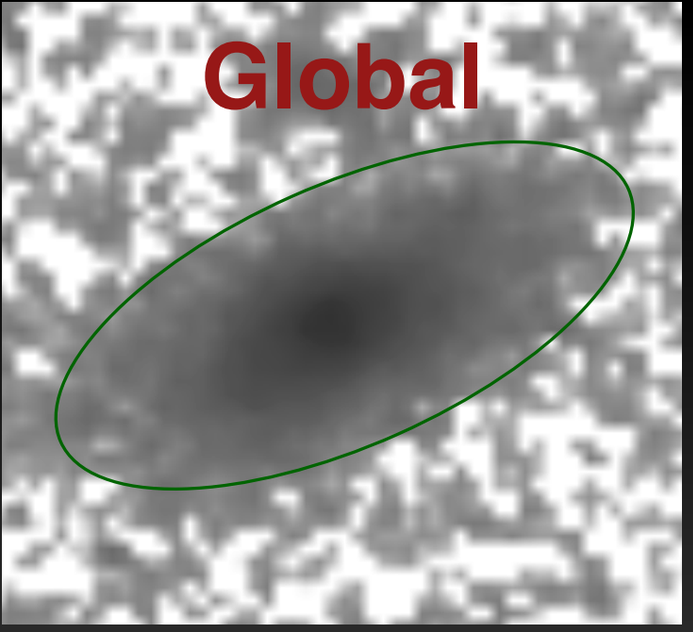
CANDELS-VAPC:
HST Multi-band Multi-Aperture Photometry Catalogs in the Five CANDELS Fields

Fengshan Liu, Dongfei Jiang ,
(*Shenyang Normal University*)
David Koo, Sandy Faber ,Yicheng Guo
(*University of Californian, Santa Cruz*)
and CANDELS Team

2017 CANDELS Meeting
5 August, 2017 @ Santa Cruz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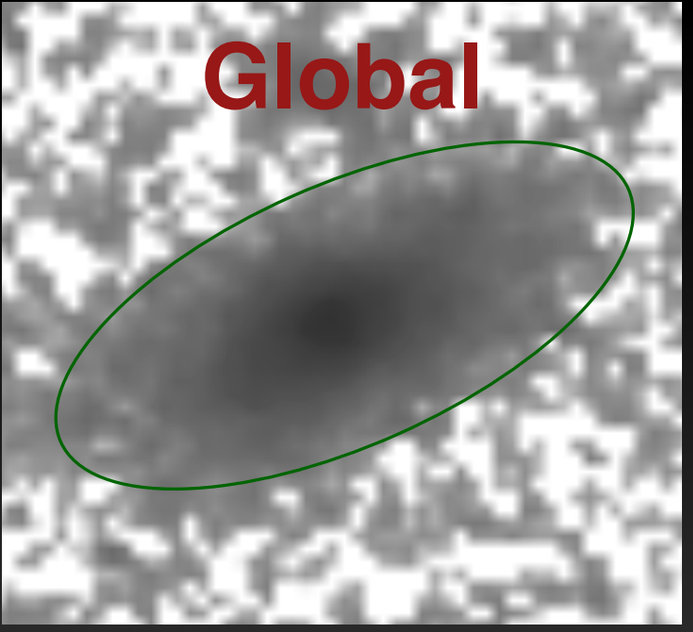
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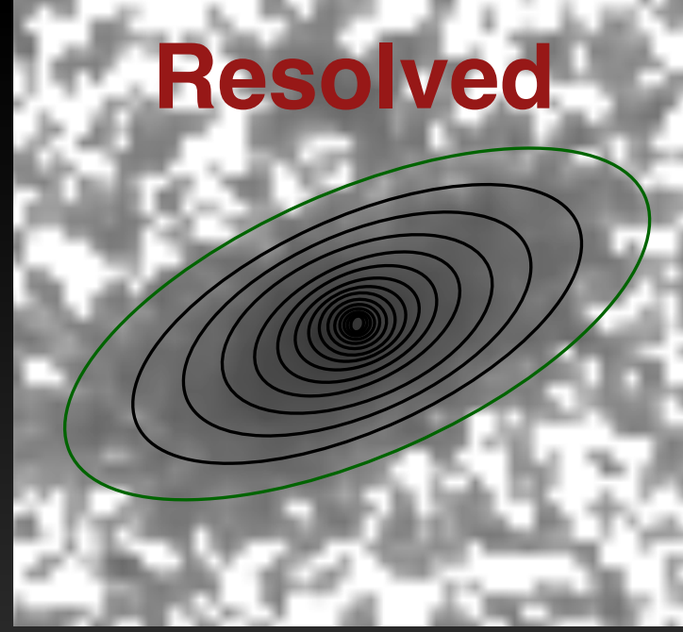
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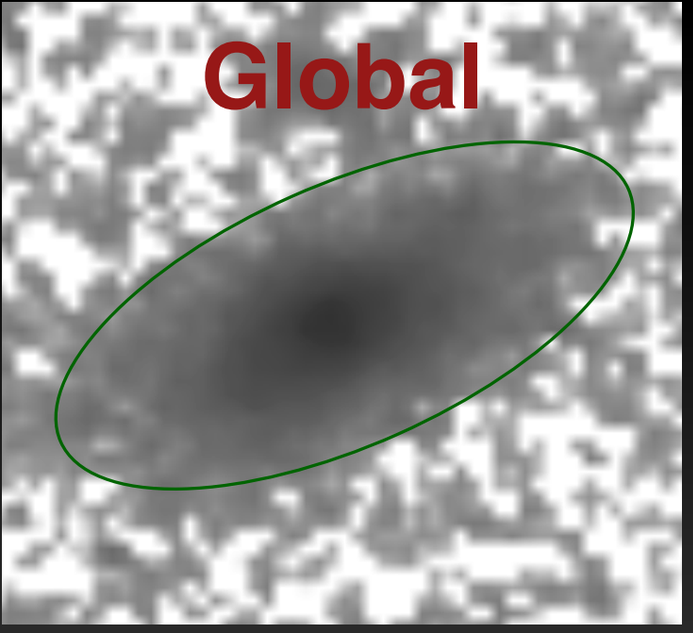

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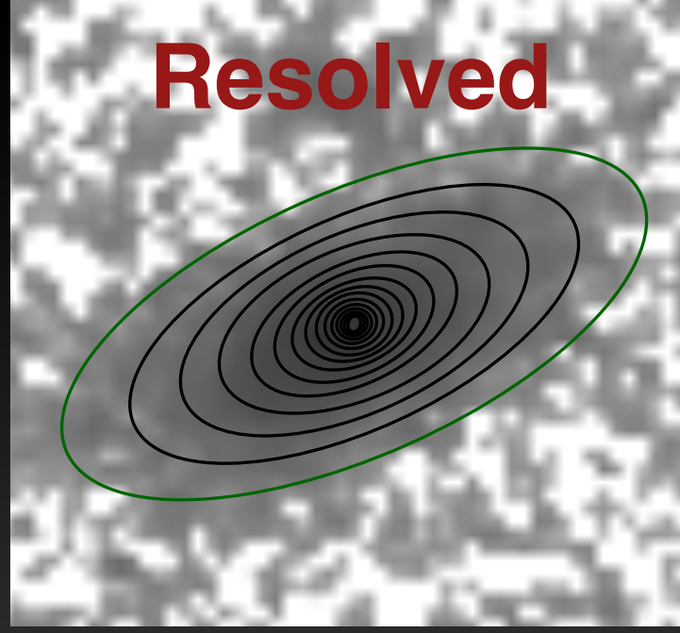

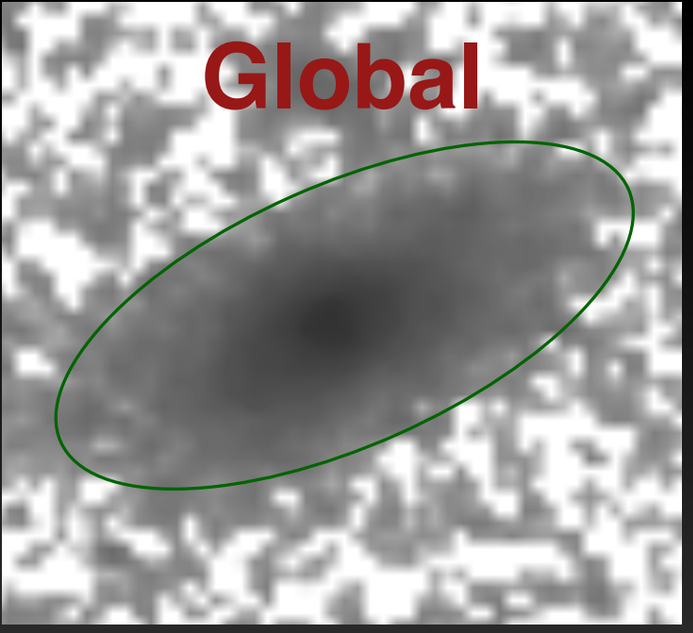

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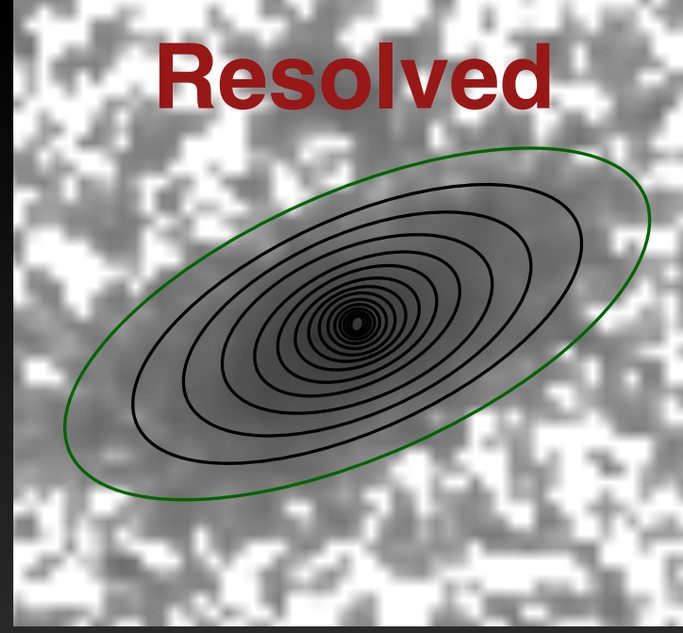
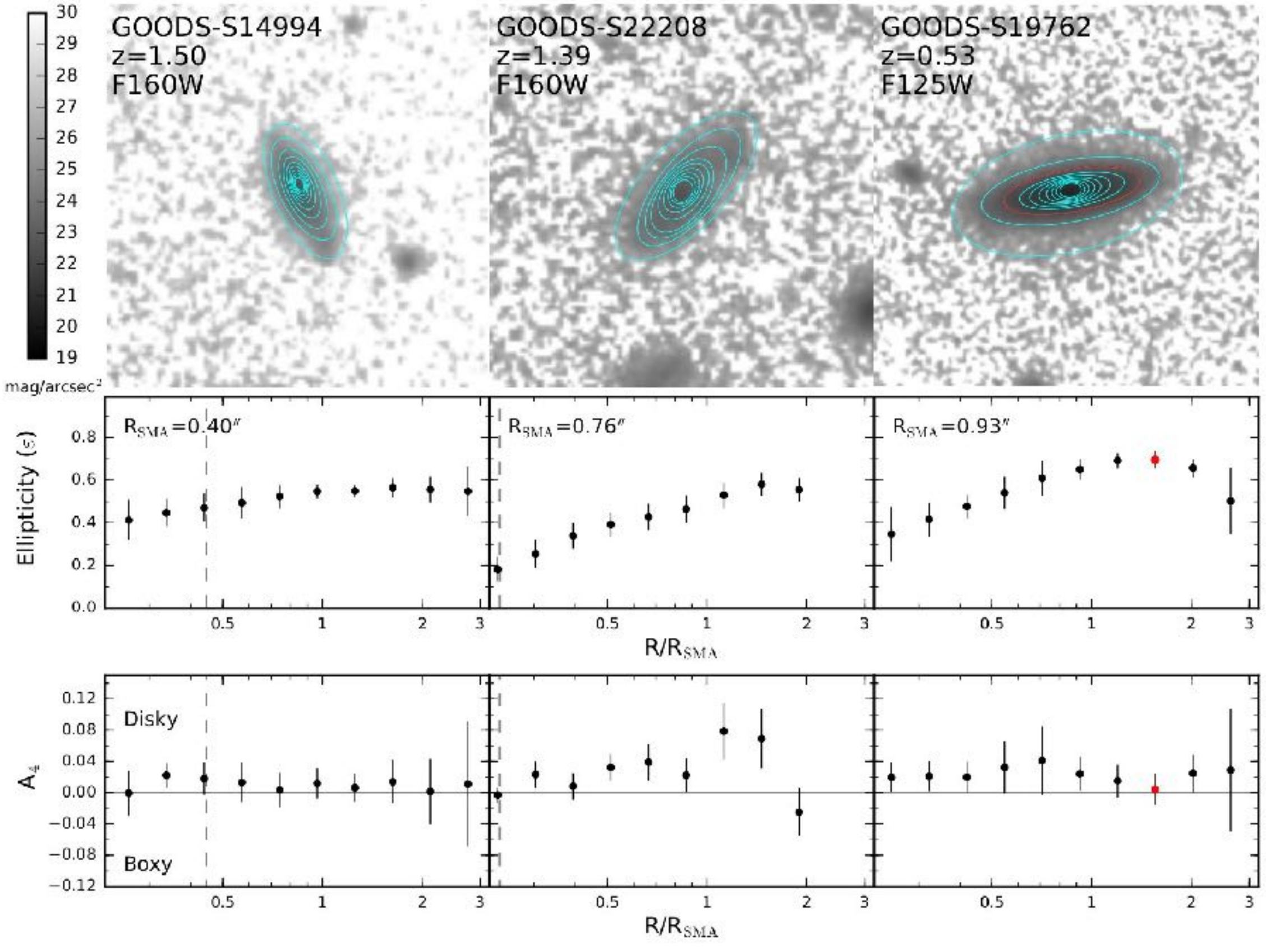


Part I : Isophotal Aperture Photometry (Fourier Expansion)

Axis ratio, Boxy/Disky A_4, PAs,… as a function of radius
(F160w and F125w)

Part I: Isophotal Photometry (Fourier Expansion)



