Constructing an attenuation proxy based on state-of-the-art cosmological simulation SIMBA

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SIMBA

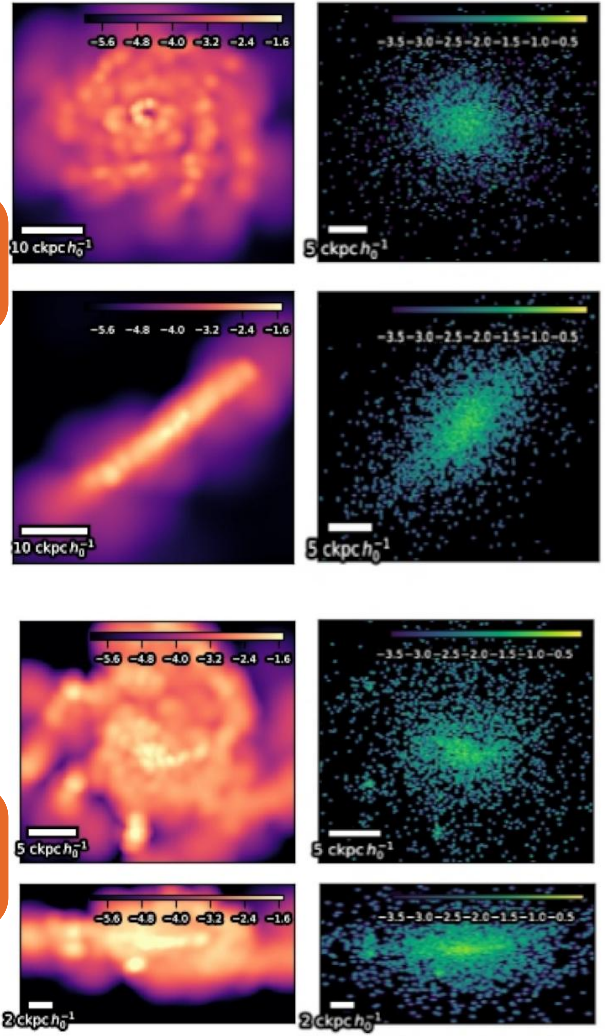
Main advantage of SIMBA:

1) chemical evolution up to 11-element chemistry,
2) black hole feedback,
3) AGN jets, radiative winds and X-ray feedback,
4) Dust production and destruction,

SIMBA not only match galaxy stellar mass function evolution but also galaxy: color, dust-to-gas ratio, atomic and molecular content and more.

