Stochasticity in dwarf galaxies during reionization

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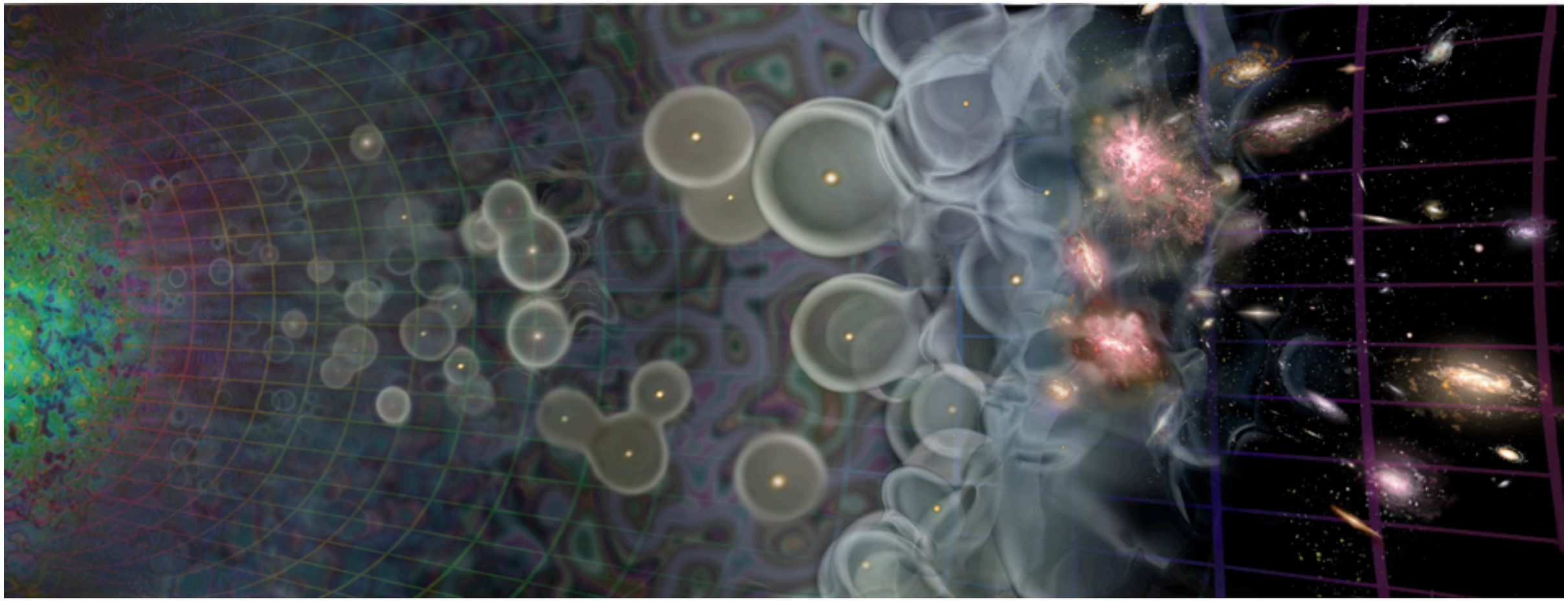