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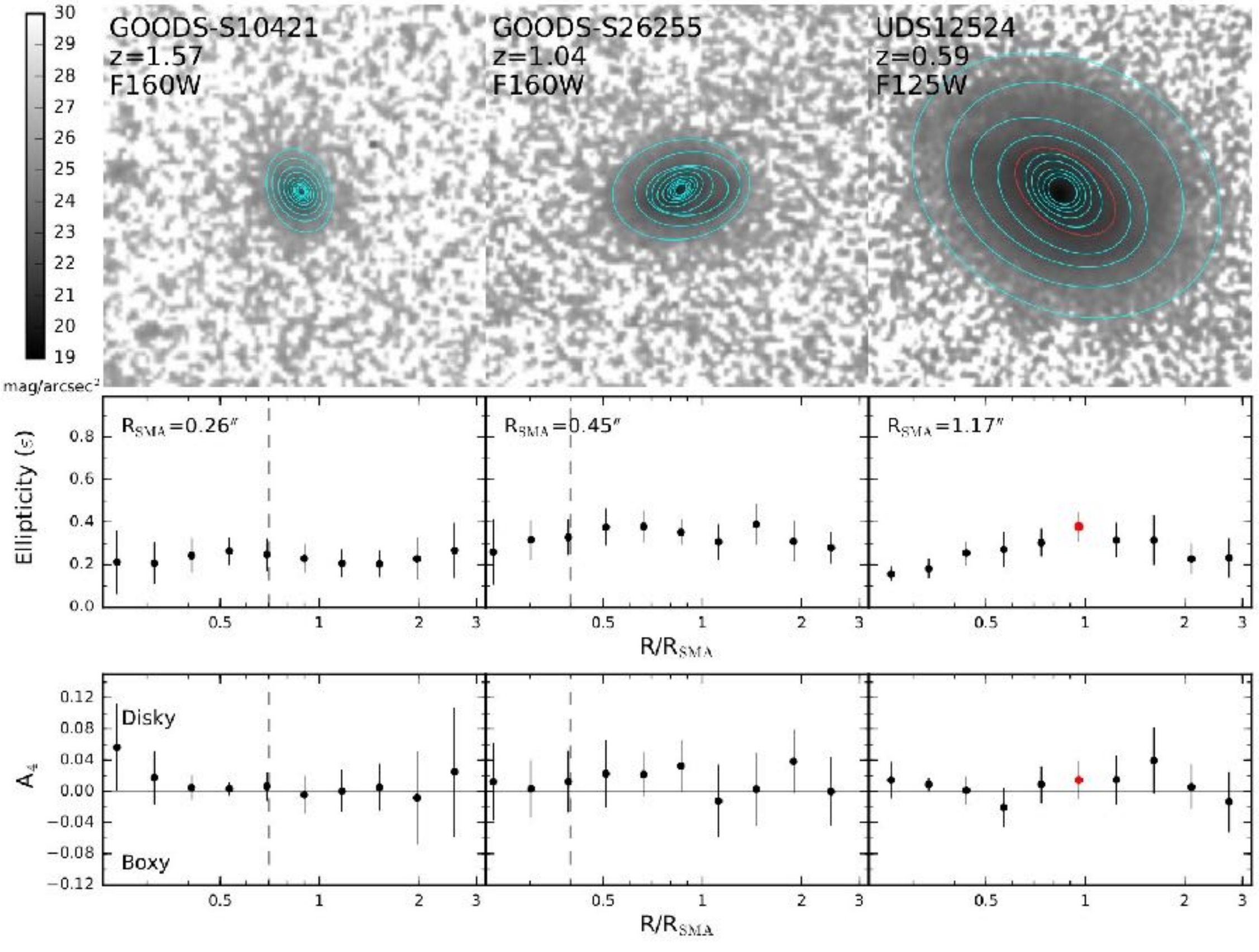

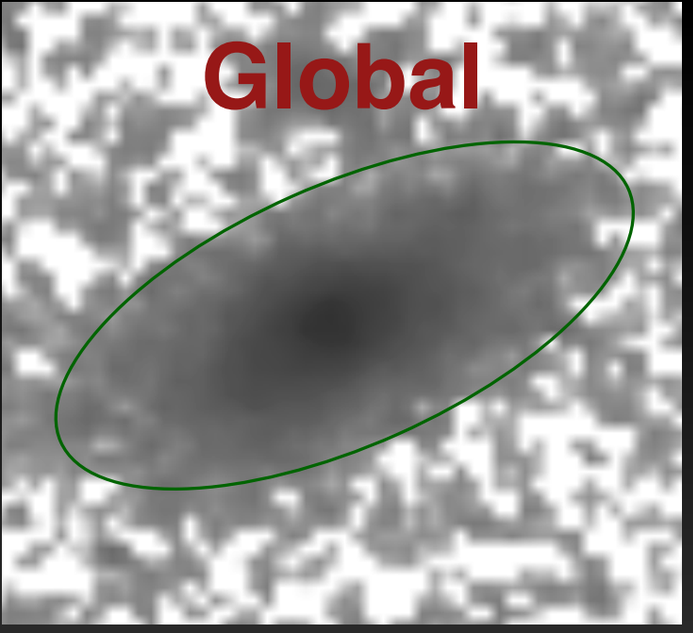

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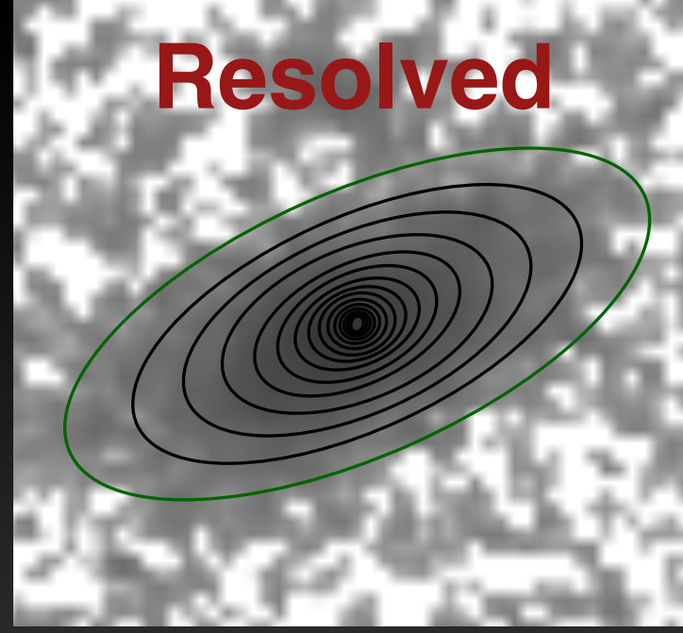

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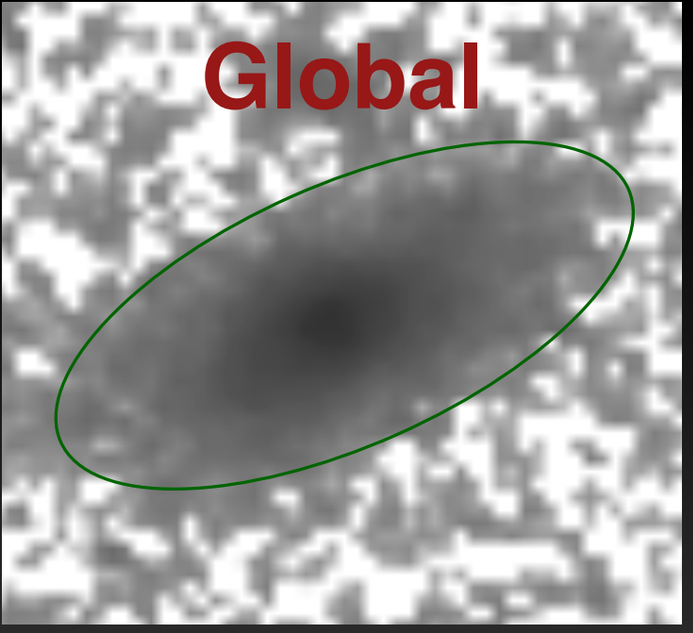

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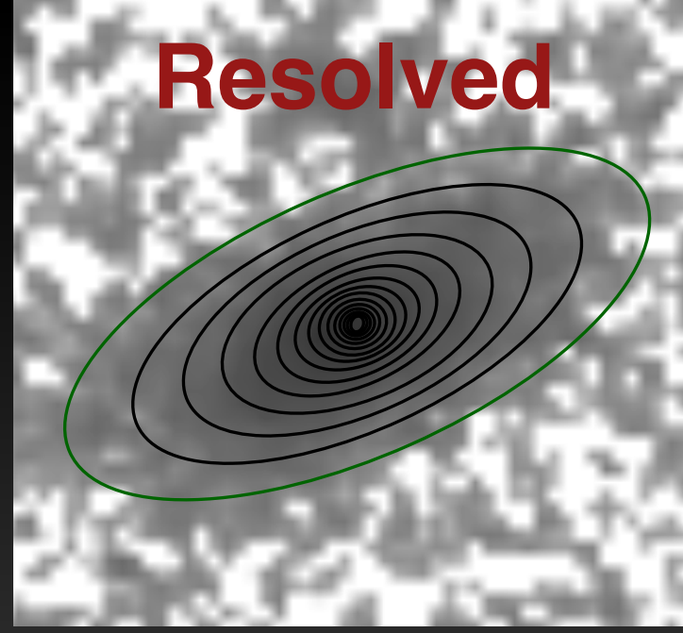


Part I : Isophotal Aperture Photometry (Fourier Expansion)

Axis ratio, Boxy/Disky A_4, PAs,… as a function of radius
(F160w and F125w)

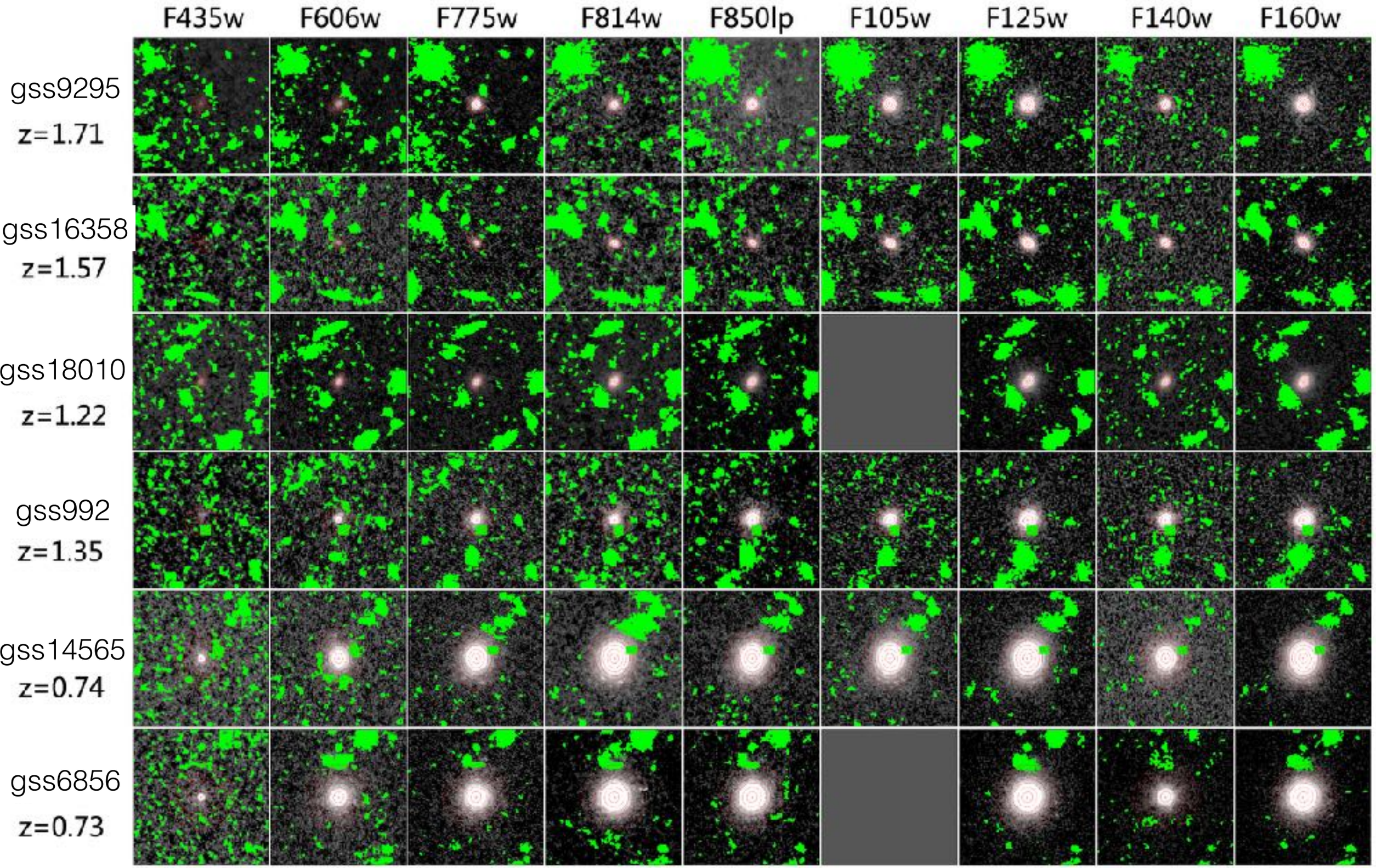
Part II: Elliptical Aperture Photometry

(the fixed centre, axis ratio, and PA)

1. **Multi-wavelength surface brightness profiles**
2. **Rest-frame colour profiles from EAZY code**
3. **Stellar mass & SFR profiles from FAST code**
4. **Cumulative magnitude and mass profiles**

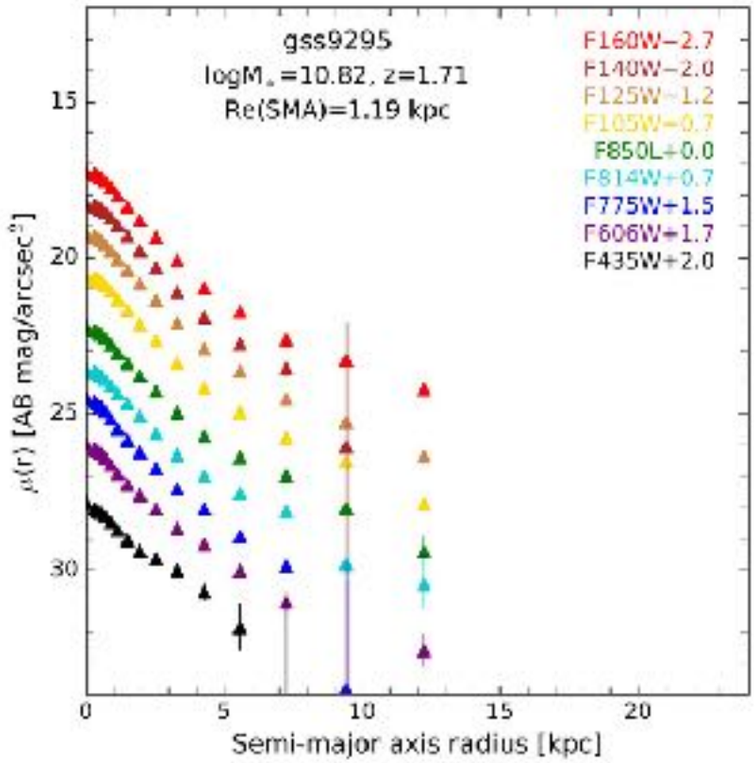
(GOODS-S & GOODS-N: 5 ACS + 4 WFC3 bands
UDS,COSMOS,EGS: 2 ACS + 3 WFC3 bands)