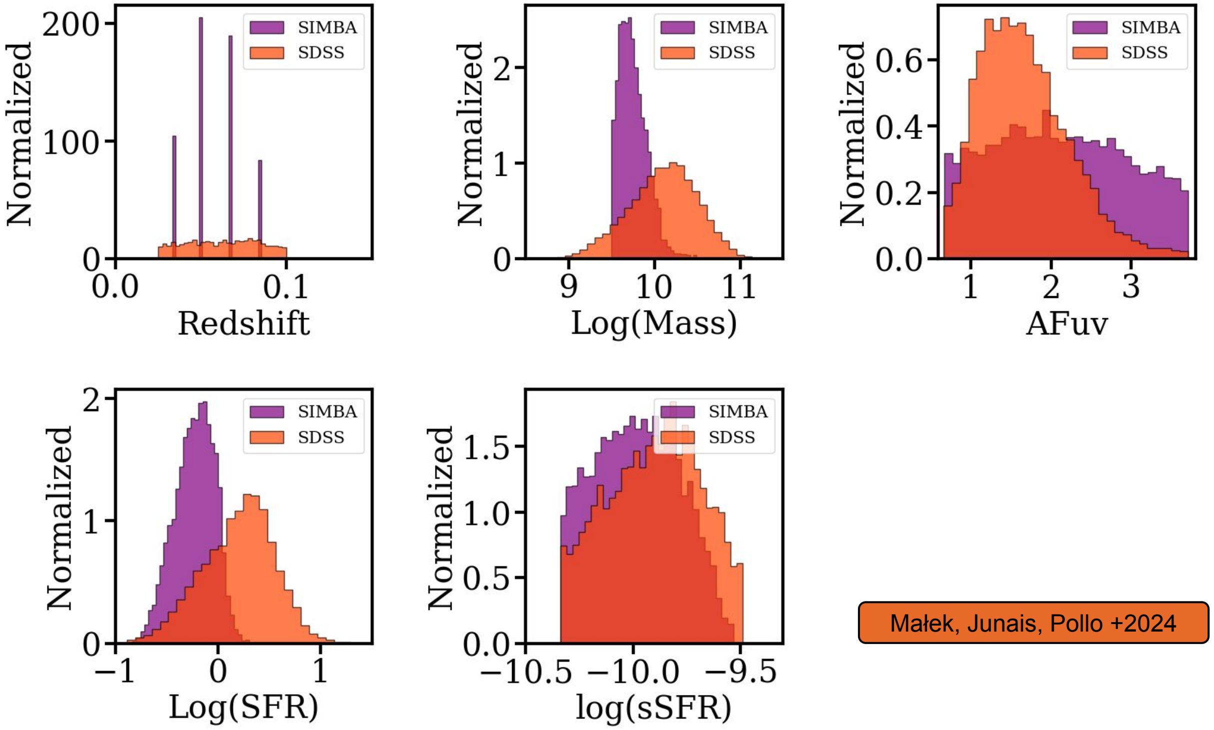
Z = 0

Z = 2



Simba: Evolution of dust at z = 0 (4 top images) and z = 2 (4 bottom images).
Romeel Dave et al. 2019

