The galaxy-wide IMF in massive early-type galaxies

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in collaboration with
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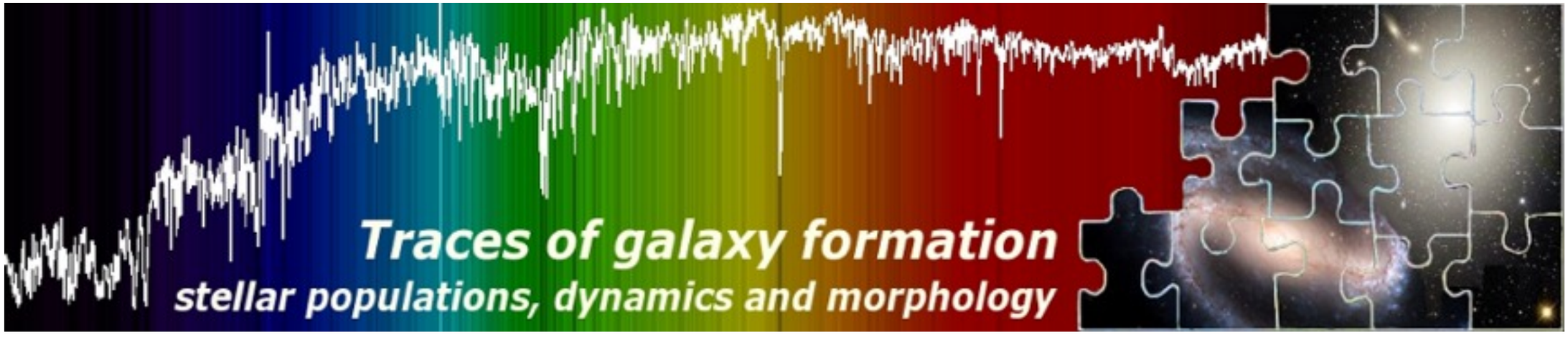
and Francesco La Barbera (INAF)

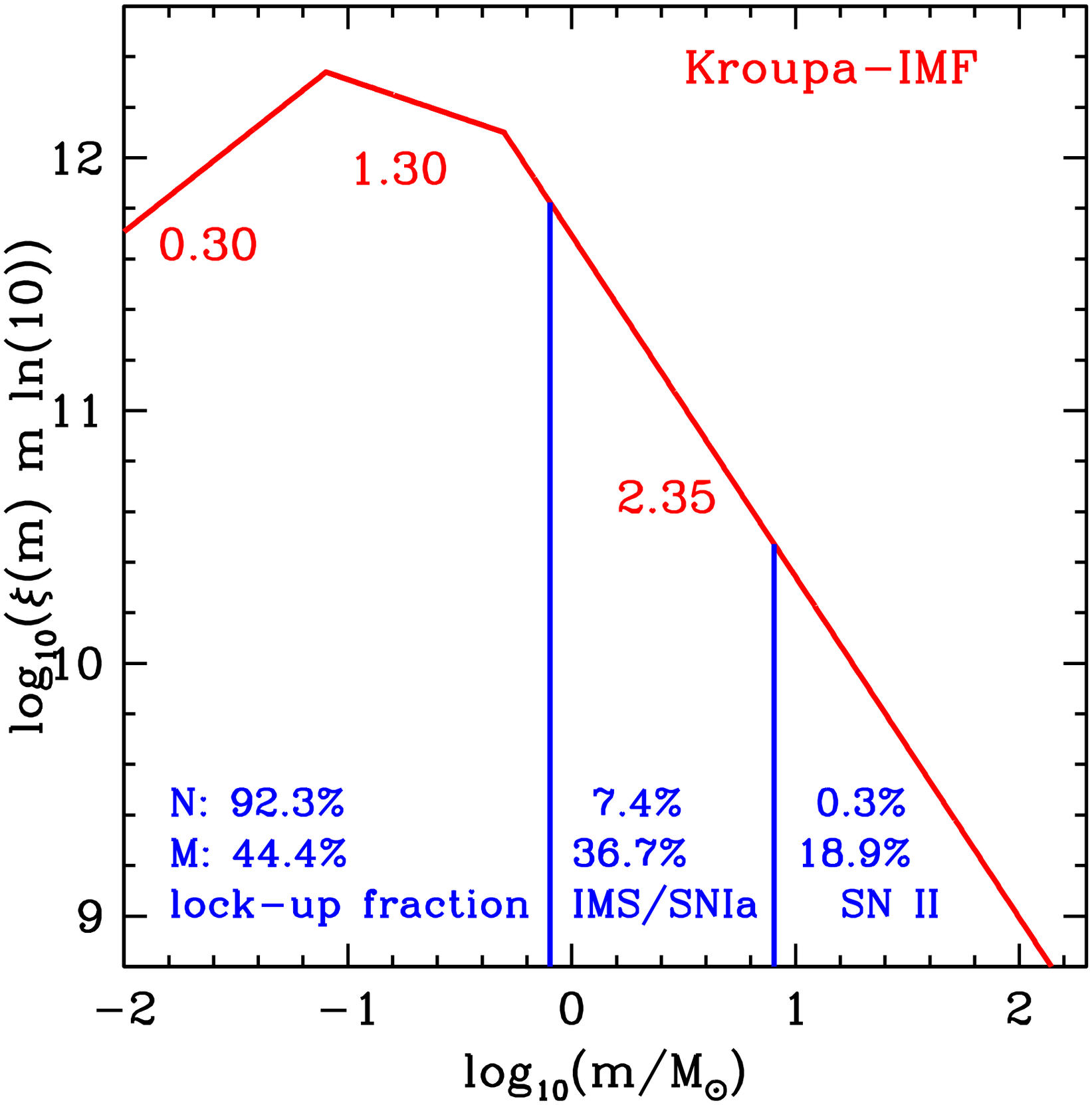
Sp12: **A fresh look at the stellar IMF**

