Radial variations in the Initial Mass Function

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SHARDS collaboration

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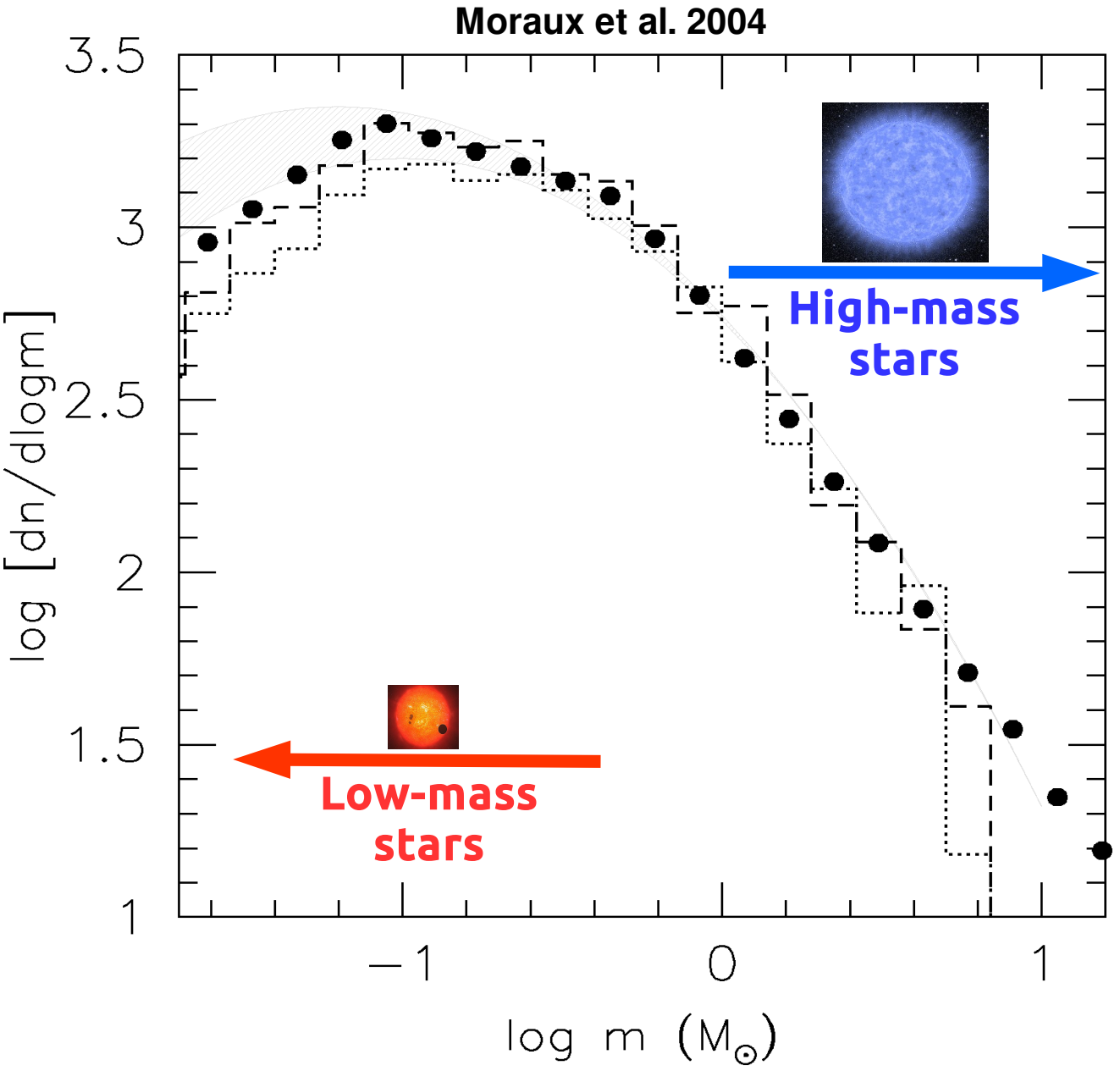
Traces of galaxy formation
www.iac.es/project/traces

How does the IMF look like?

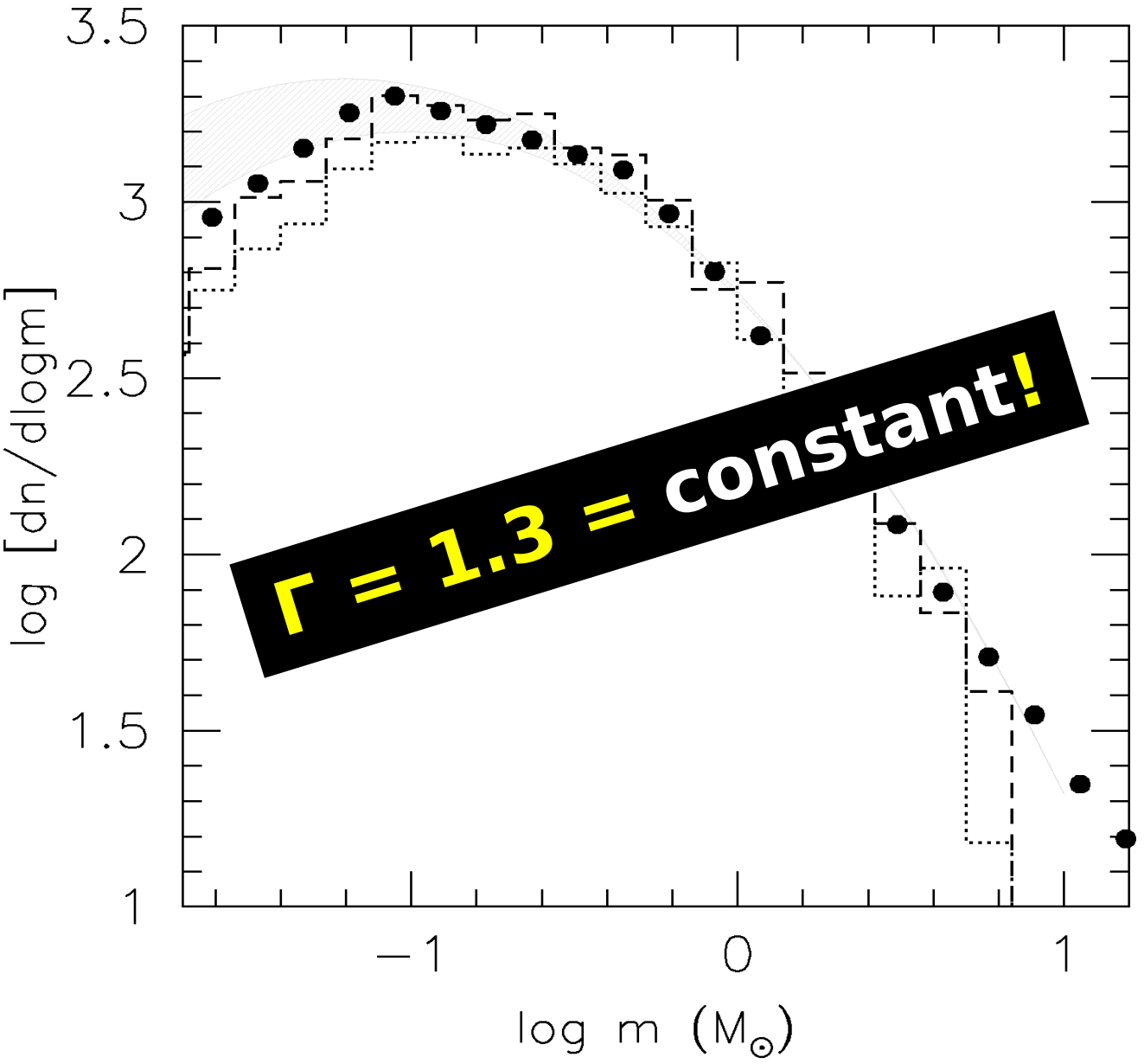


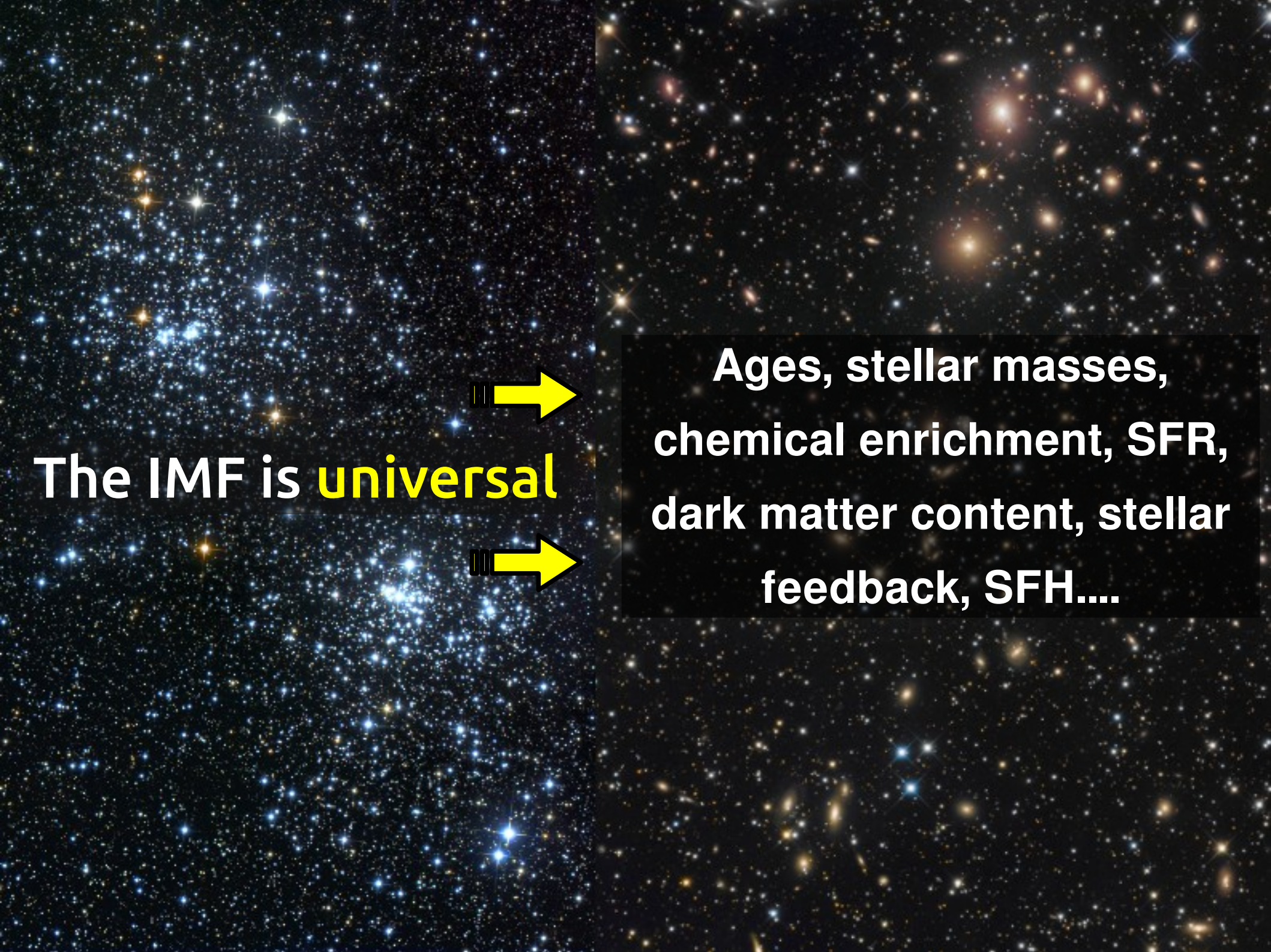
How does the IMF look like?