SIMBA and SDSS data comparison



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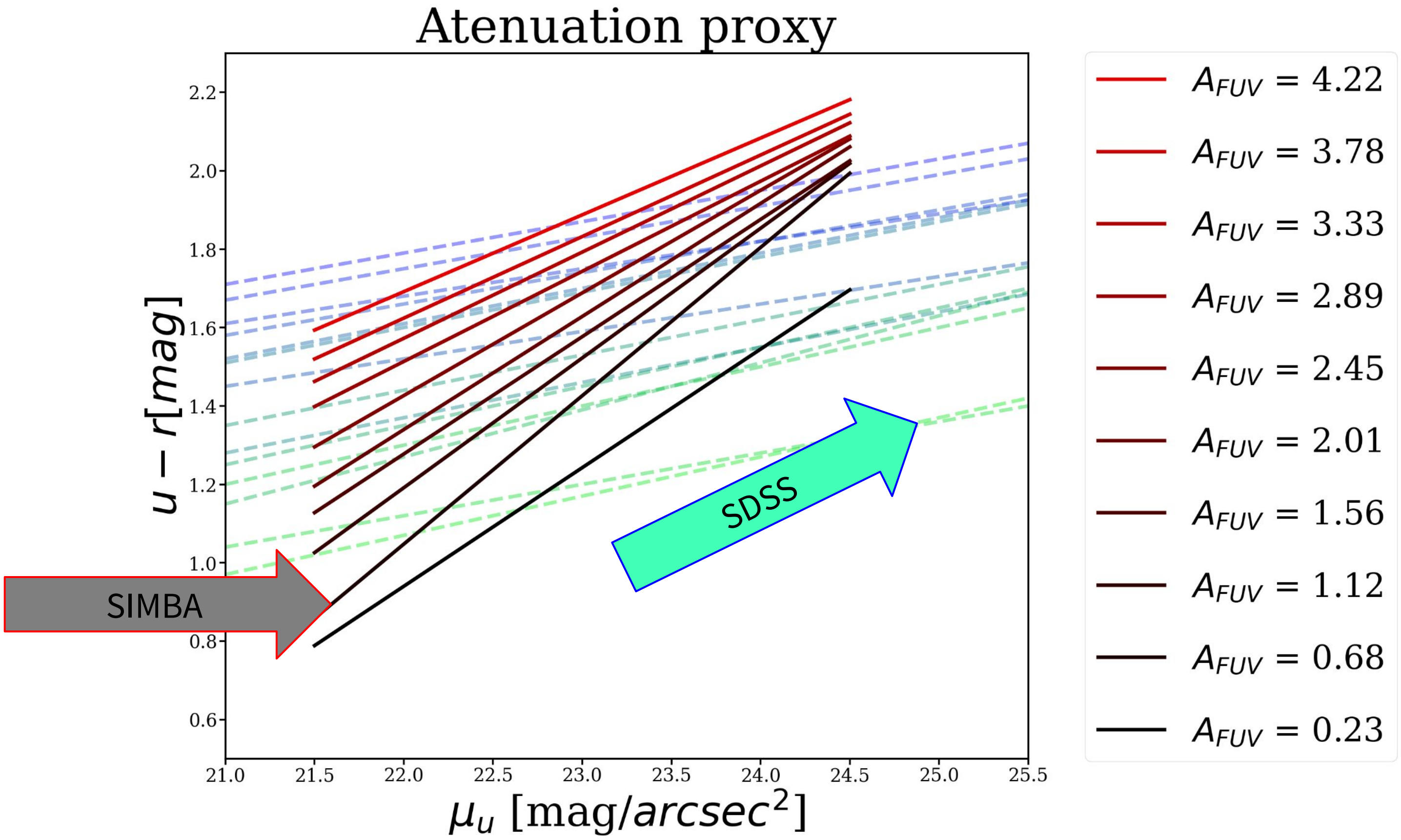
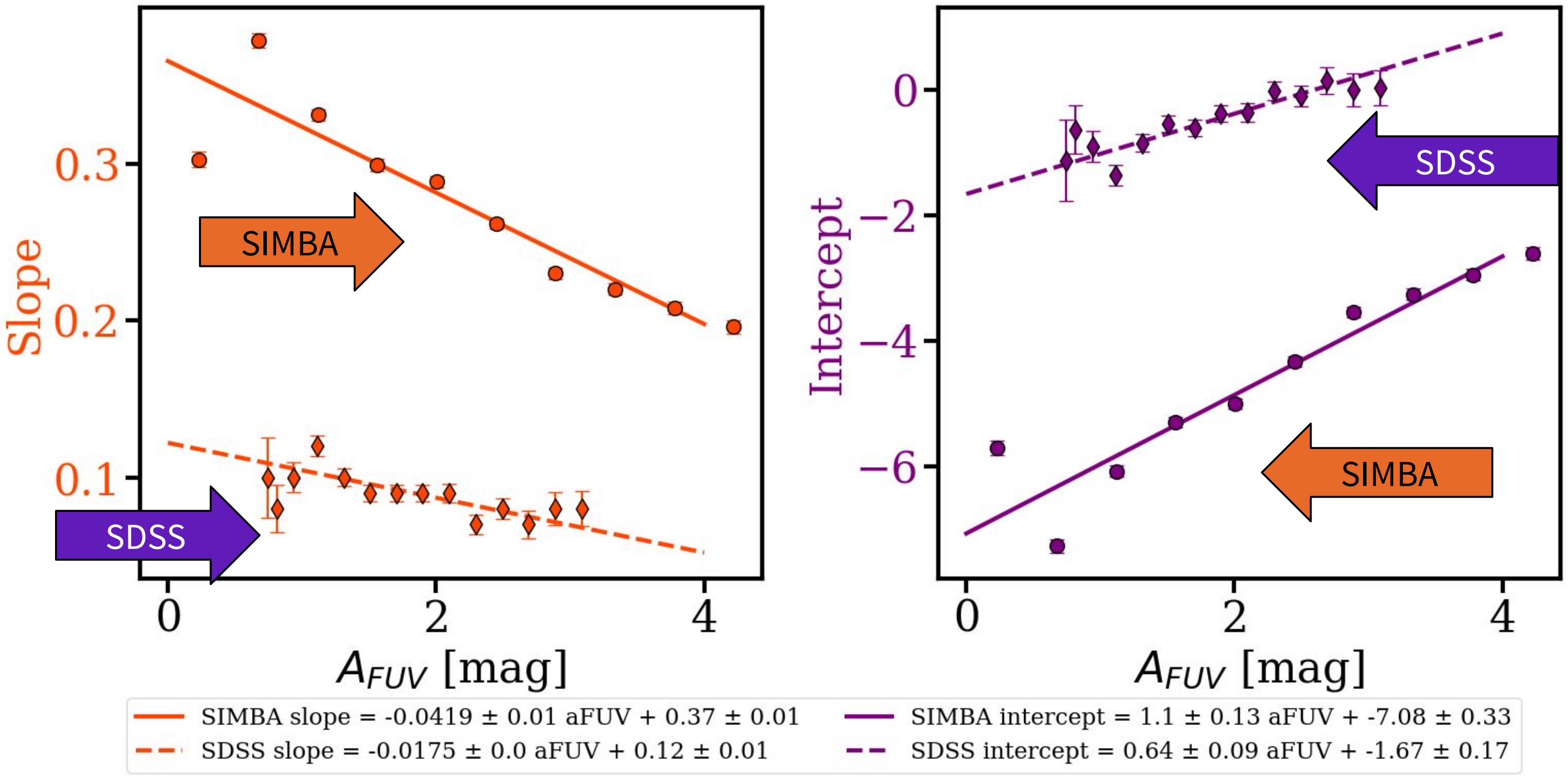
Our results



