The mass-metallicity (MZR) and fundamental metallicity relation (FMR) at z~1.4 using VLT-SINFONI near-infrared spectroscopy of zCOSMOS galaxies

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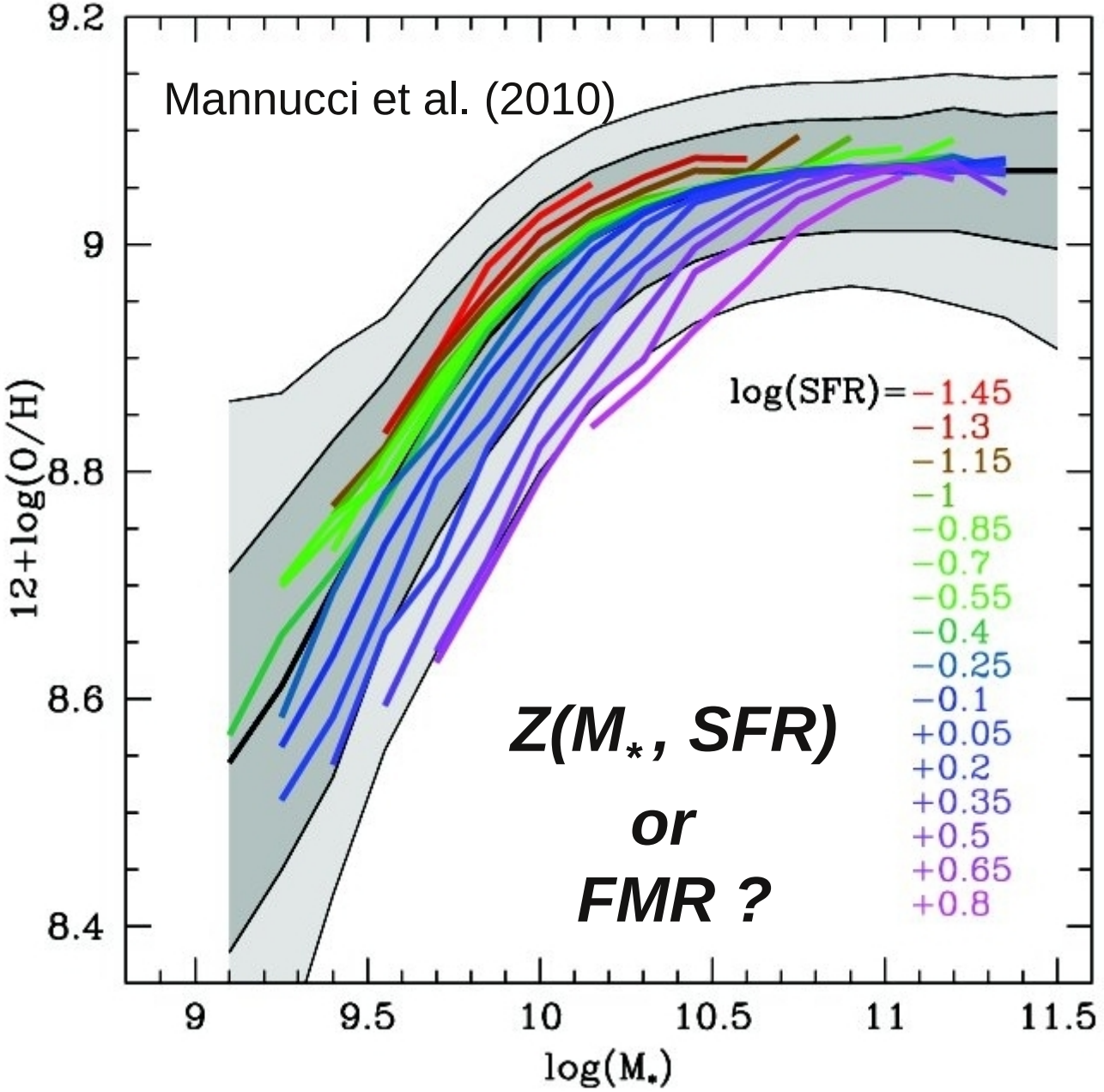