Kroupa et al. 2002

Bastian et al. 2010

Kroupa et al. 2013

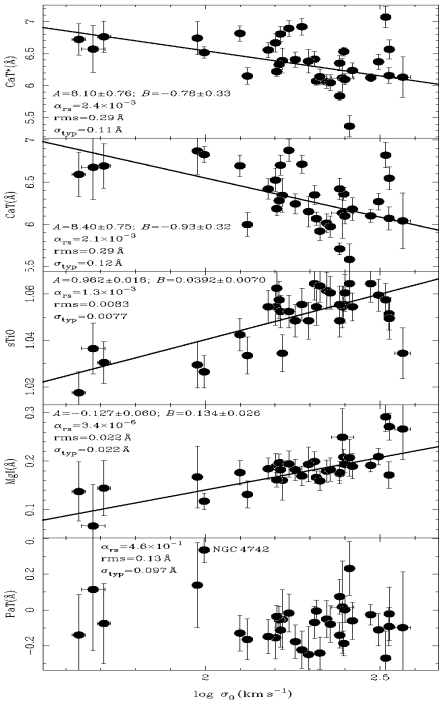



The IMF is universal
Ages, stellar masses, chemical enrichment, SFR, dark matter content, stellar feedback, SFH....

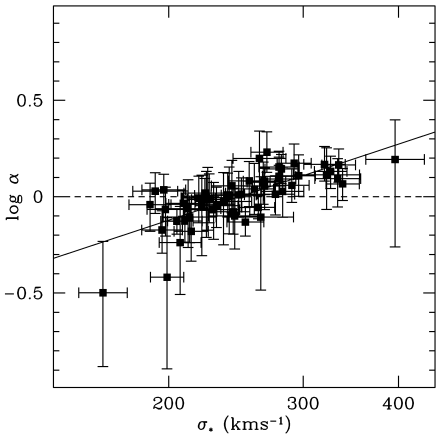
- SFR ~ 10^3 [$M_\odot$ / yr]
- τ ~ 100 [Myr]
- Formed at z ~ 2

Is the IMF universal?