Keck

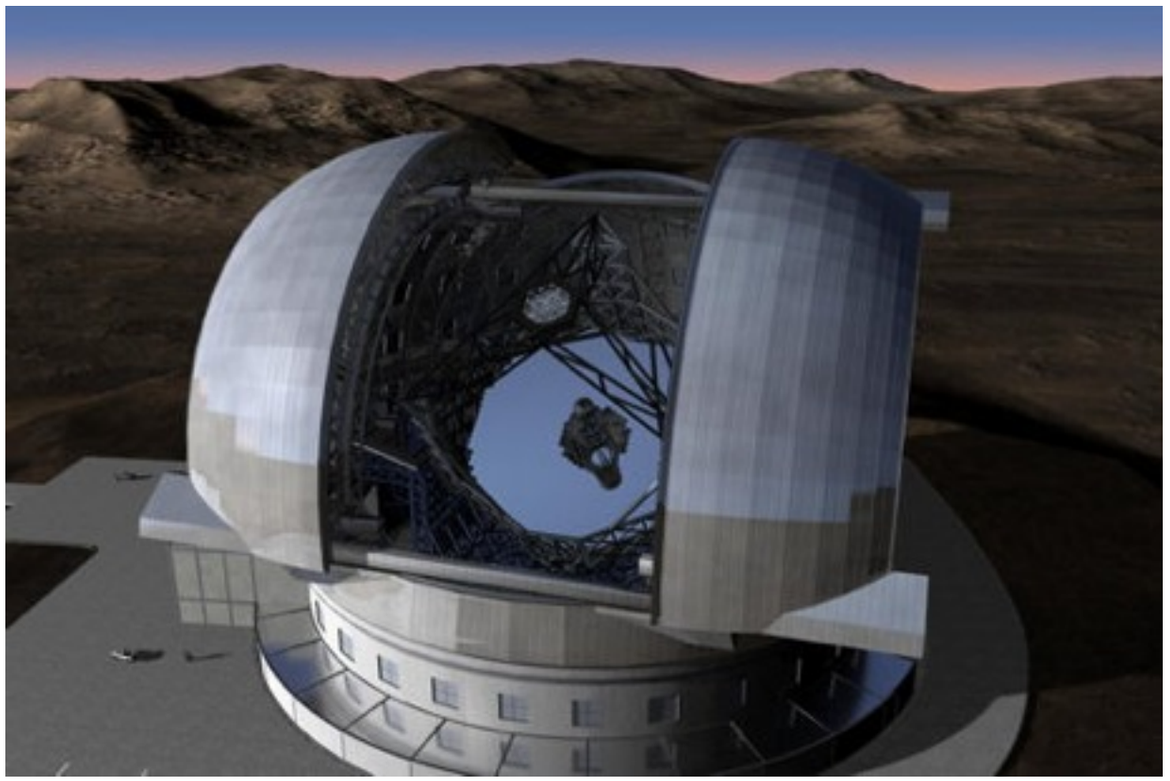
Hubble

VLT

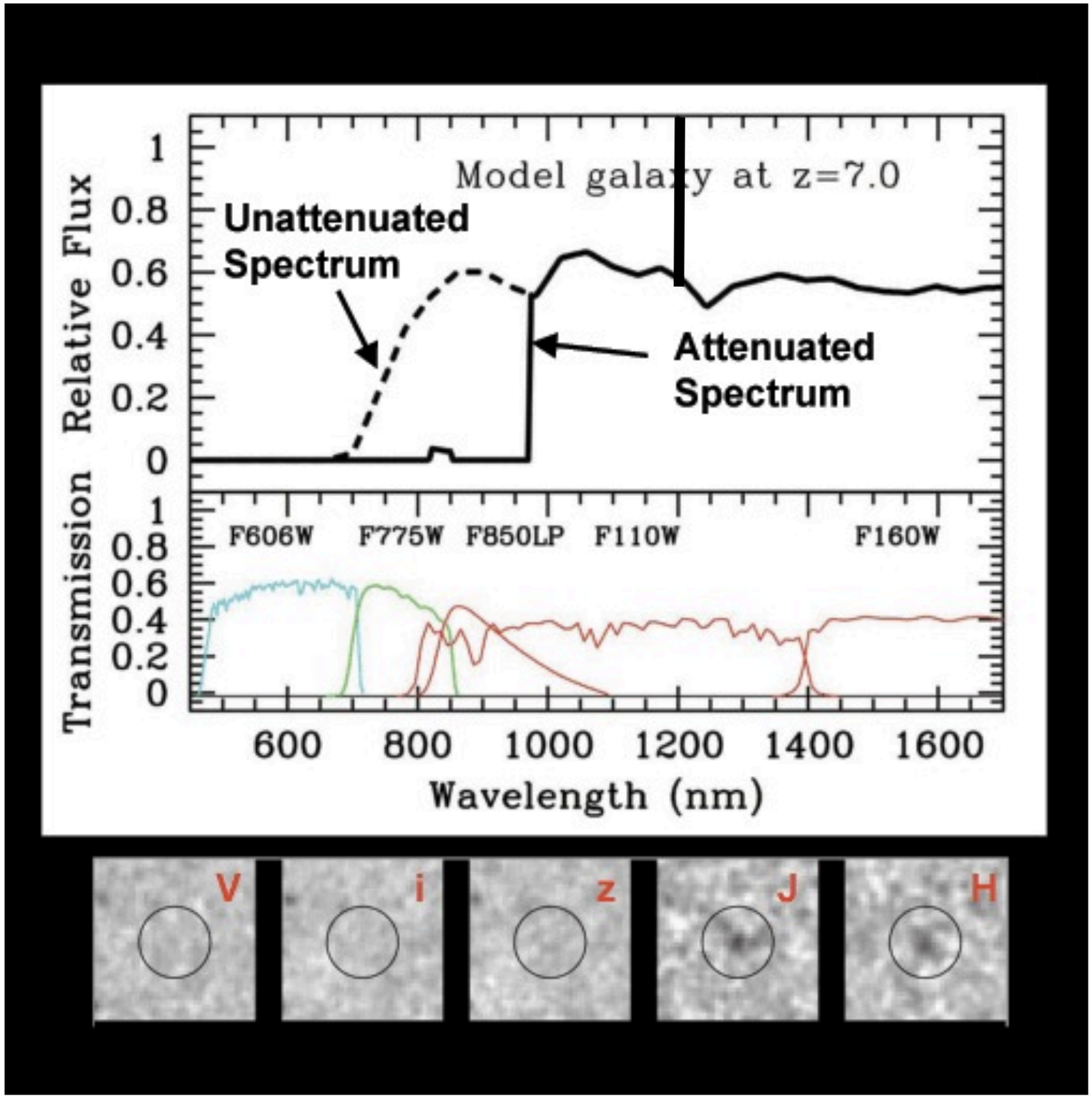
ALMA

JWST

ELT

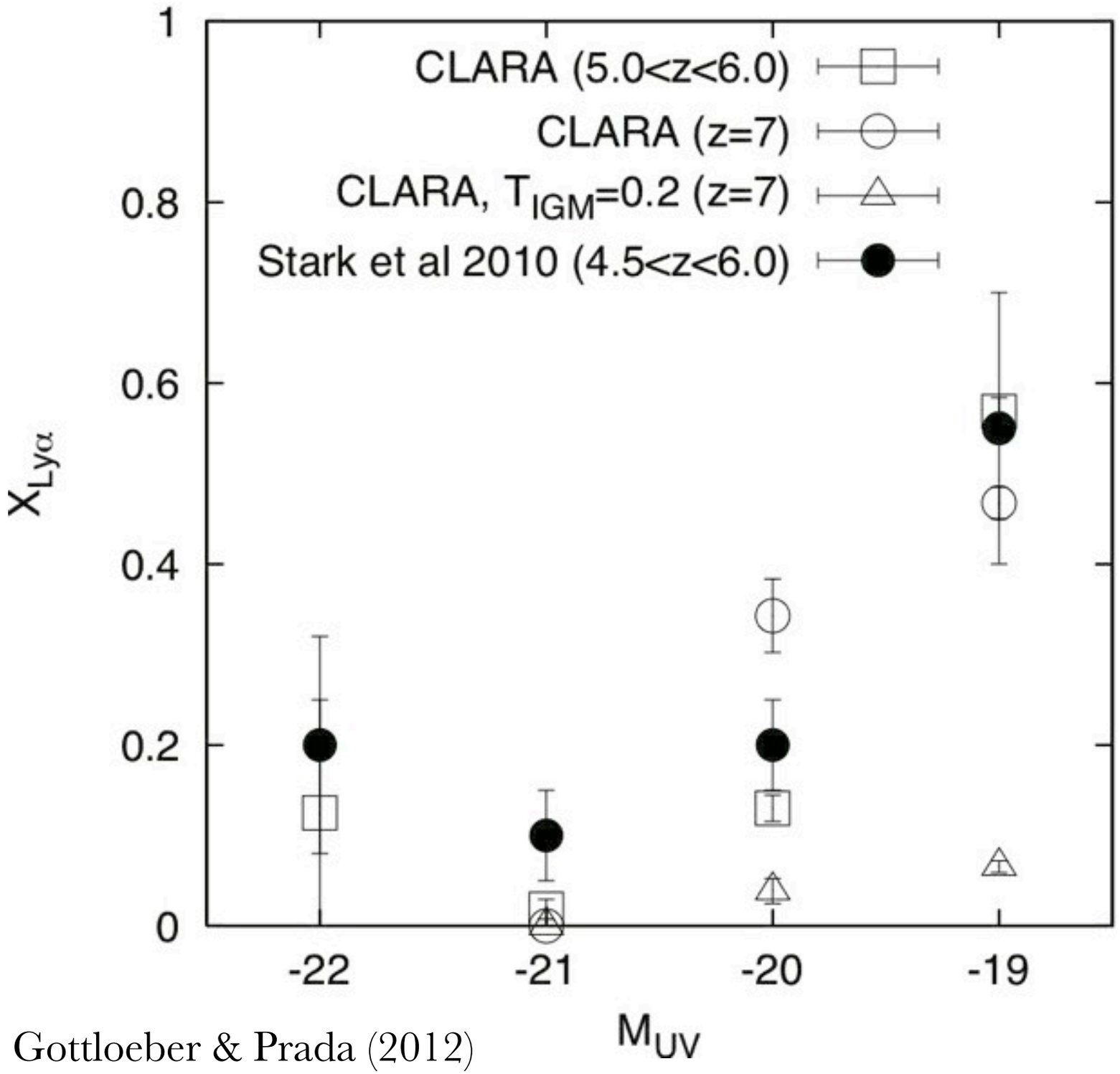


LyC Lyα UV



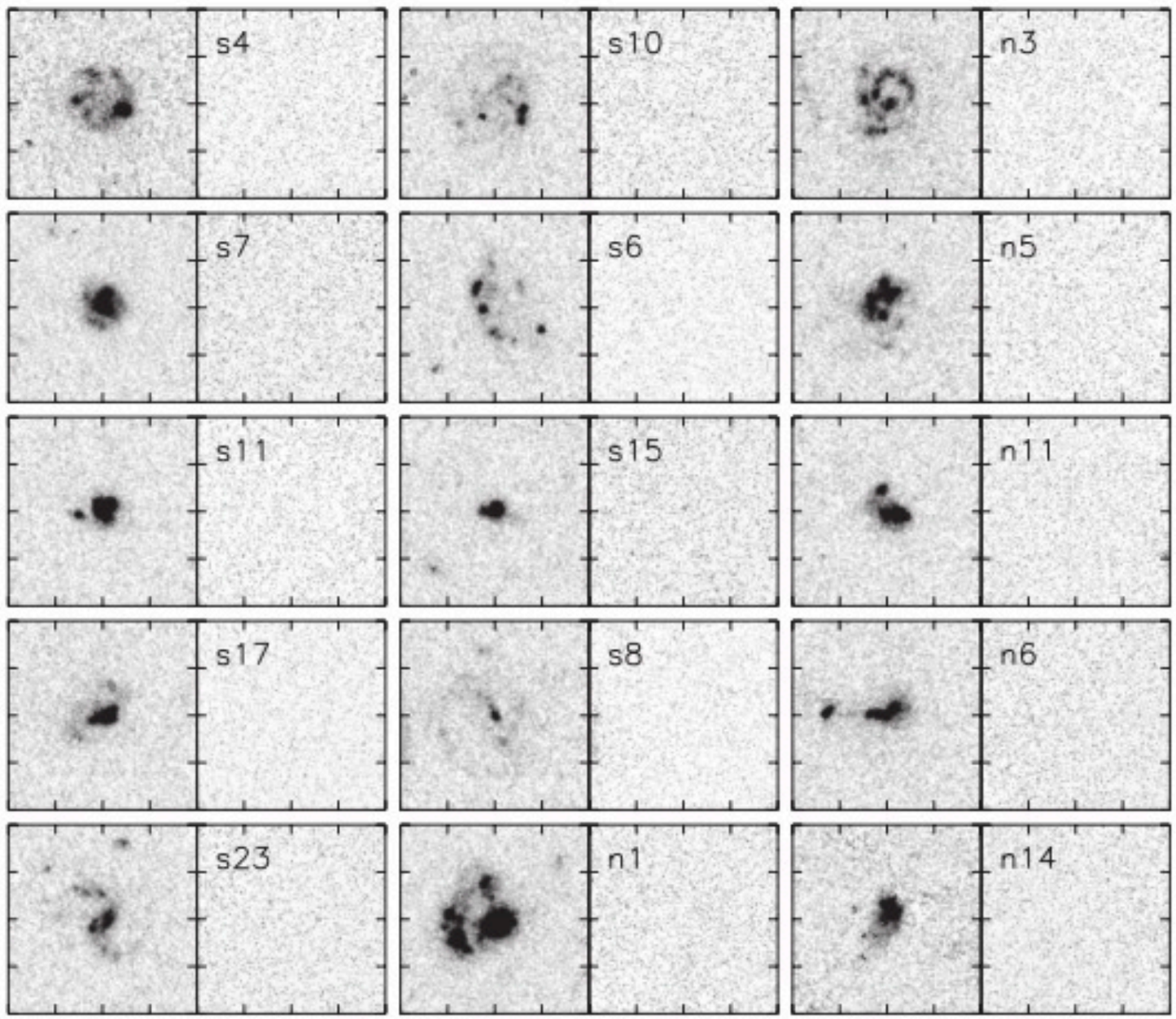
Illingworth

Lyman-alpha / UV



JEFR, Yepes, Gottloeber & Prada (2012)

Lyman-C / UV



GOODS *B*-band (F435W, rest-frame ~1900 Å left) and far-UV (F150LP, rest-frame LyC, right) images of all 15 targets. The stamps are 4″ o
$z = 1.3$). The target galaxies display a variety of morphologies: including spirals, compact galaxies, mergers, and/or clumpy disks.

Siana et al. (2010)

Effects of Star Formation Stochasticity on the Lyα & Lyman Continuum Emission from Dwarf Galaxies