EWASS 2013

July 11th 2013, Turku, Finland



The canonical IMF



$\xi(m) \propto m^{-\alpha_i}$

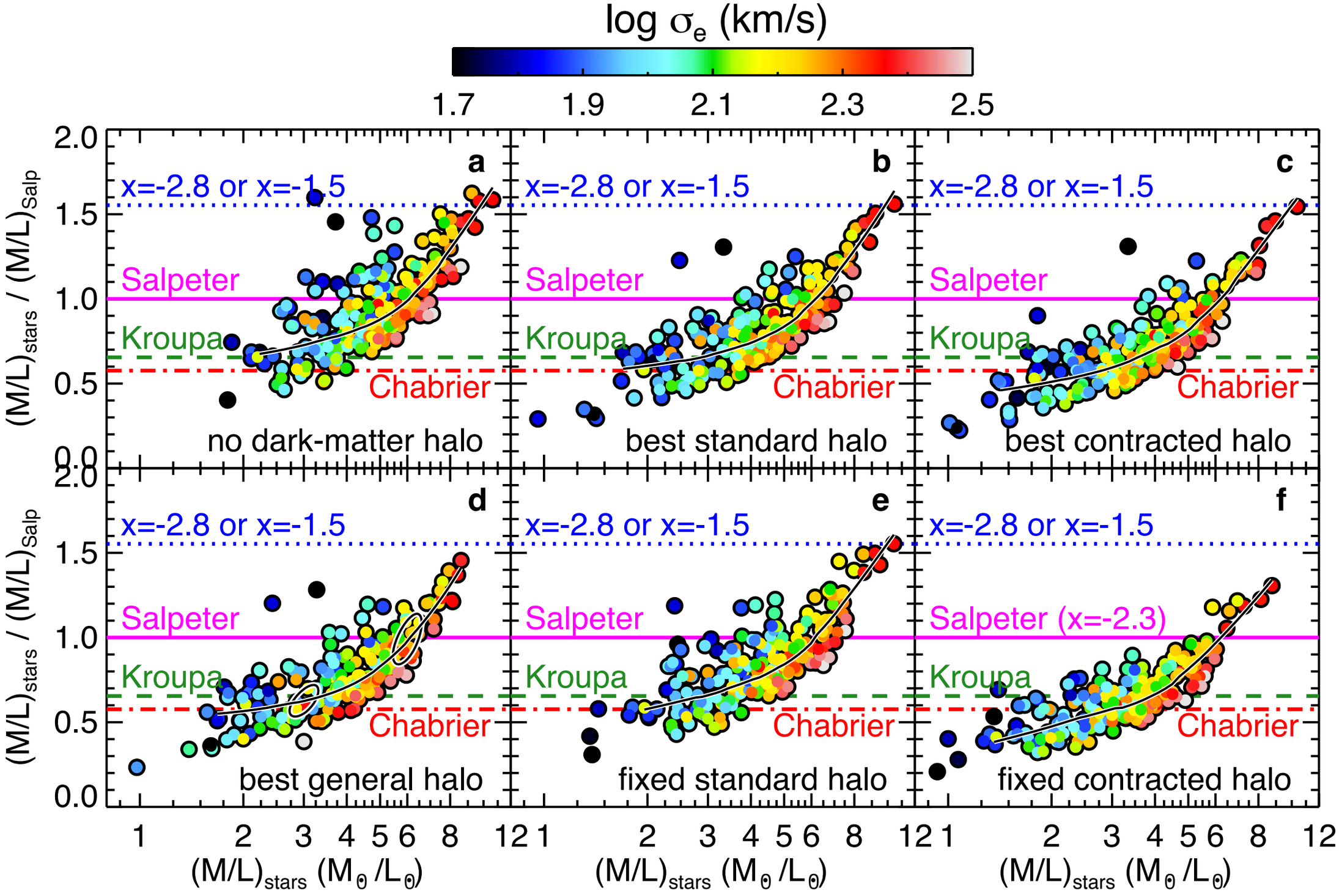
Systematic IMF variations in ETGs from M/L ratios