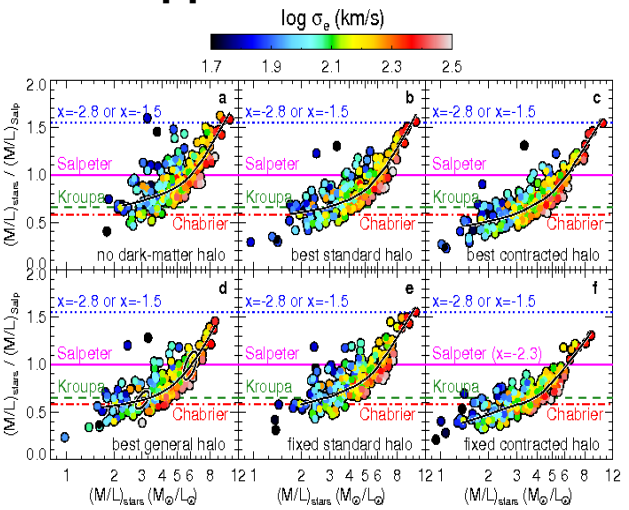
Cenarro et al. 2003



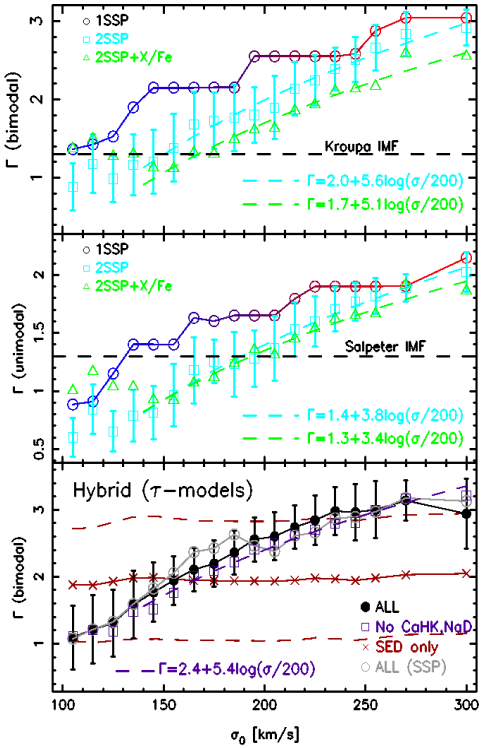
Treu et al. 2010



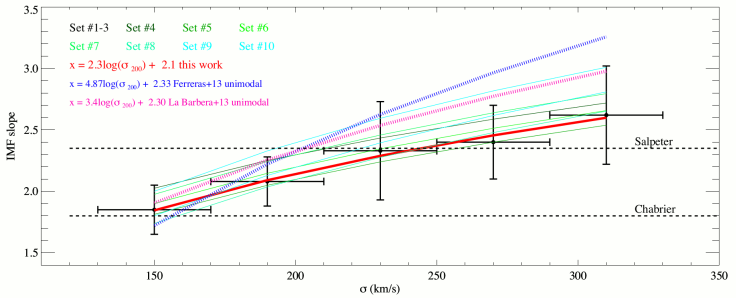
Cappellari et al. 2012



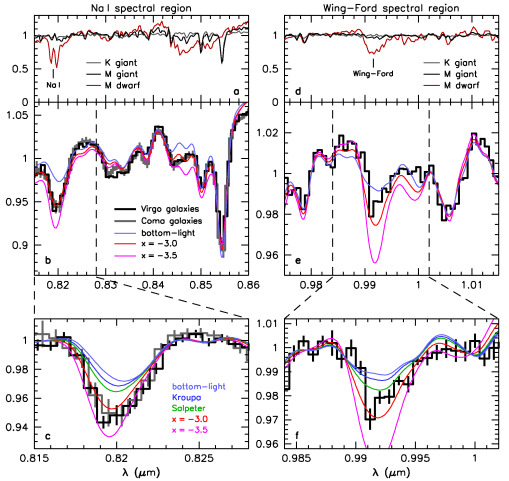
La Barbera et al. 2013



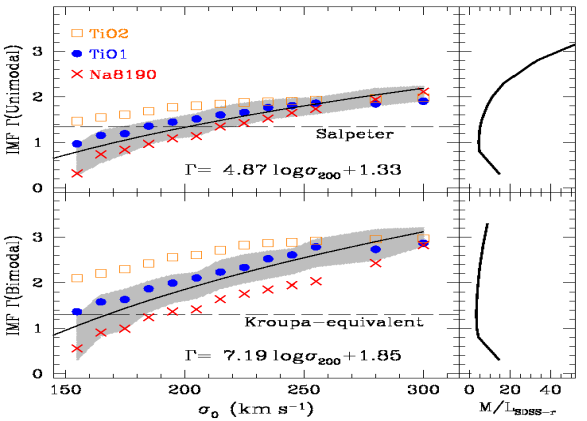