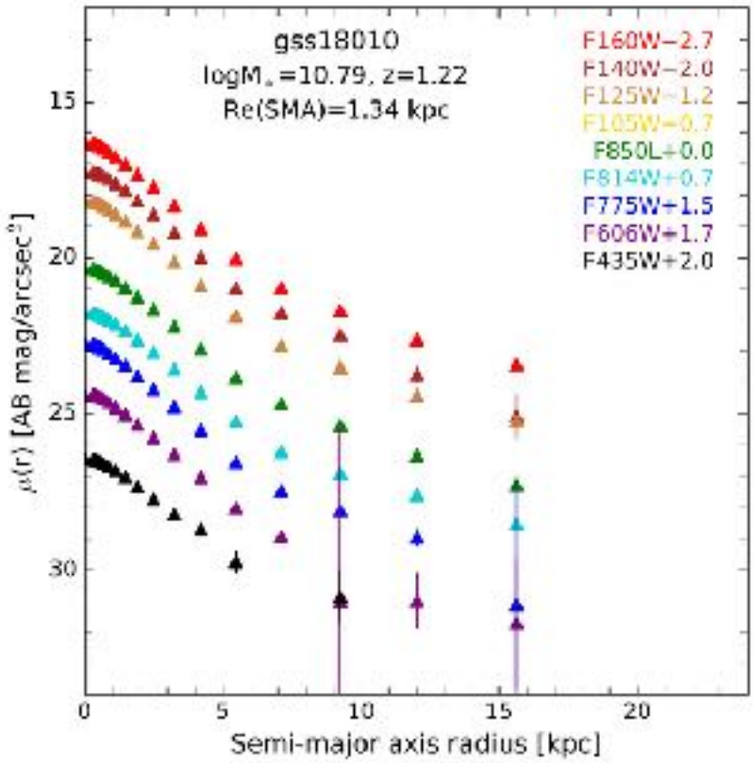
Part II: Elliptical Aperture (fixed centre, ellipticity, PA)
(Examples of Quiescent Galaxies)

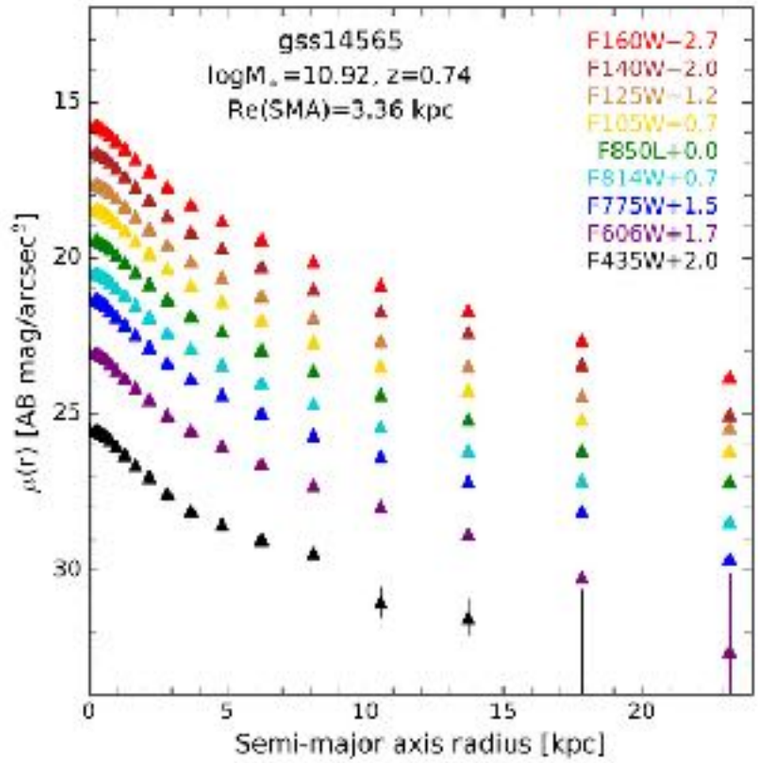


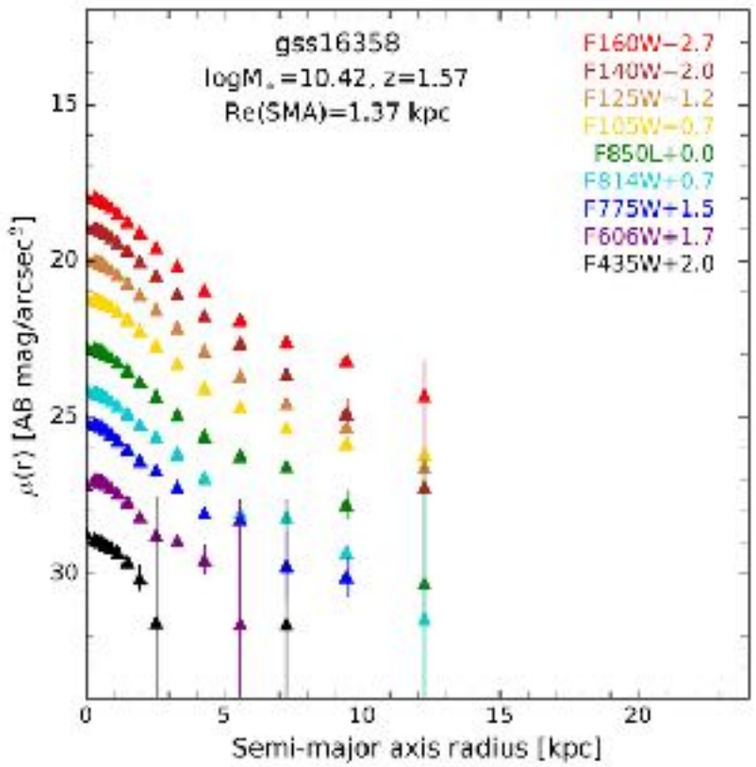
GOODS-S UVJ-classification: quiescent galaxies (10.5<logM*<11,0.4<z<2.2);imaging size:80kpc X 80kpc

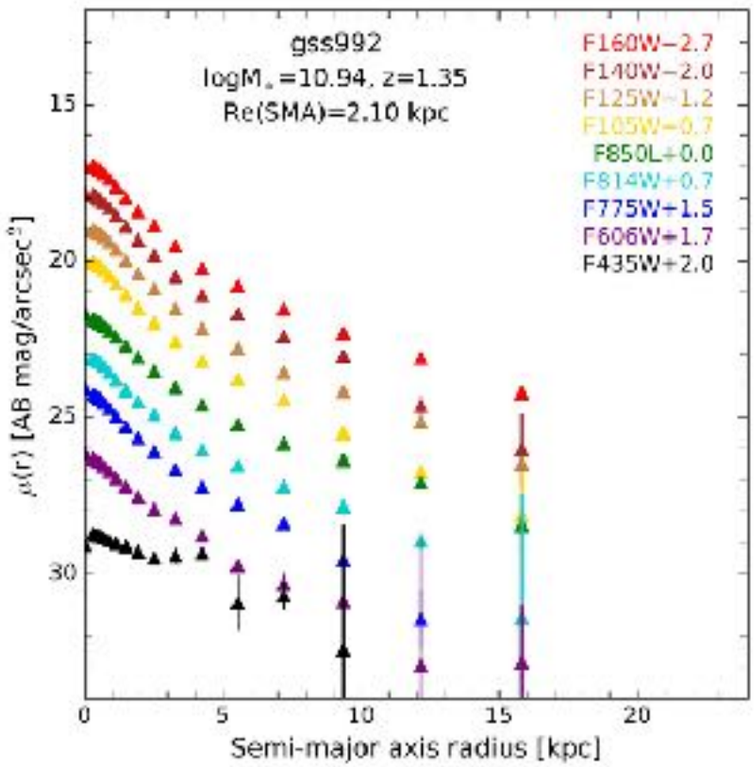
Part II: Elliptical Aperture (fixed centre, ellipticity, PA) (Examples of Quiescent Galaxies)

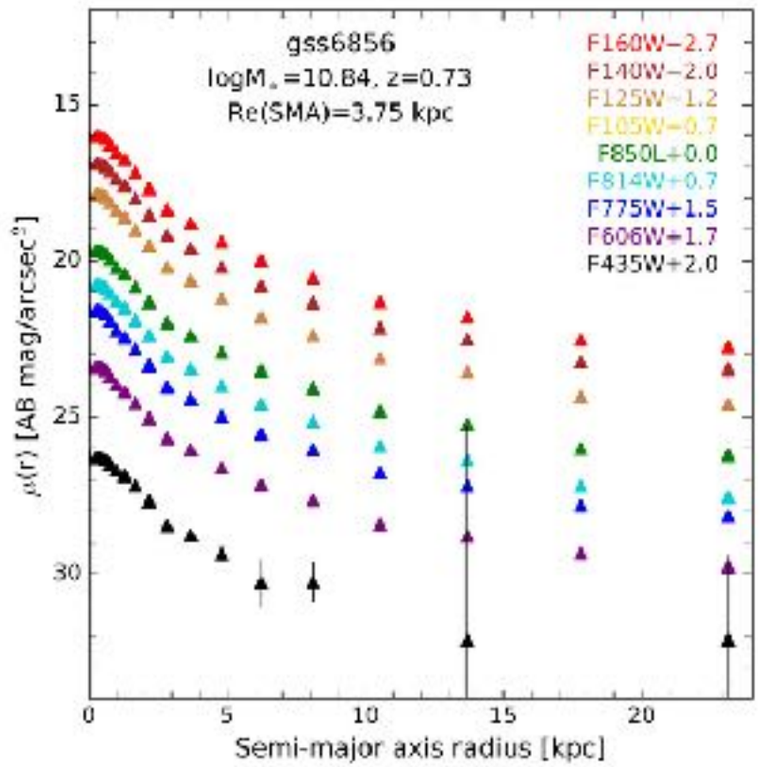




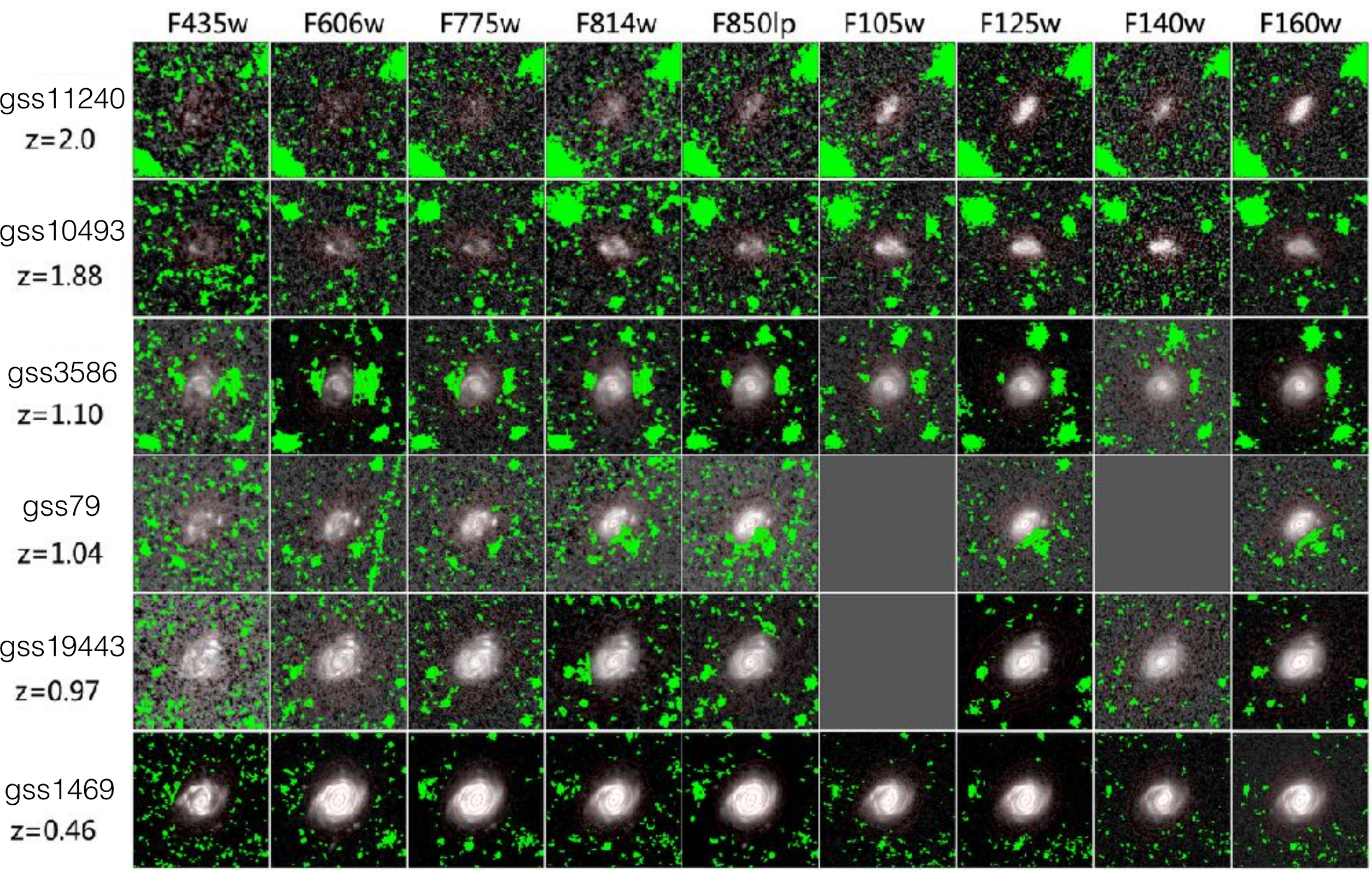






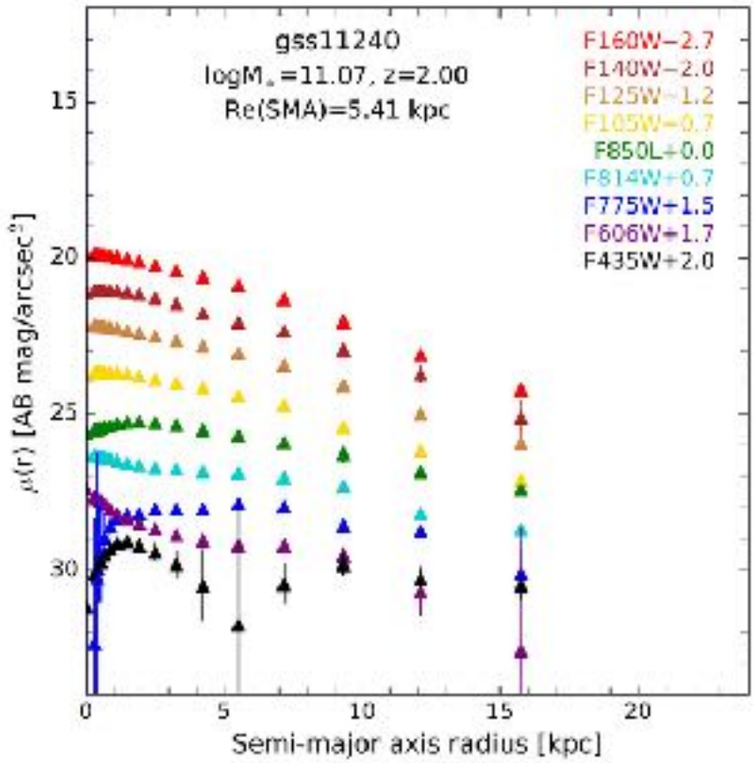


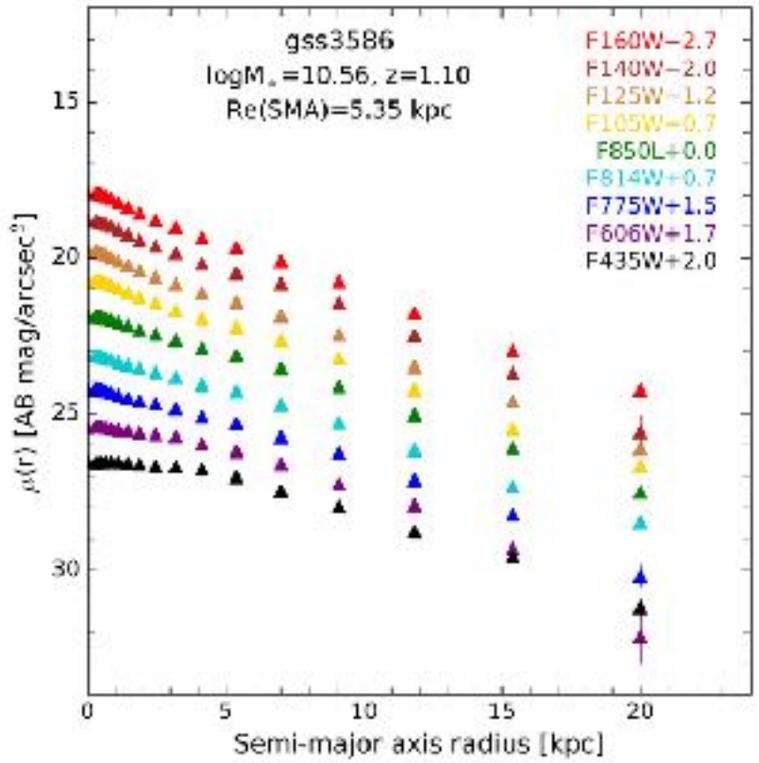
Part II: Elliptical Aperture (fixed centre, ellipticity, PA)
(Examples of Star-Forming Galaxies)

