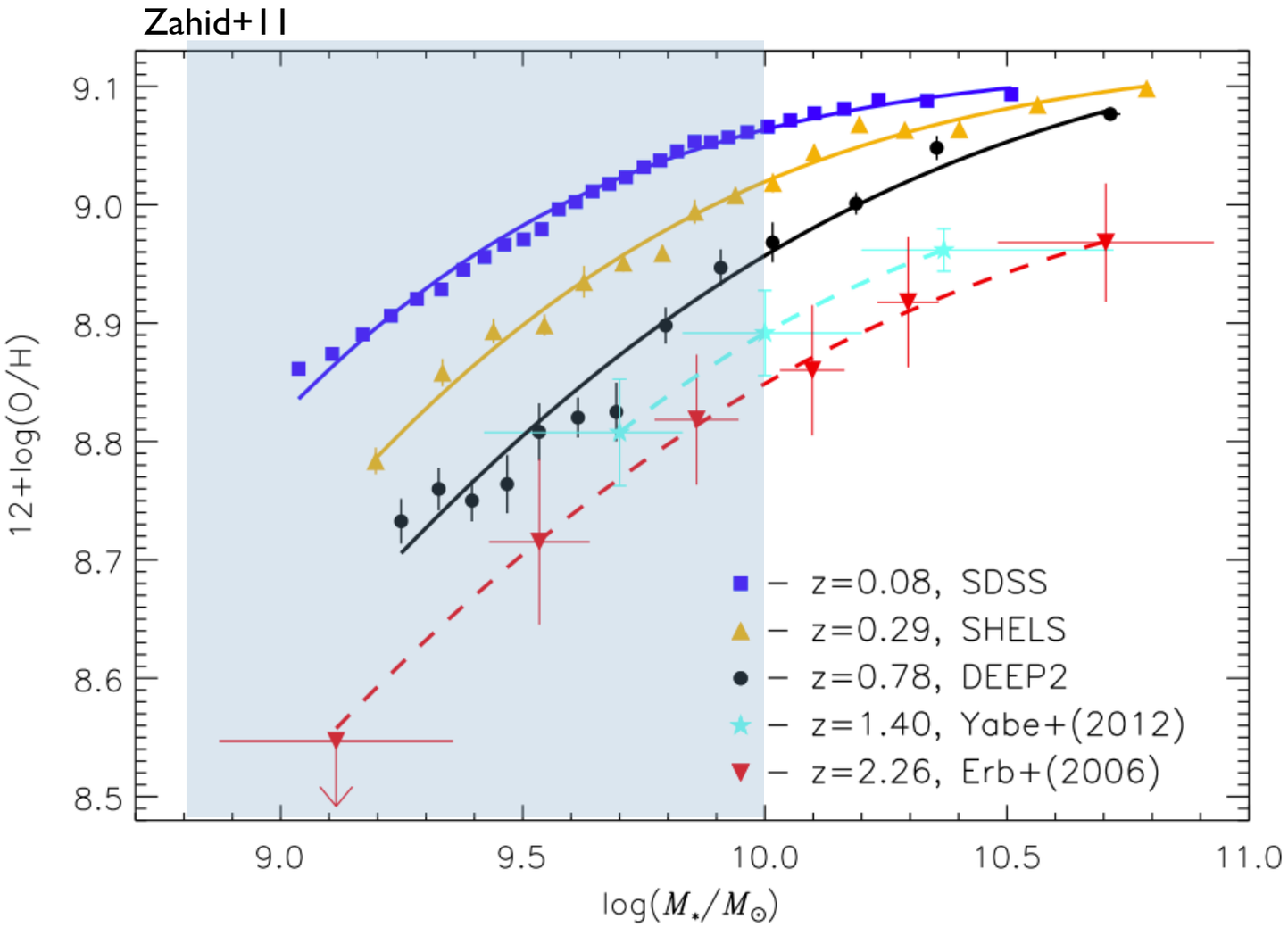




Survey	Redshift	Volume (h^{-3} Mpc^3)	#Objects
SDSS	$0 < z < 0.2$	1×10^8	10^6
MOONS	$0.8 < z < 1.8$	5×10^7	2.5×10^6

Evolution of the Masse - Metallicitity relation

The shape & evolution of the M-Z relation gives constraints for galaxy formation models



Observations

- Fundamental metallicity relation: Dependence with SFR (Lara-Lopez +10, Mannucci +10)
- Companions, bars (Ellison +08, +11)

Models and simulations:

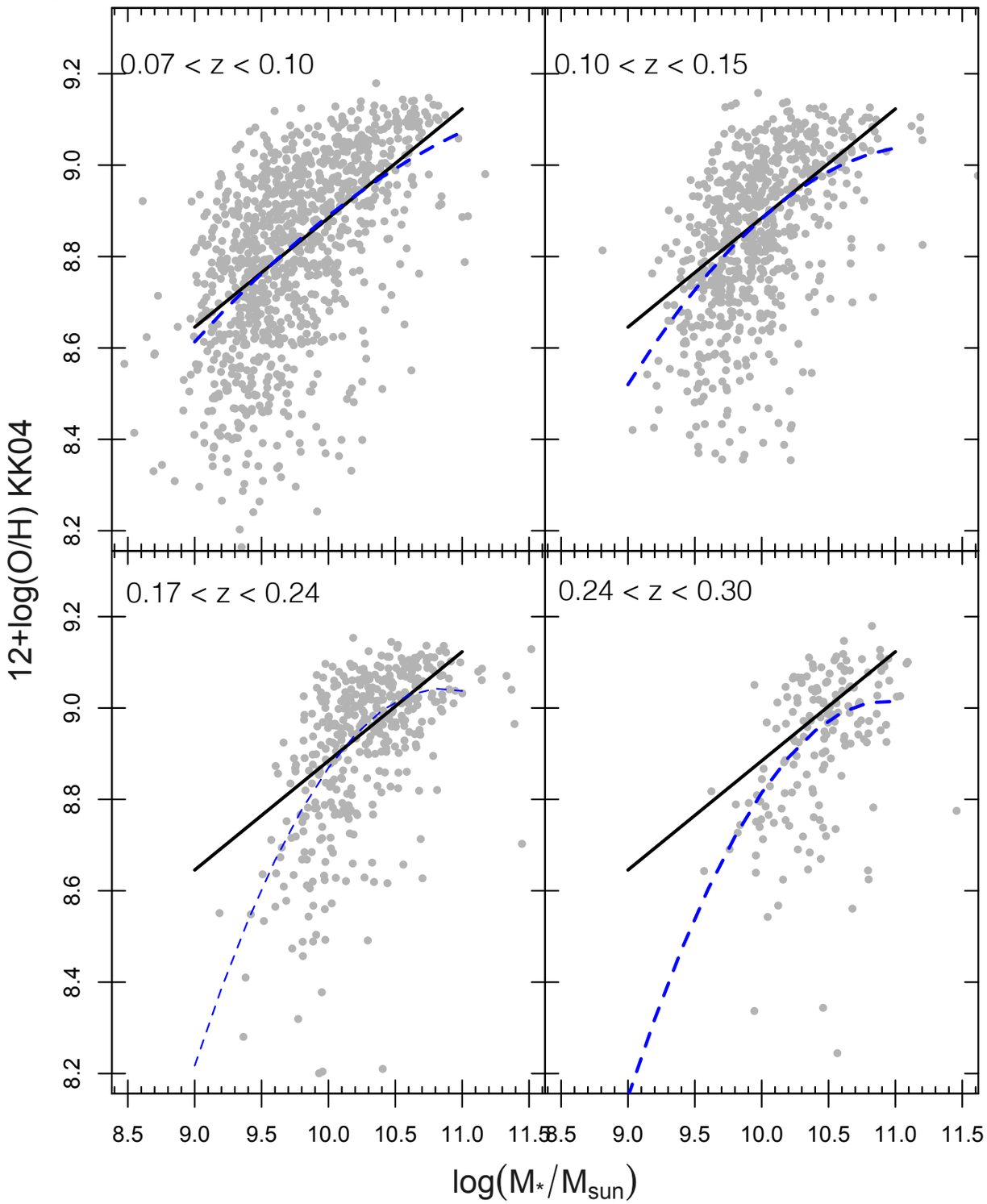
Aim to reproduce the M-Z shape and evolution :

- Feedback (AGN, SN, stellar winds)
- Gas inflow
- Varying IMF (Koppen, Weidner & Kroupa 2007)

Low-mass galaxies : M-Z shape and dispersion gives stringest constraints on feedback

M-Z relation in the nearby Universe (z<0.3)

Rodrigues et al. 2015



Evolution of the M-Z relation within the GAMA survey in 4 Mr-selected and volume limited samples

- The M* turnover of the M-Z sample seems to increases with z.
- Good agreement with observations at z~0.6 [e.g Zahid+11]
- Importance of outflows in the evolution of low-mass systems

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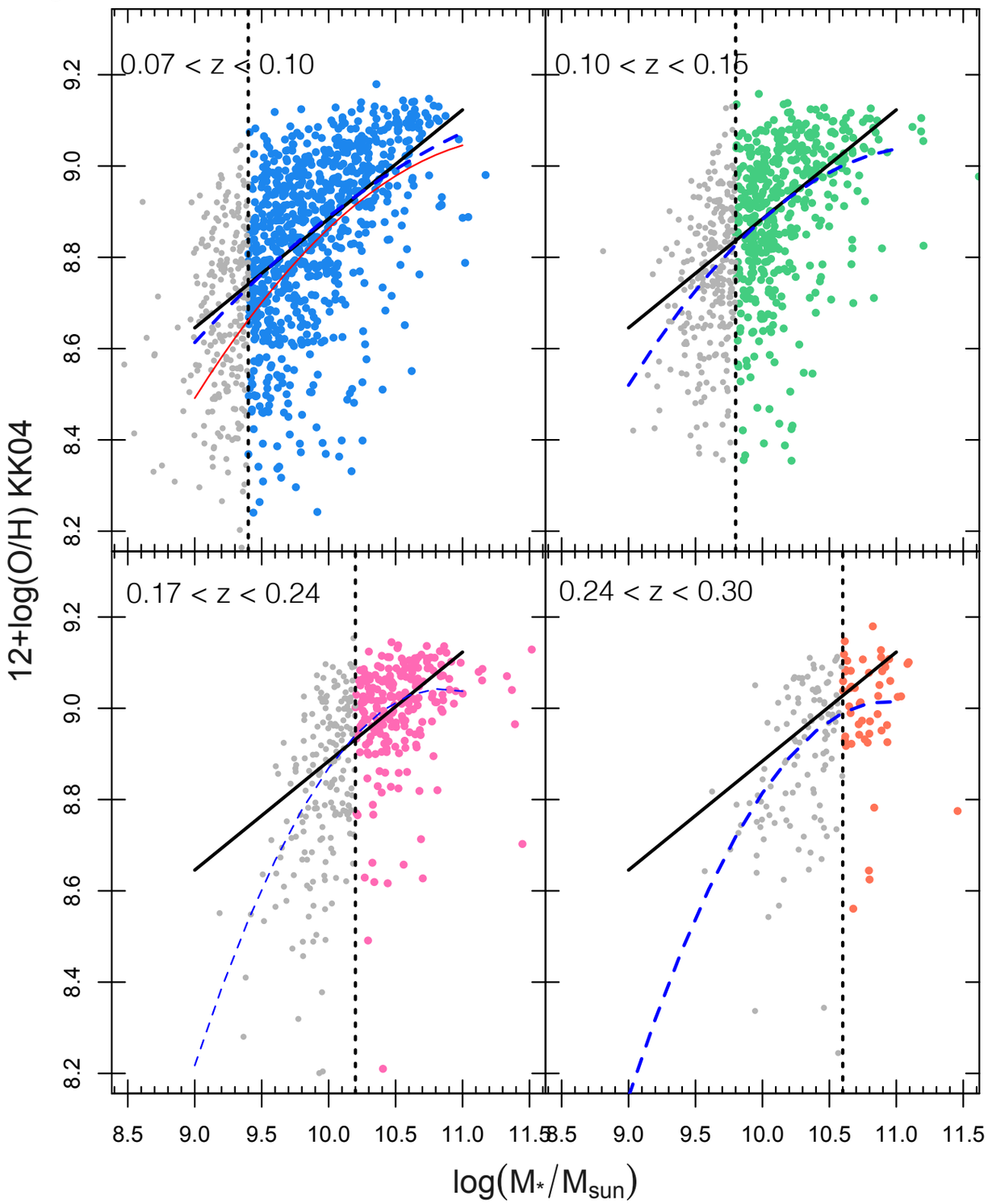