Empirical dependence: $Z(M_{stellar}, SFR)$ for SDSS galaxies at 0.07<z<0.3: at a given mass, galaxies with higher SFRs have lower metallicities

Question: Z(M,SFR) or FMR?

see also discussion in:

Maier, Lilly, Ziegler et al. (2014), ApJ accepted, arXiv:1406:6069

- **Is there a dependence of the mass-metallicity relation (MZR) on SFR at z>1, i.e., does a Z(M,SFR) exist at z>1?**
- **Z(M,SFR) universal (FMR)?**
- **Z(M,SFR) redshift independent or not?**

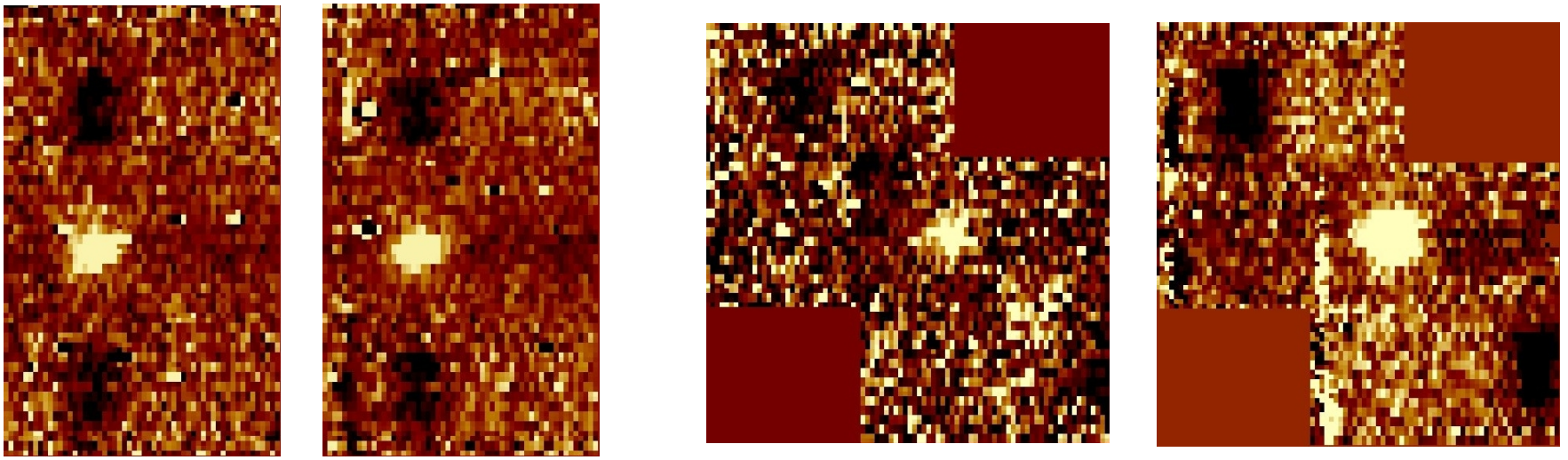
Z: metallicity