JEF-R & Mark Dijsktra, 2012

arXiv: 1206.0726

stochasticity

Star Formation Stochasticity

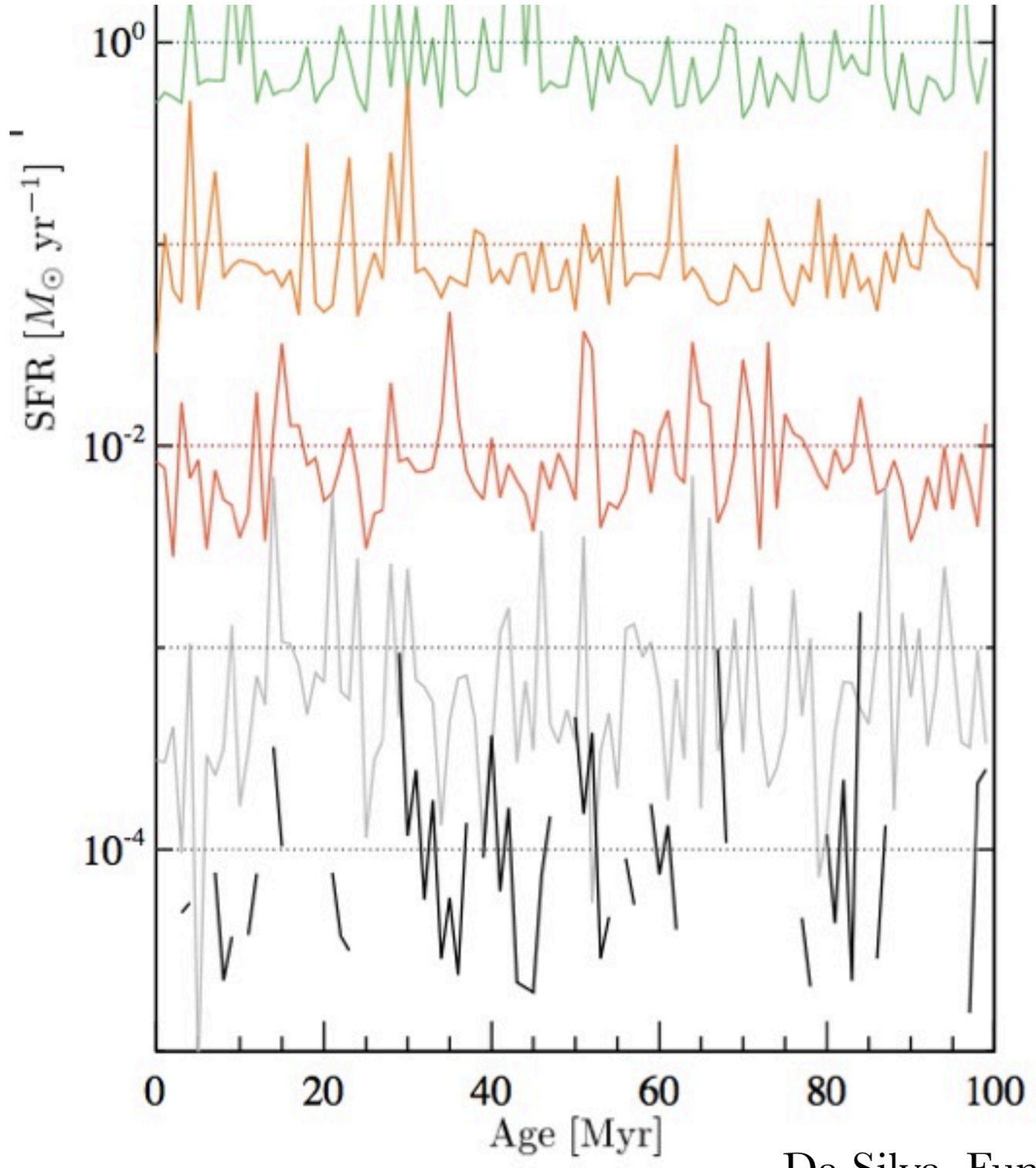
Sampling stochasticity

Temporal stochasticity

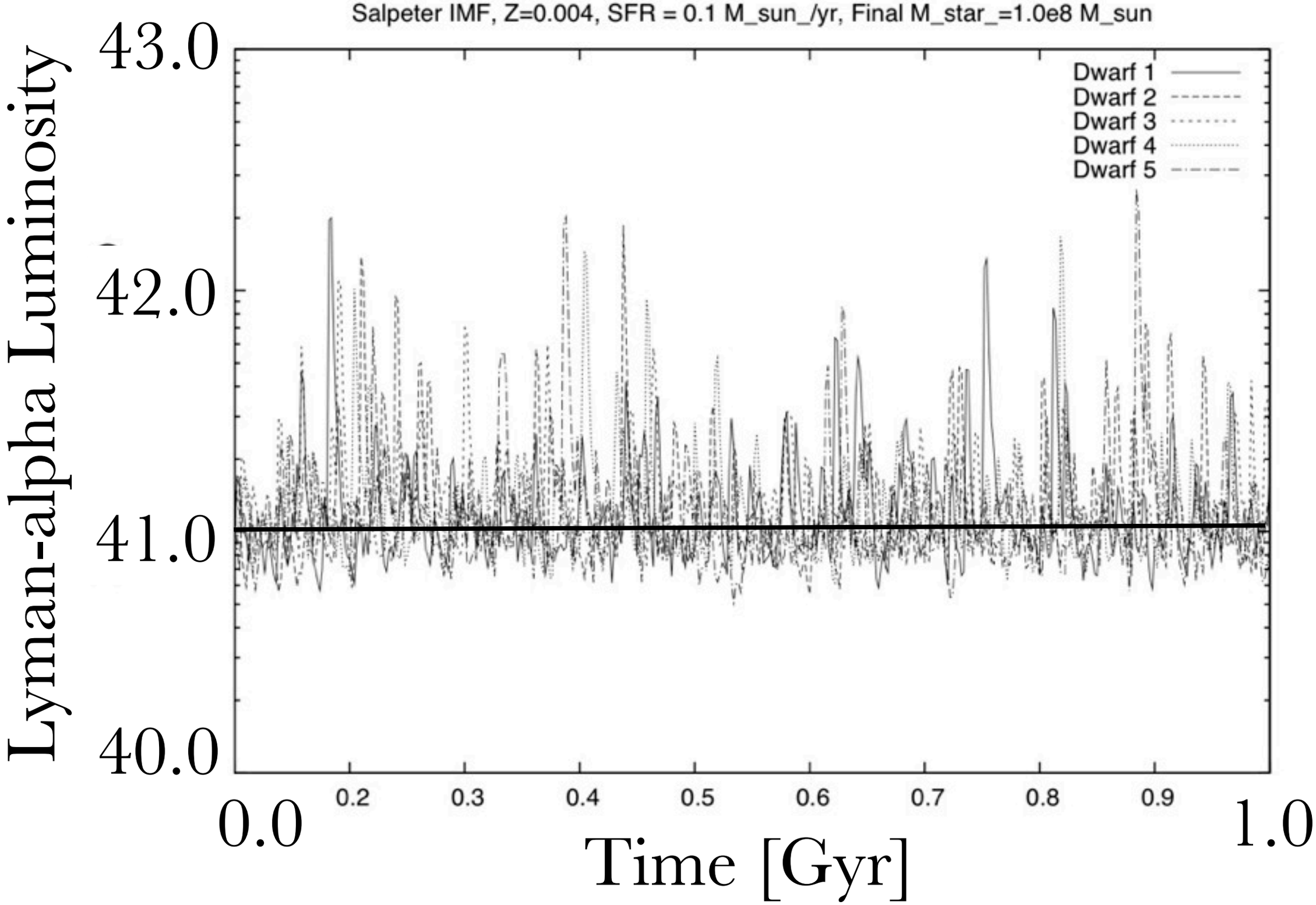
Cluster amplification

Da Silva, Fumagalli & Krumholz (2012)

Stochastically Lighting Up Galaxies (SLUG)



Da Silva, Fumagalli & Krumholz (2012)

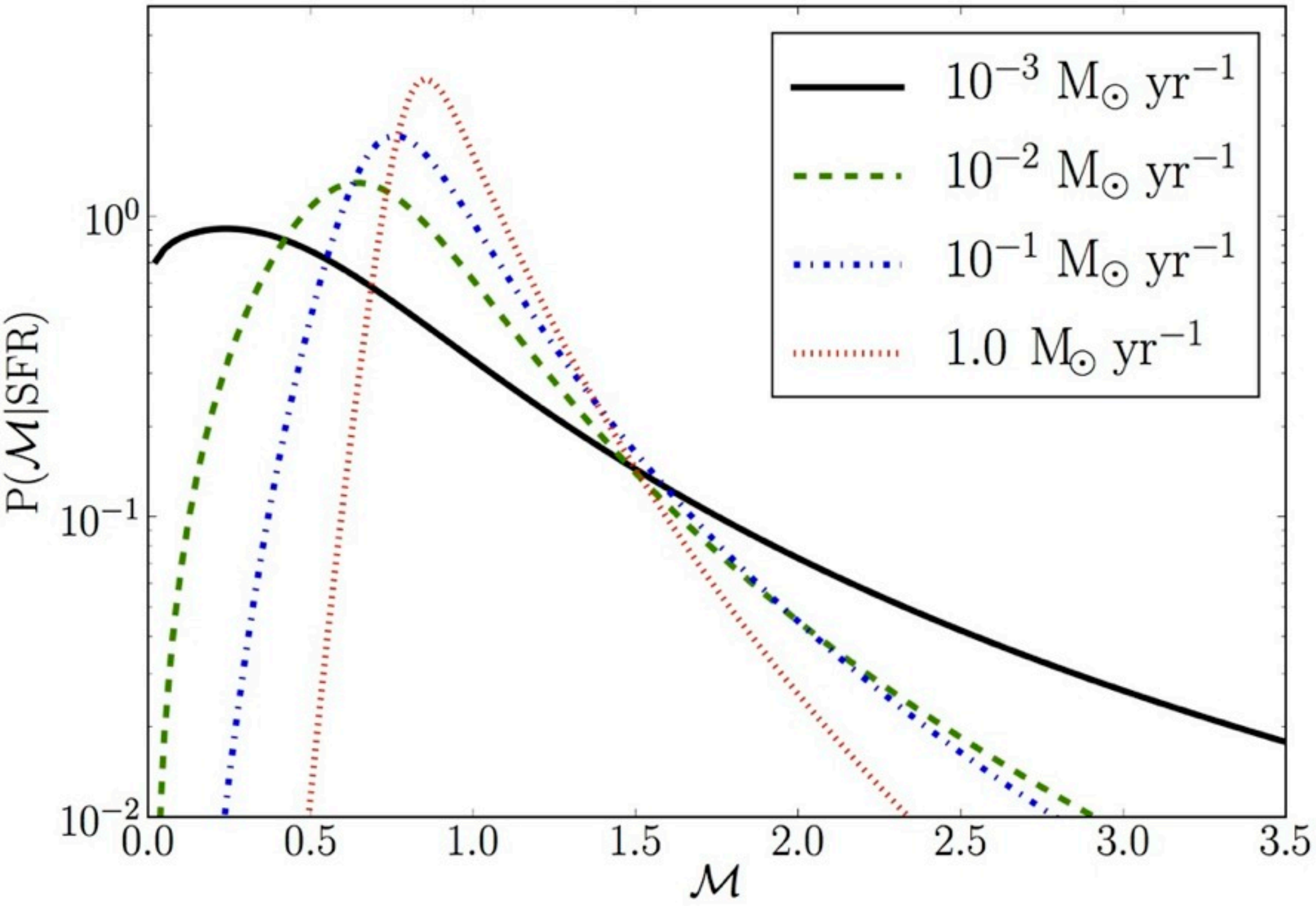

Salpeter IMF, Z=0.004, SFR = 0.1 M_sun_/yr, Final M_star_=1.0e8 M_sun
Dwarf 1
Dwarf 2
Dwarf 3
Dwarf 4
Dwarf 5
Lyman-alpha Luminosity
43.0
42.0
41.0
40.0
0.0
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
Time [Gyr]