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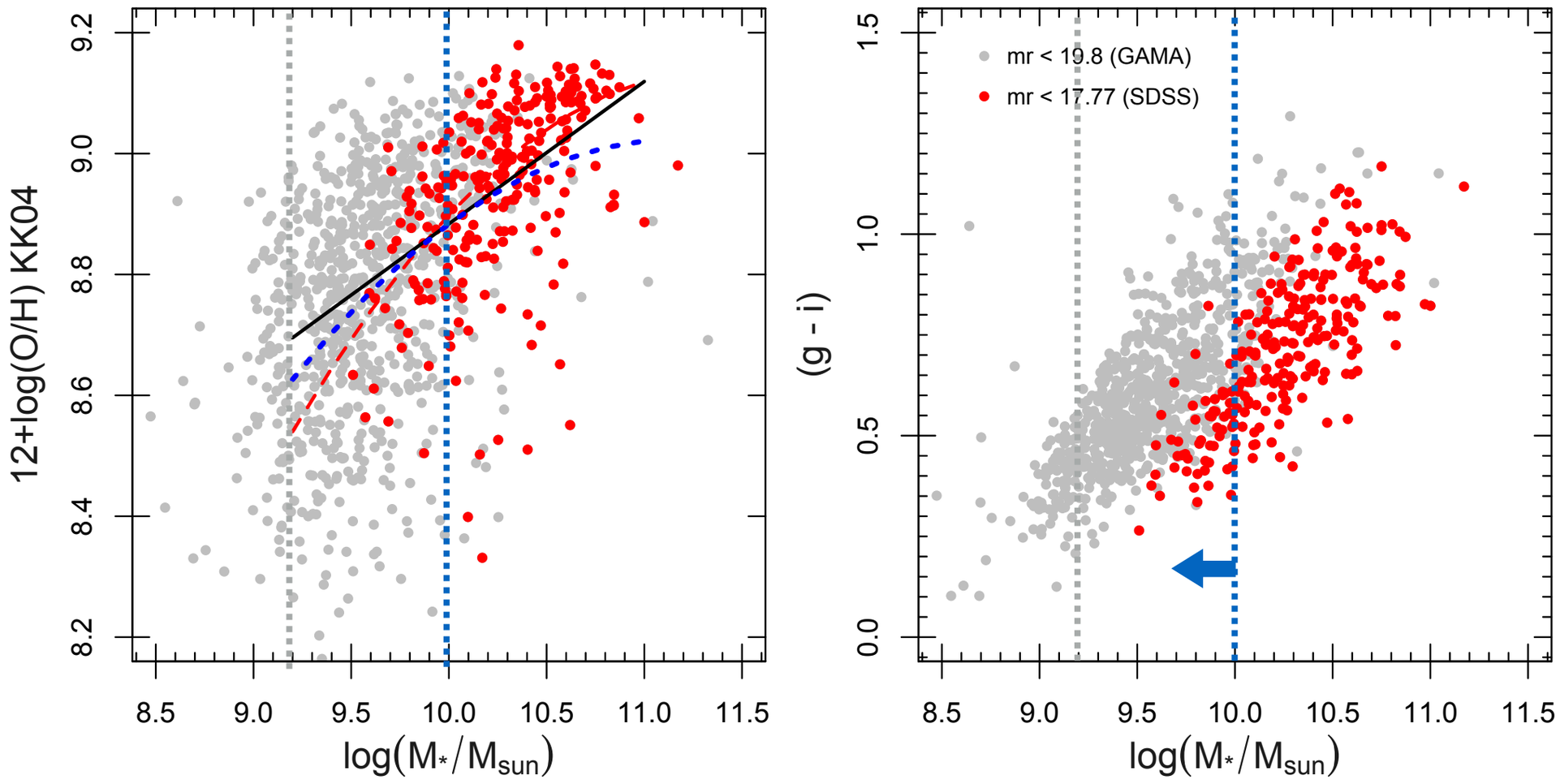
BUT when taking into account the range of representativity of the samples

