From Dwarfs to Giants: the history of Star-formation since z~1

The Redshift One LDSS3 Emission line Survey

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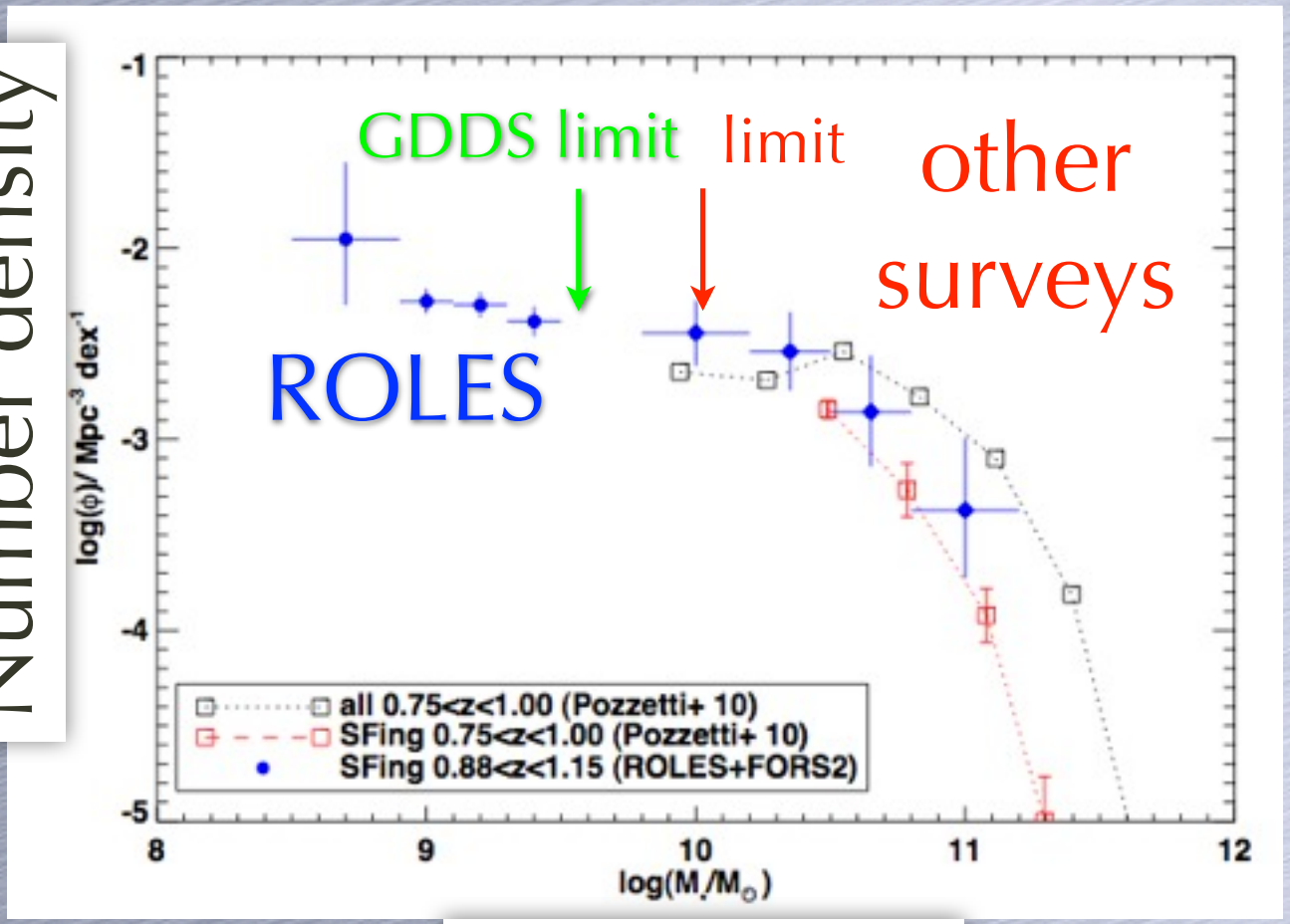
Galaxy Formation, Durham 2011