M: stellar mass of a galaxy

SFR: star formation rate

FMR: fundamental metallicity relation

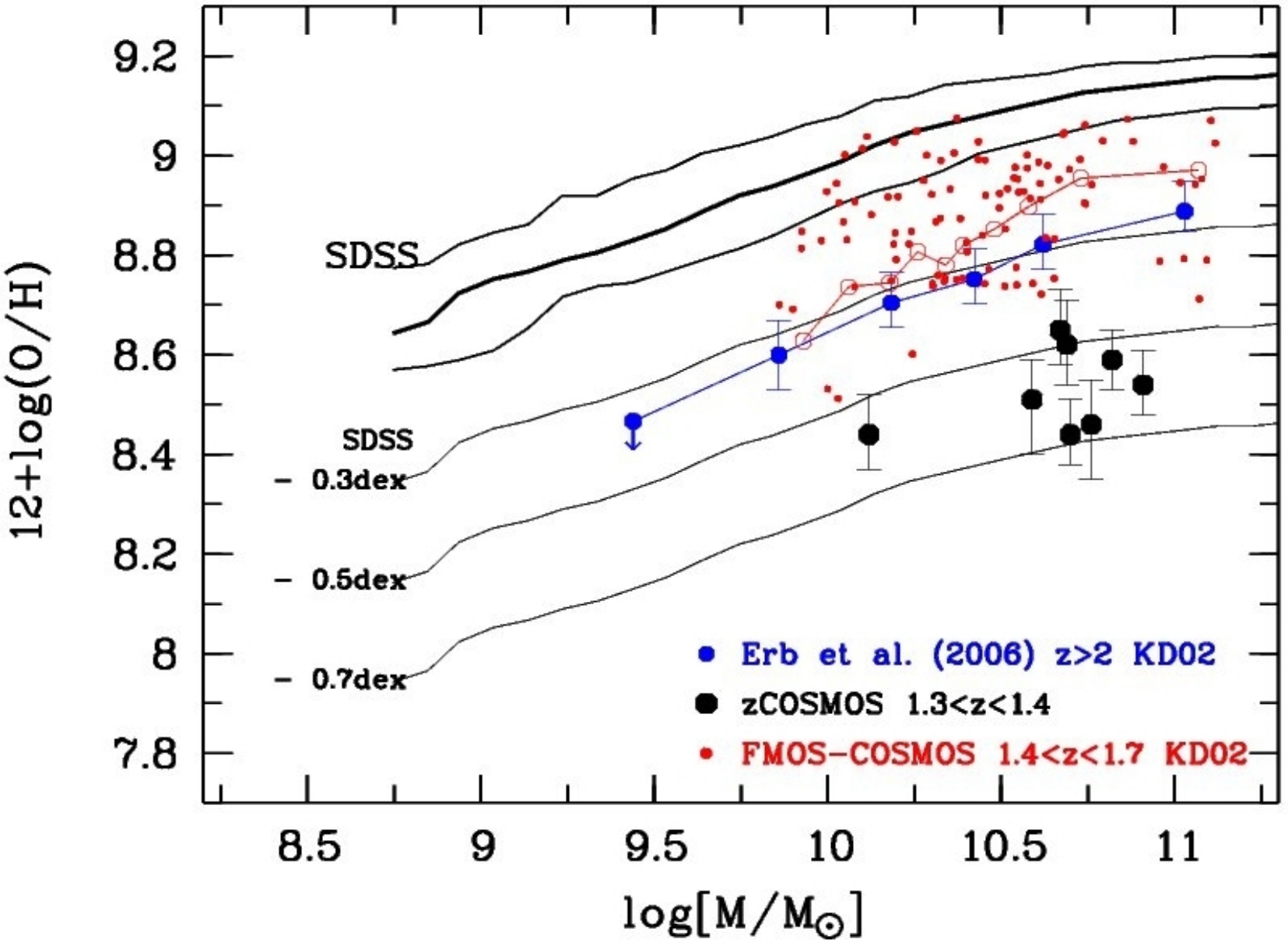
Near-infrared spectroscopy with VLT-SINFONI of zCOSMOS galaxies at z~1.4



Aim: measure 5 emission line fluxes of z~1.4 zCOSMOS galaxies:
[OII] with VIMOS,
Hβ and [OIII] (SINFONI J-band)
Hα and [NII] (SINFONI H-band)

- to measure reliable metallicities, which also allows:
- to measure SFRs from extinction corrected Hα
- to identify Type-2 AGNs using the BPT diagram
- to study the Z(M,SFR) and FMR