The increase of the slope could be explained by the lack of representativity of the samples

M-Z relation in the nearby Universe (z<0.3)

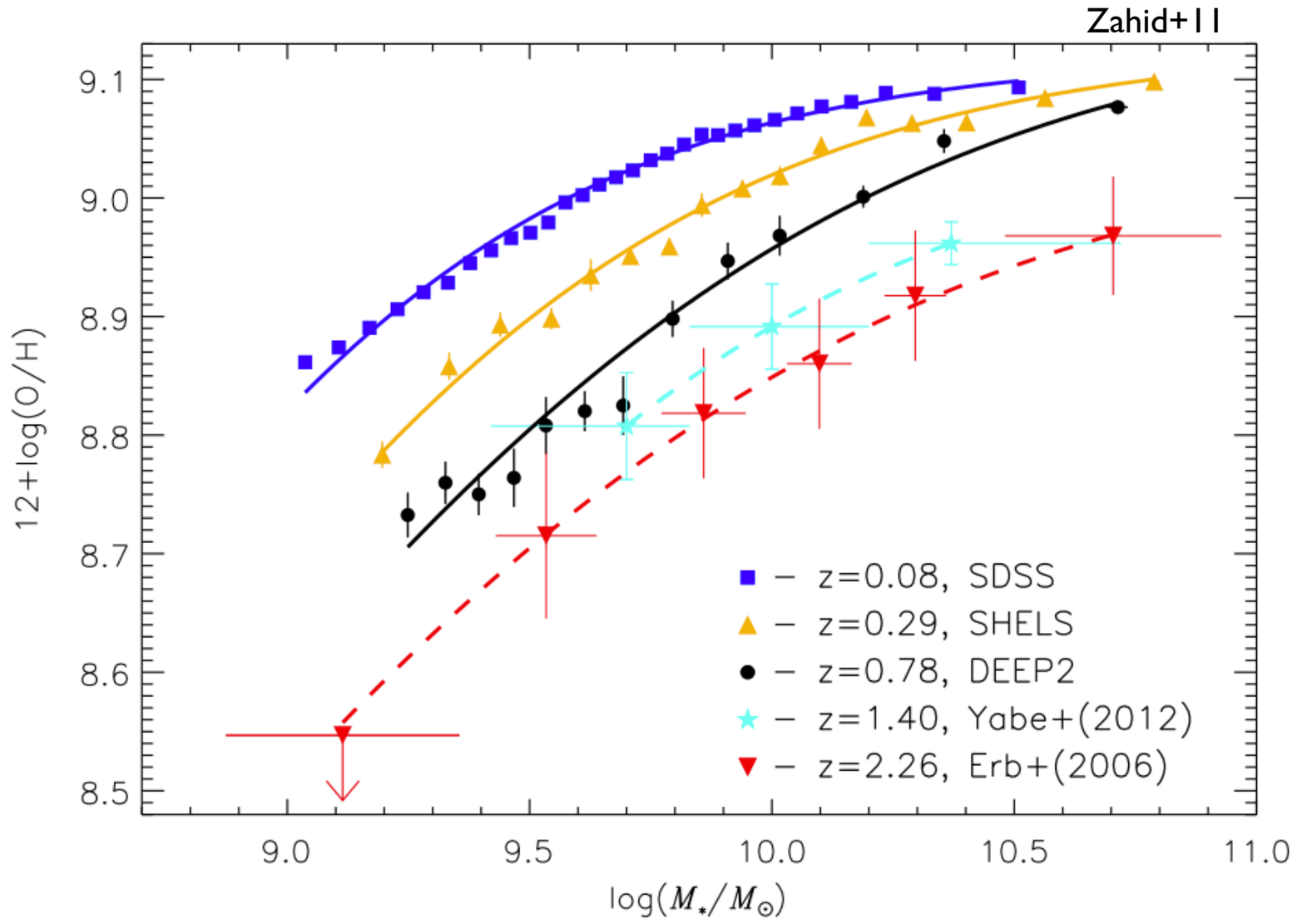
- The population of low-mass galaxies is still poorly constrain even in the nearby Universe
- SDSS samples are affected by Malmquist bias and color biais (r-band selection)

Rodrigues et al. 2015



Only the bluest galaxies are selected for log M_*< 10.2, missing an important population of red and metal-rich galaxies.