Current z~1 spectroscopic surveys



Low mass galaxies
much more numerous than their higher mass counterparts
=> important for
-metal enrichment of Universe
-reionisation

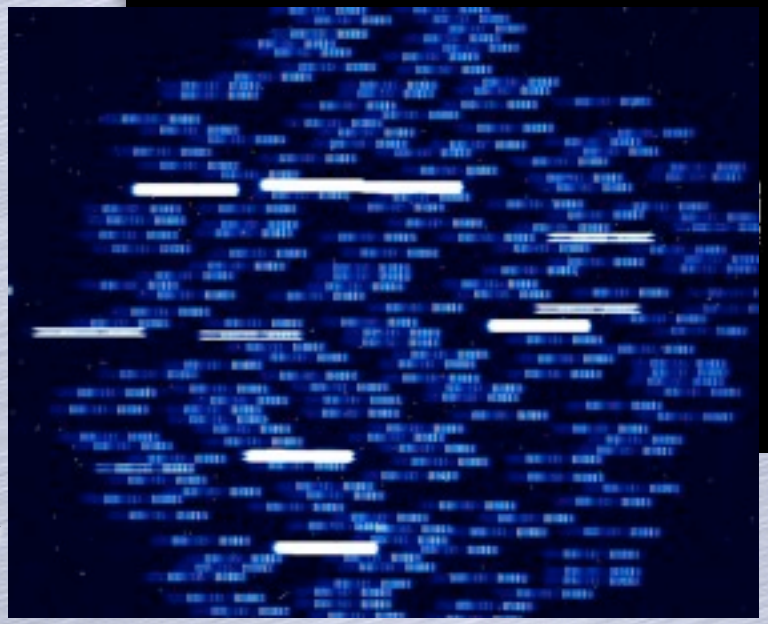
ROLES

Two fields: GOODS-S/CDFS

& MS1054 FIRES

$22.5 < K_{AB} < 24.0$

$8.5 < \log(M_s/M_{Sun}) < 9.5$



7000A--8000A

band-limited spectroscopy

[OII]λ3727 : $0.889 < z < 1.149$

~4 hours with

LDSS3 (6.5-m Magellan)