Lyman-alpha equivalent width

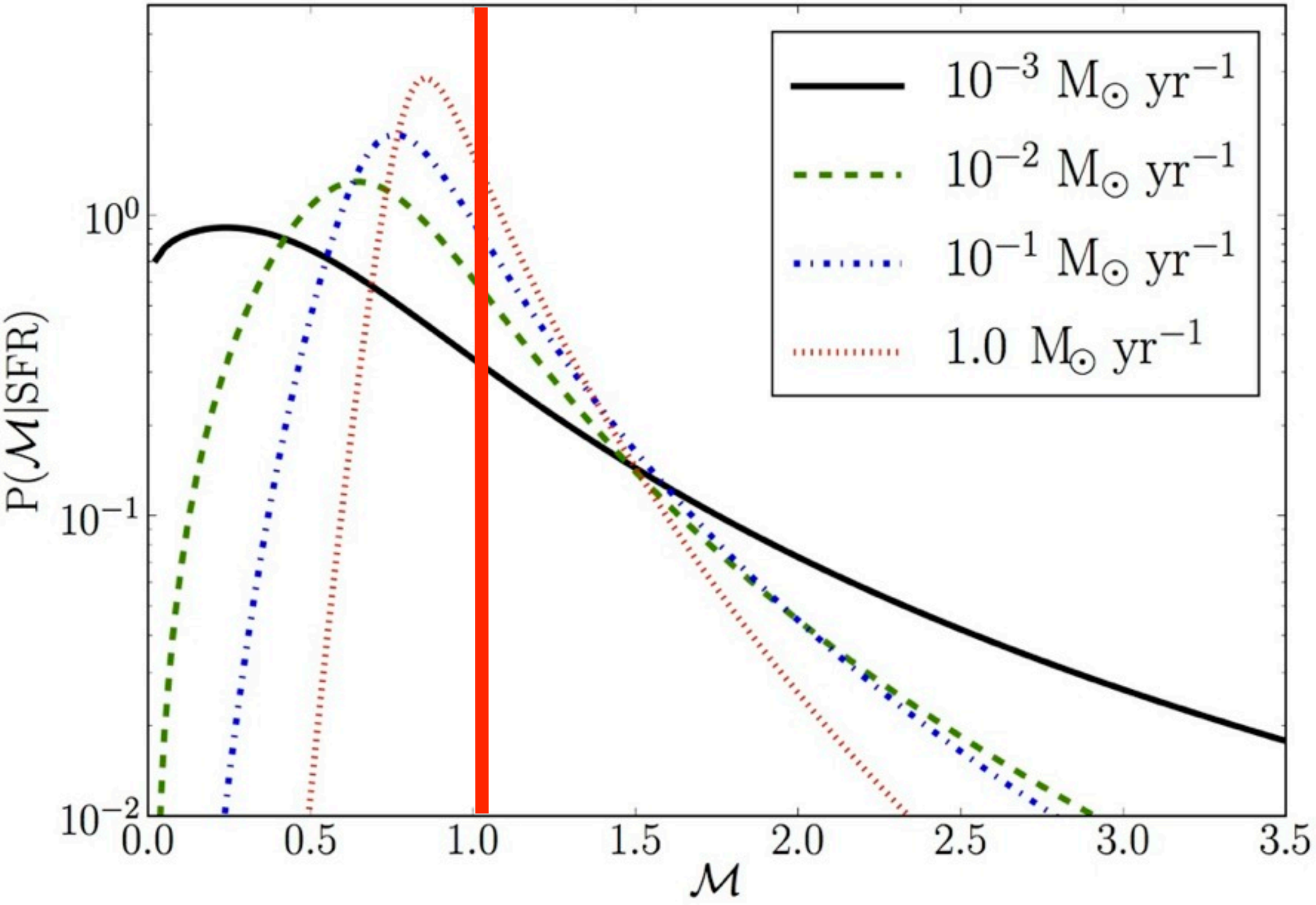
$$\mathrm{EW} \equiv \frac{L_{Ly\alpha}}{L_{\lambda,UV}} = \frac{\lambda_{\mathrm{UV}}}{\nu_{\mathrm{UV}}} \frac{L_{Ly\alpha}}{L_{\nu,UV}}$$

$$\mathrm{EW} = \frac{\lambda_{\mathrm{UV}}}{\nu_{\mathrm{UV}}} \frac{c_0 Q_H}{F_{\nu,\mathrm{UV}}}$$

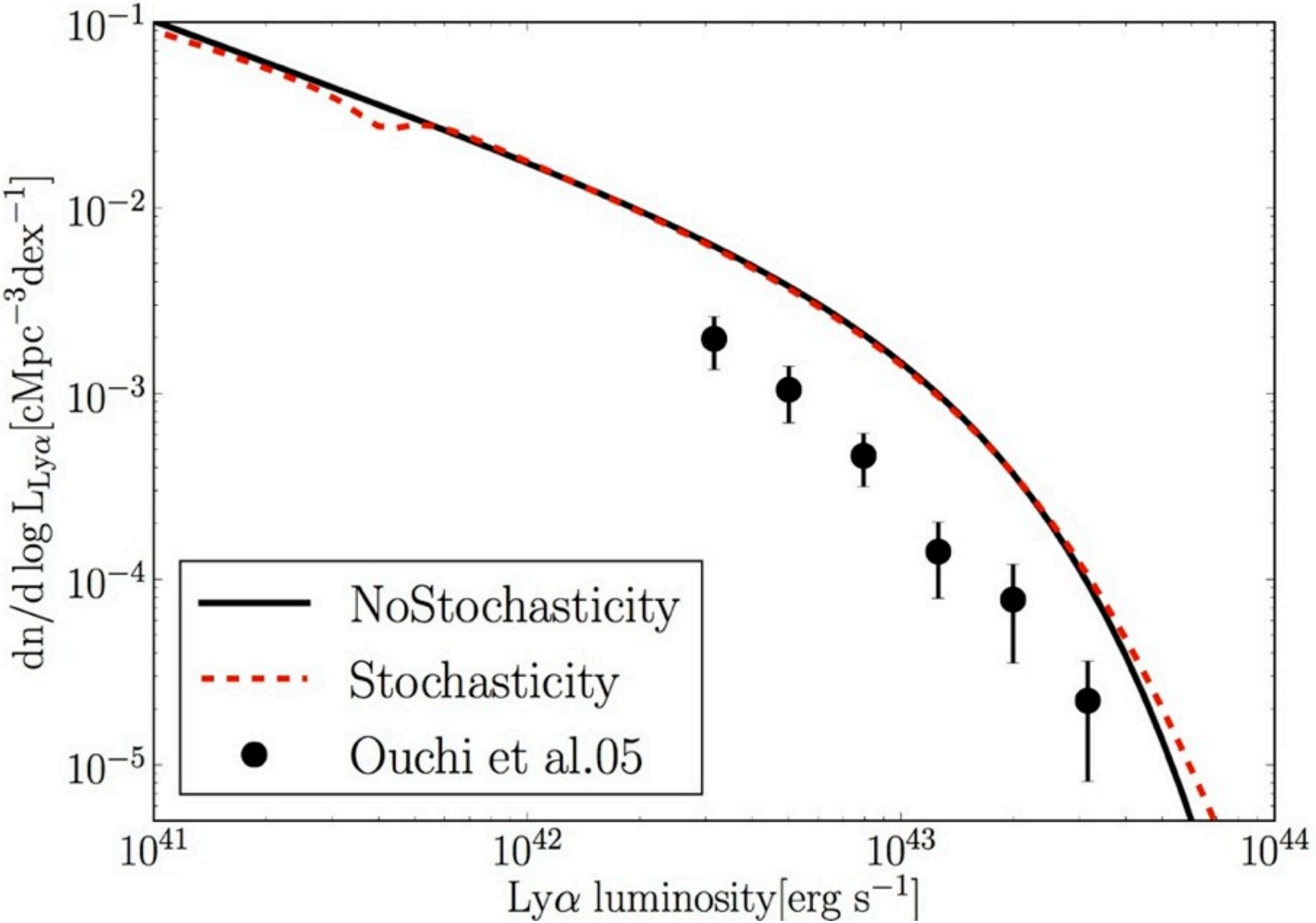
$$\mathcal{M} \equiv \frac{\mathrm{EW}}{\mathrm{EW}_0},$$