The mass - metallicity relation in the nearby Universe

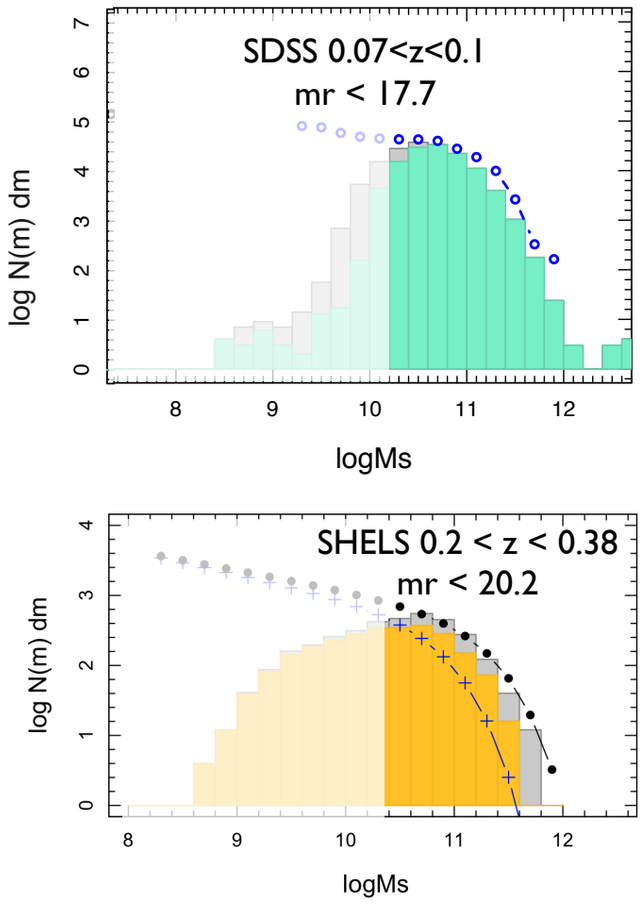


z> 0.5

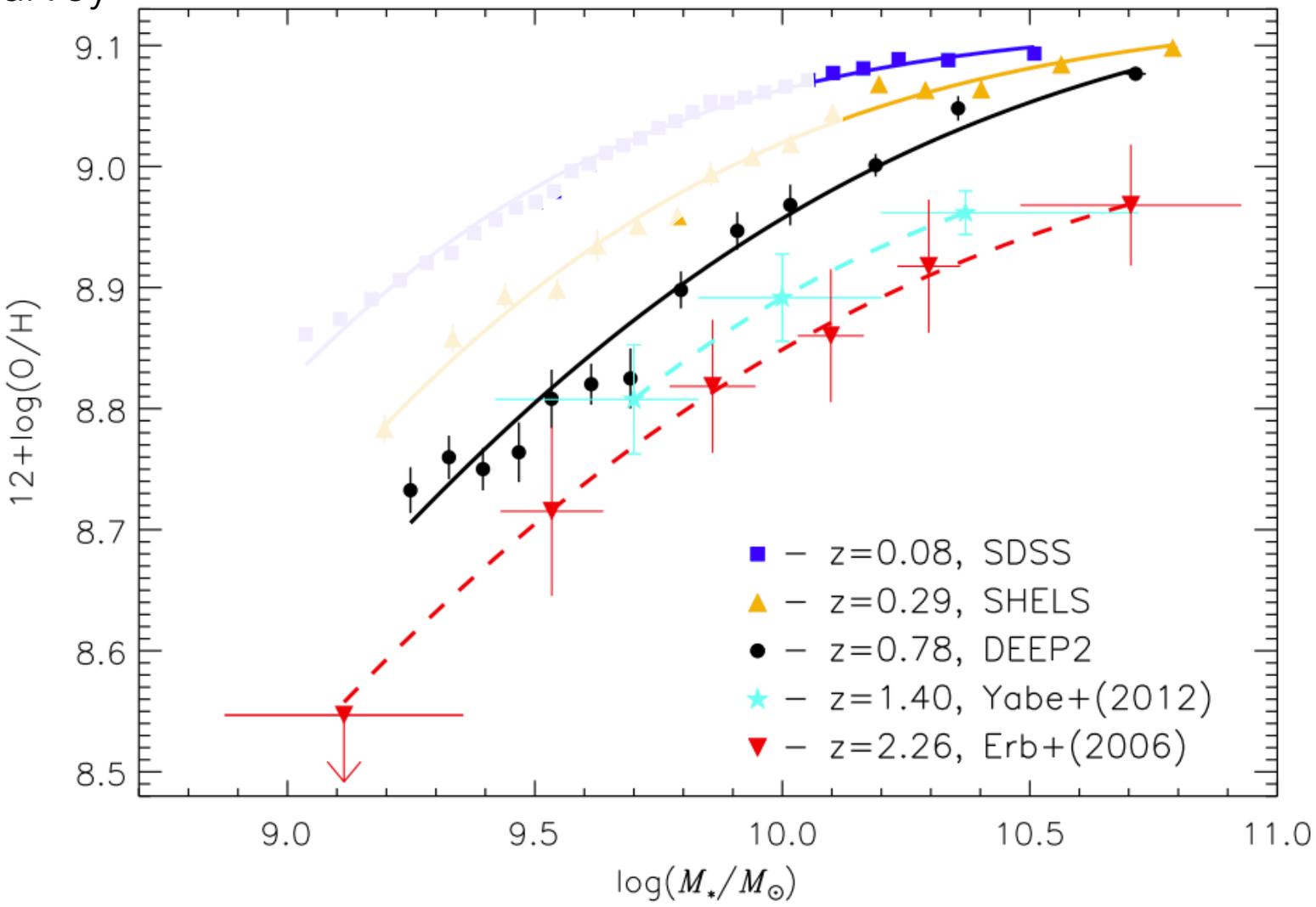
- Small representative samples
- Surveys with variety of selection (color pre-selection or photo-z)

The mass - metallicity relation in the nearby Universe

- Large statistics but ‘shallow’ survey
- Specific targets (e.g. dwarfs)