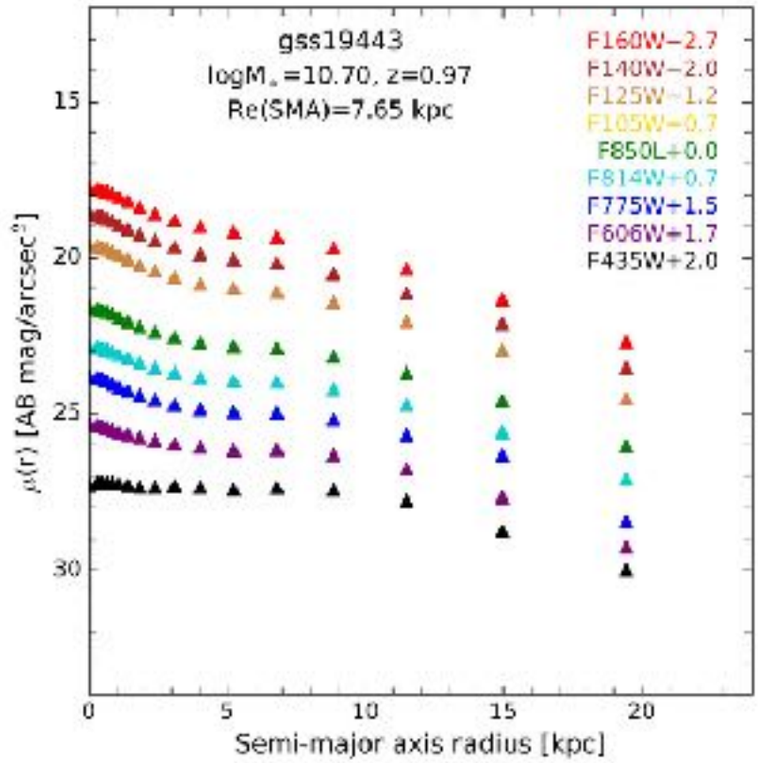


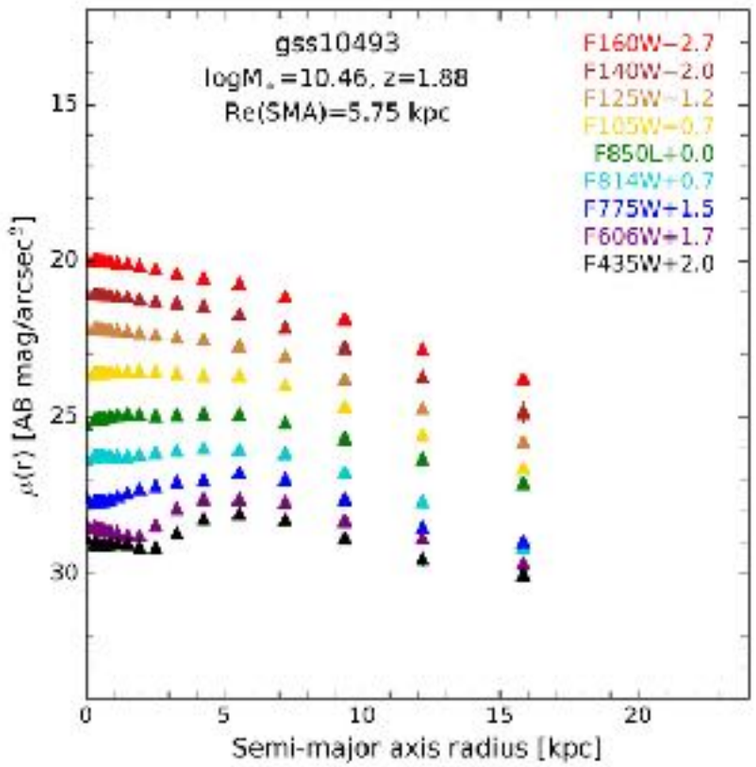
GOODS-S UVJ-classification: star-forming galaxies (10.5<logM*<11,0.4<z<2.2);imaging size:80kpc X 80kpc

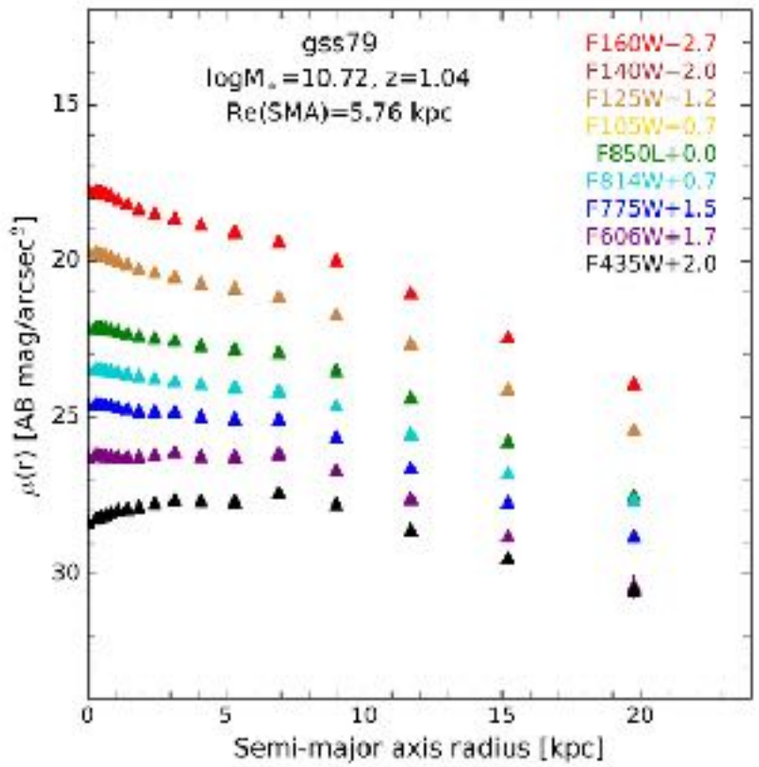
Part II: Elliptical Aperture (fixed centre, ellipticity, PA) (Examples of Star-Forming Galaxies)

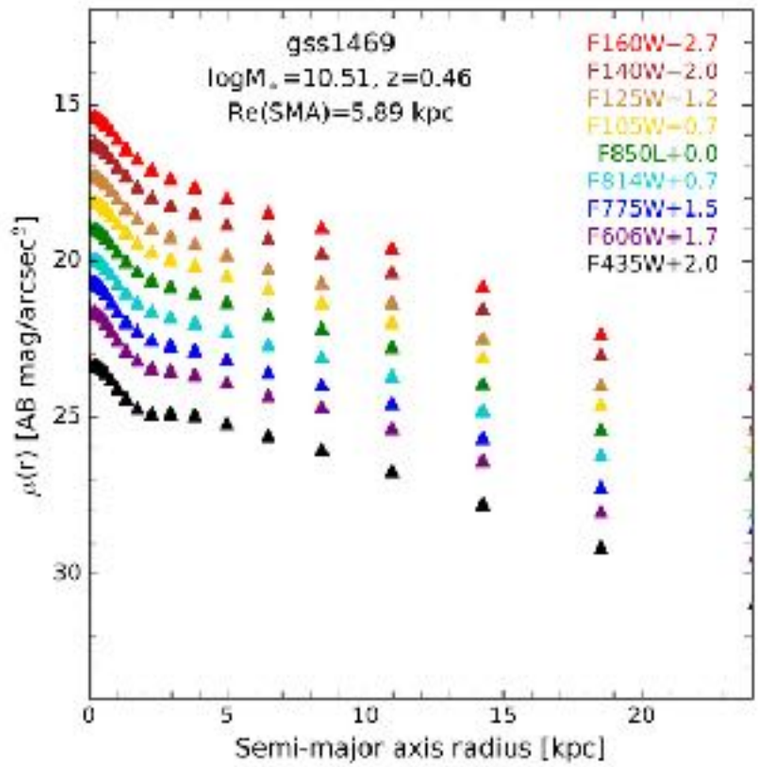




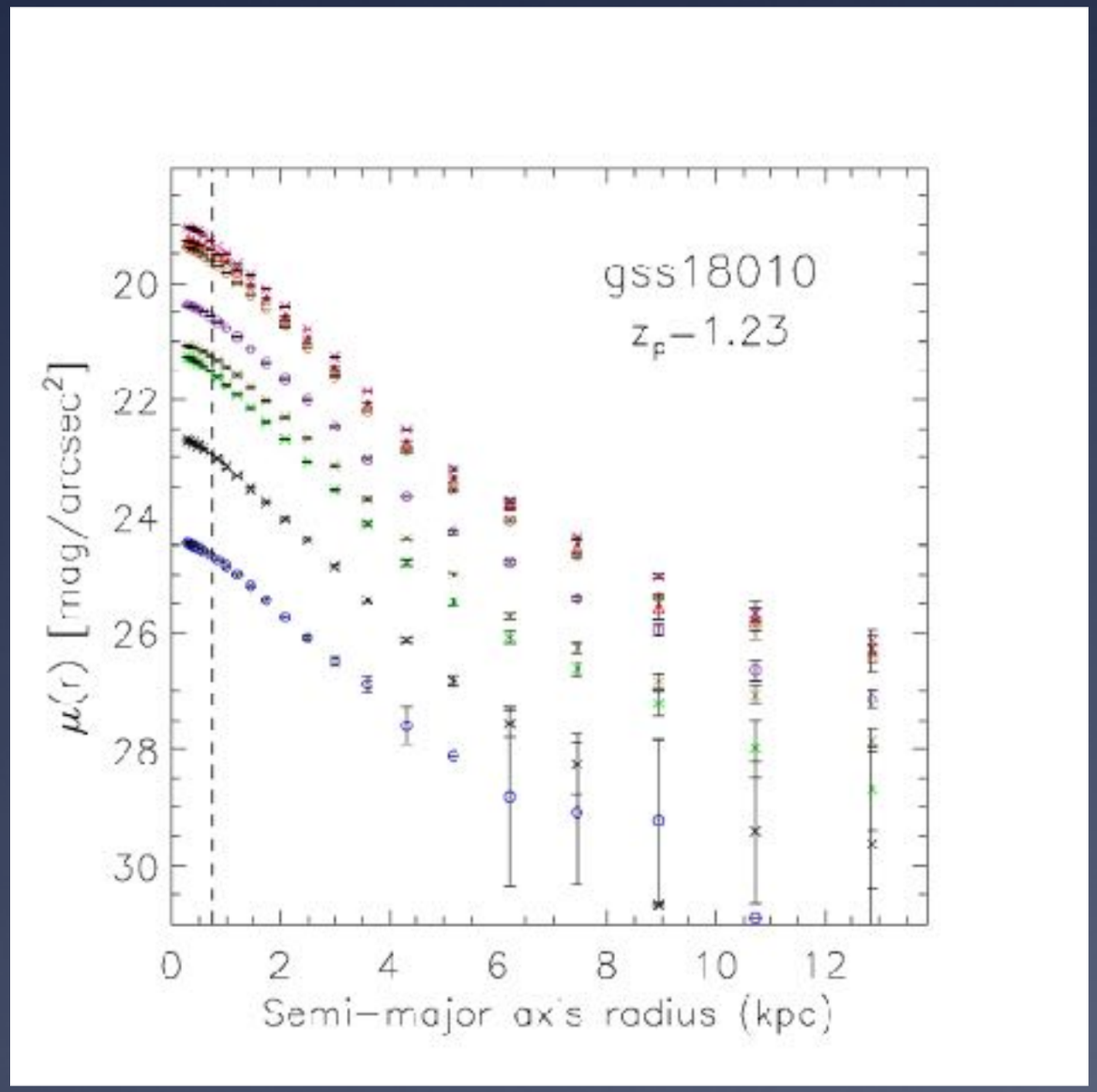








Rest-frame color profiles from EAZY code



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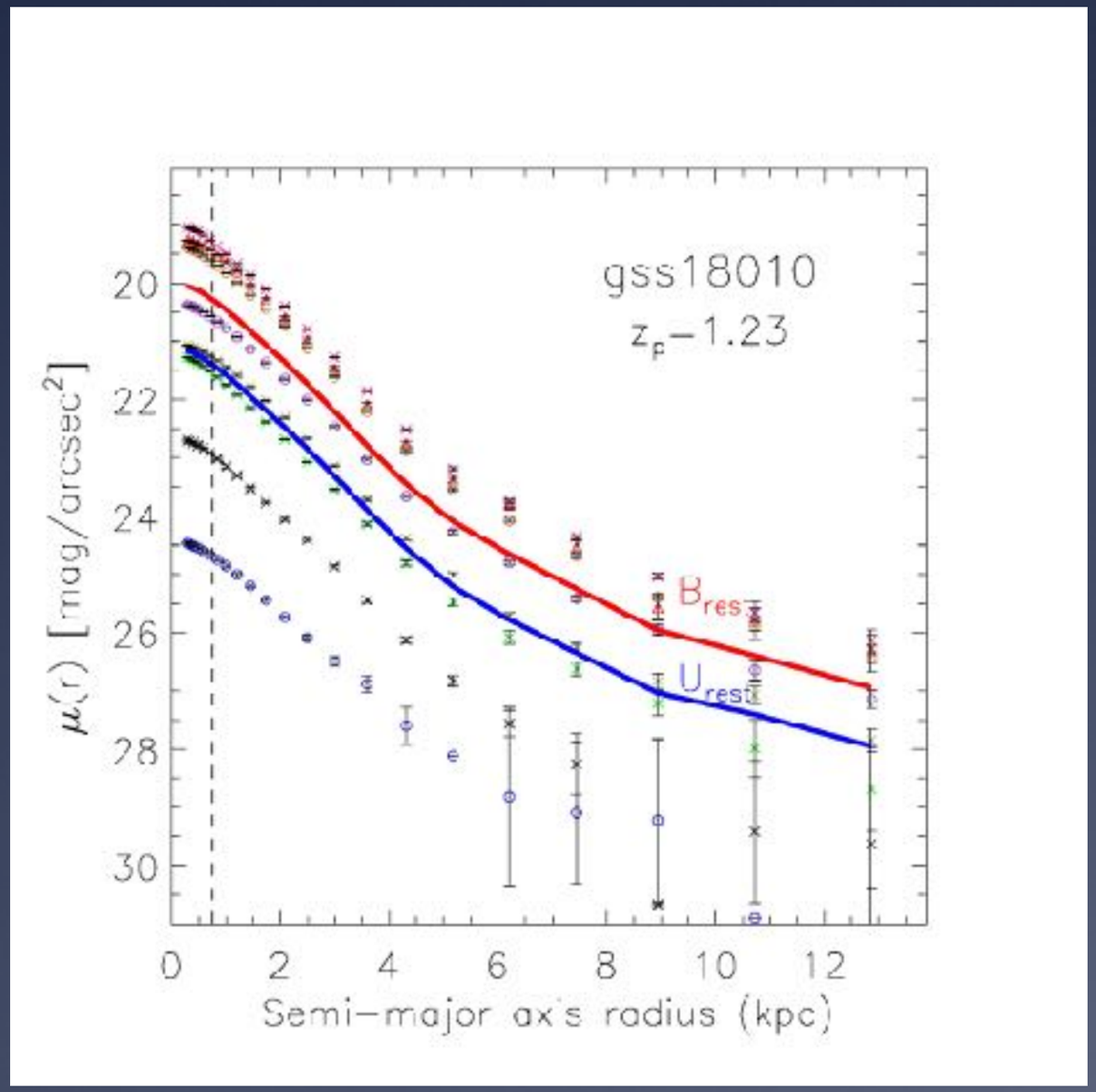