Spiniello et al. 2014



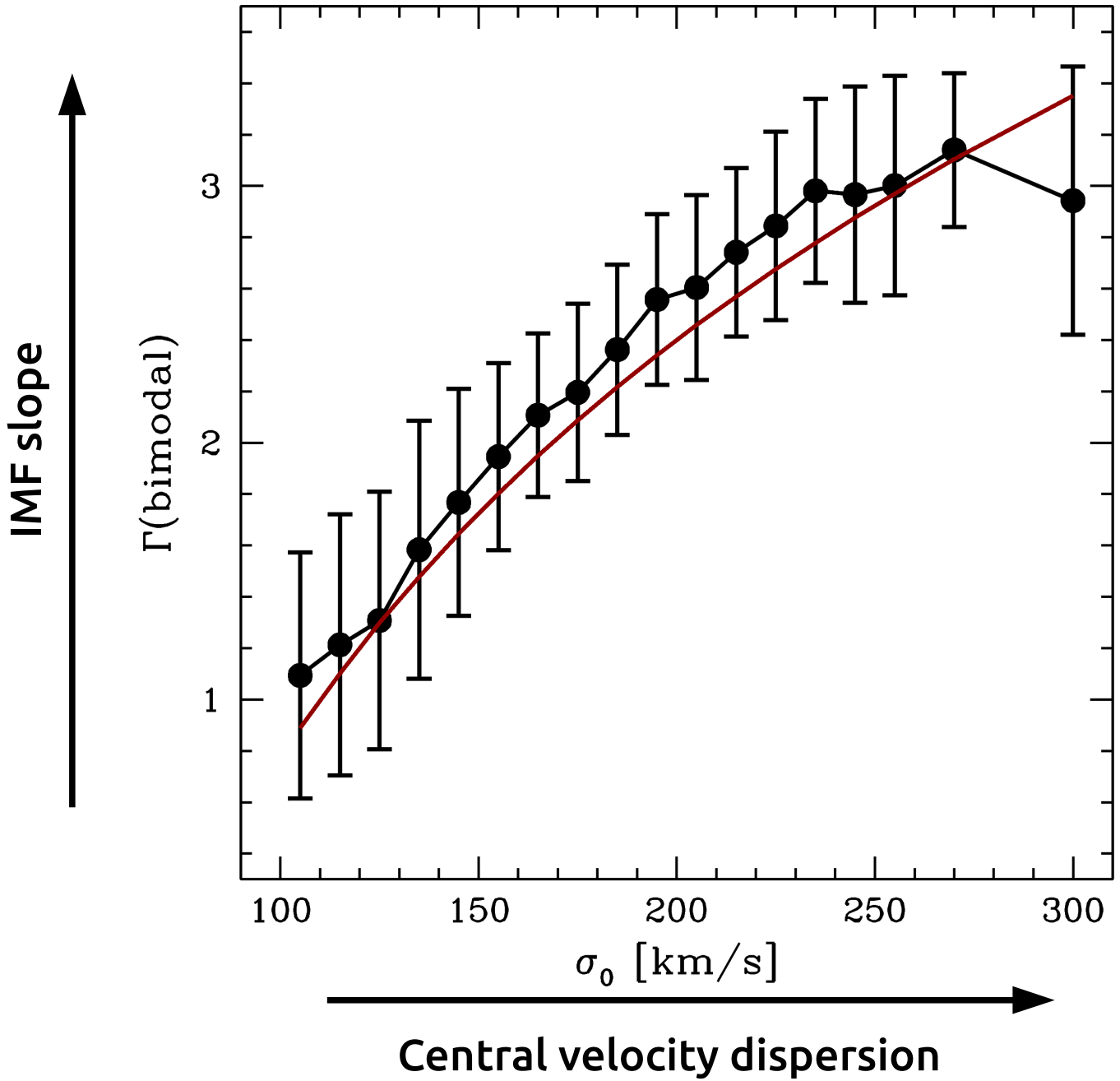
van Dokkum & Conroy 2010



Ferreras et al. 2013

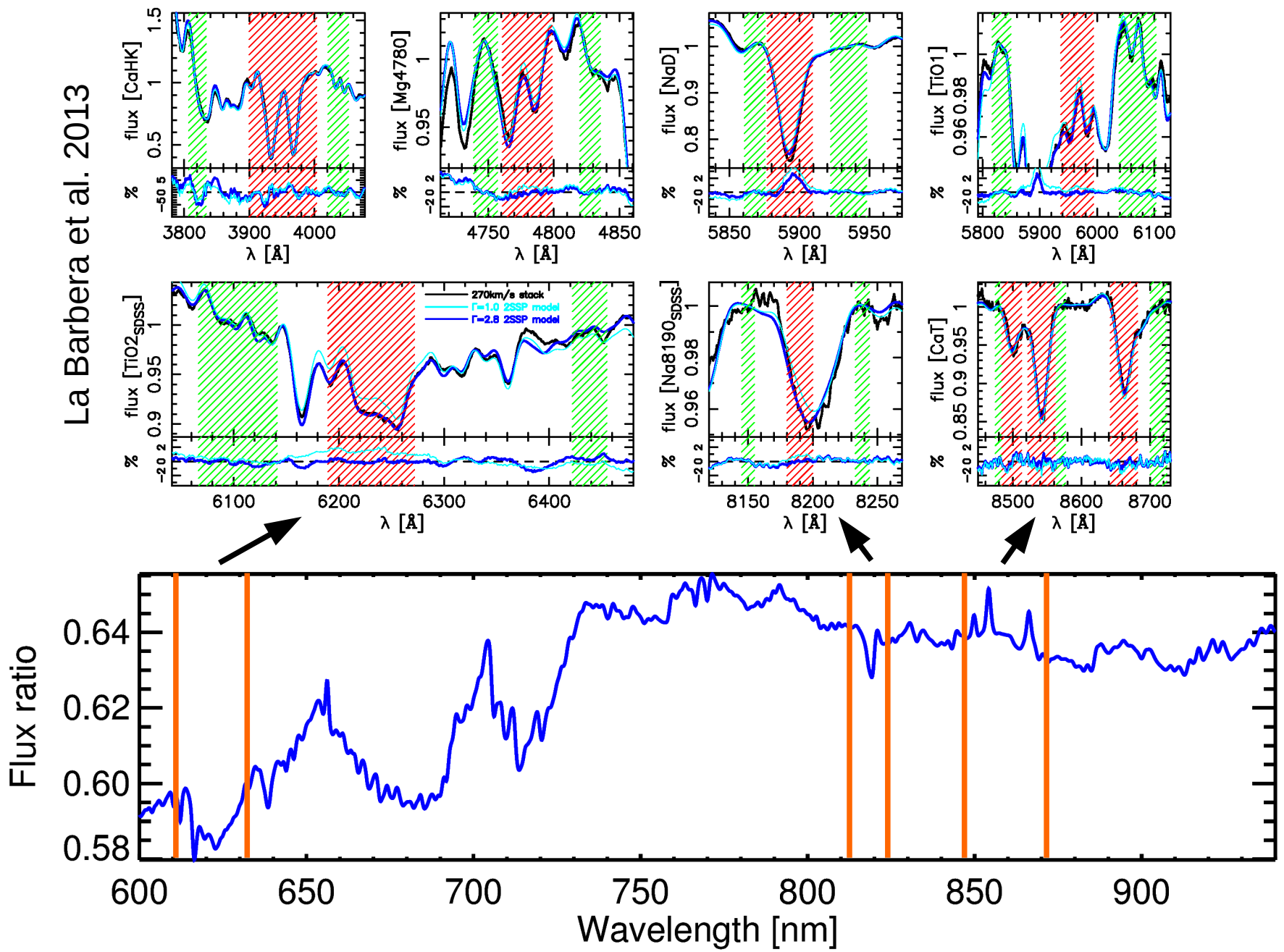


Is the IMF universal?

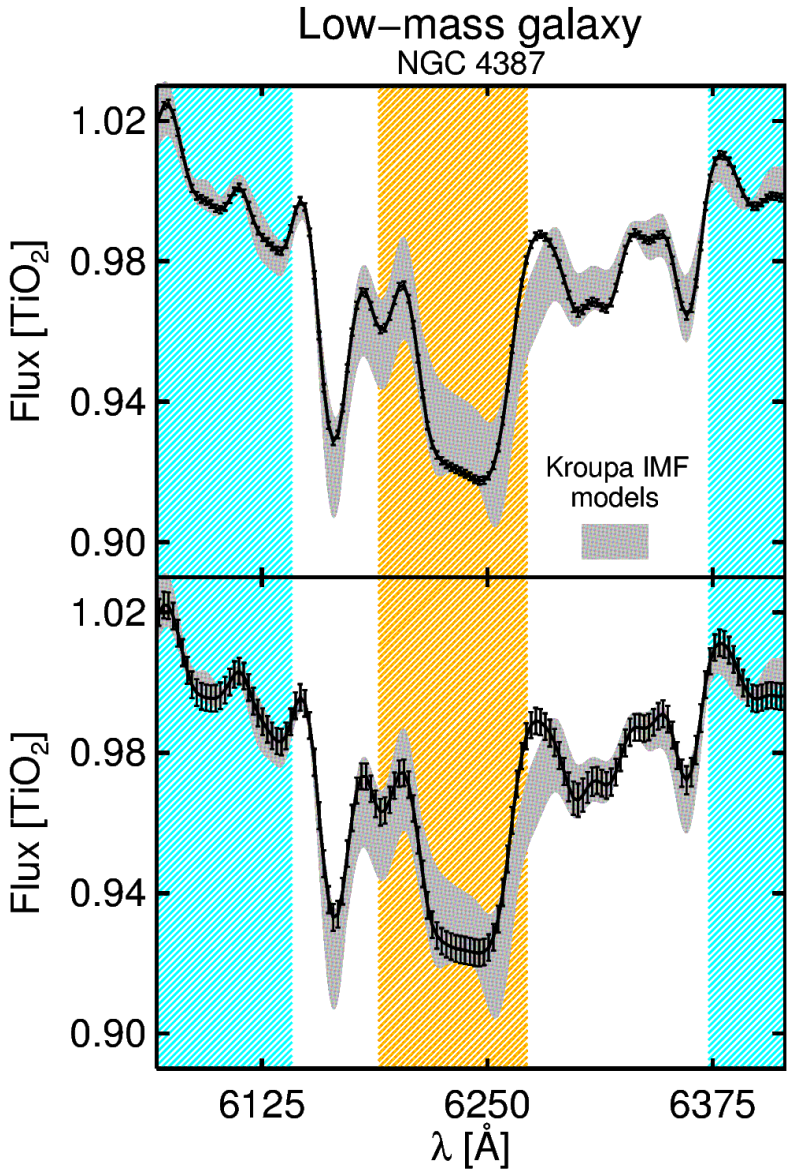



Is the IMF a local or a global property?
What drives the IMF variations?