The mass-metallicity relation (MZR) at z~1.4



Maier, Lilly, Ziegler et al., in preparation

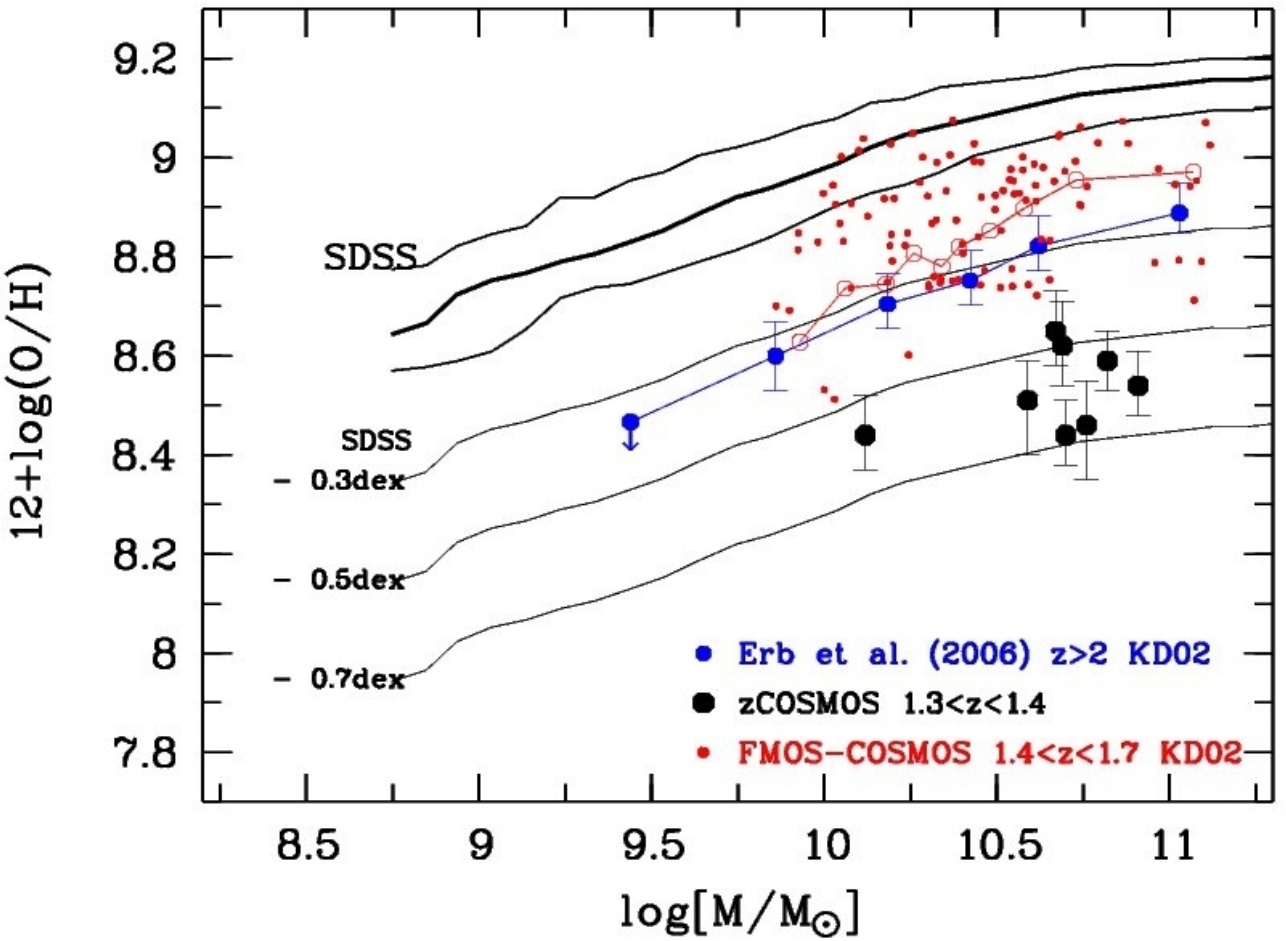
The mass-metallicity relation (MZR) at z~1.4

The MZR of z~1.4 zCOSMOS galaxies is lower by a factor of 3 to 5 (0.5 - 0.7 dex) than the SDSS relation, while the [NII]/Hα-based FMOS-COSMOS O/Hs from Zahid et al. (2014) are lower by up to ~2 (0.3dex)

- All O/Hs are transformed to the KD02 (Kewley & Dopita 2002) O/H calibration

- Newman et al. (2014): **MZR at higher redshifts determined using the N2-method might be 2-3 times too high in O/H**