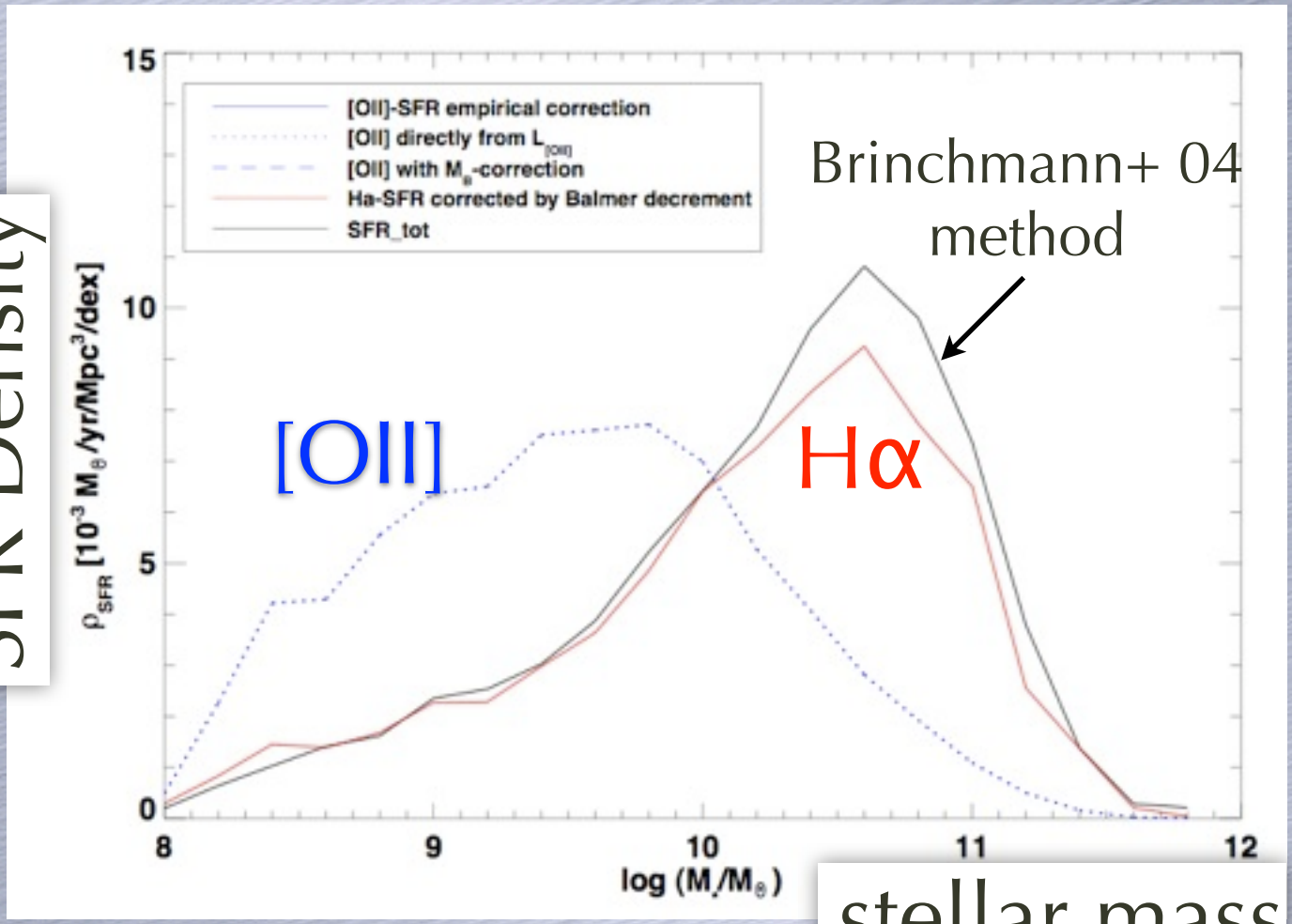
~200 slits per mask, 19 masks total

285 z~1 dwarf galaxies with $SFR_{corr} \gtrsim 0.3 M_{\odot} yr^{-1}$

Deriving local SFR calibrations from SDSS

- Check consistency between **SFR indicators** (using Hα, [OII], *u*-band, FUV from *GALEX)* in Stripe 82
- **SFRD** as a function of **stellar mass**