Inferring the IMF

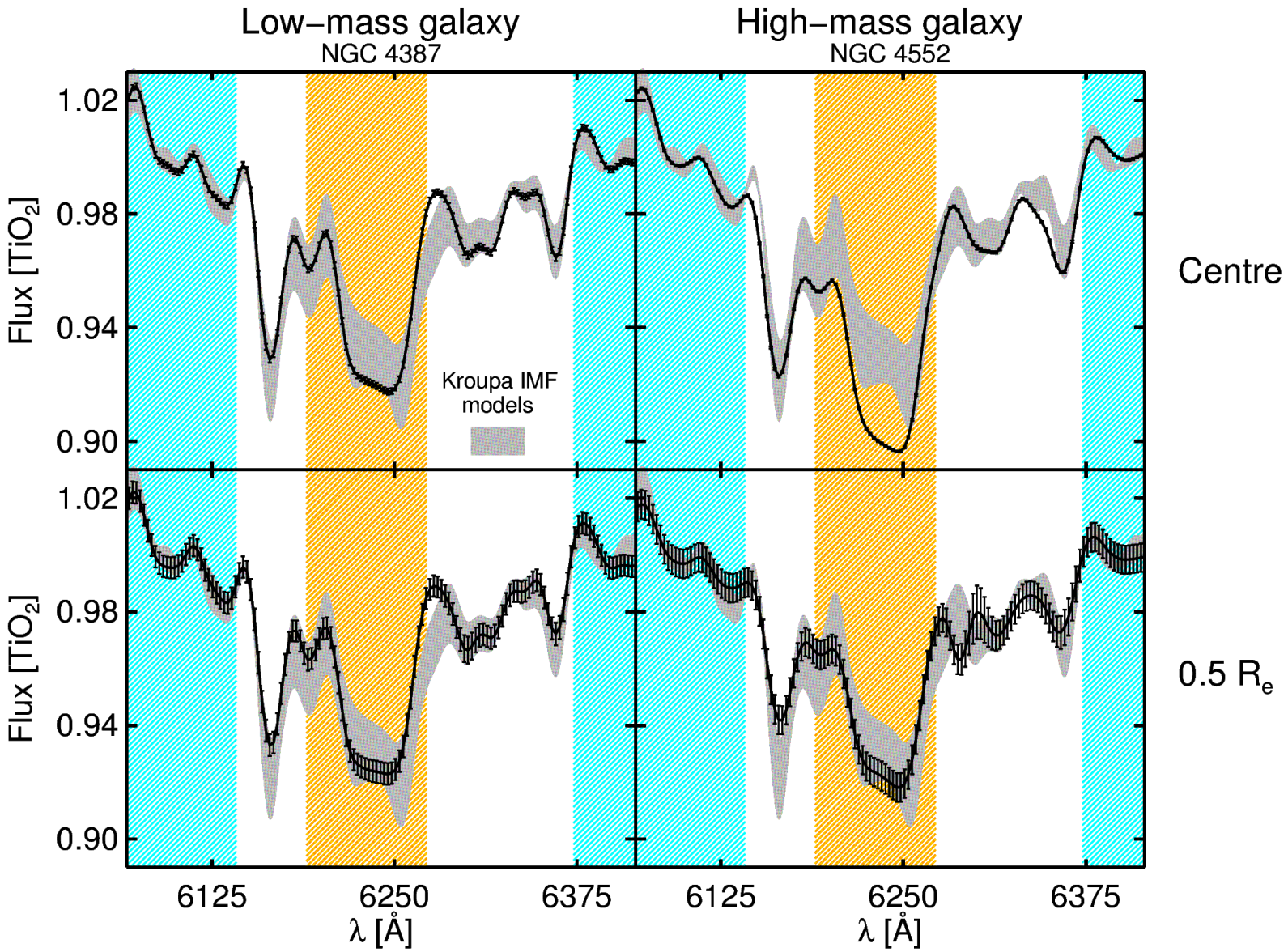


IMF gradients



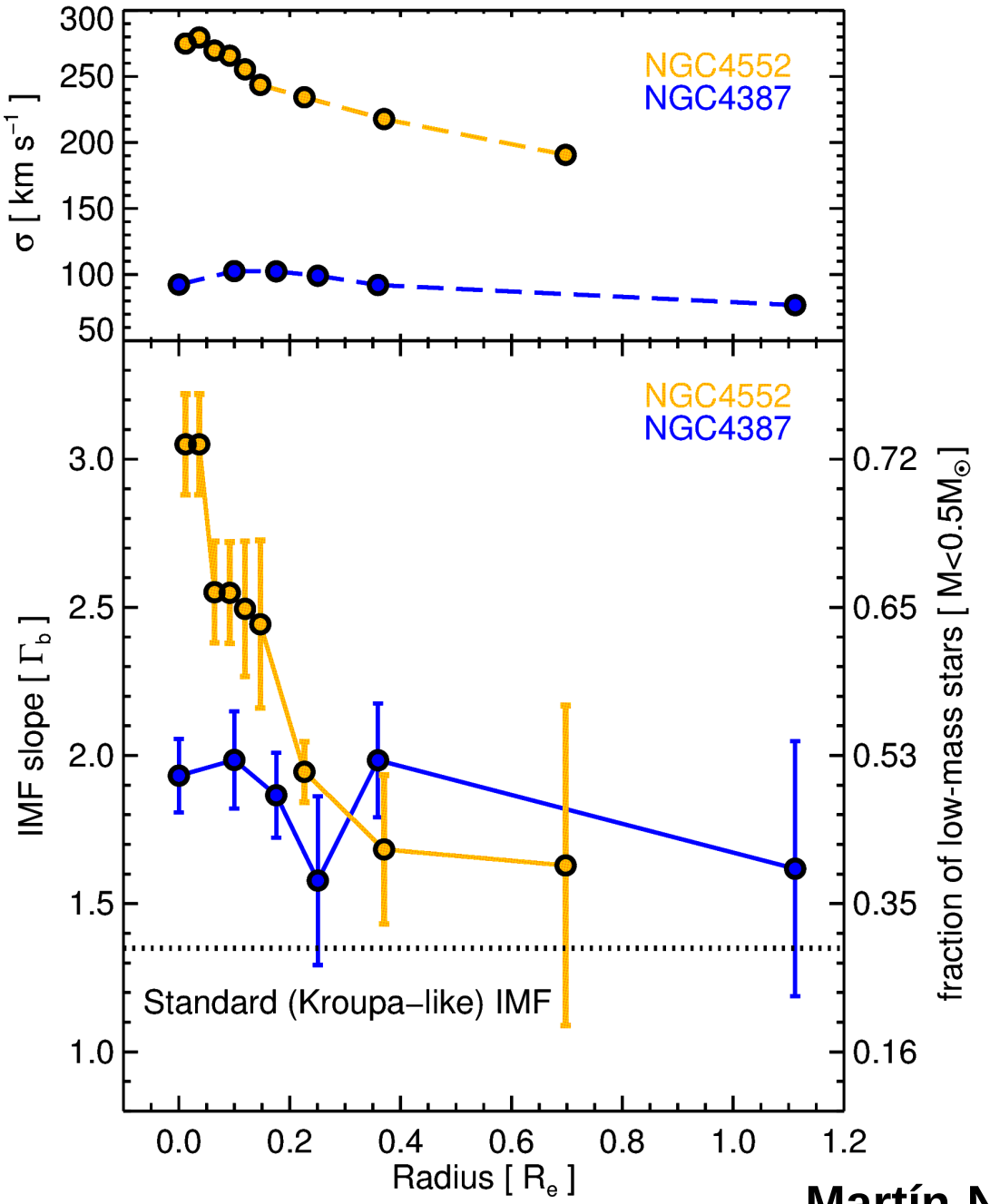
Martín-Navarro et al. 2014*a*

IMF gradients



Martín-Navarro et al. 2014*a*

IMF gradients



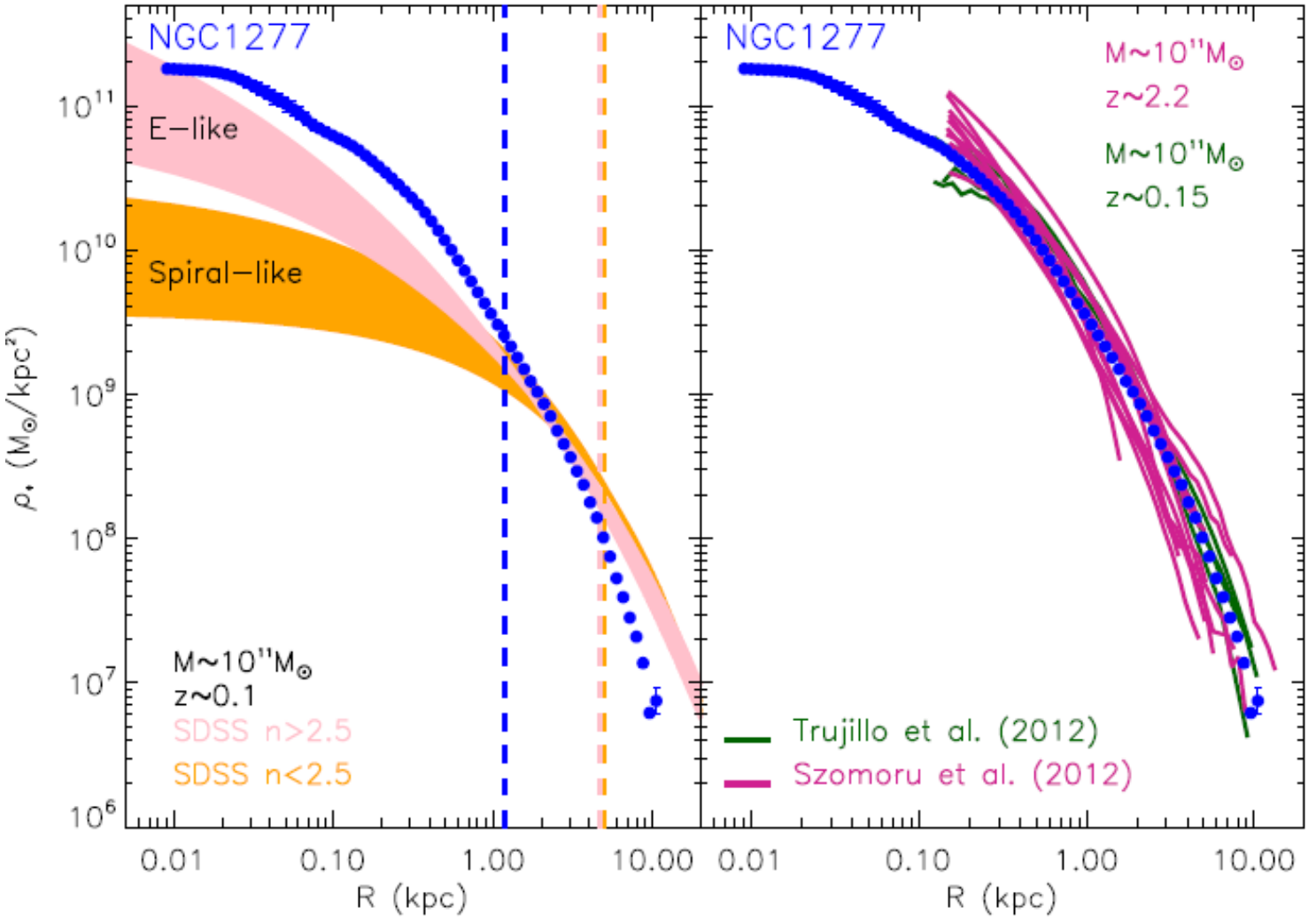
Martín-Navarro et al. 2014*a*

NGC1277: the pristine IMF

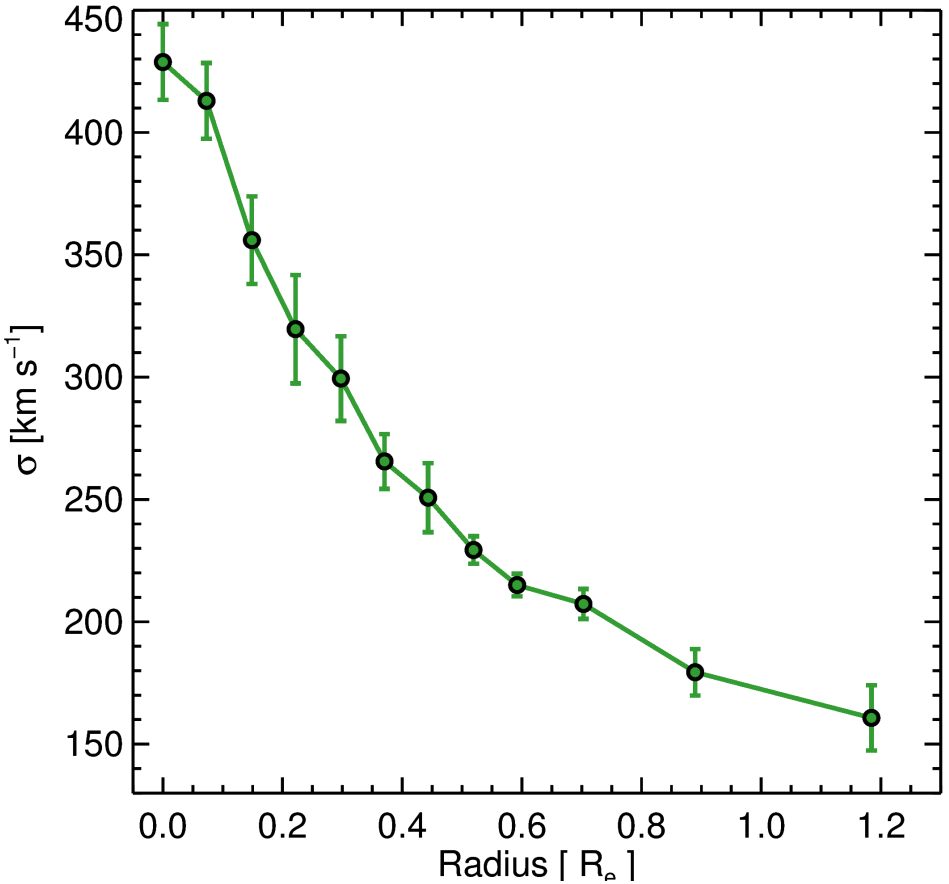
- Extremely massive **black hole** (van den Bosh et al. 2012)
- Potential **relic galaxy** (Trujillo et al. 2014)
- Very peculiar combination of **morphology** + **kinematics** + **stellar populations**