Cappellari et al. 2012 (Nature 484, 485)

- The ATLAS^{3D} project studied integral-field maps of stellar kinematics early-type galaxies.
- Volume-limited sample of 260 galaxies.
- Derived dynamical *r*-band $(M/L)_{stars}$ ratios using a range of dark-matter halo assumptions.
- Compared the $(M/L)_{stars}$ to $(M/L)_{pop}$ using different stellar population syntheses models but a fixed (Salpeter) IMF.

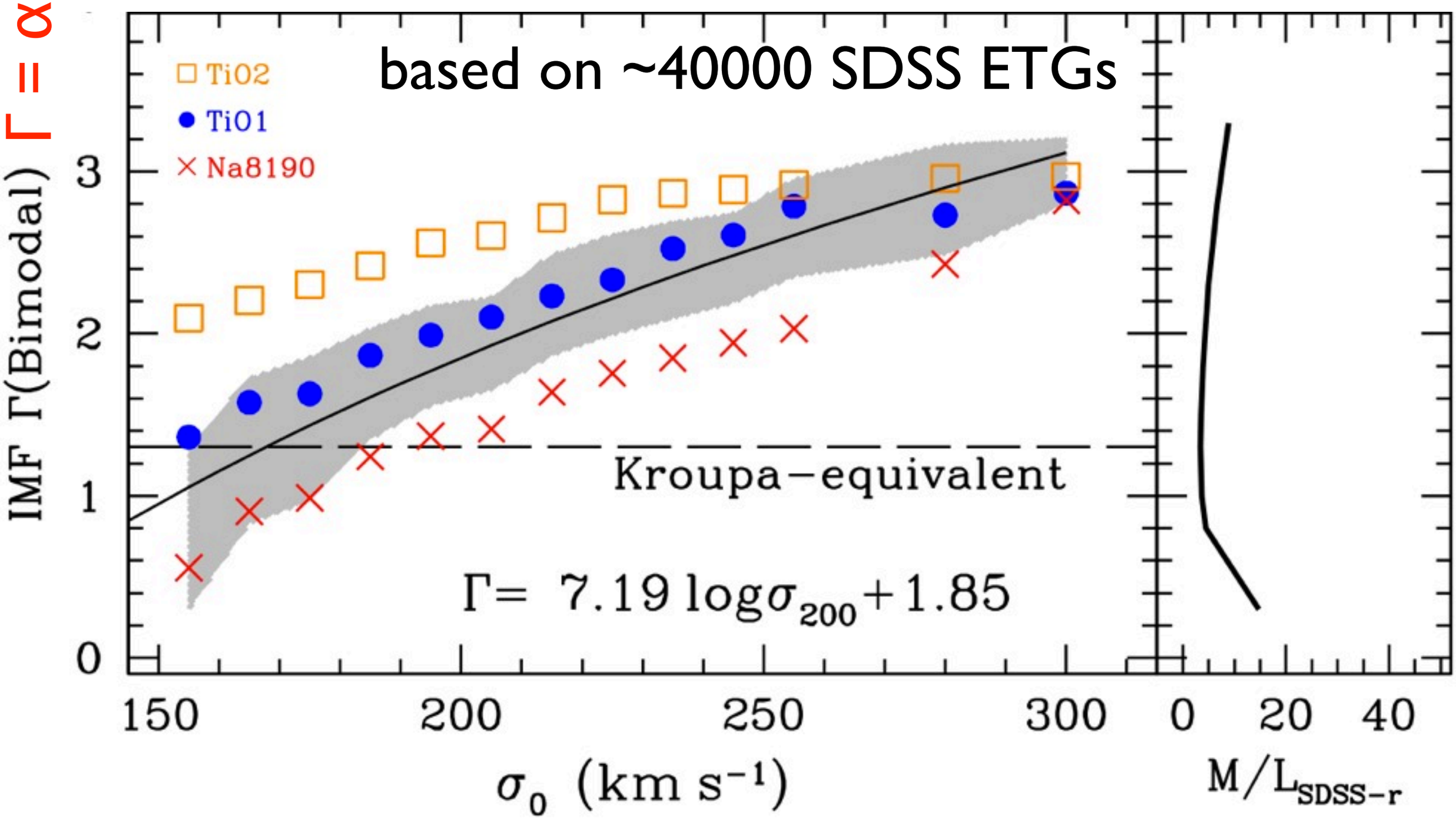
r-band M/L ratios

Cappellari et al. 2012 (Nature 484, 485)