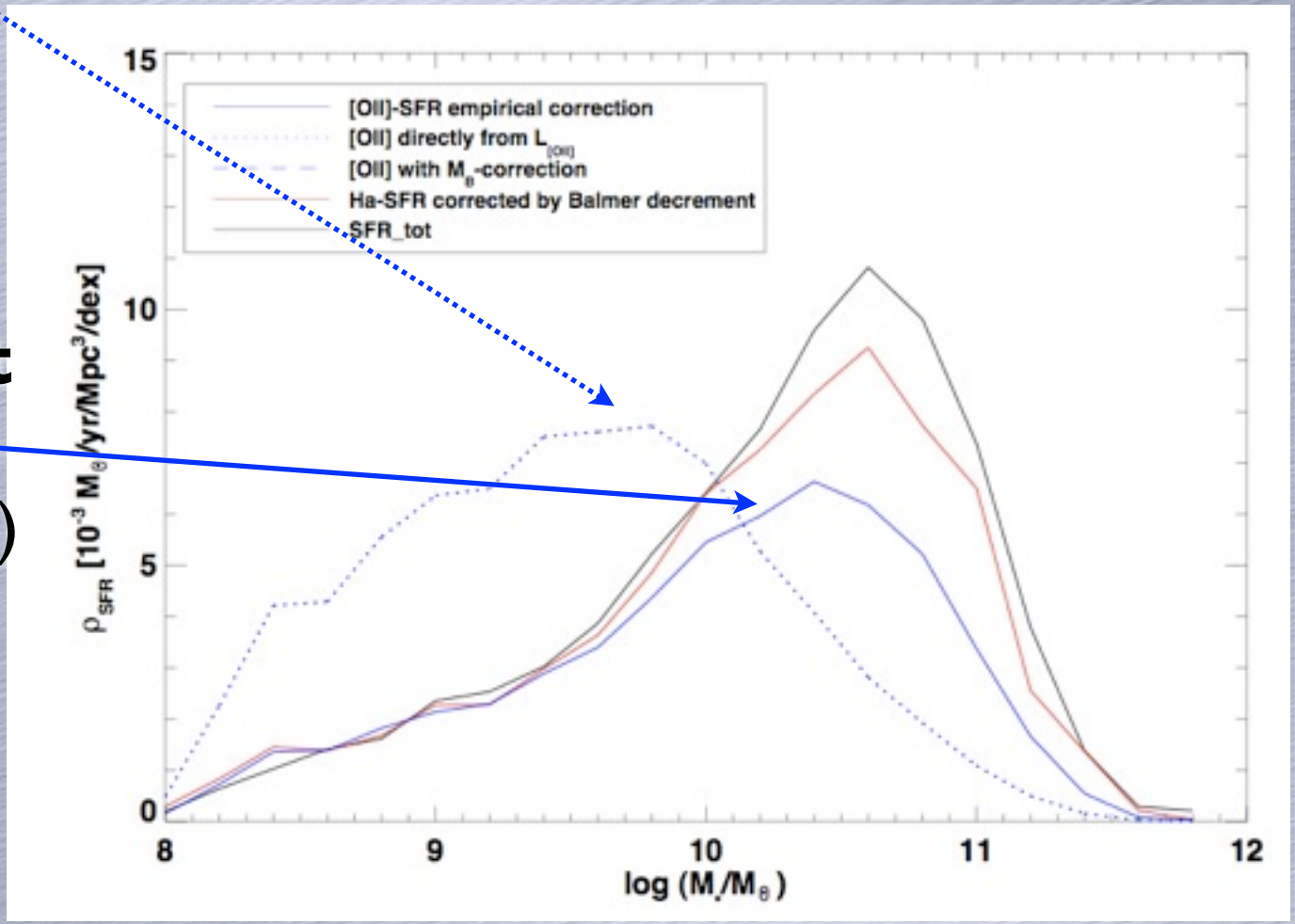
Conversion L([OII])<-->SFR depends on metallicity, dust and ionisation parameter



Deriving local SFR calibrations from SDSS

- Constant scaling from L([OII]) to SFR (as often assumed) gives v. different answer!
- New, **empirical mass-dependent correction** (Gilbank et al. 2010a)