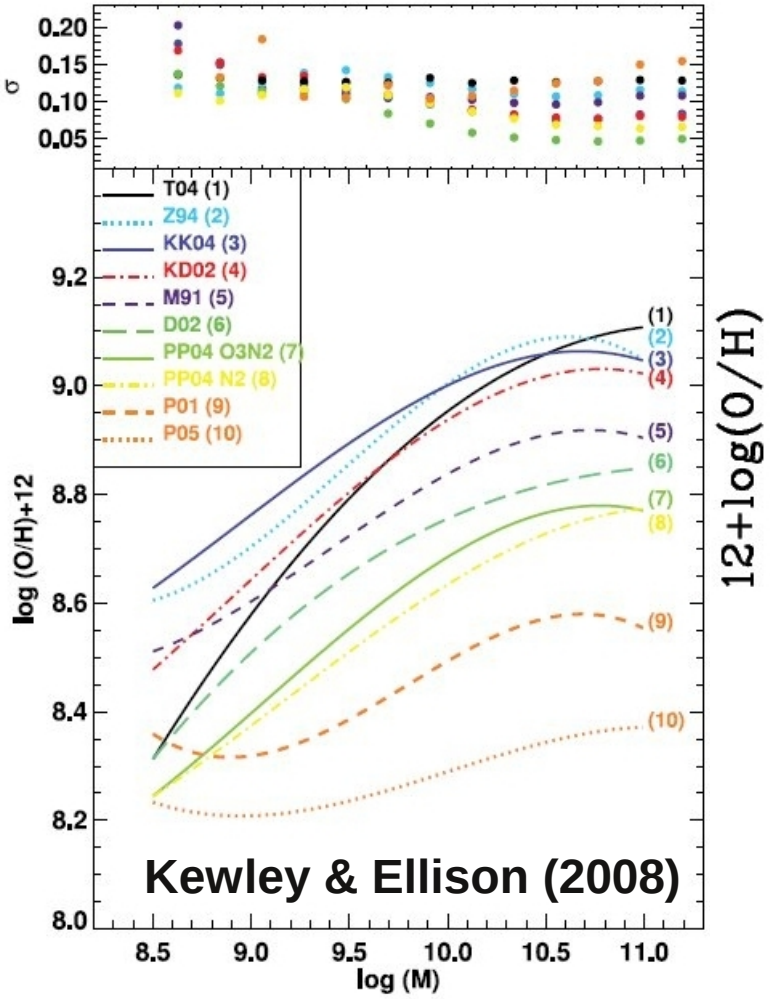
- Type-2 AGNs contamination in Zahid et al. (2014) sample?