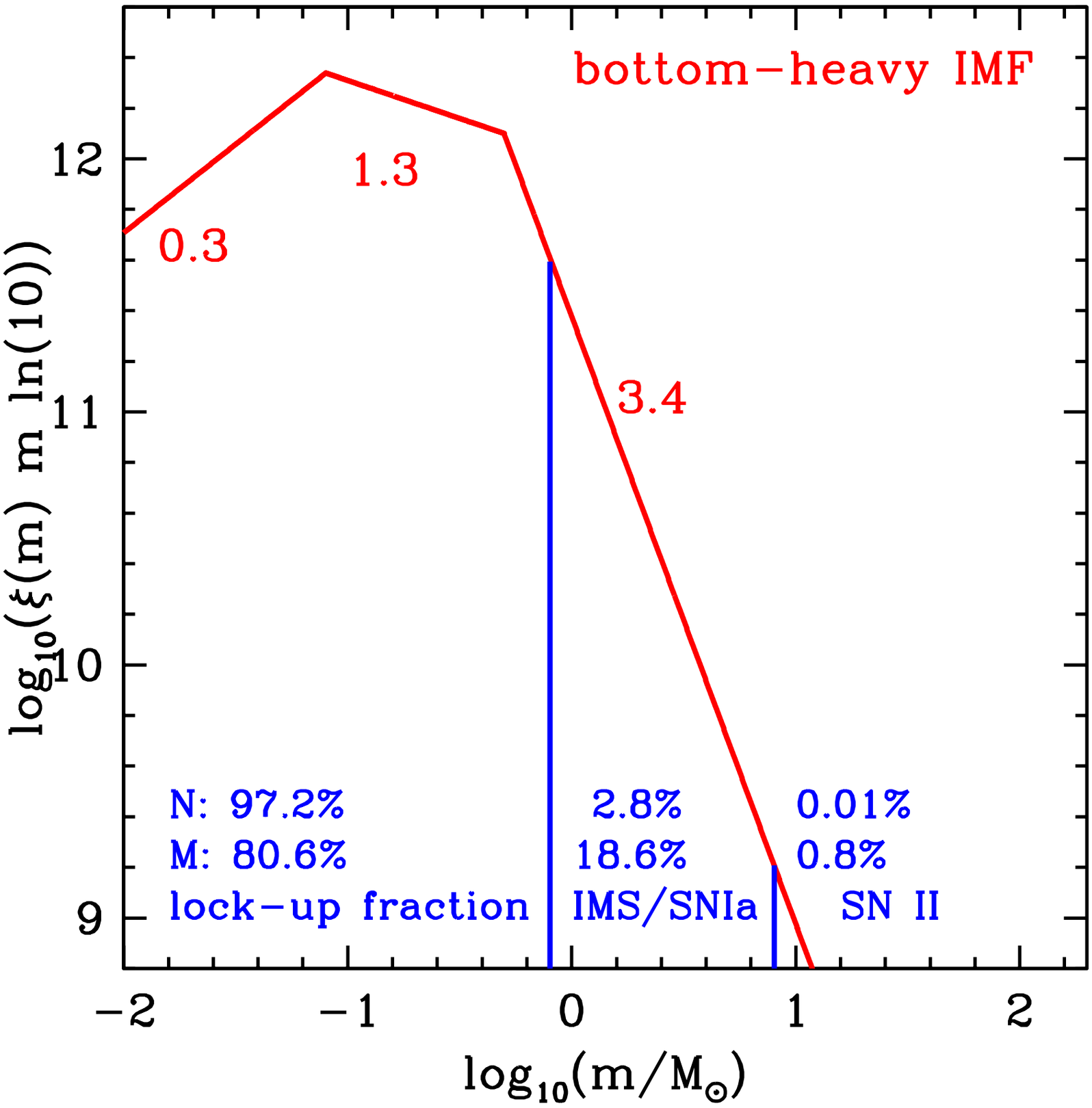


Systematic IMF variations in ETGs from spectral indices

Ferreras et al. 2013 (MNRAS 429, L15); La Barbera et