Conversion L([OII])<-->SFR depends on metallicity, dust and ionisation parameter

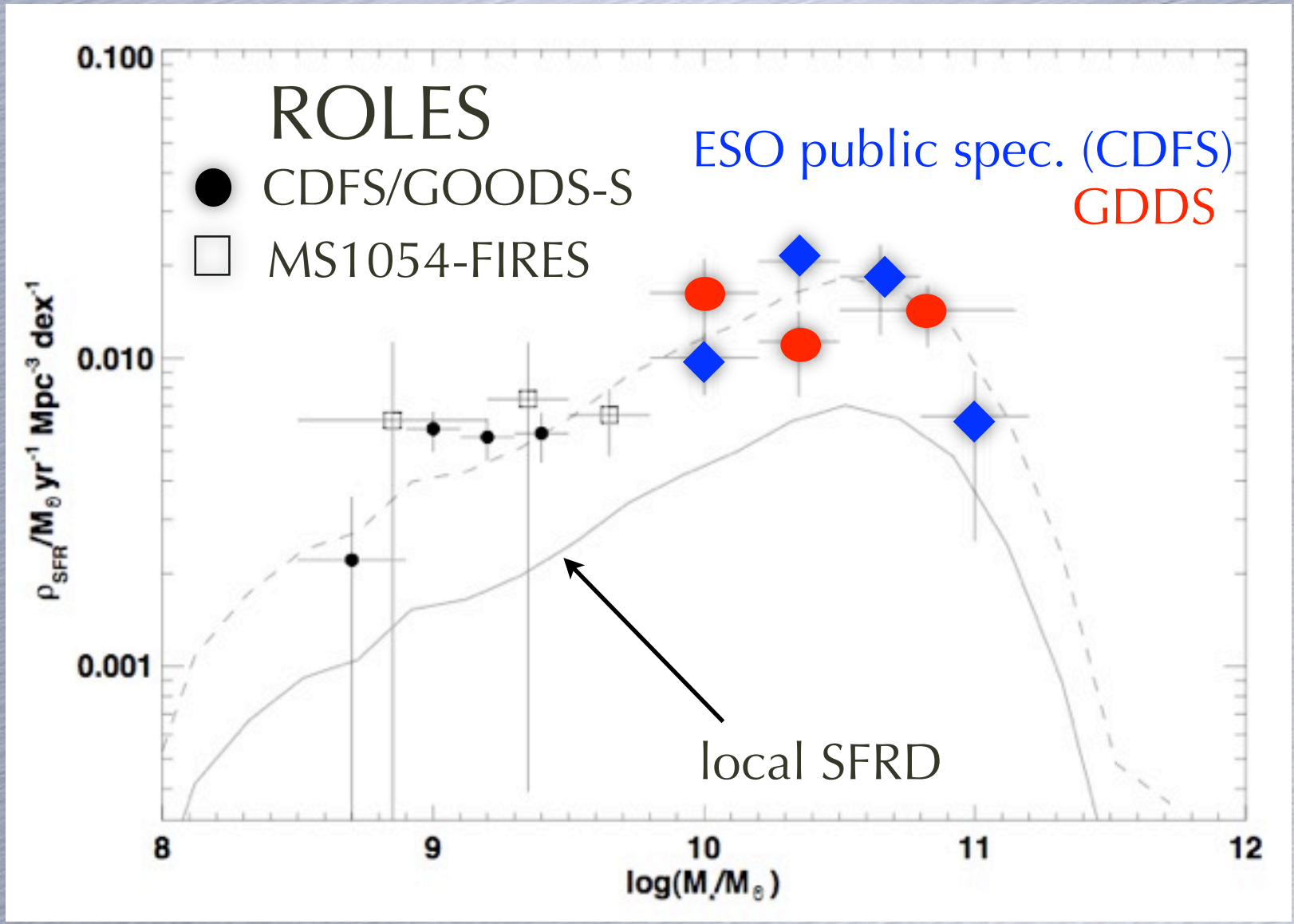


Gilbank et al. 2010a, MNRAS 405, 2594

z~1 SFRD

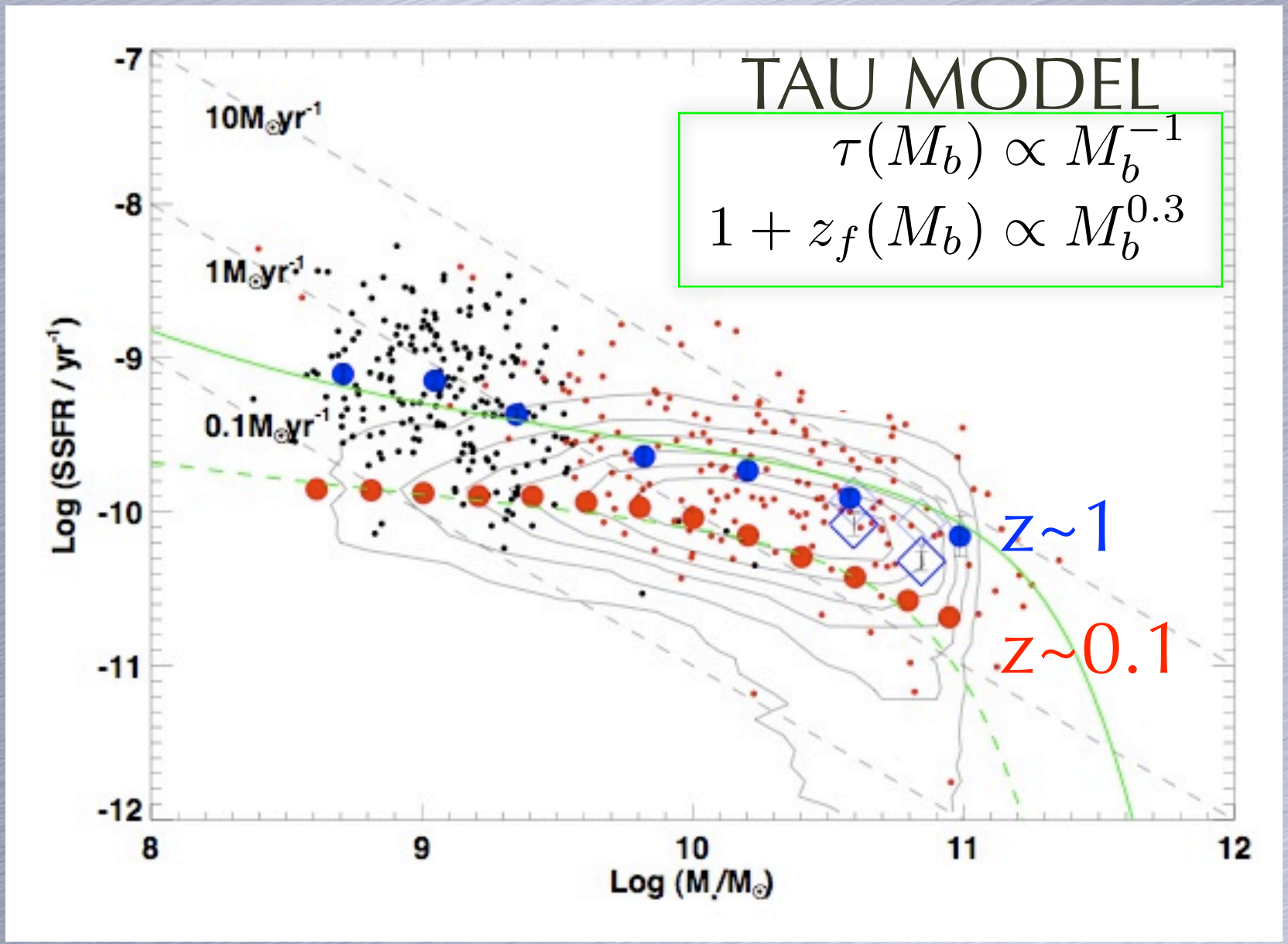
Empirically-corrected [OII] SFRD

Gilbank et al. 2010b, MNRAS 405, 2419



Specific SFR--Mass Relation