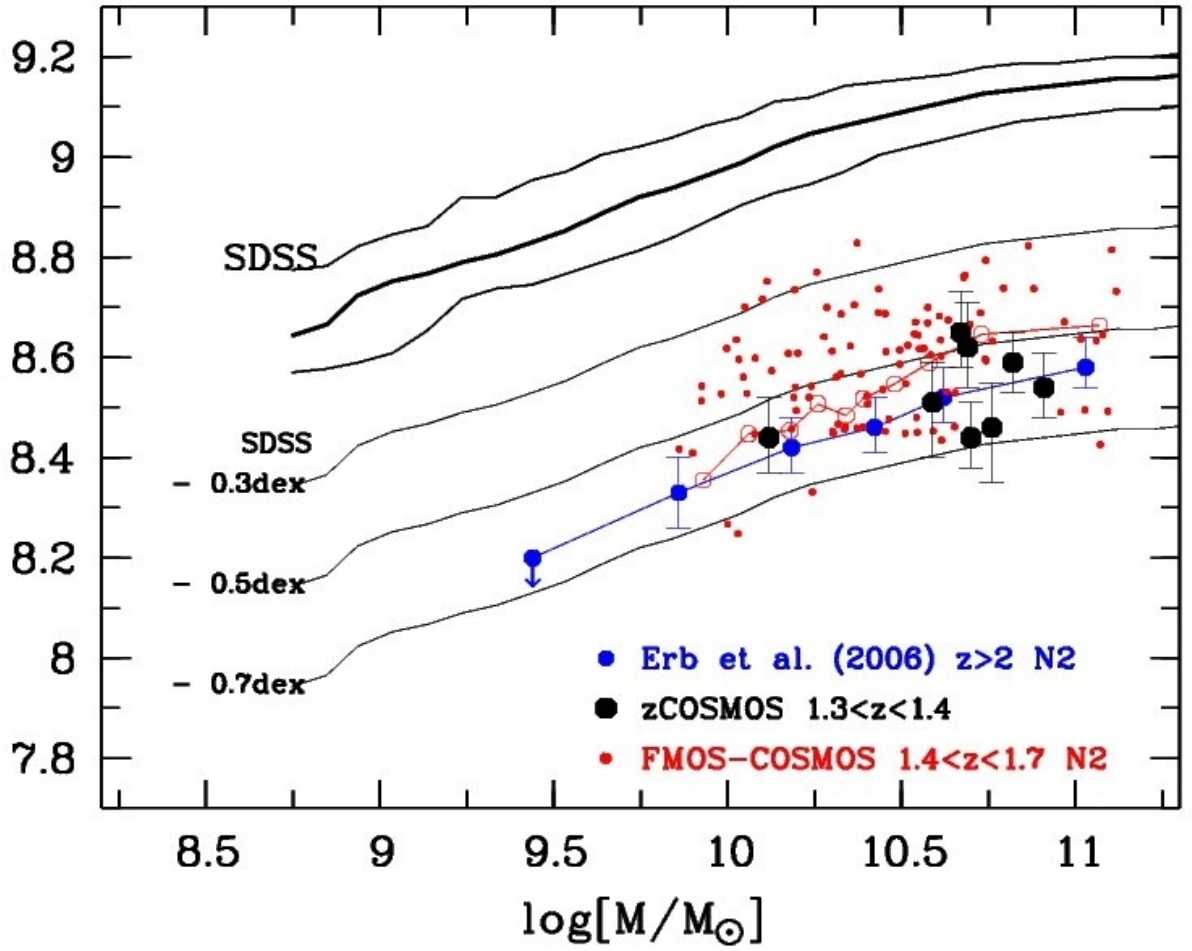


Maier, Lilly, Ziegler et al., in preparation

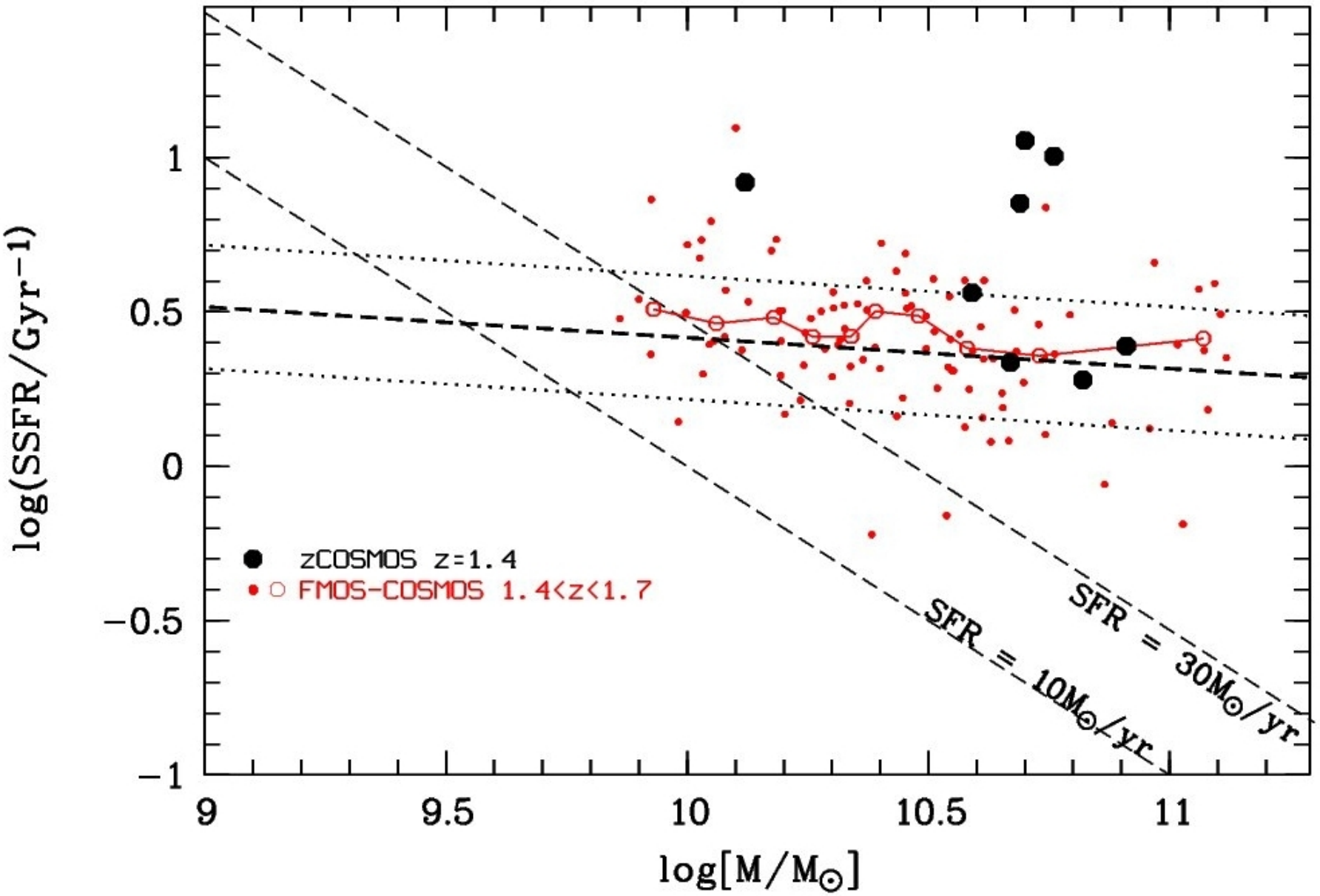
The MZR combining KD02 and N2 O/H calibrations at z~1.4

The mean MZR at z~1.4 is lower by a factor of 3-5 (0.5-0.7 dex) than the SDSS relation, when plotting N2-metallicities (~0.3 dex lower than O/Hs from KD02) for z~1.4 FMOS-COSMOS galaxies (Zahid et al. 2014)