al. 2013 (MNRAS, arXiv:1305.2273)



Bottom-heavy IMF



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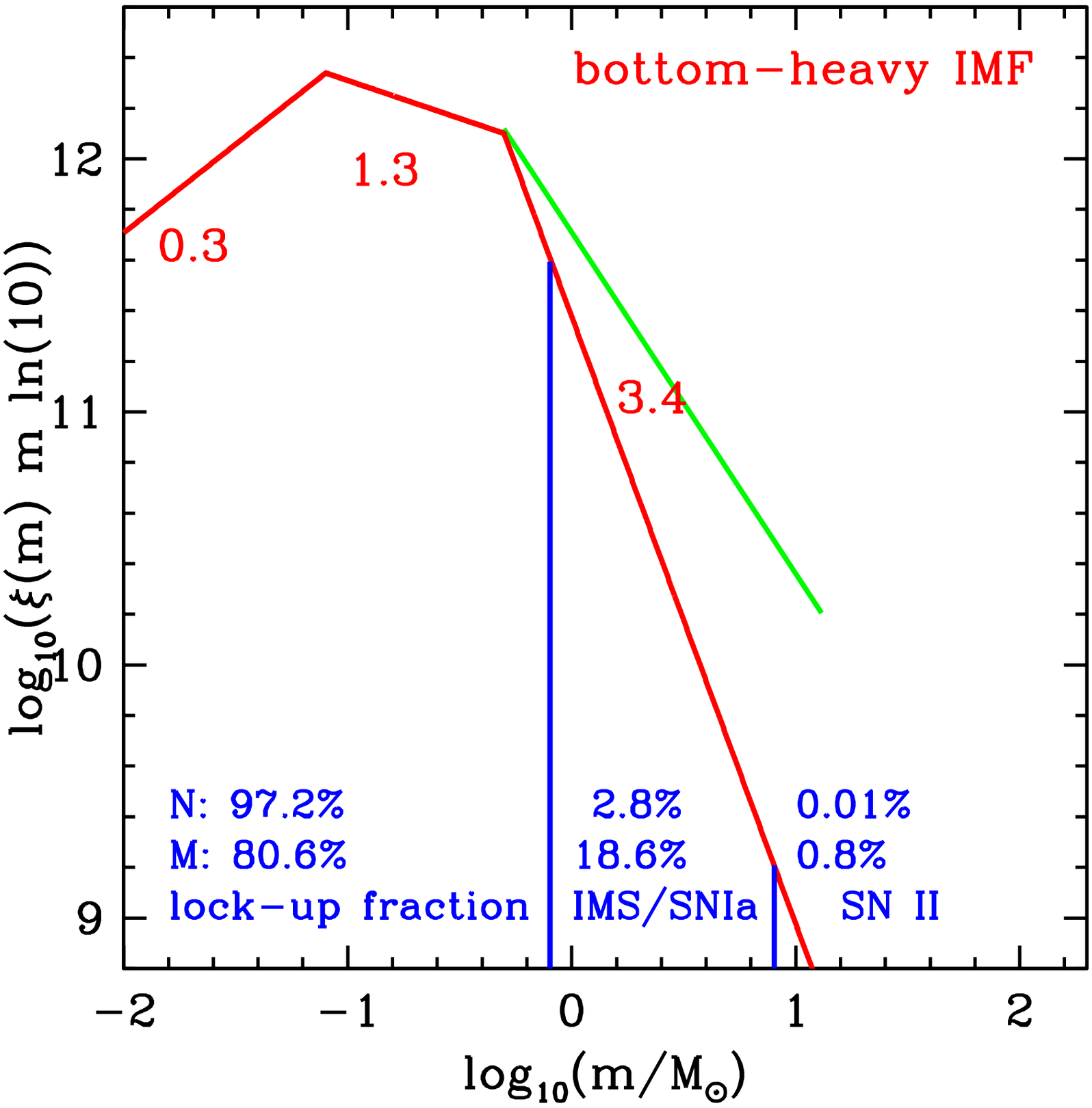