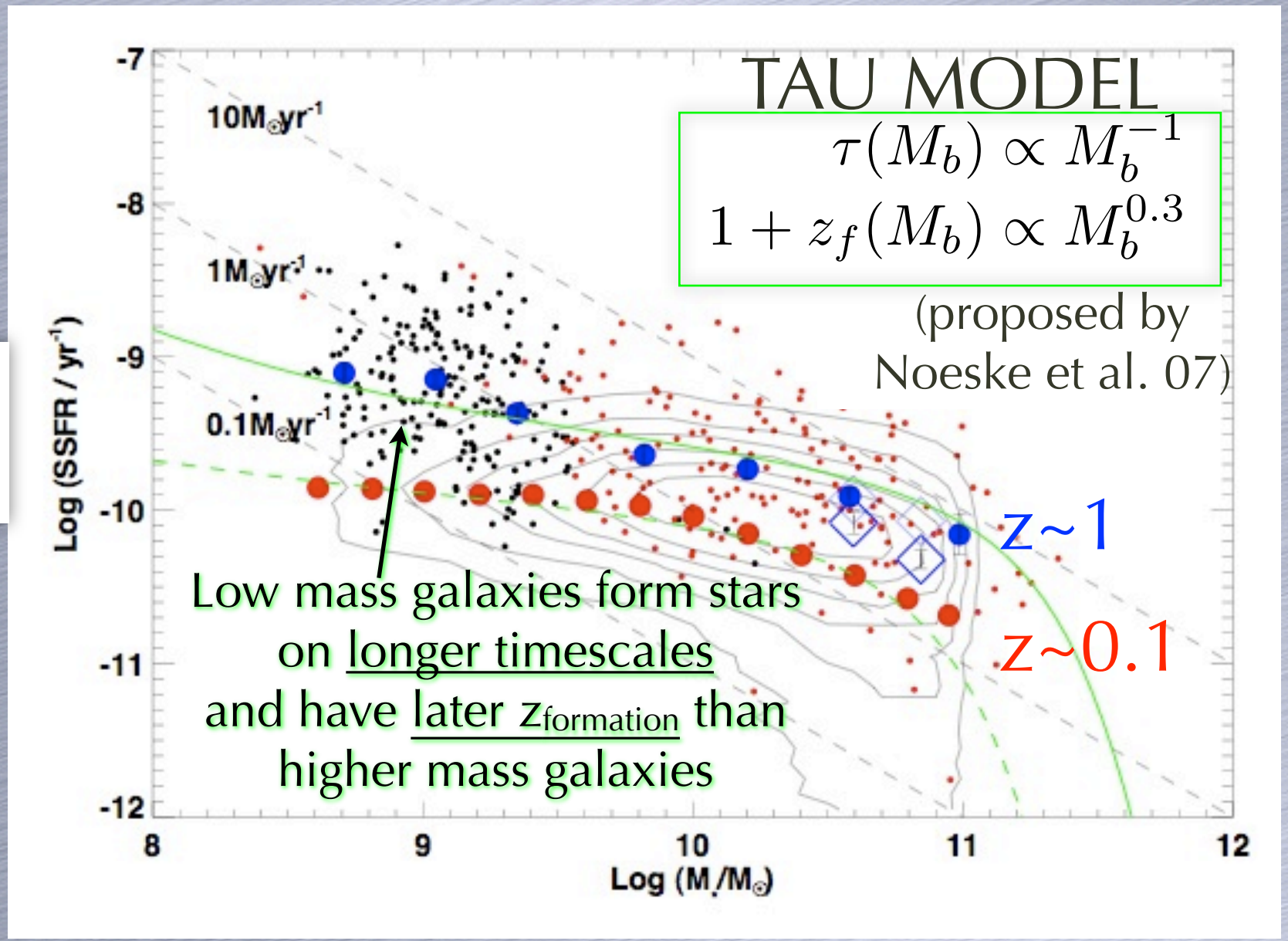
$SFR/M_{stellar} = M/\dot{M} \sim 1/t$



Gilbank et al. 2011, MNRAS, 414, 304

Specific SFR--Mass Relation

$SFR/M_{stellar} = \dot{M}/M \sim 1/t$

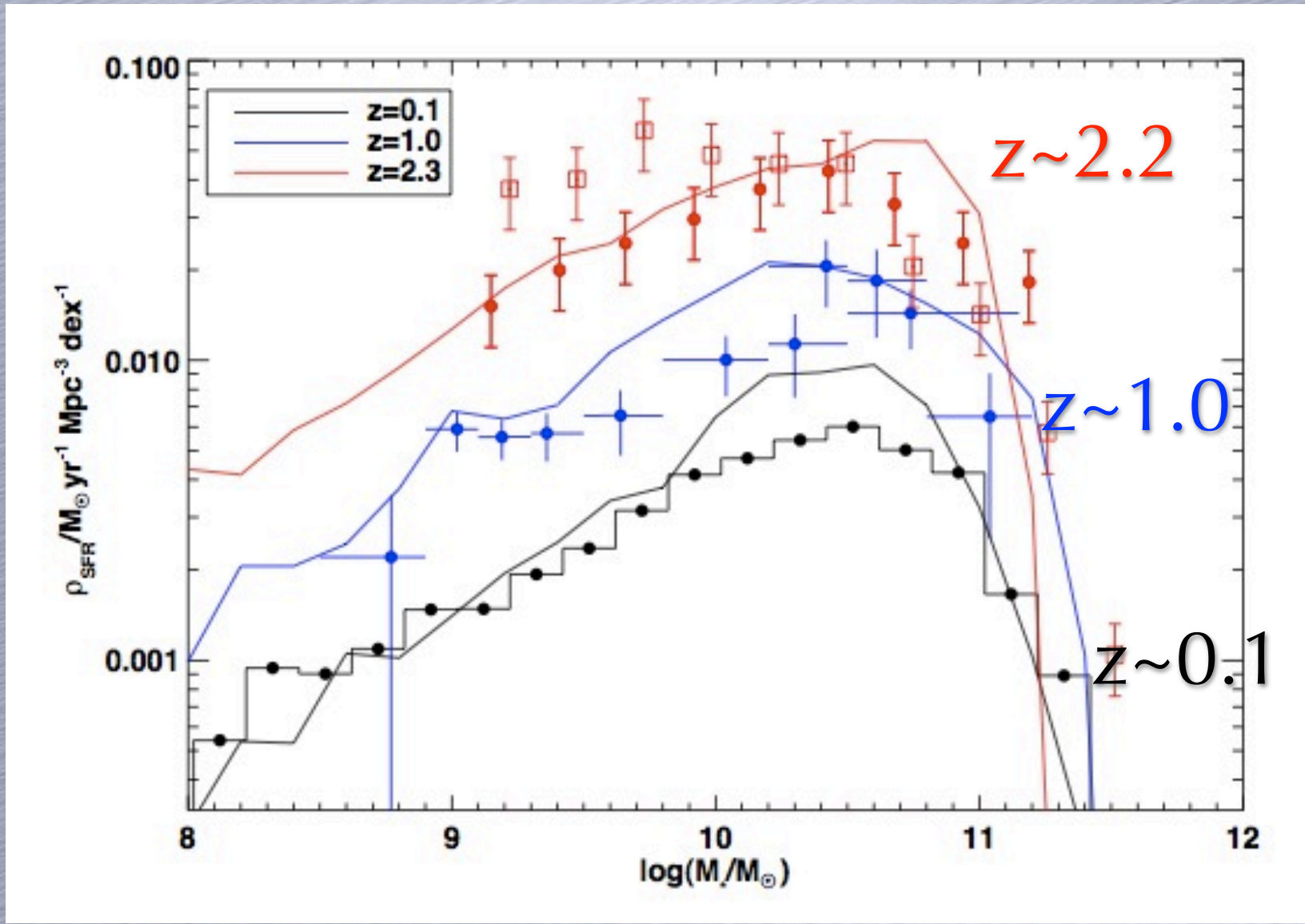


Gilbank et al. 2011, MNRAS, 414, 304

Comparison with Galform

[updated version of Bower et al. (2006)]

Gilbank et al. 2011, MNRAS, 414, 304



Summary

- New empirical mass-dependent correction for [OII]-SFR previous corrections all underestimates
- ROLES: [OII] SFRs for dwarf gals at z~1 (robust!)
  Extinction negligible for these low mass sources ($8.5<\log(M_*/M_\odot)<9.5$), so obscured SF not problematic
- Evolution of SFRD from z~1 to z~0.1 is an equal decrease for all mass galaxies
- SSFR--mass potentially more sensitive test
  - => high mass galaxies formed stars earlier and faster ("down-sizing")

Down-sizing extremely subtle! Must be careful about systematics