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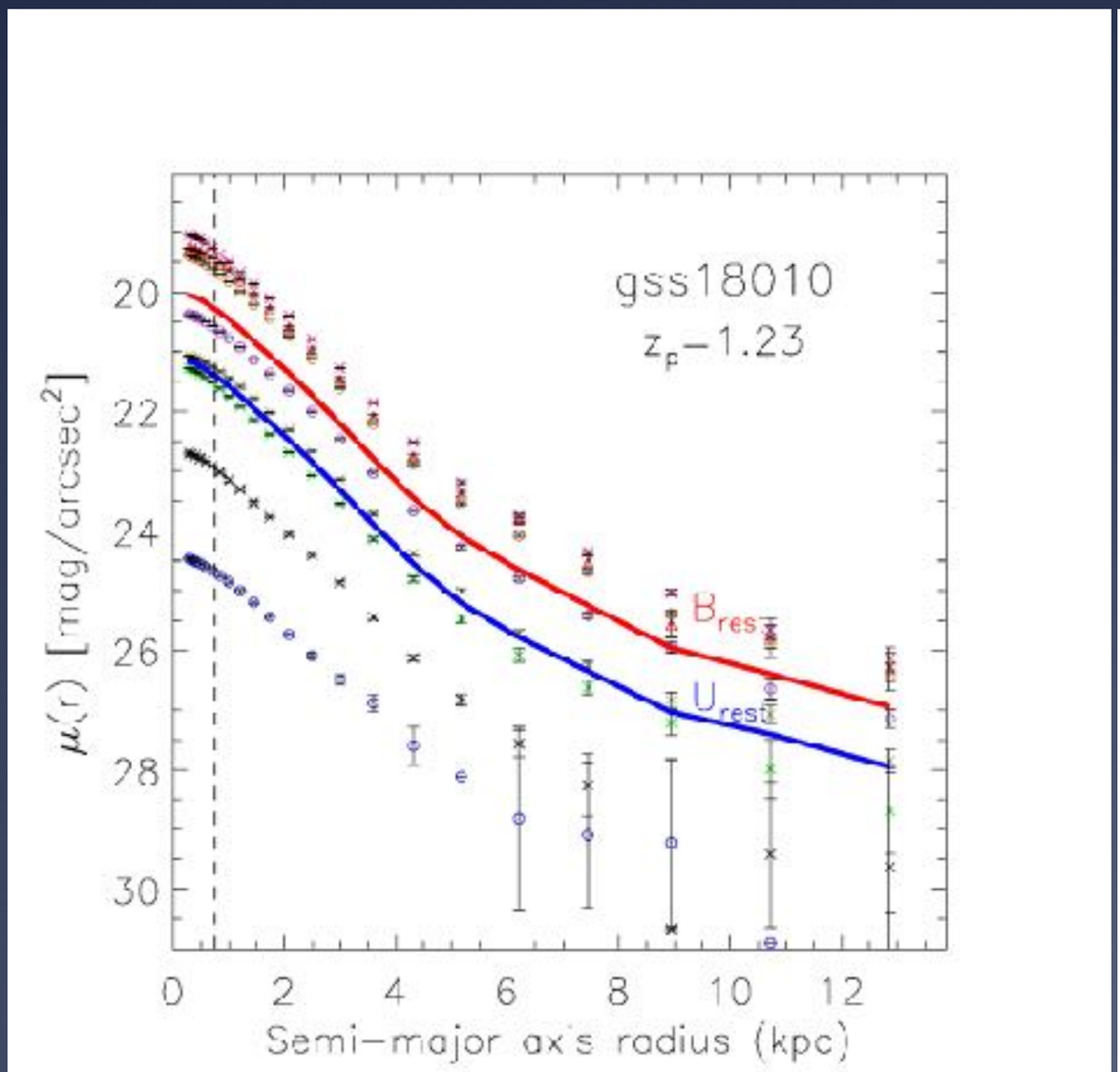

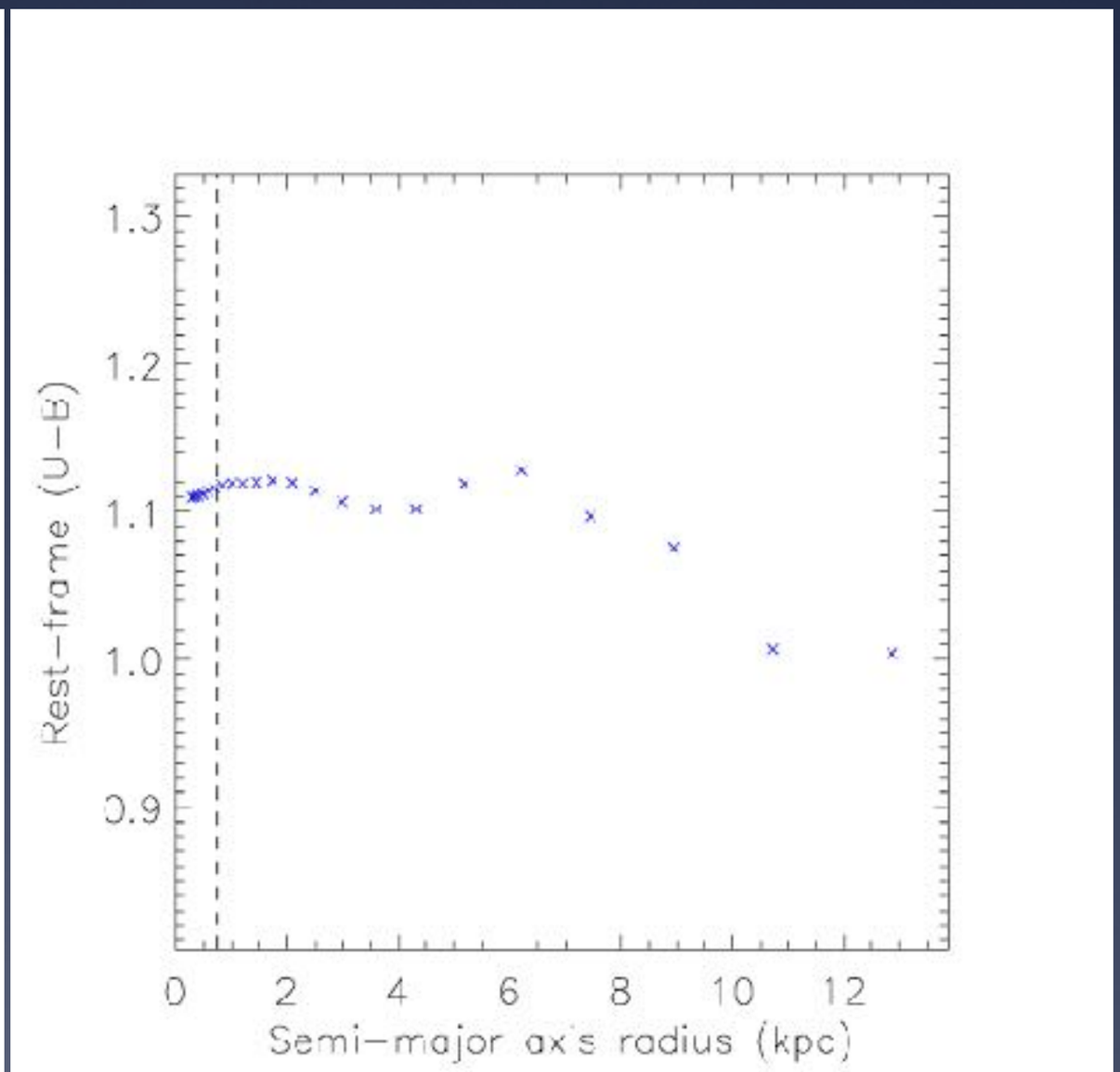

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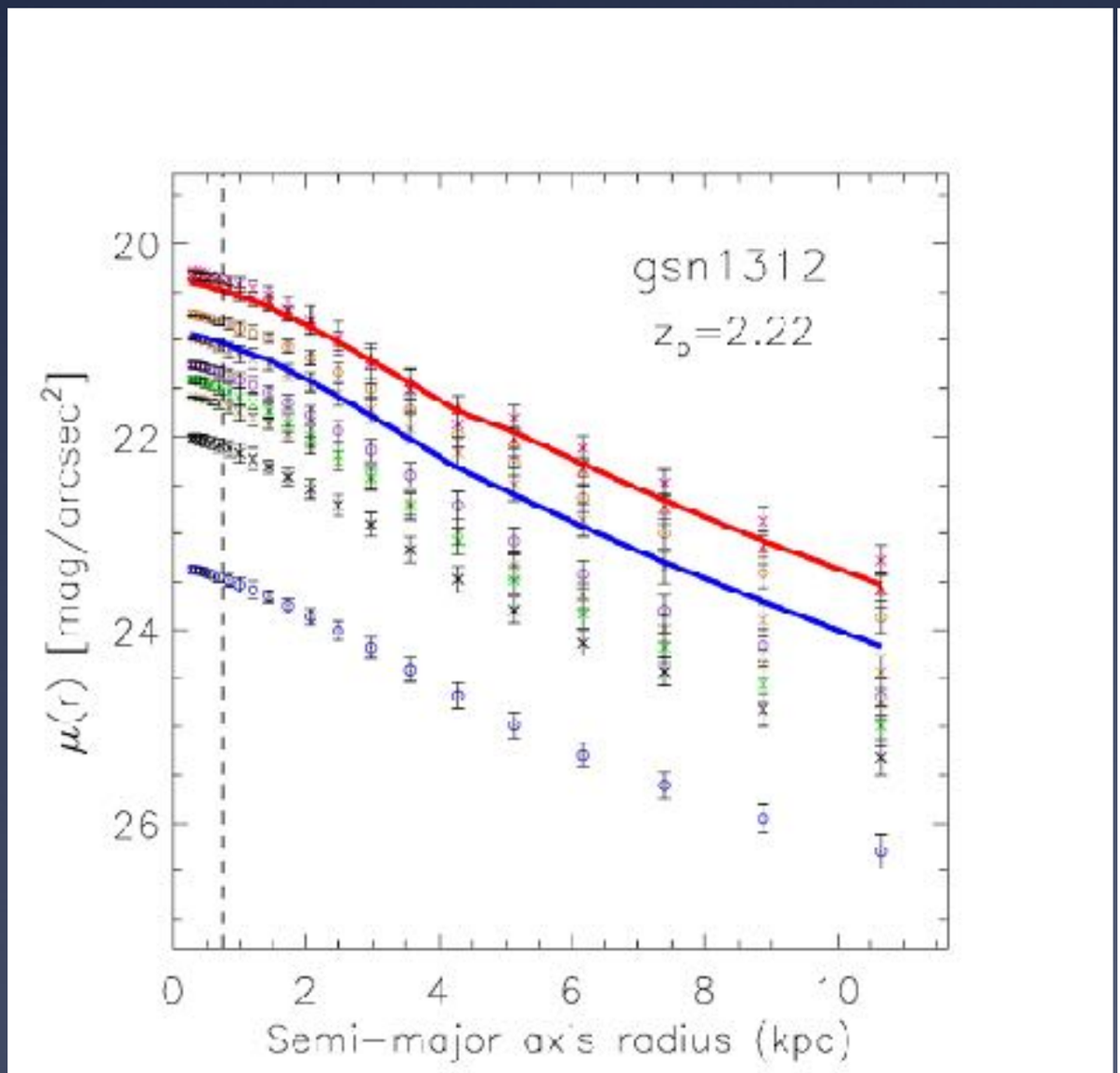
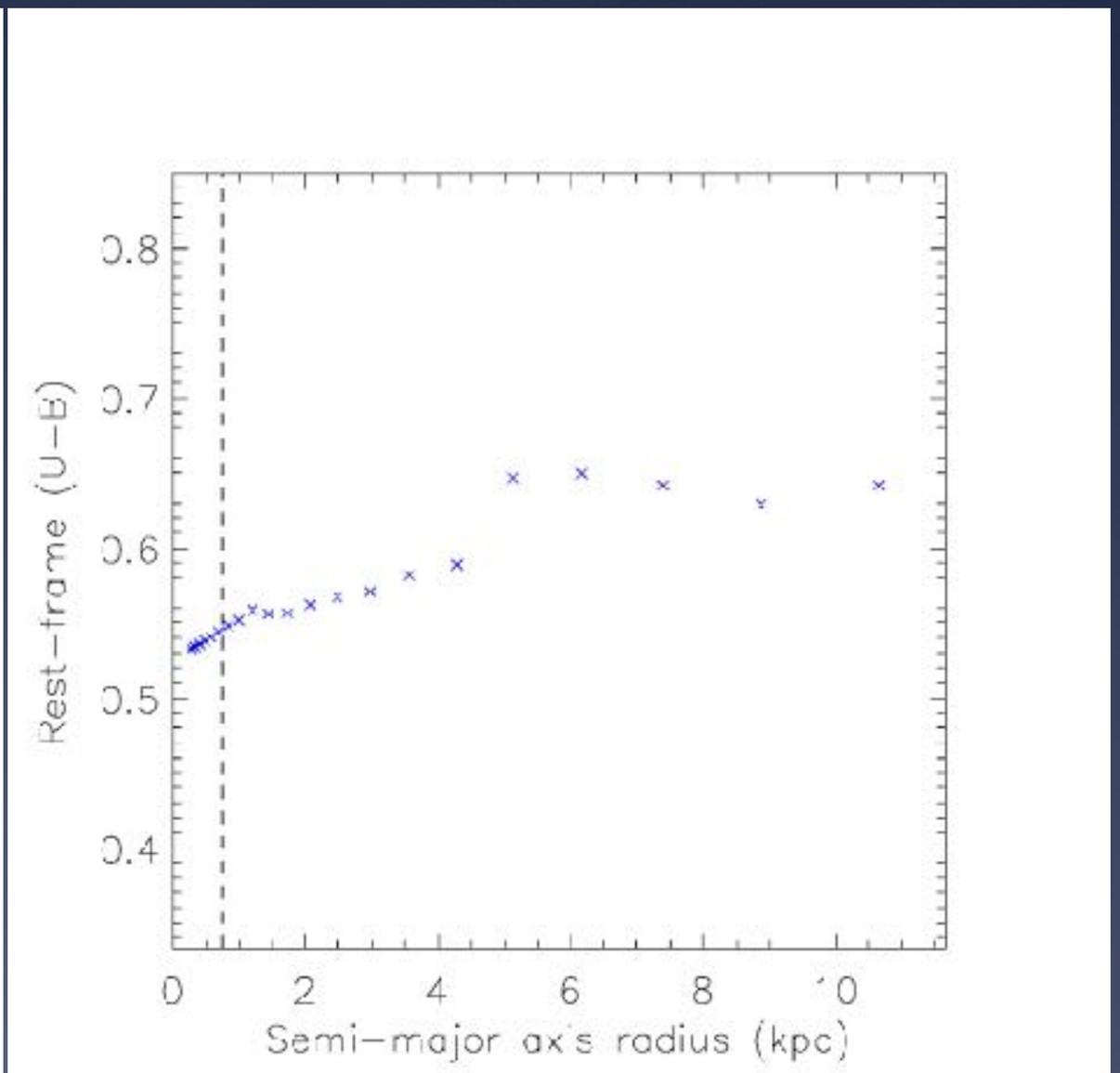
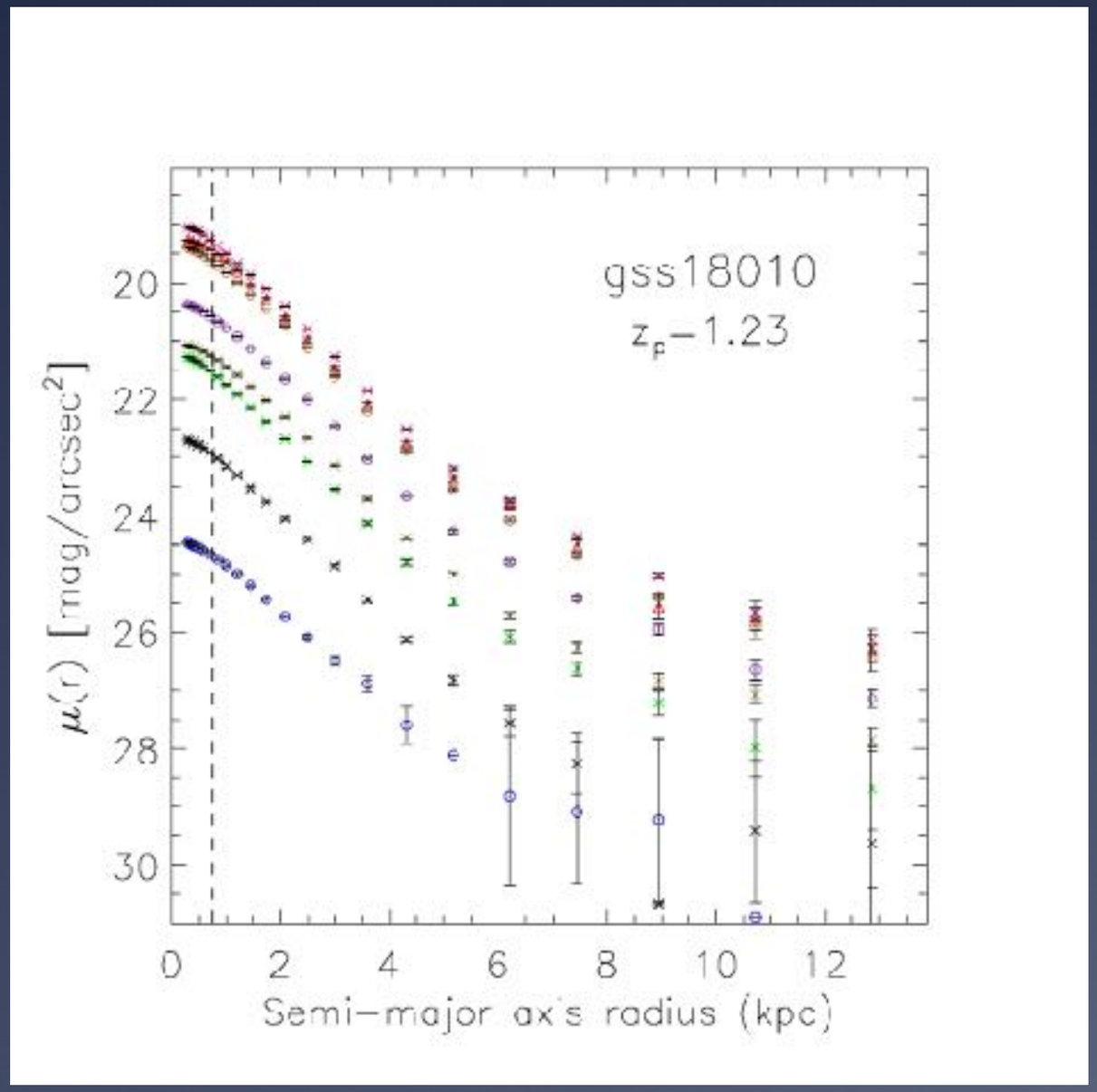