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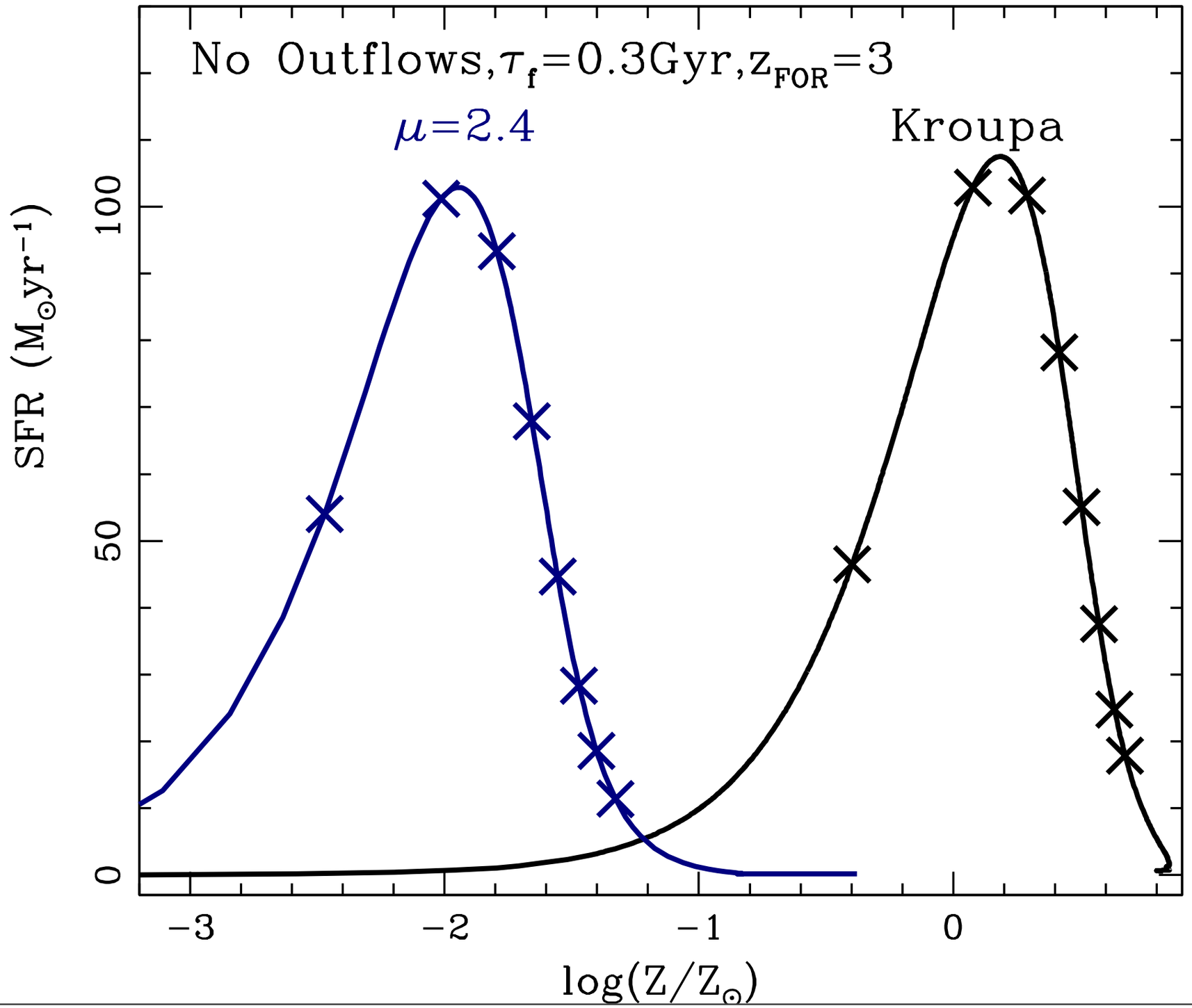