Zahid+11



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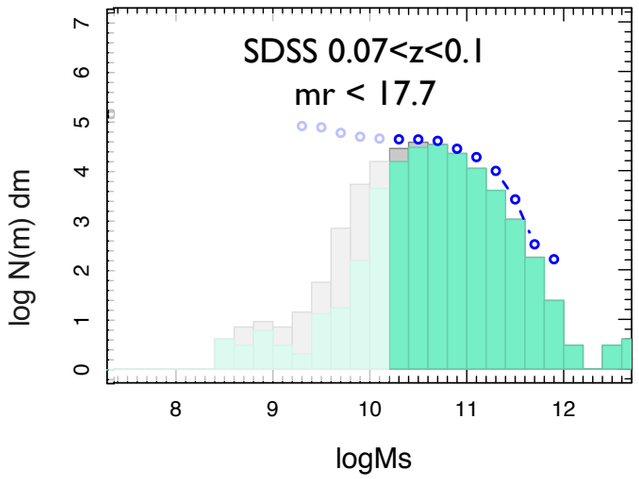
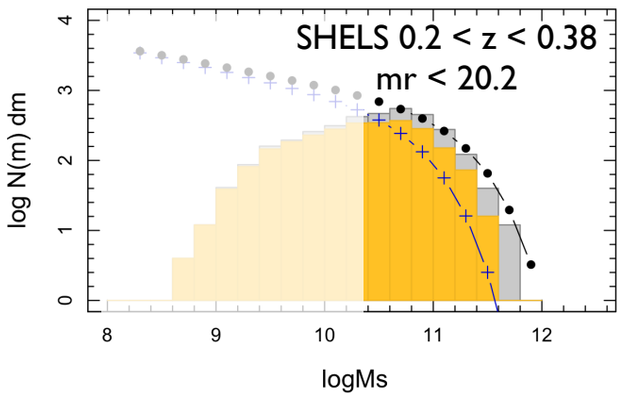
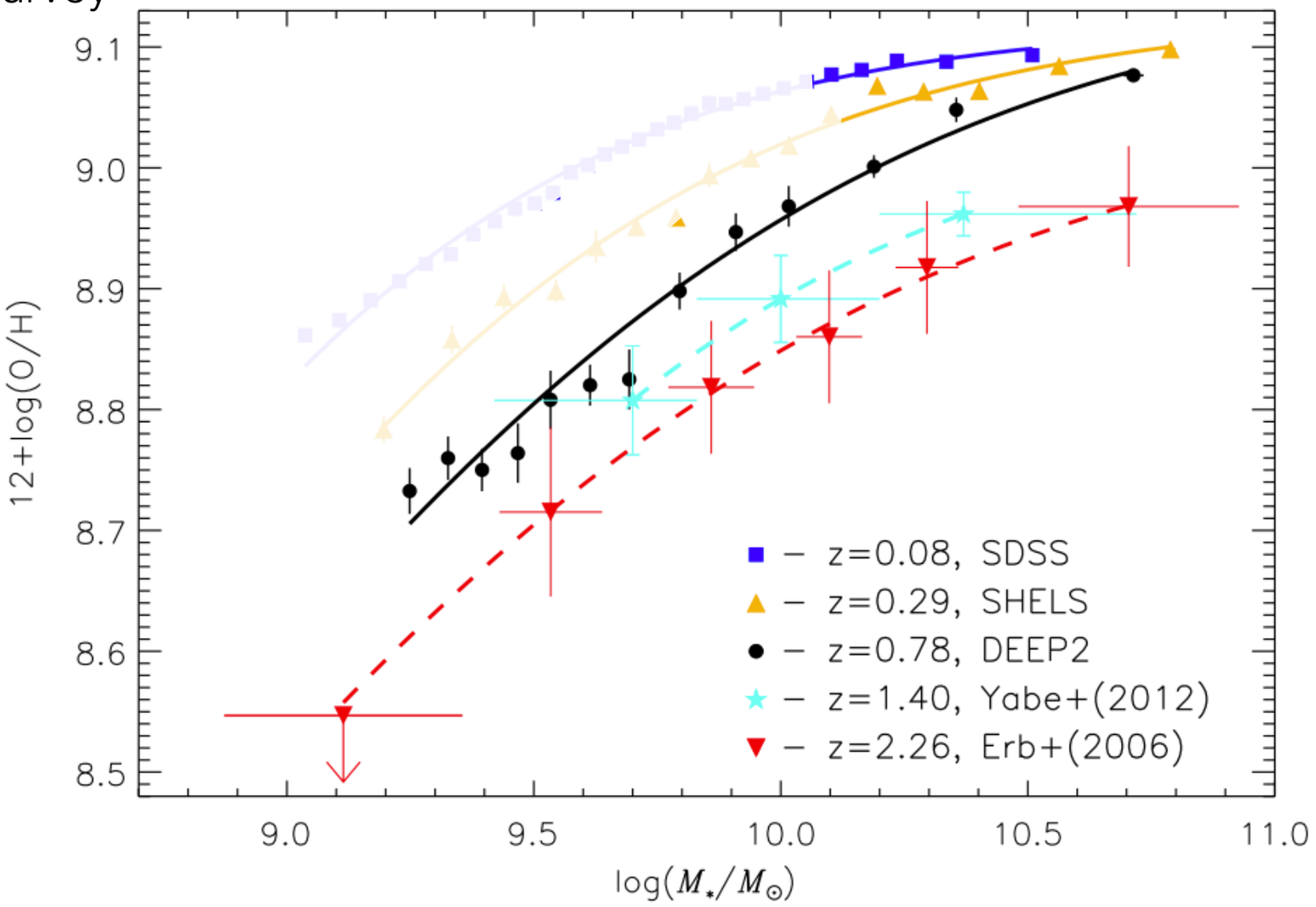




WAVES

WEAVE & 4MOST surveys

Zahid+11



z> 0.5

- Small representative samples
- Surveys with variety of selection (color pre-selection or photo-z)