NGC1277: the pristine IMF

Trujillo et al. 2014

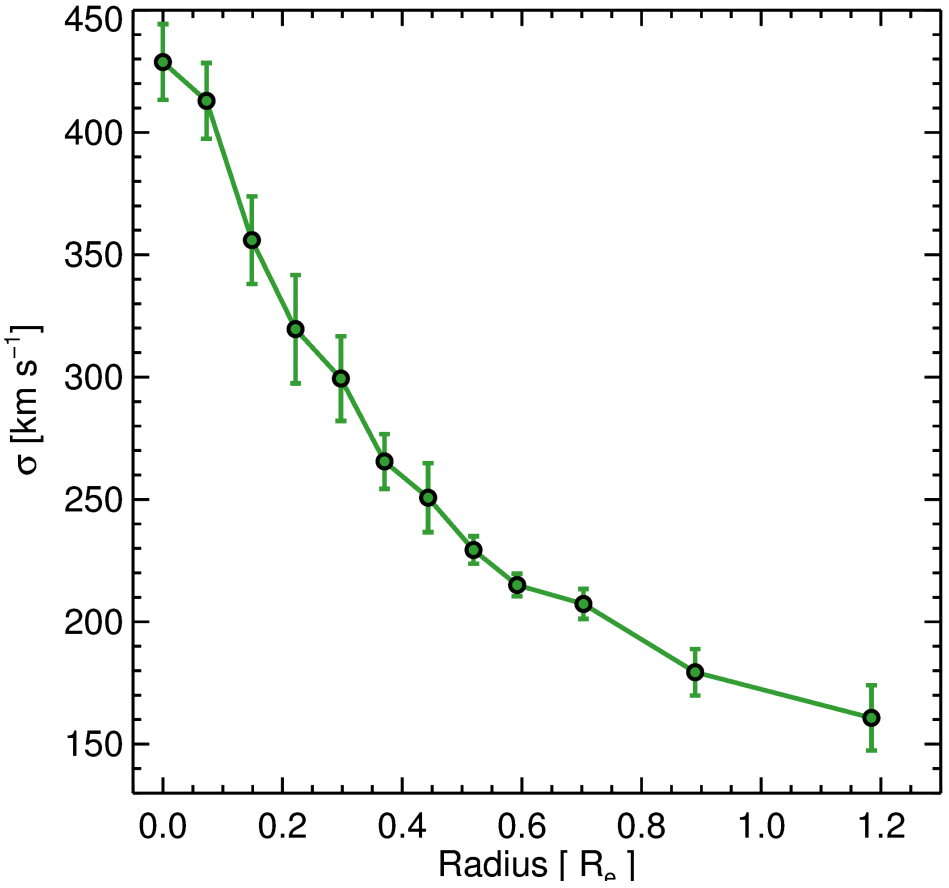


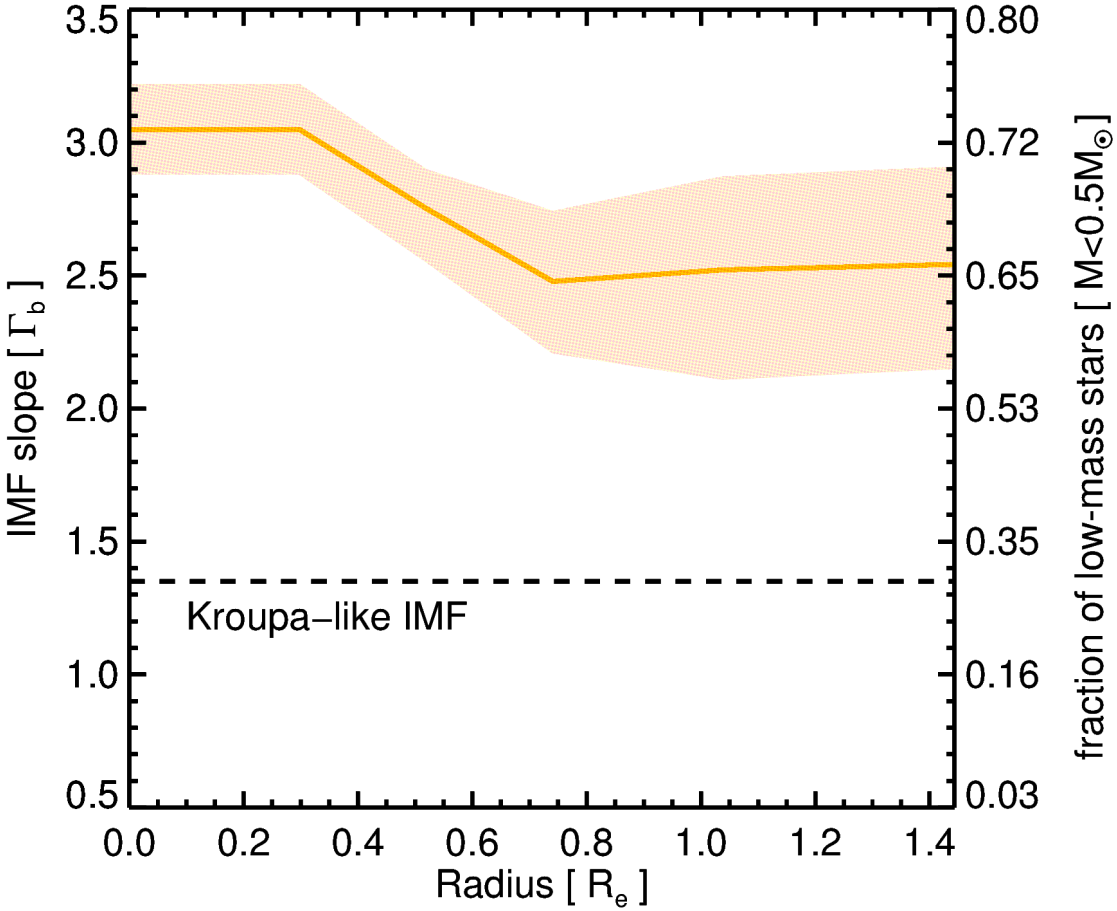
NGC1277: the pristine IMF



Martín-Navarro et al. 2014*b*

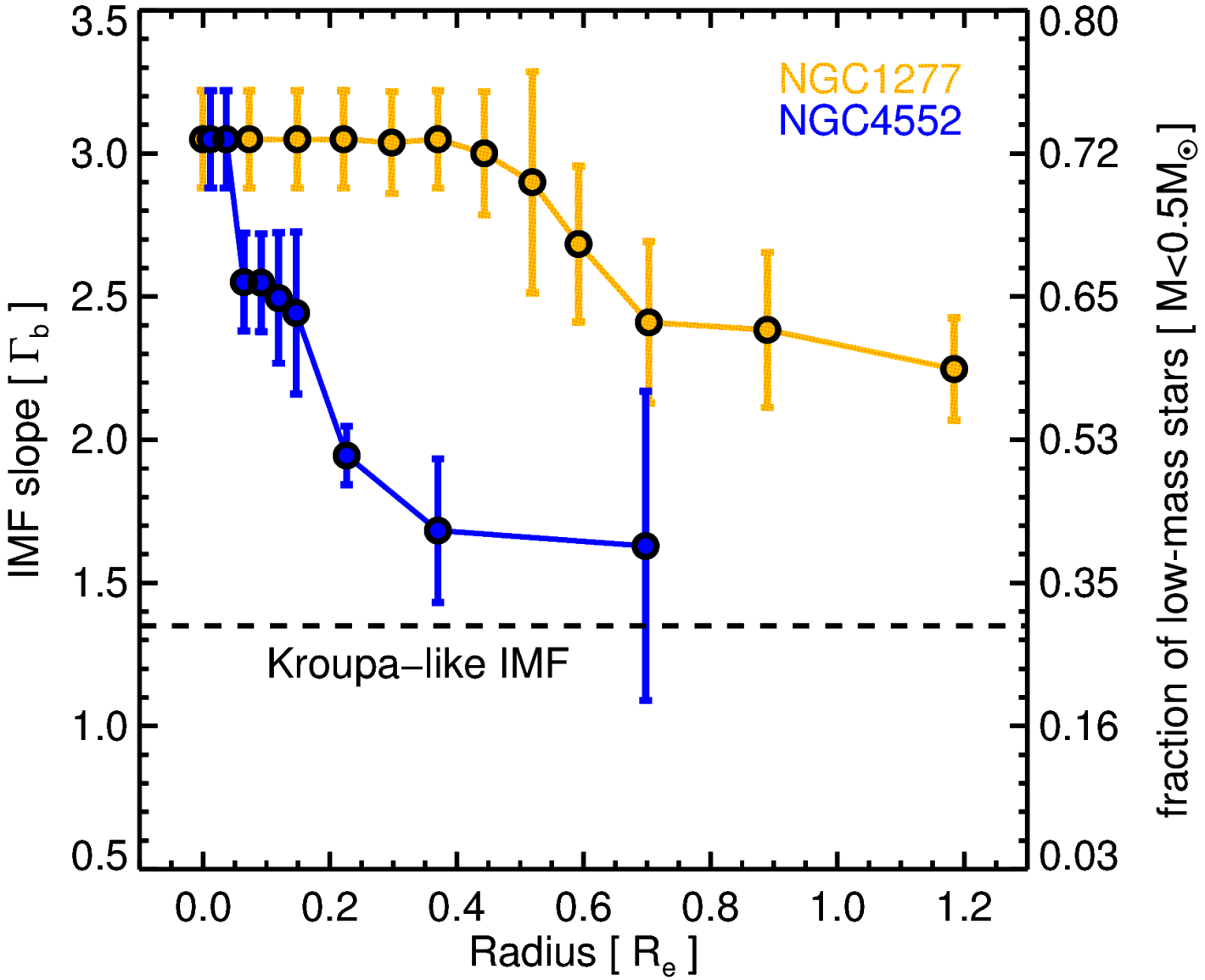
NGC1277: the pristine IMF





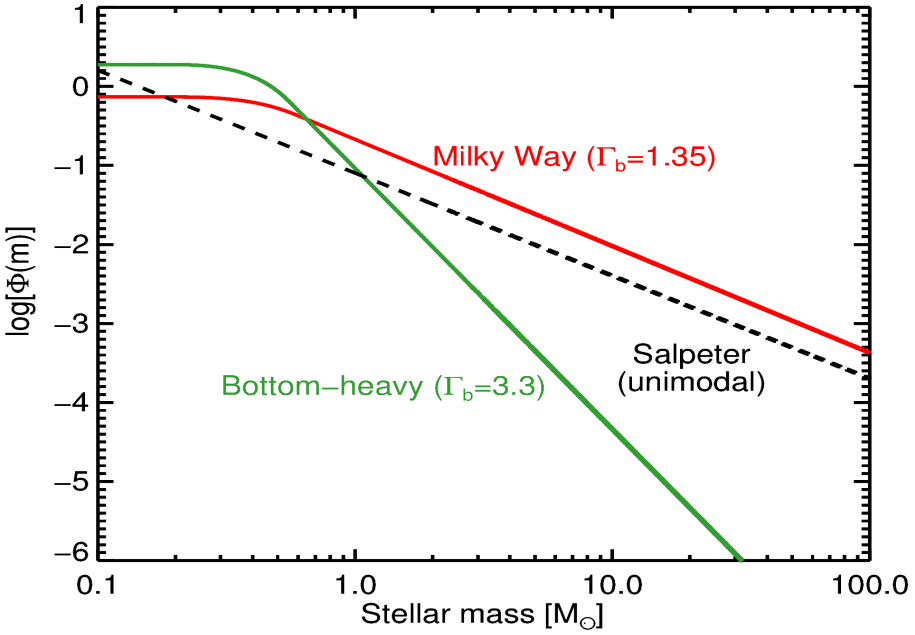
Martín-Navarro et al. 2014*b*

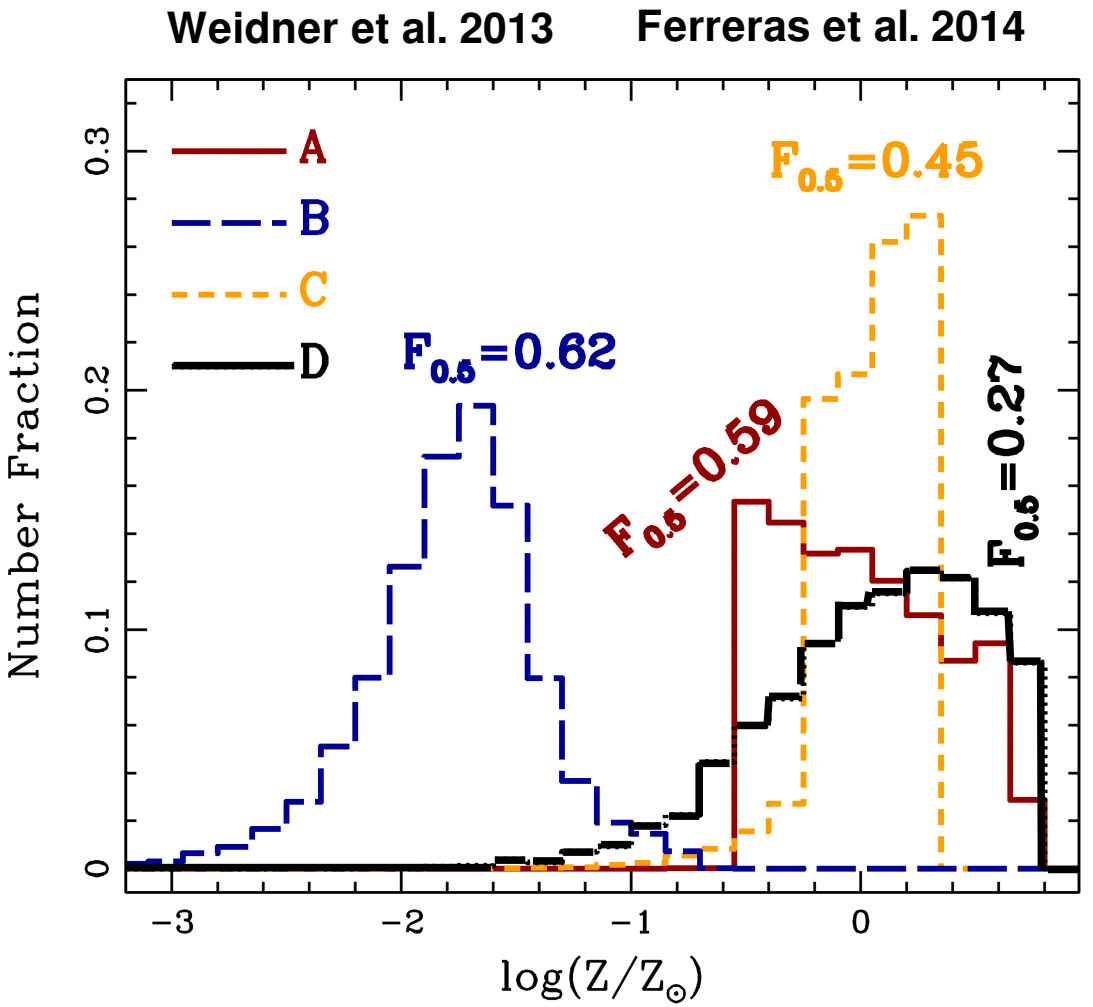