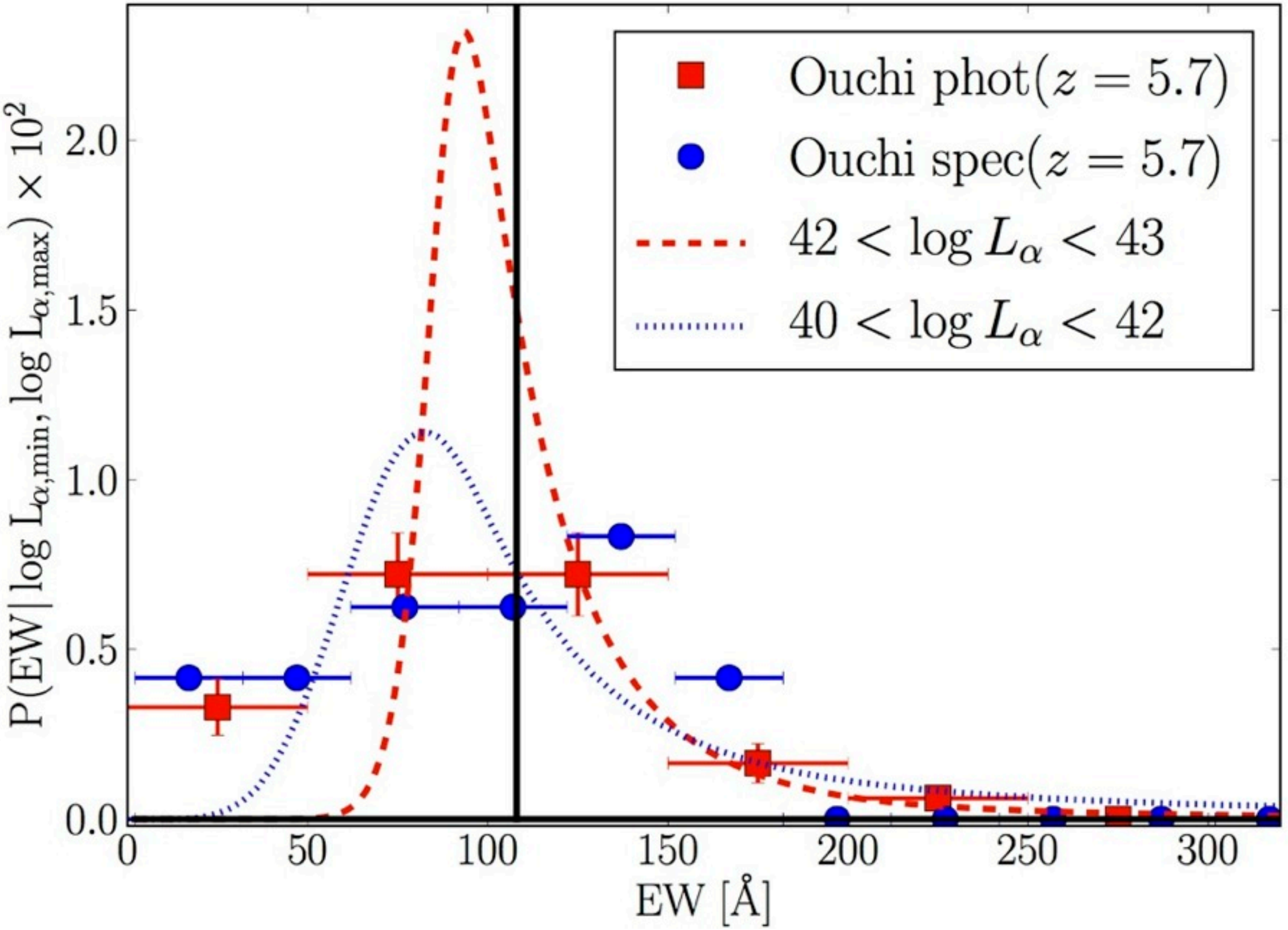
JEFR & Dijkstra (2012)



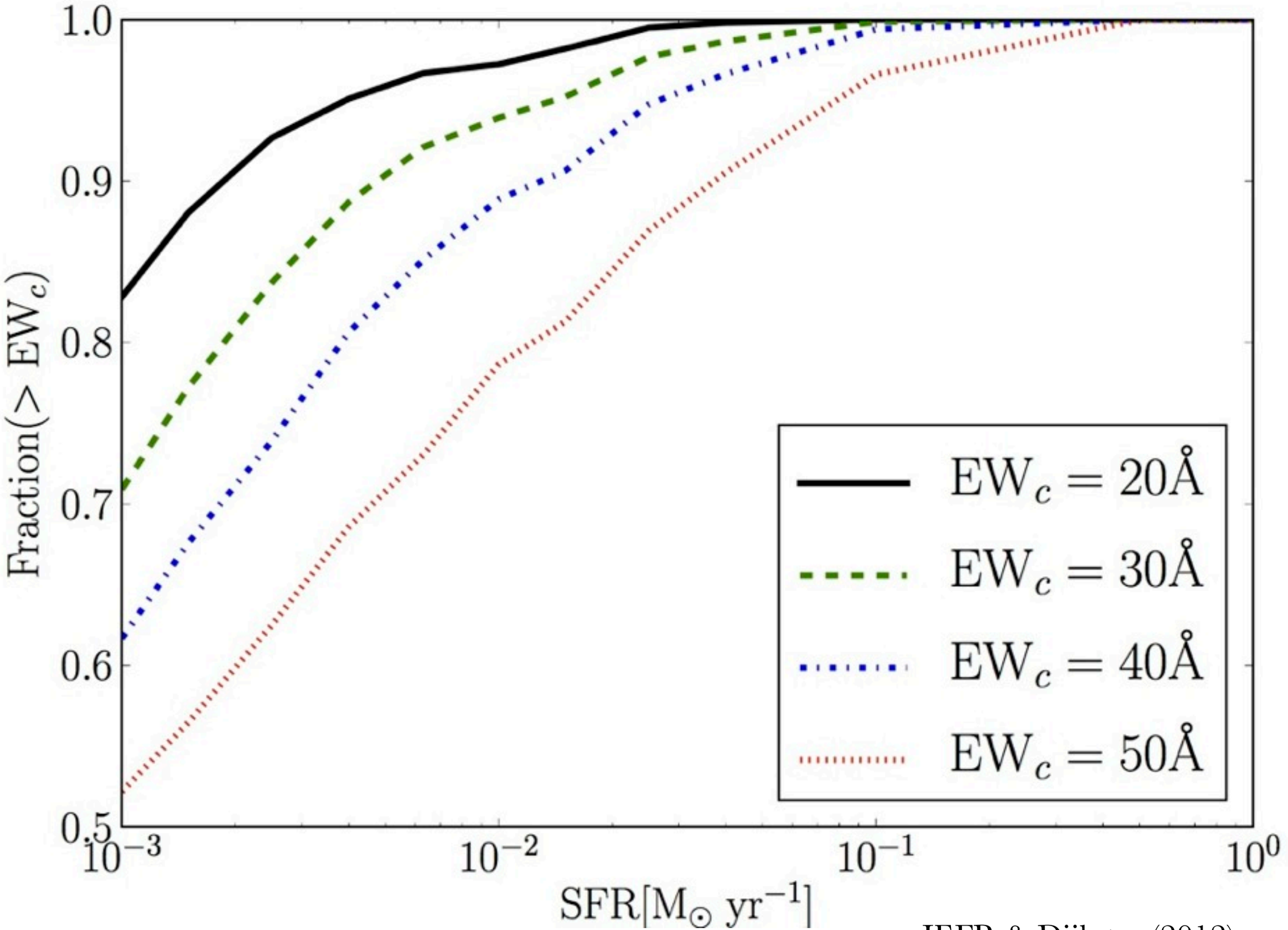
JEFR & Dijkstra (2012)



JEFR & Dijkstra (2012)