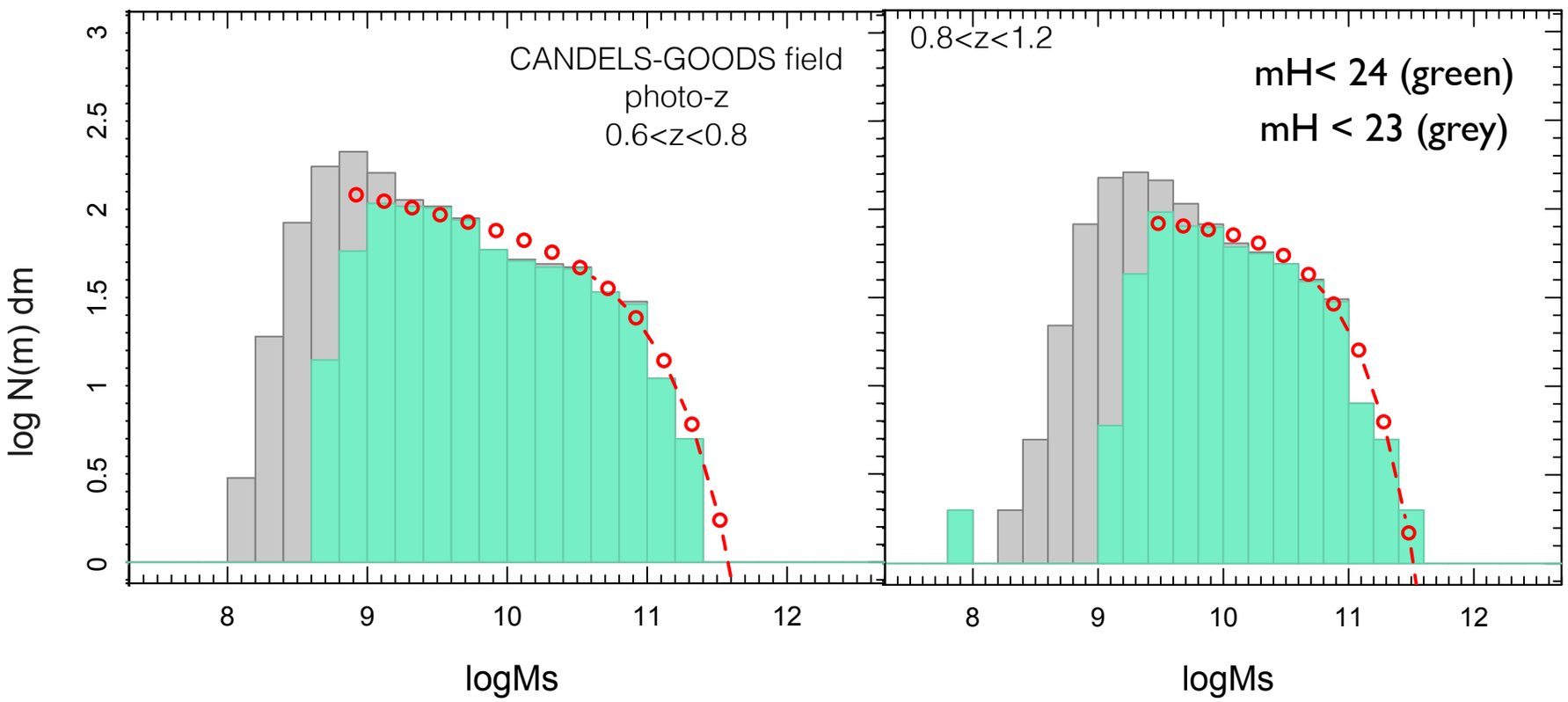
A 0.6 <z <1.2 low-mass galaxy survey with MOONS

Survey strategy

- H-band selected survey (closest to a mass-selection)
- mH < 24
- Without pre-selection (photo-z or color cut)
- Severals fields to limit cosmic variance

Science goals

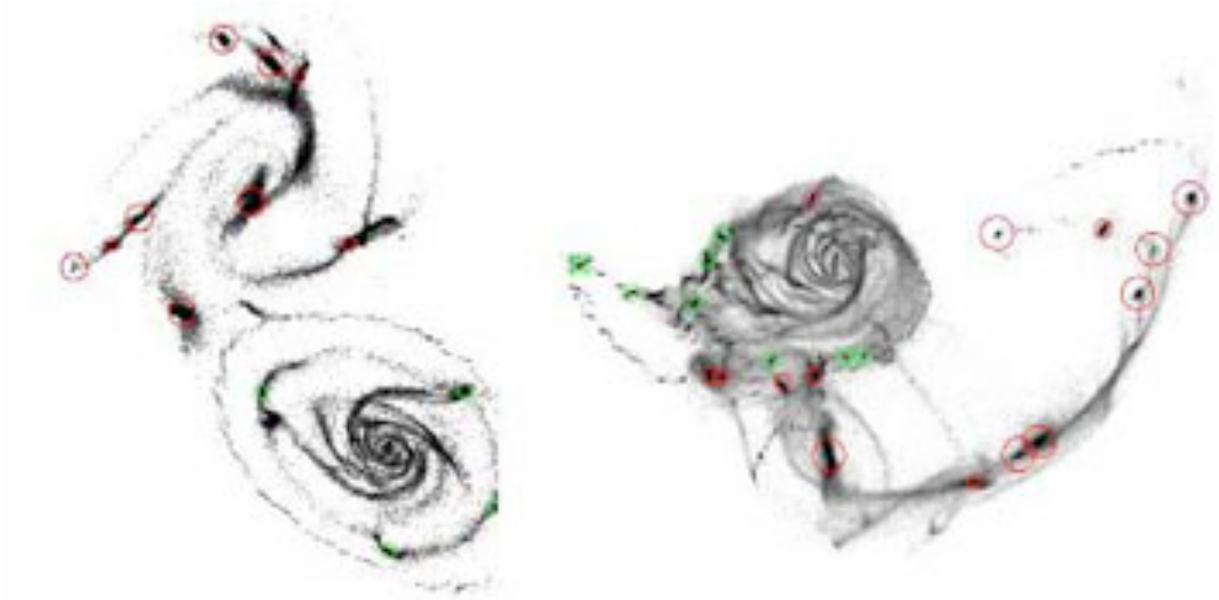
- Improve the constrains on the faint-end slope of the luminosity function
- z= [0.8 - 1.5] Probe the metallicities, extinctions, SFR up to z~1.5 in complete sample down to logM* = 9
- z= [0.6 - 1.5] Probe low-mass companions around MW-mass galaxies
- Low-surface brigthness galaxies