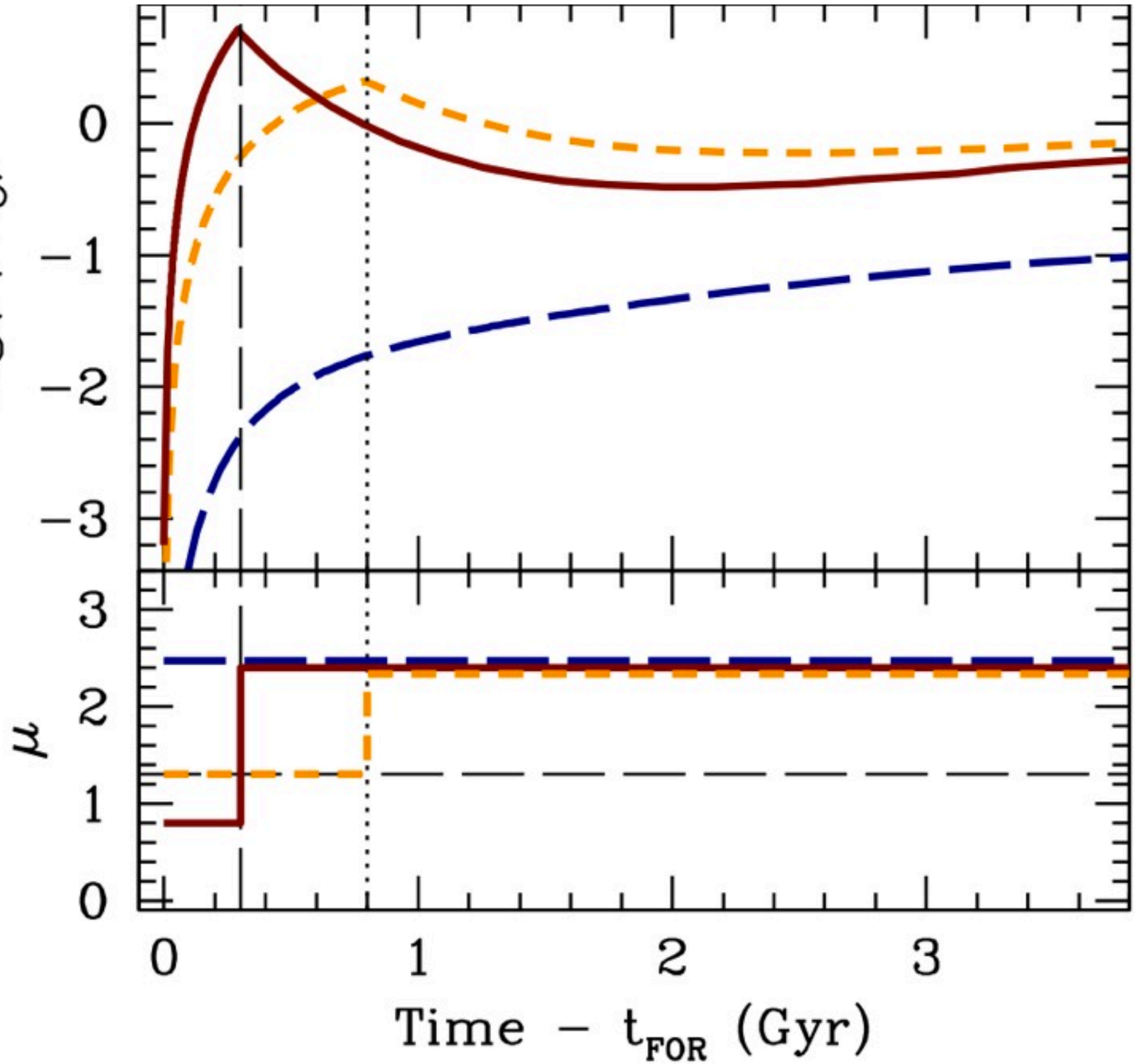
Chemical evolution with a bottom-heavy IMF