Stellar mass profiles from FAST code



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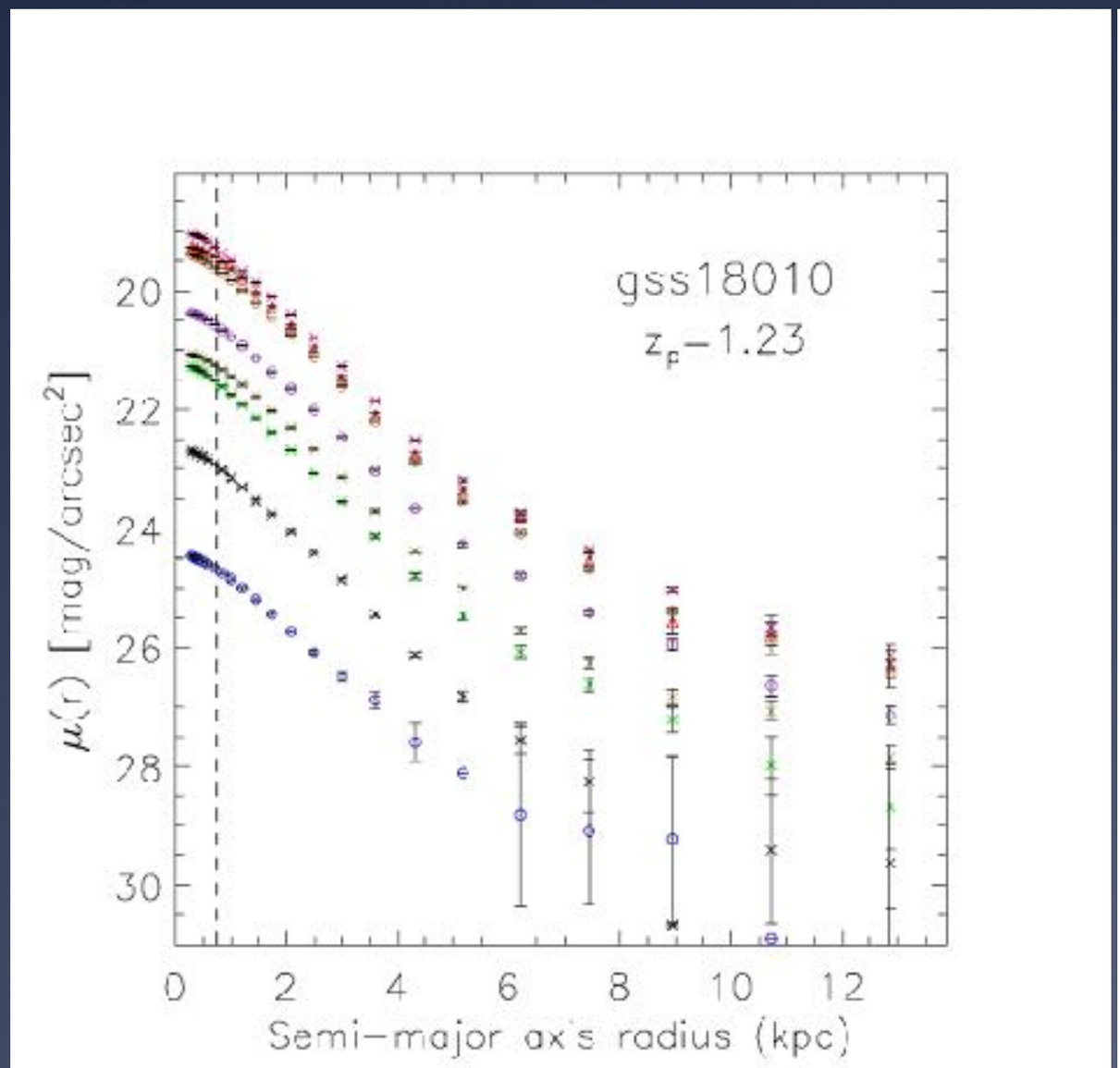

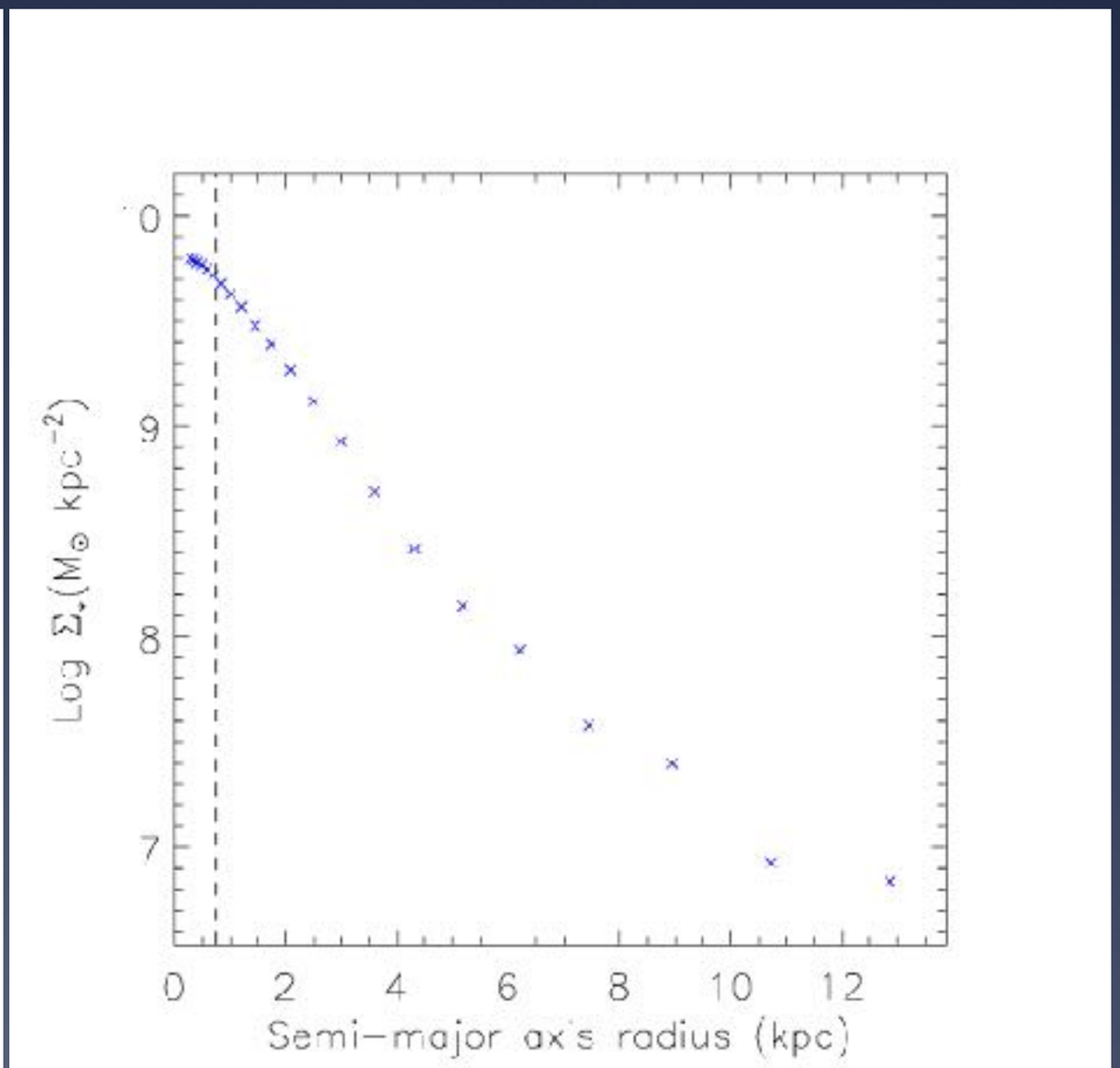

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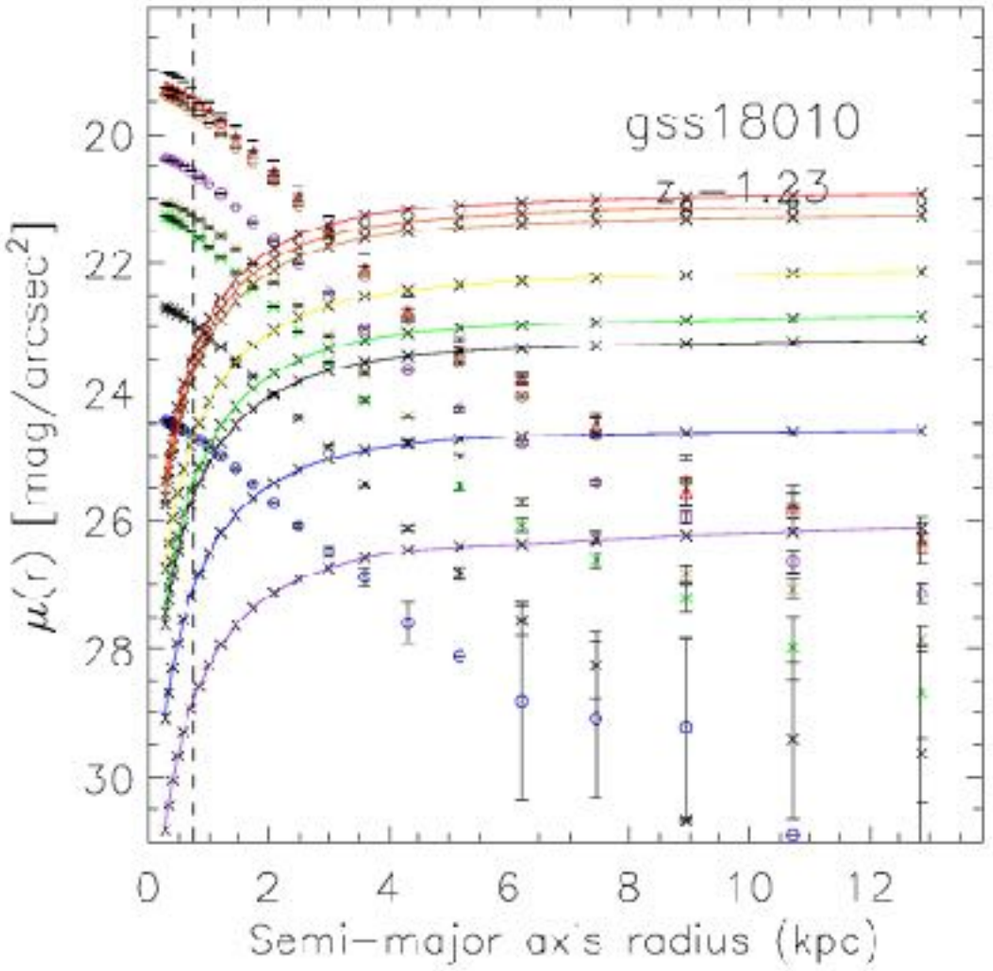