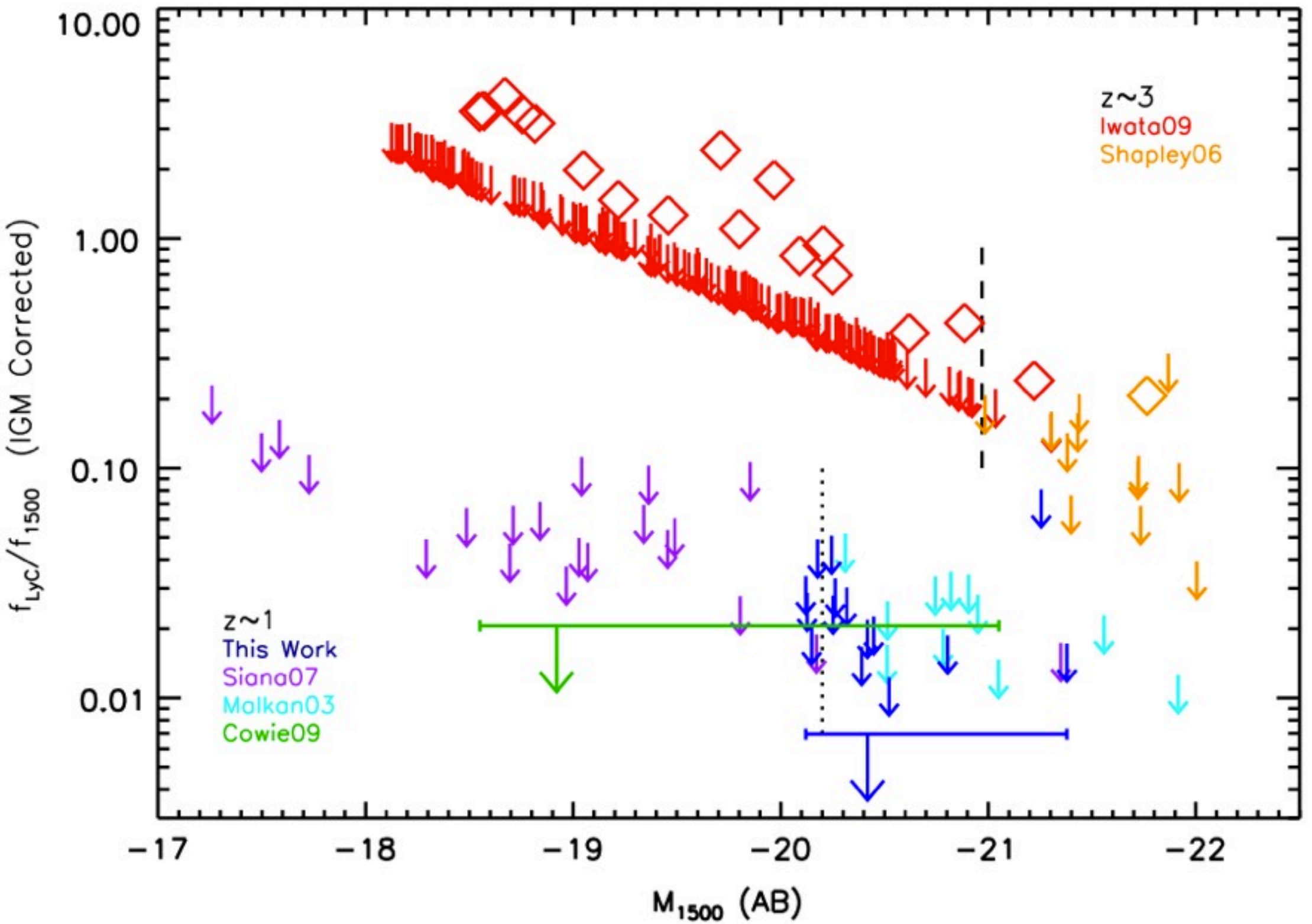
JEFR & Dijkstra (2012)



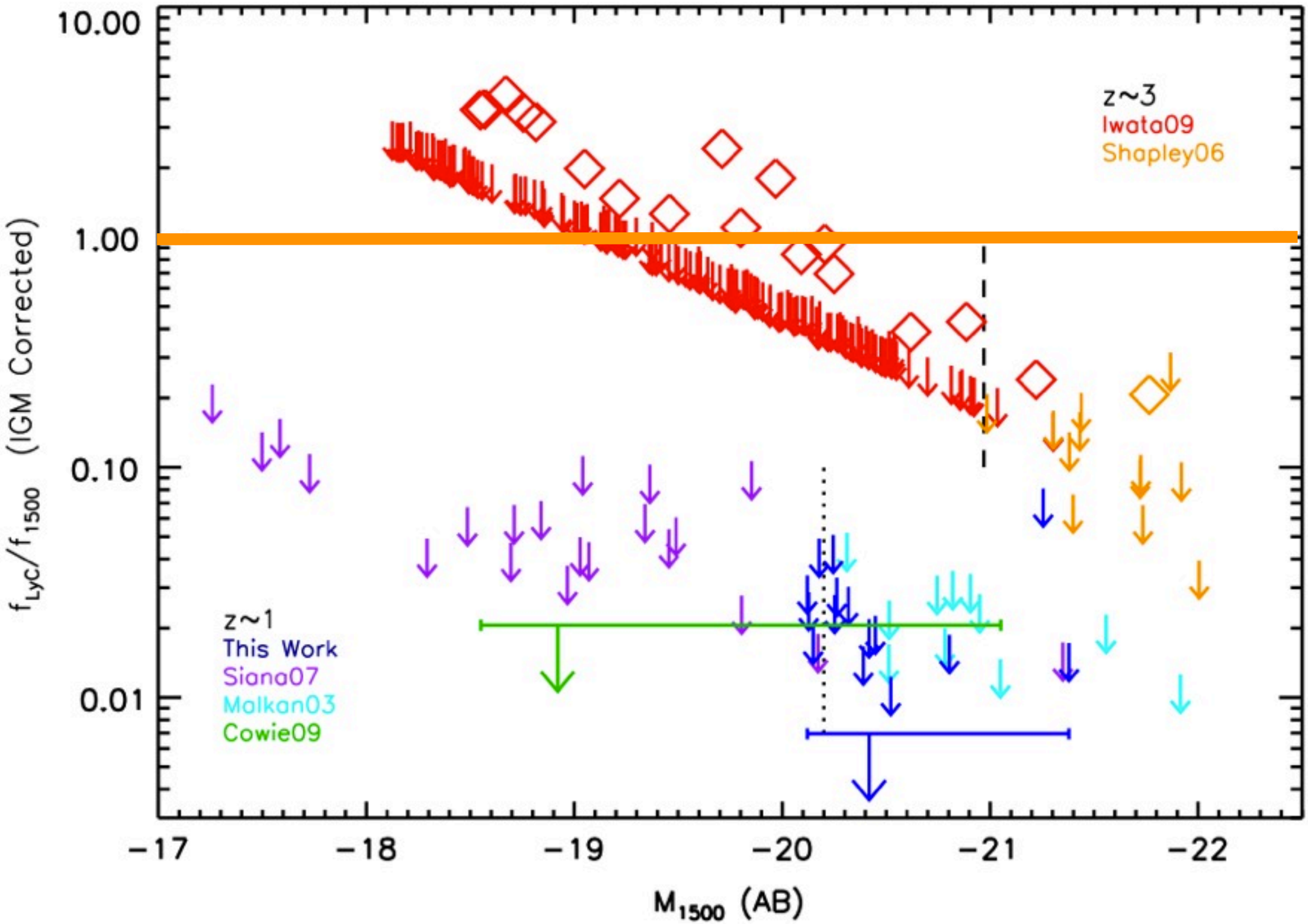
JEFR & Dijkstra (2012)