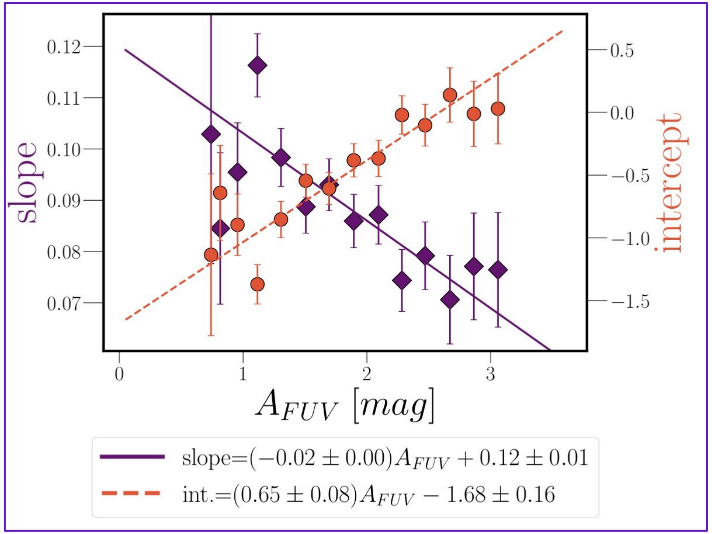
Atenuation proxy
$u - r[mag]$
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
21.0
21.5
22.0
22.5
23.0
23.5
24.0
24.5
25.0
25.5
μ_u [mag/$arcsec^2$]
SIMBA
SDSS
A_{FUV} = 4.22
A_{FUV} = 3.78
A_{FUV} = 3.33
A_{FUV} = 2.89
A_{FUV} = 2.45
A_{FUV} = 2.01
A_{FUV} = 1.56
A_{FUV} = 1.12
A_{FUV} = 0.68
A_{FUV} = 0.23