NGC1277: the pristine IMF



Martín-Navarro et al. 2014*b*

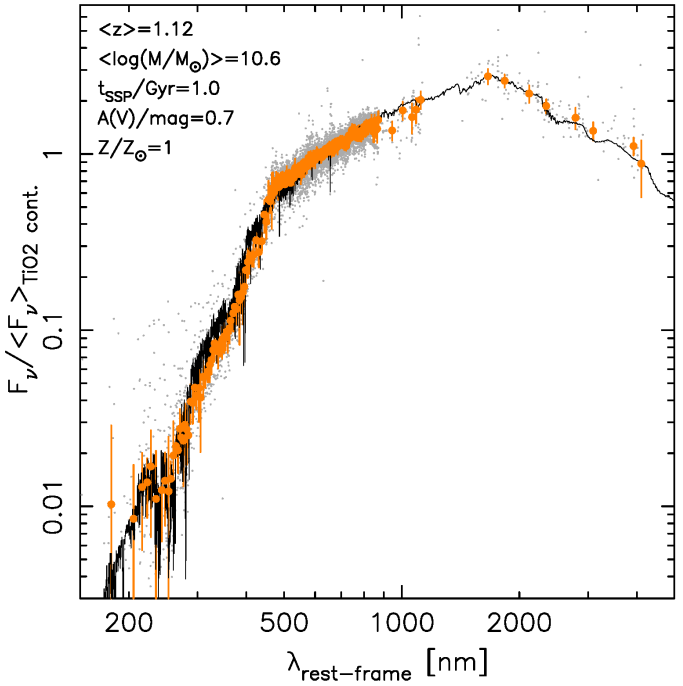
Time-dependent IMF



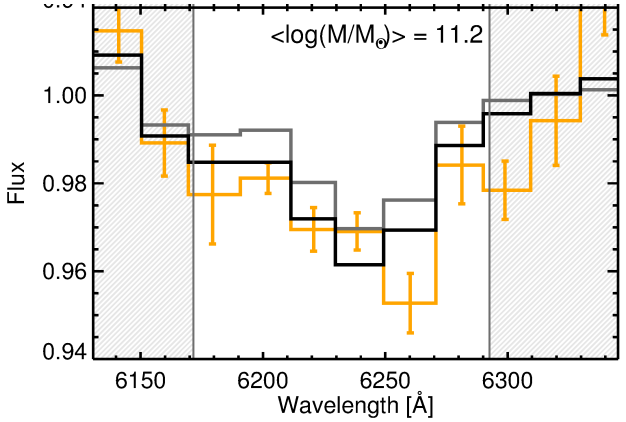


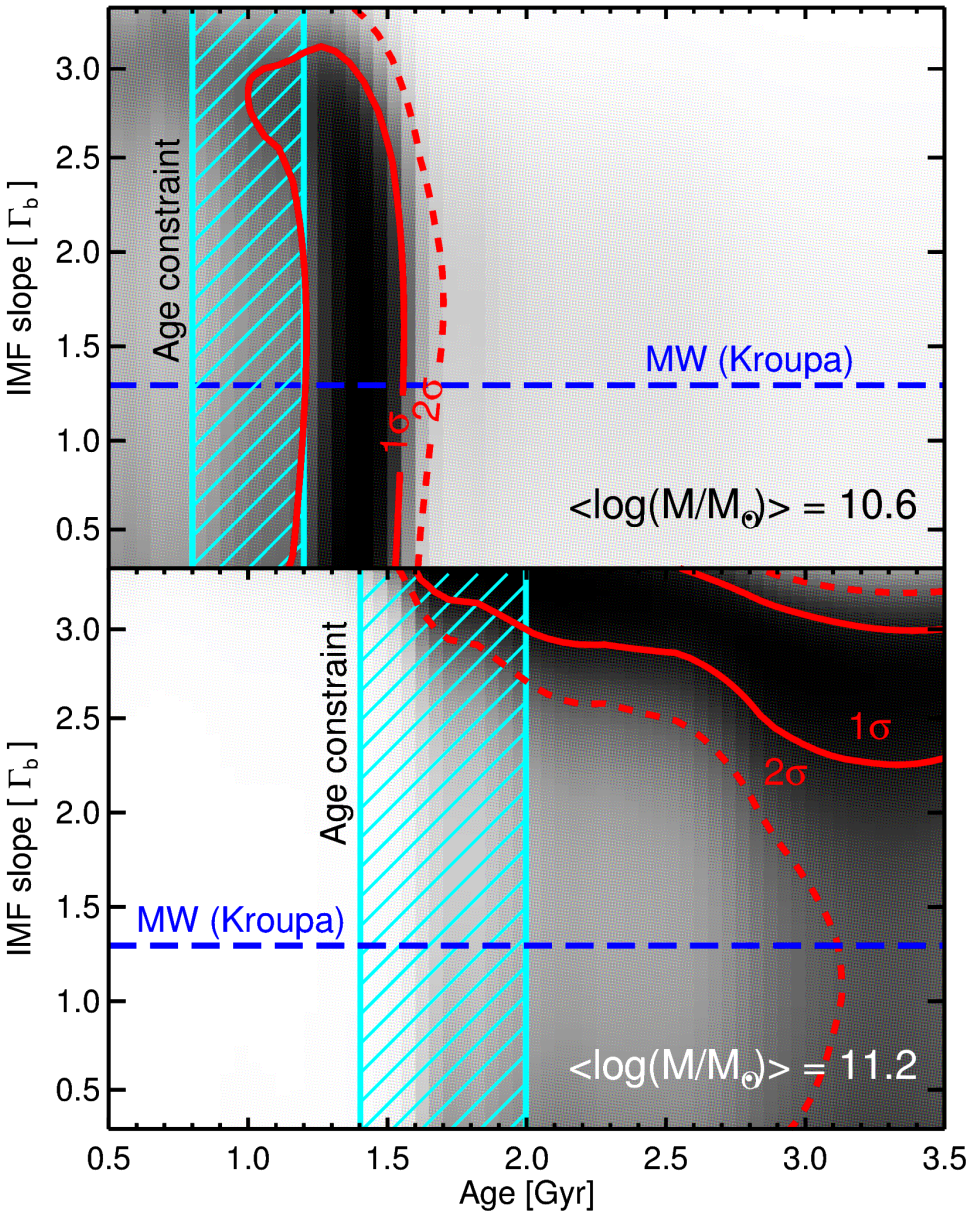
Time-dependent IMF

SED fitting



TiO2





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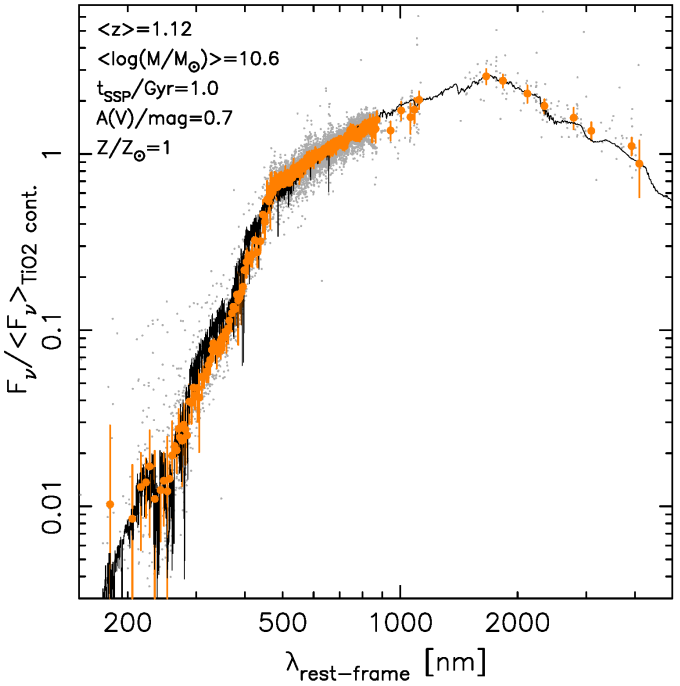
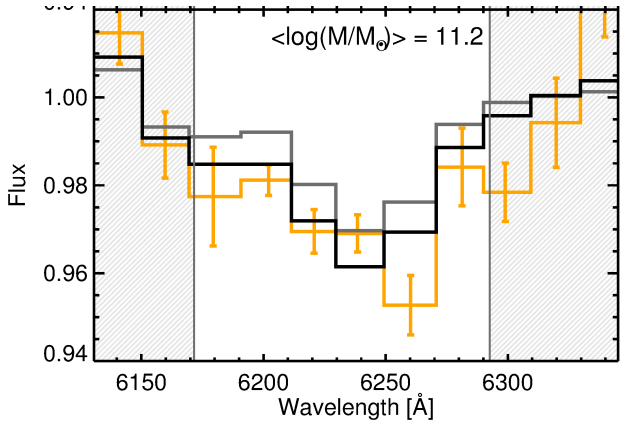
Time-dependent IMF