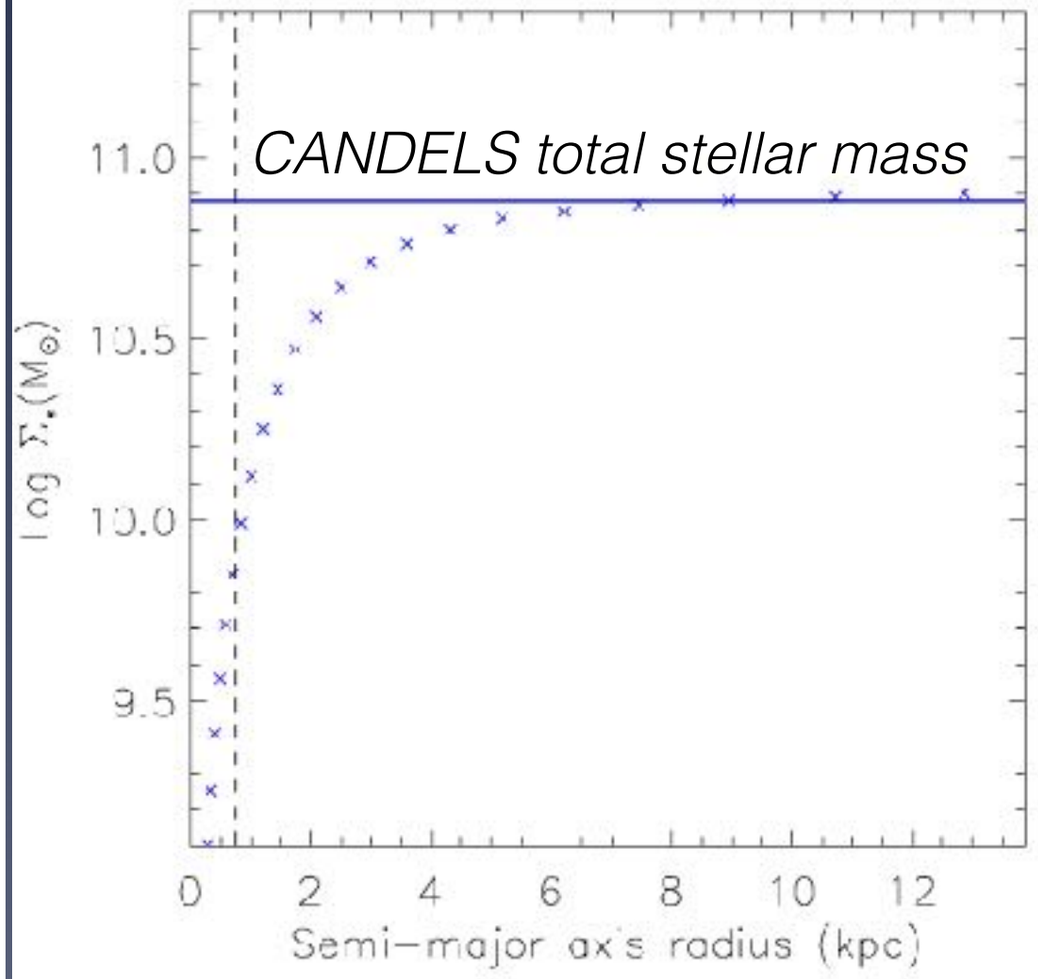

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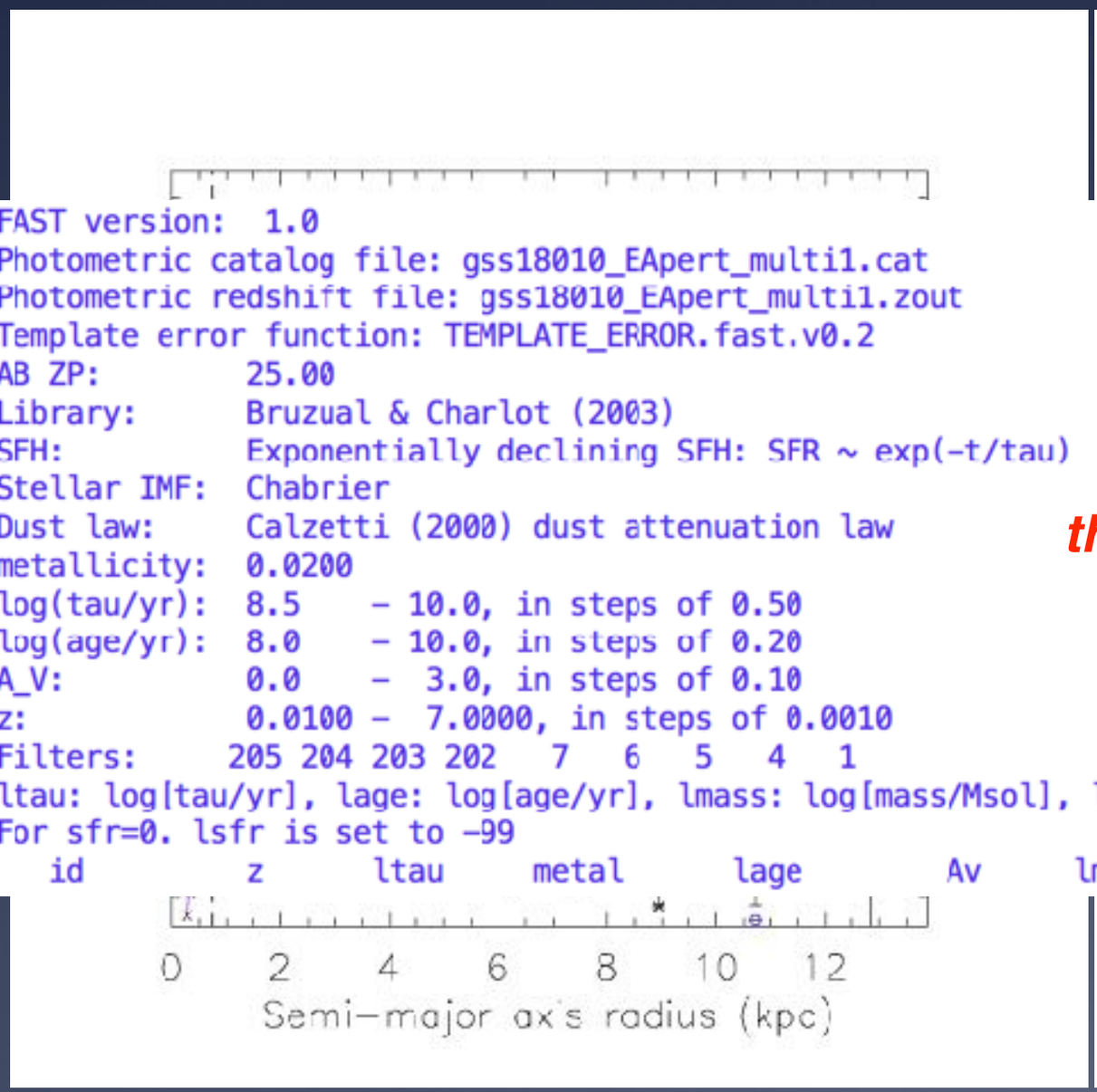
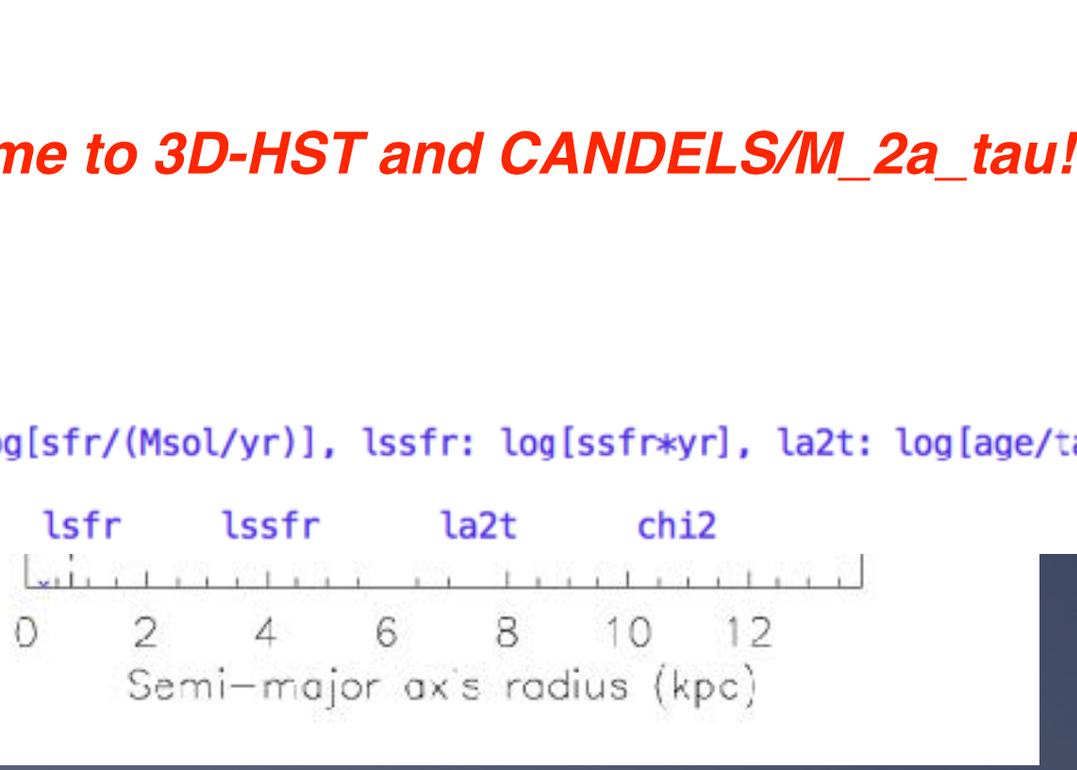
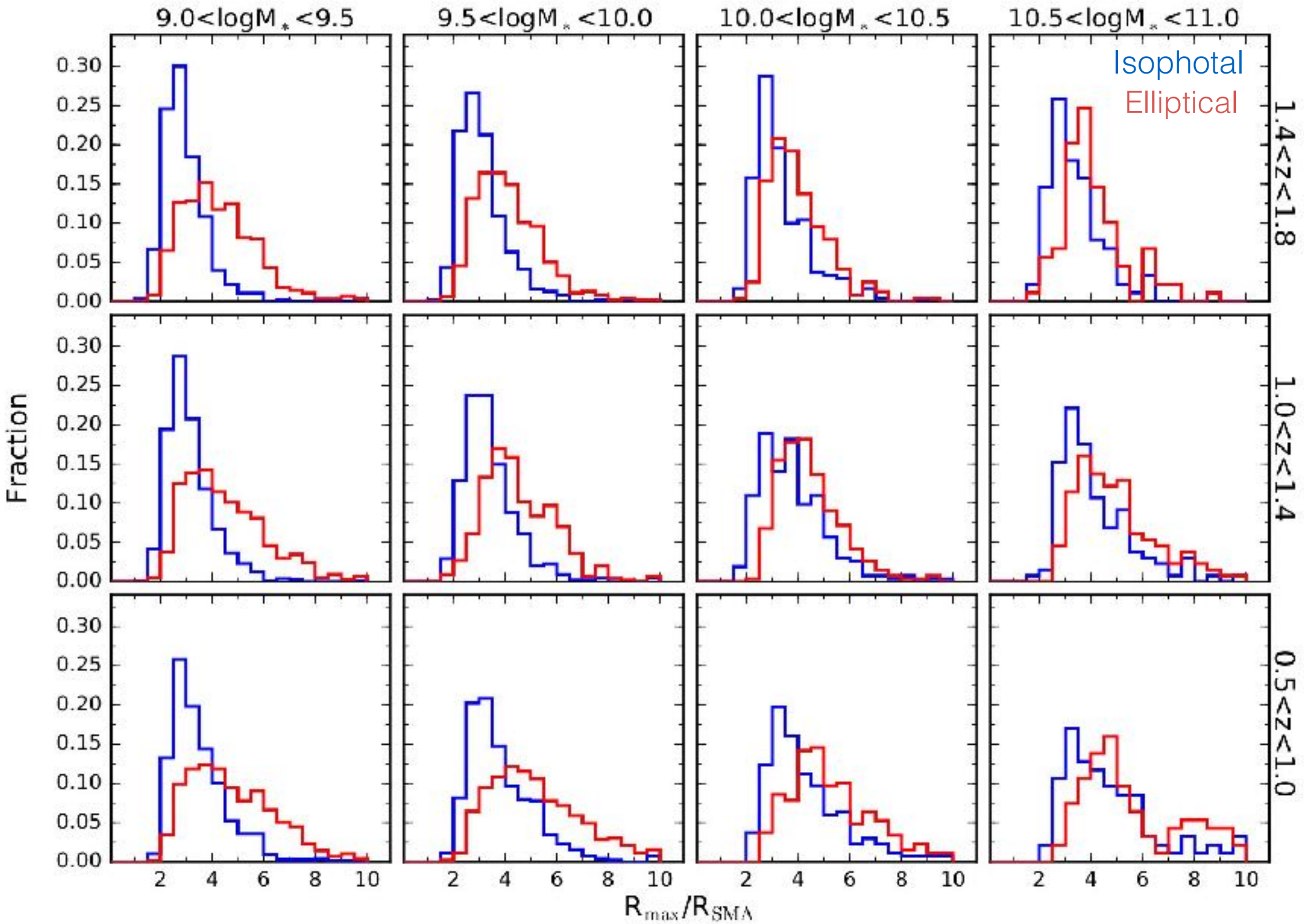



```
# FAST version:  1.0
# Photometric catalog file: gss18010_EApert_multi1.cat
# Photometric redshift file: gss18010_EApert_multi1.zout
# Template error function: TEMPLATE_ERROR.fast.v0.2
# AB ZP:          25.00
# Library:        Bruzual & Charlot (2003)
# SFH:            Exponentially declining SFH: SFR ~ exp(-t/tau)
# Stellar IMF:    Chabrier
# Dust law:       Calzetti (2000) dust attenuation law
# metallicity:    0.0200
# log(tau/yr):    8.5    - 10.0, in steps of 0.50
# log(age/yr):    8.0    - 10.0, in steps of 0.20
# A_V:            0.0    -  3.0, in steps of 0.10
# z:              0.0100 -  7.0000, in steps of 0.0010
# Filters:      205 204 203 202   7   6   5   4   1
# ltau: log[tau/yr], lage: log[age/yr], lmass: log[mass/Msol], lsfr: log[sfr/(Msol/yr)], lssfr: log[ssfr*yr], la2t: log[age/tau]
# For sfr=0. lsfr is set to -99
#    id         z      ltau     metal      lage        Av     lmass      lsfr     lssfr      la2t      chi2
```

the same to 3D-HST and CANDELS/M_2a_tau!