Sample selection zCOSMOS z~1.4 vs. FMOS-COSMOS

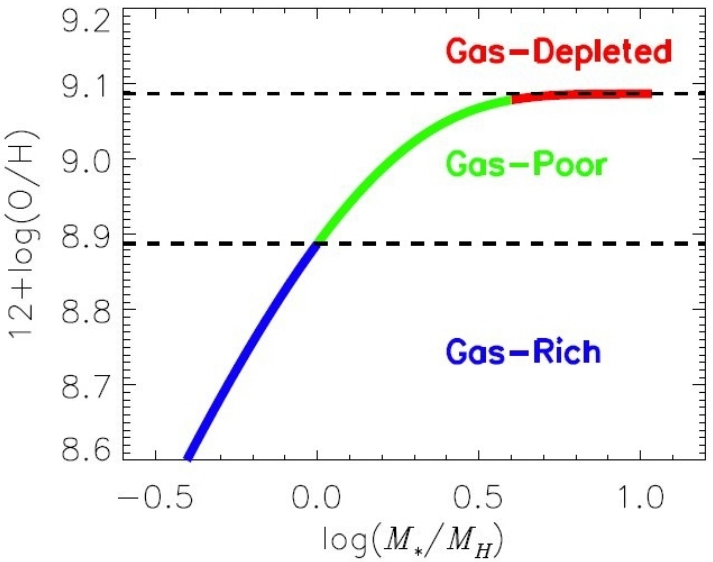


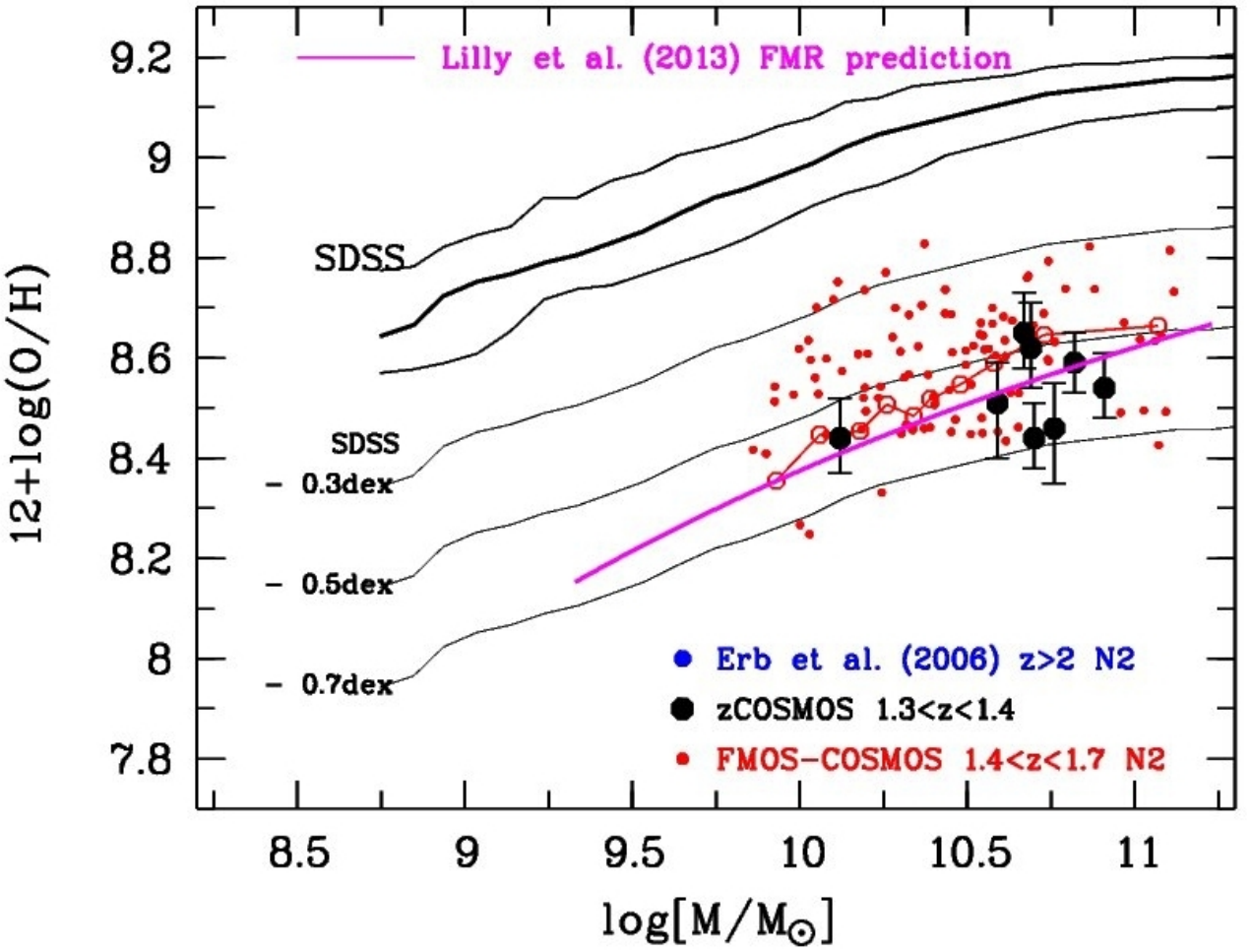
Maier, Lilly, Ziegler et al., in preparation

Z(M, SFR) independent of redshift? FMR?

The z~1.4 zCOSMOS and the Zahid et al. (2014) FMOS-COSMOS data are consistent with a non-evolving FMR prediction of Lilly et al. (2013)

Work in progress:
compare the z~1.4 observed relation with the model expectations of Zahid et al. (2014b)





$$12 + \log(O/H) = Z_o + \log\left[1 - \exp\left(-\left[\frac{M_*}{M_o}\right]^{\gamma}\right)\right]$$