Weidner, Ferreras, Vazdekis & La Barbera 2013 (MNRAS, arXiv: 1306.6332)



The two-stage model



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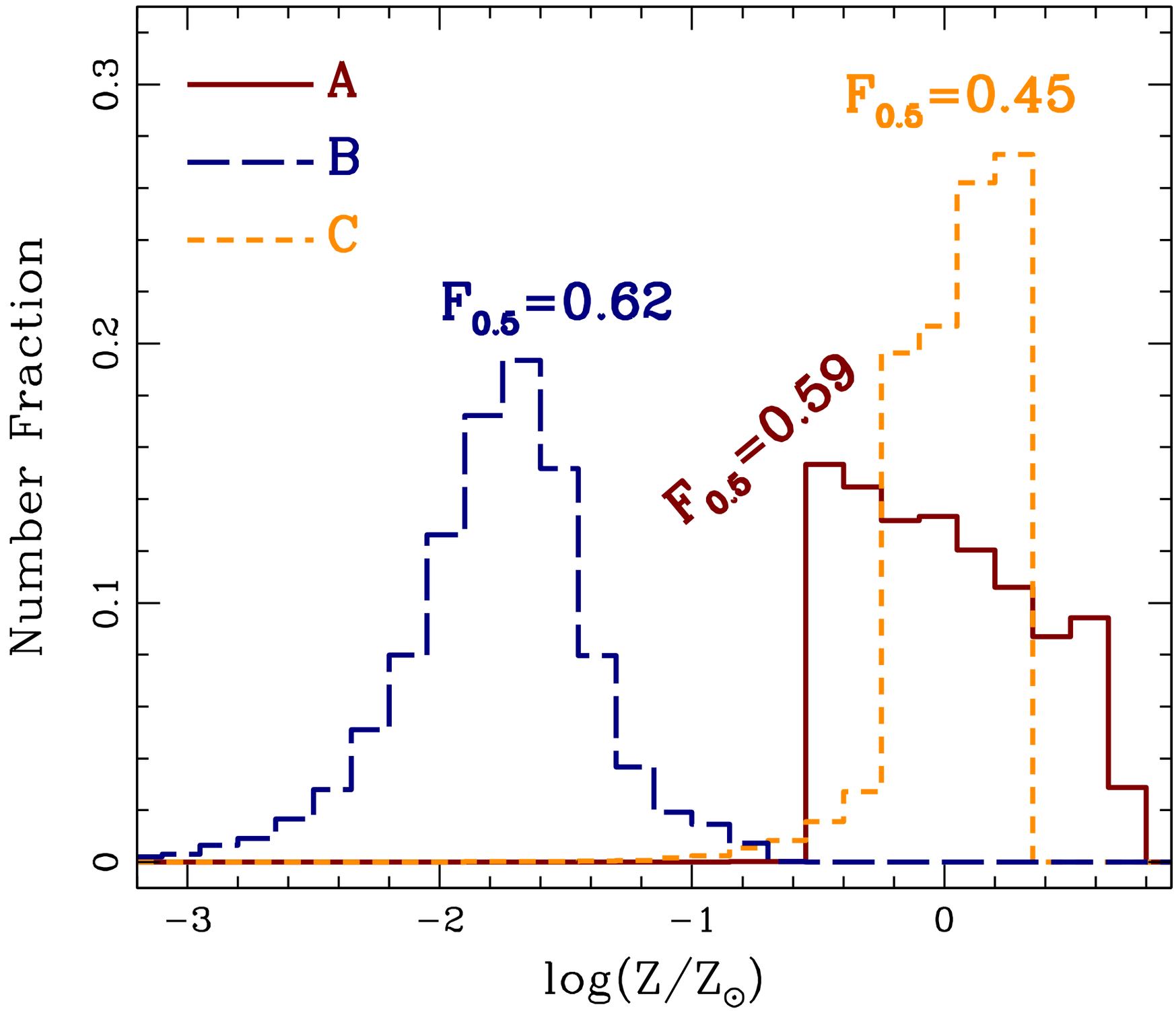

Low-mass X-ray binaries (LMXBs)

A view from a different perspective

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- A fraction of ~8% of the Milky Way GCs show LMXBs.
- If the (galaxy-wide) IMF in ETGs is bottom-heavy 10 to 20 times fewer LMXBs are to be expected.
- In nearby ETGs (Kim et al. 2009) the fraction of GCs with LMXBs is 7 to 14%.

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- A purely top-heavy galaxy-wide IMF can not reproduce many other observational constrains.

- Introducing a two-phase model with a short initial top-heavy phase and a longer bottom-heavy one solves the issue.