A 0.6 < z <1.2 low-mass galaxy survey with MOONS

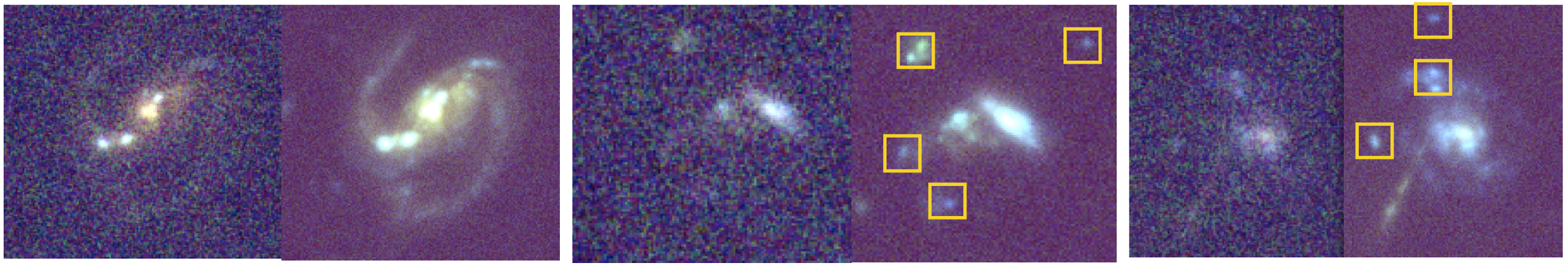
Correlation of low-mass companion with the presence of tidal features around MW- mass galaxies to access the contribution of merger to create dwarf and low mass galaxies

1) need redshifts for faint objects around a representative sample of massive galaxies and deep imagery -> MOONS
2) Deep imagery from JWST NIRCAM to observed the low sufrace brigthness tidal tails (27 mag/arcsec2 in V-band)



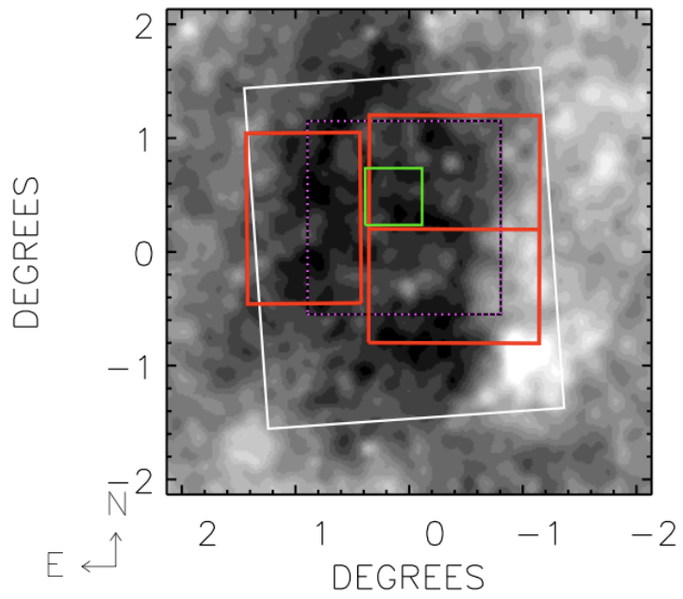
Bournaud+08

GOODS: 3hrs UDF: 120 hrs



MOONS Deep survey : which field ?

- Target selection: deep fields with photometric completeness about magH >25
- Morphology and tidal features : include a JWST deep field
- Multi-wavelength follow-up

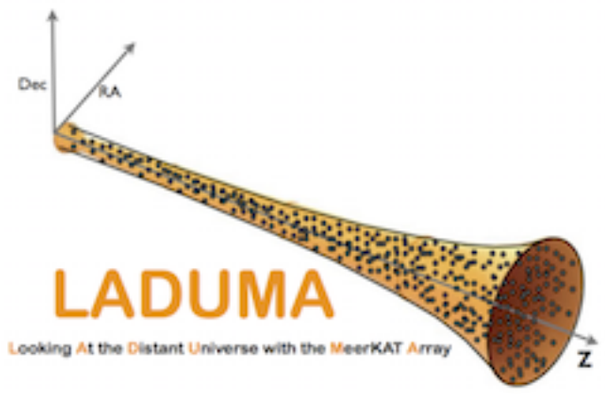


Extended Chandra Deep Field South

VIDEO: 4.5 square degrees, mH =24

UltraVista: 1.5 square degrees, mH =25.1

also observed in HI with MEERKAT



Also Euclide field for photo-z validation and target selection for E-ELT/MOSAIC