Lyman-continuum escape fraction

$$f_{\rm esc,rel} = \frac{(f_{1500}/f_{\rm LyC})_{\rm stel}}{(f_{1500}/f_{\rm LyC})_{\rm obs}} \exp(\tau_{\rm IGM})$$



Siana et al. (2010)



Siana et al. (2010)

Lyman 'bump' galaxies – I. Spectral energy distribution of galaxies with an escape of nebular Lyman continuum

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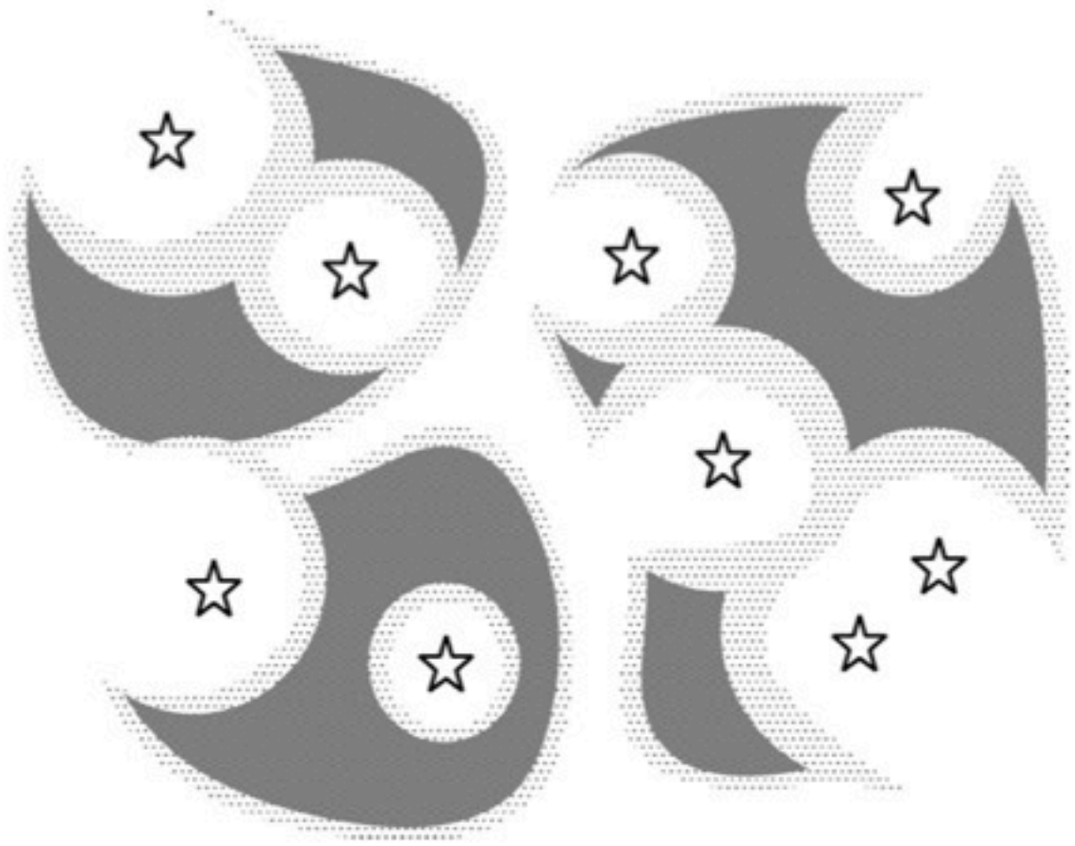
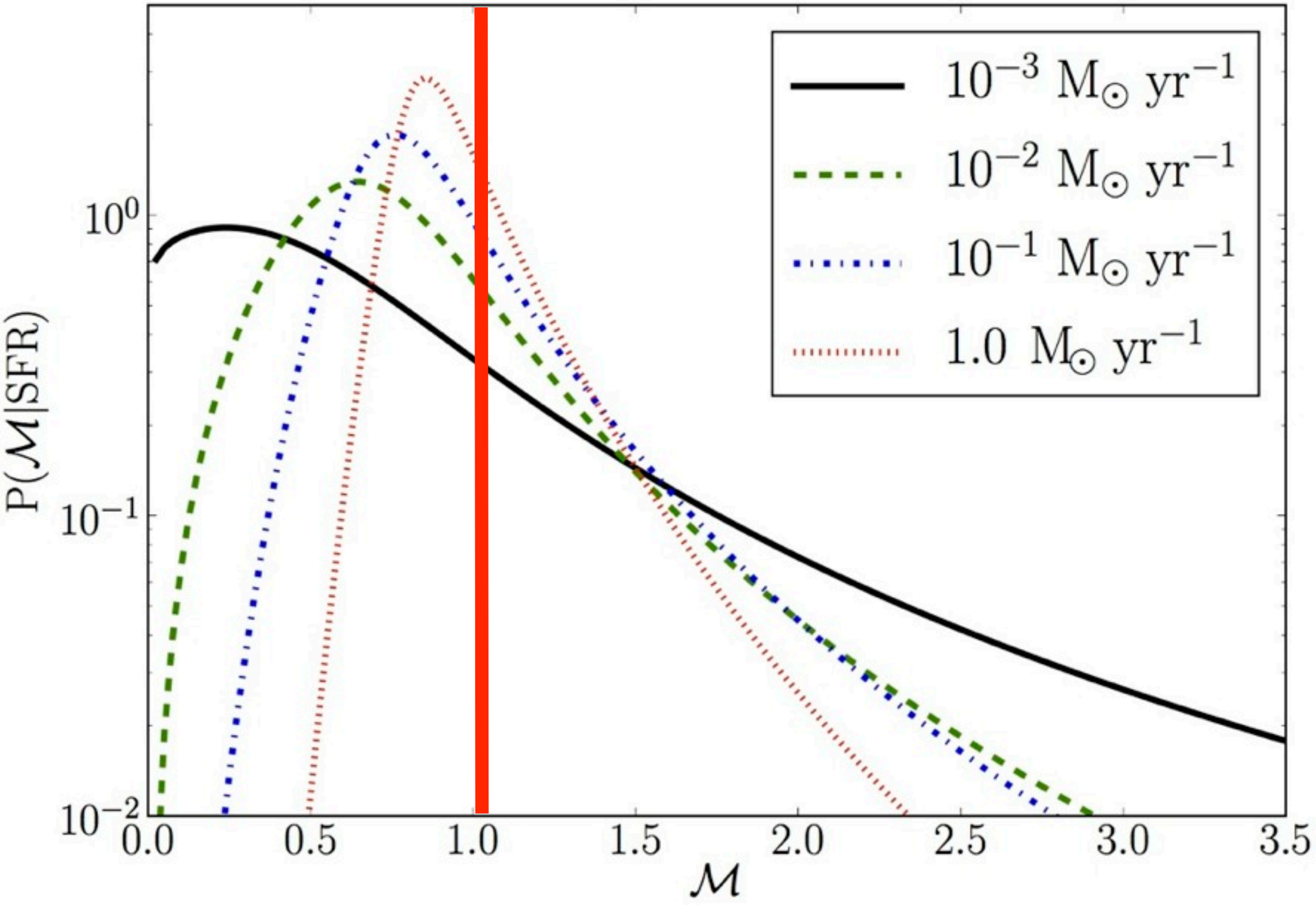


Figure 1. Schematic picture of clumpy ISM. Dense regions which remain neutral against the ionization by the stellar radiation are shown by the thick shades, and ionized nebulae formed at the surface of the dense regions are shown by the thin shades. Other space is filled with diffuse ionized gas which has negligible opacity for LyC.



JEFR & Dijkstra (2012)

Stochasticity in Dwarf Galaxies

- Explain high EW Lyman-alpha values.
- Produce low EW Lyman-alpha values.
- Explain observations of ‘Lyman-bump galaxies’
- Strong conclusions require large galaxy samples.