Our results

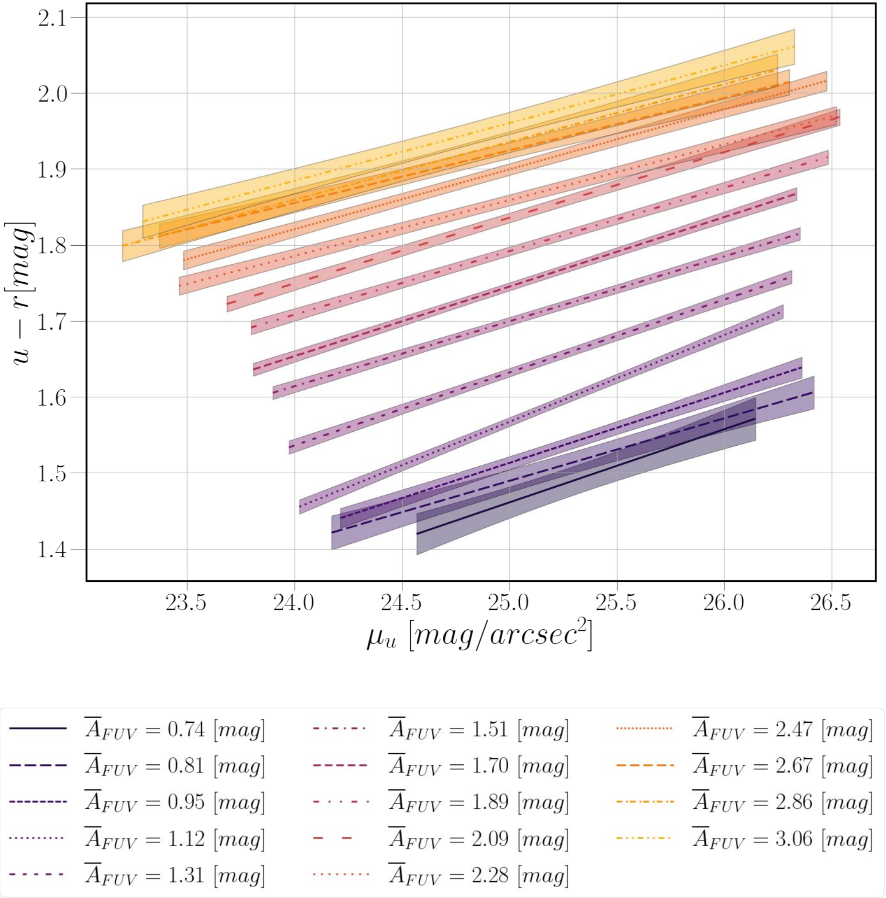

SIMBA
SDSS
Slope
0.3
0.2
0.1
0
2
4
A_{FUV} [mag]
SDSS
SIMBA
Intercept
0
−2
−4
−6
0
2
4
A_{FUV} [mag]
SIMBA slope = -0.0419 ± 0.01 aFUV + 0.37 ± 0.01
SDSS slope = -0.0175 ± 0.0 aFUV + 0.12 ± 0.01
SIMBA intercept = 1.1 ± 0.13 aFUV + -7.08 ± 0.33
SDSS intercept = 0.64 ± 0.09 aFUV + -1.67 ± 0.17

Thank you for your atten(ua)tion!

Kasia results



$$A_{FUVp} = \frac{(u - r) - (0.12 \cdot \mu_u) + 1.68}{(-0.02 \cdot \mu_u) + 0.65}$$



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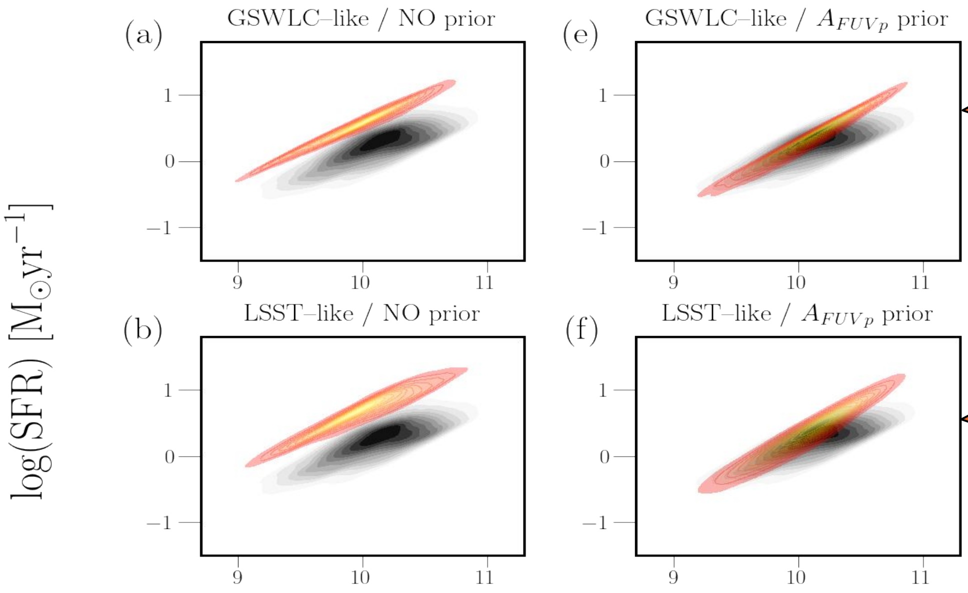
No prior

Purely optical A_{FUV} prior



As Salim et al.,2016,2018
332 640 templates per redshift bin
(203 s.)

Much smaller parameter space 5 540 templates per redshift bin (85 s.)

Computation with CIGALE SED fitting tool, Intel Core i9, 62,7 GB, 16 cores

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