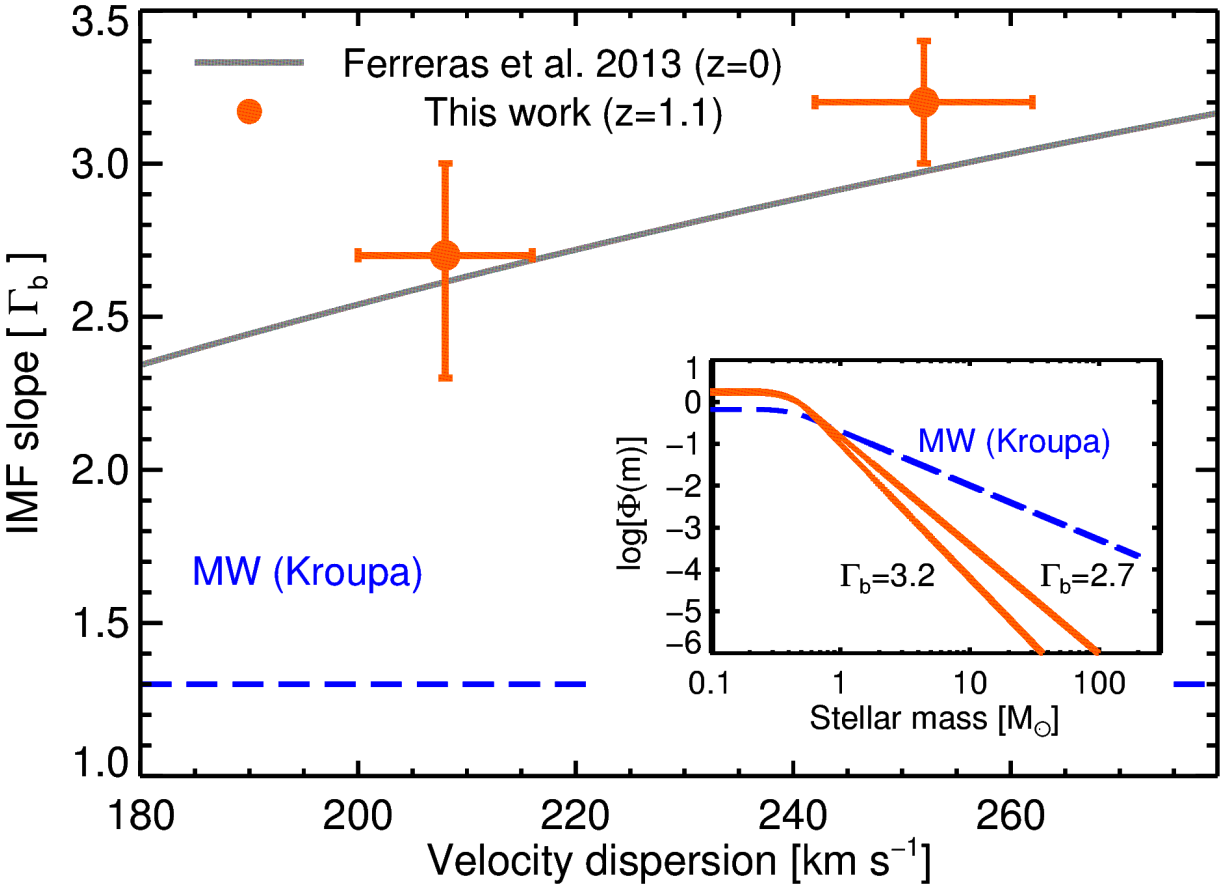
SED fitting



TiO2



IMF at z~1



Martín-Navarro et al. 2014*c*

Take-away message

The IMF is a local property in ETGs.

The pristine IMF gradient of NGC1277 does not follow the velocity dispersion profile.

The IMF of massive galaxies *is* already bottom-heavy at z ~ 1

Stay tuned!

Radial variations in the stellar Initial Mass Function

(*arXiv:1404.6533*)

The IMF at 0.9 < z < 1.5

(*arXiv:1407.4455*)

The pristine IMF of massive ETGs

(submitted)

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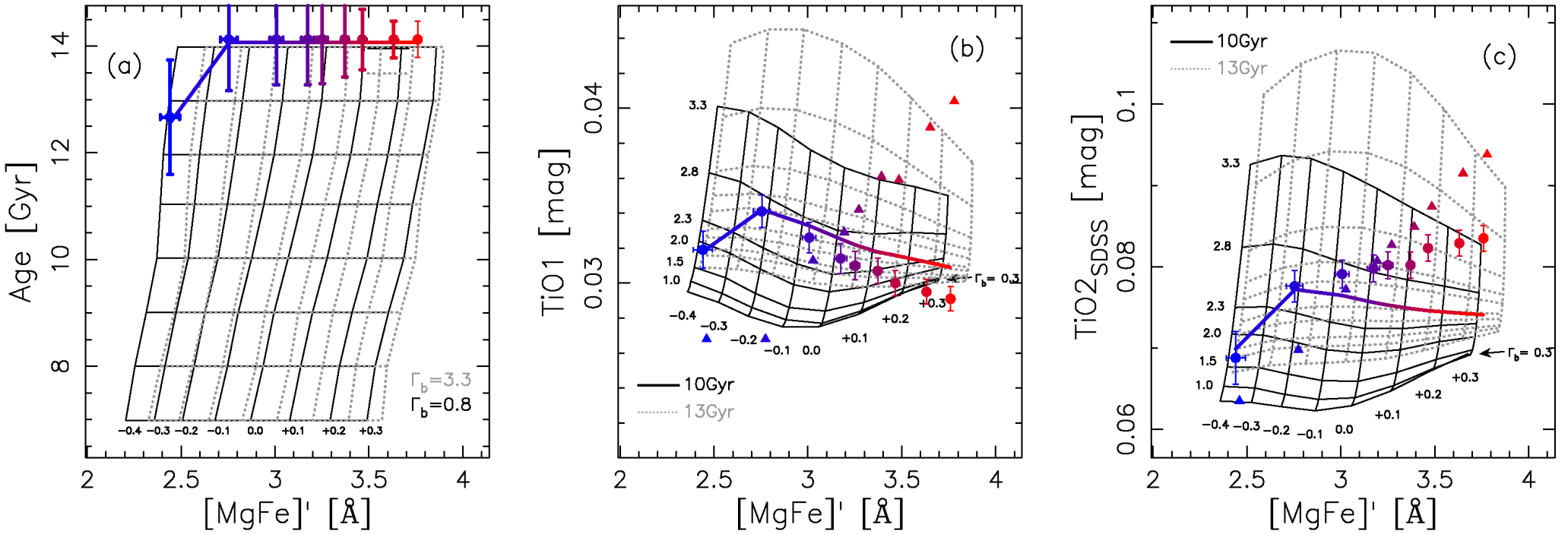
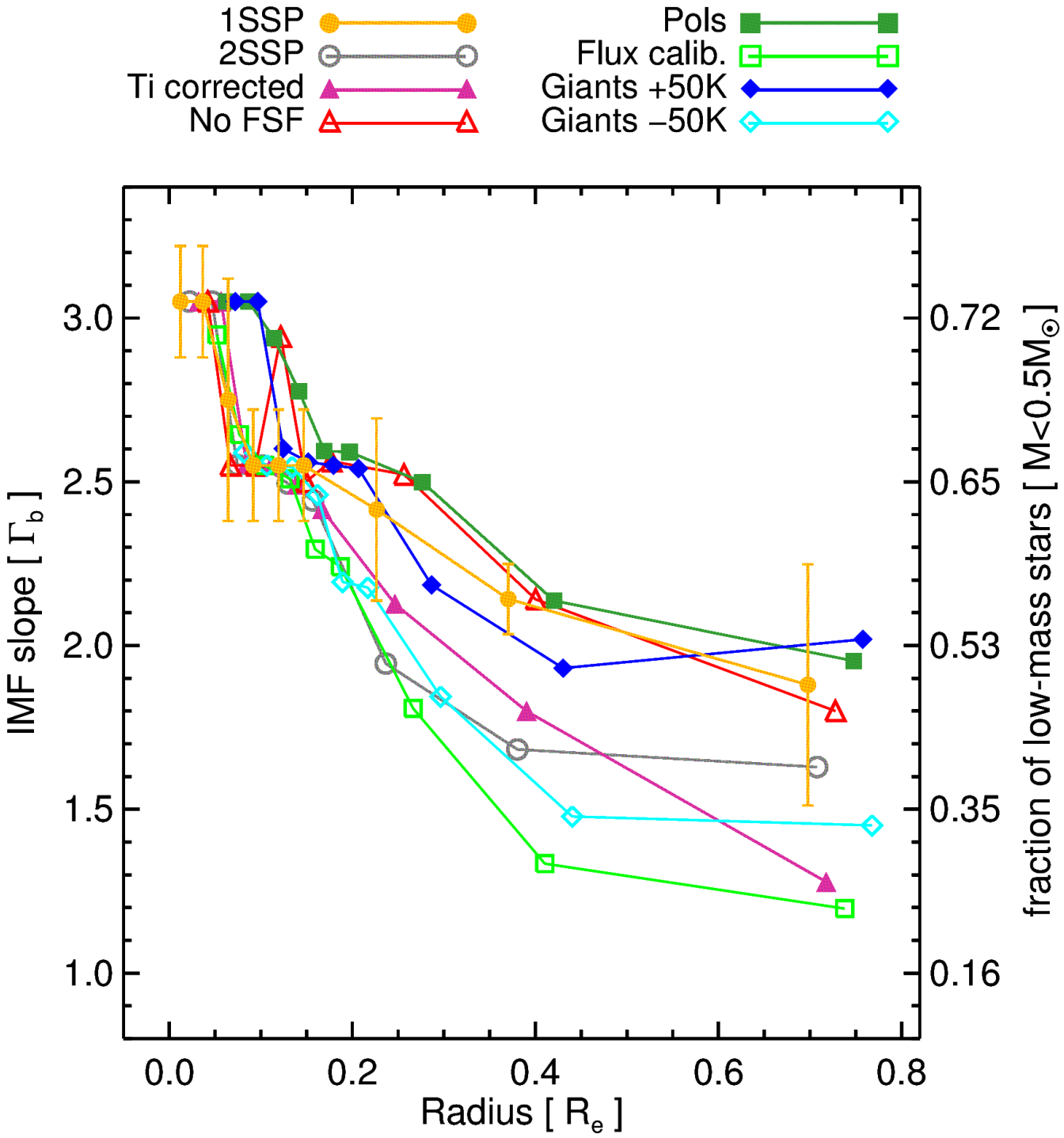
Traces of galaxy formation
www.iac.es/project/traces


(a)
Age [Gyr]
[MgFe]' [Å]
Γb=3.3
Γb=0.8
−0.4 −0.3 −0.2 −0.1 0.0 +0.1 +0.2 +0.3
(b)
TiO1 [mag]
[MgFe]' [Å]
10Gyr
13Gyr
Γb= 0.3
(c)
TiO2SDSS [mag]
[MgFe]' [Å]
10Gyr
13Gyr
Γb= 0.3


1SSP
2SSP
Ti corrected
No FSF
Pols
Flux calib.
Giants +50K
Giants –50K
IMF slope [Γ_b]
fraction of low-mass stars [M<0.5$M_\odot$]
Radius [R_e]
3.0
2.5
2.0
1.5
1.0
0.72
0.65
0.53
0.35
0.16
0.0
0.2
0.4
0.6
0.8