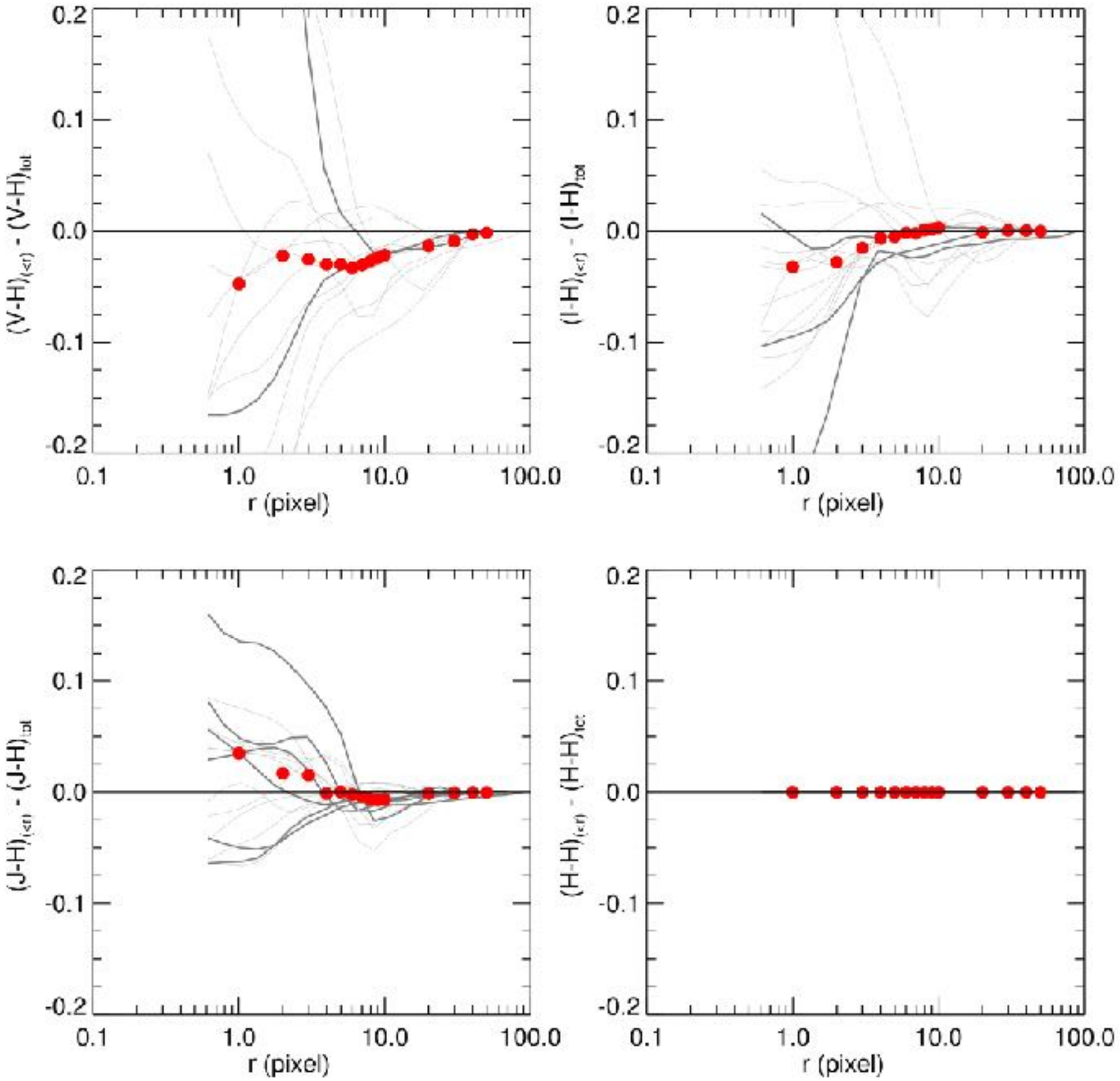


How far we can measure
(3*Re ~ 4*Re on average in F160w)



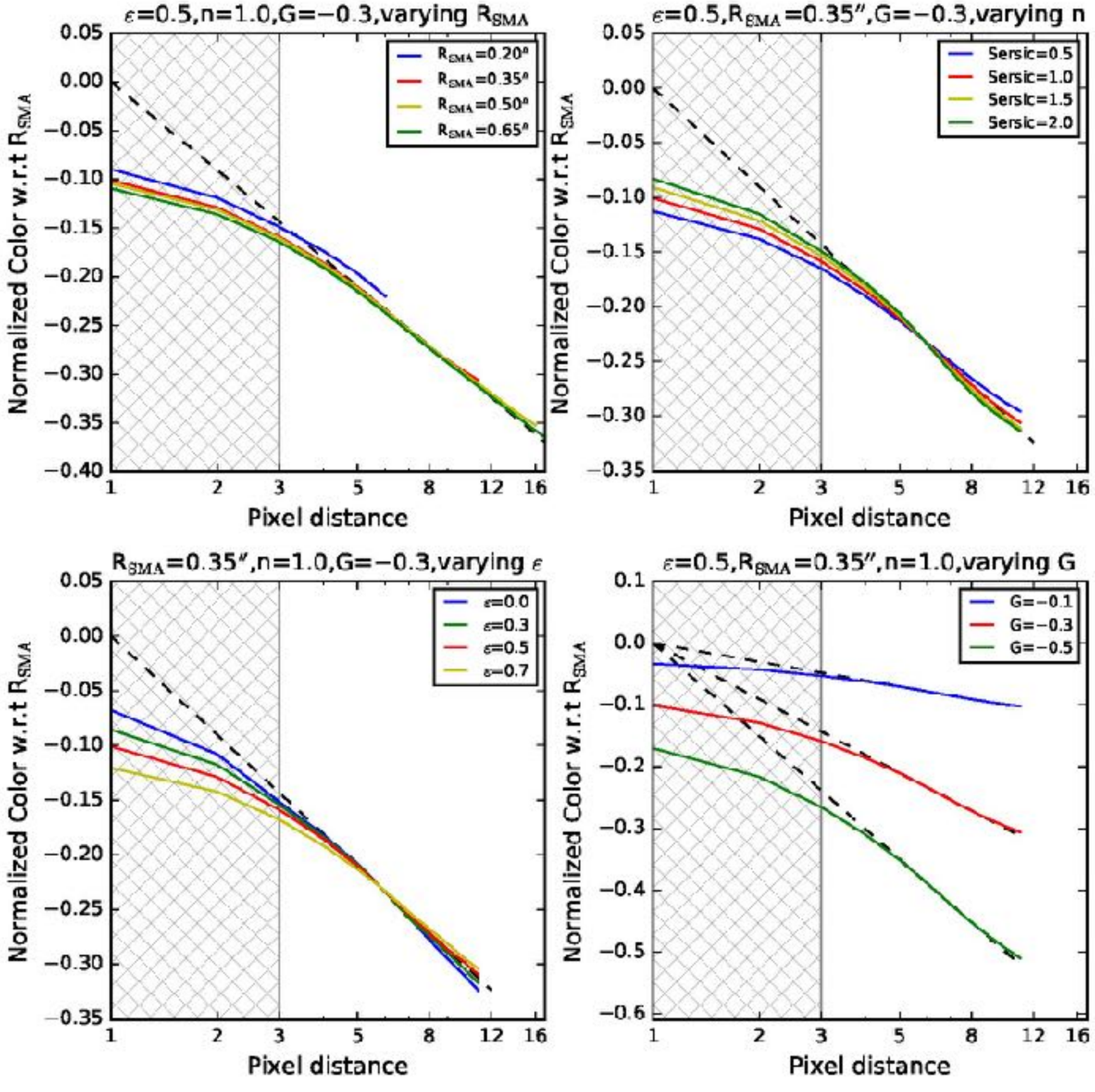
Effect of PSF mis-matching on colours (unsantaured stars)

credit :Yicheng Guo

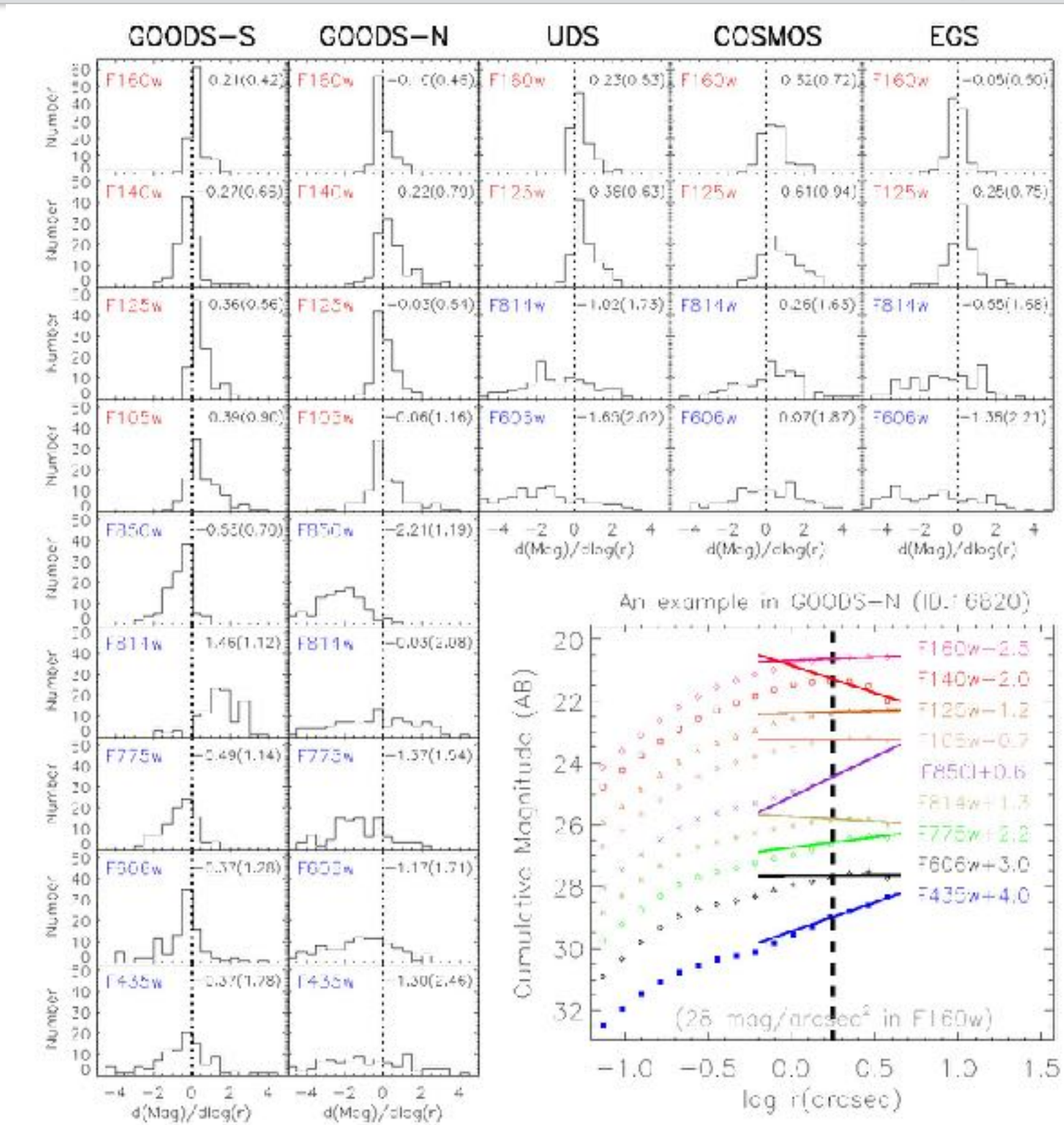


PSF smearing effect on colours

credit :Weichen Wang



The uncertain and biased “local background” of CANDELS mosaic imaging



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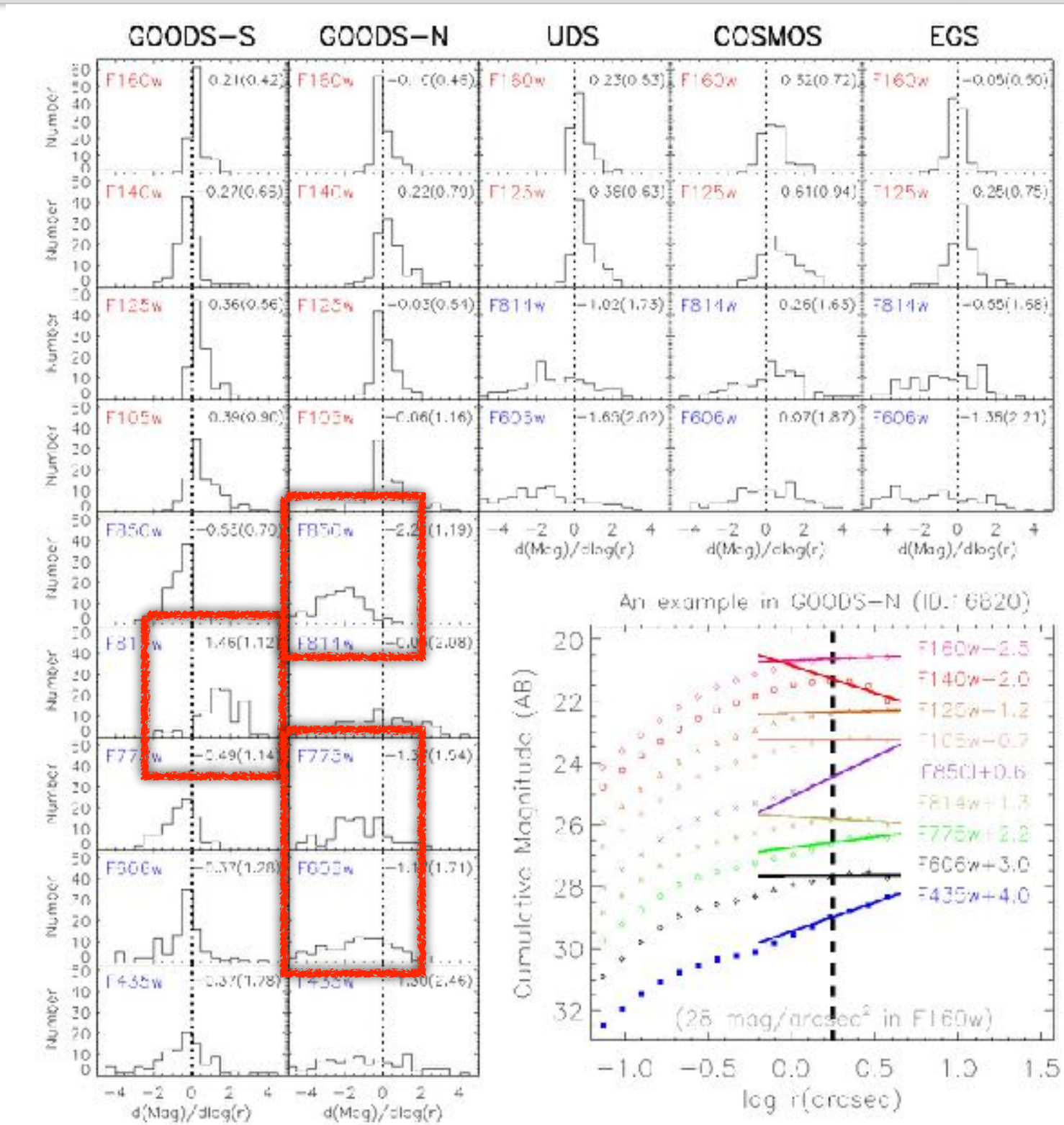
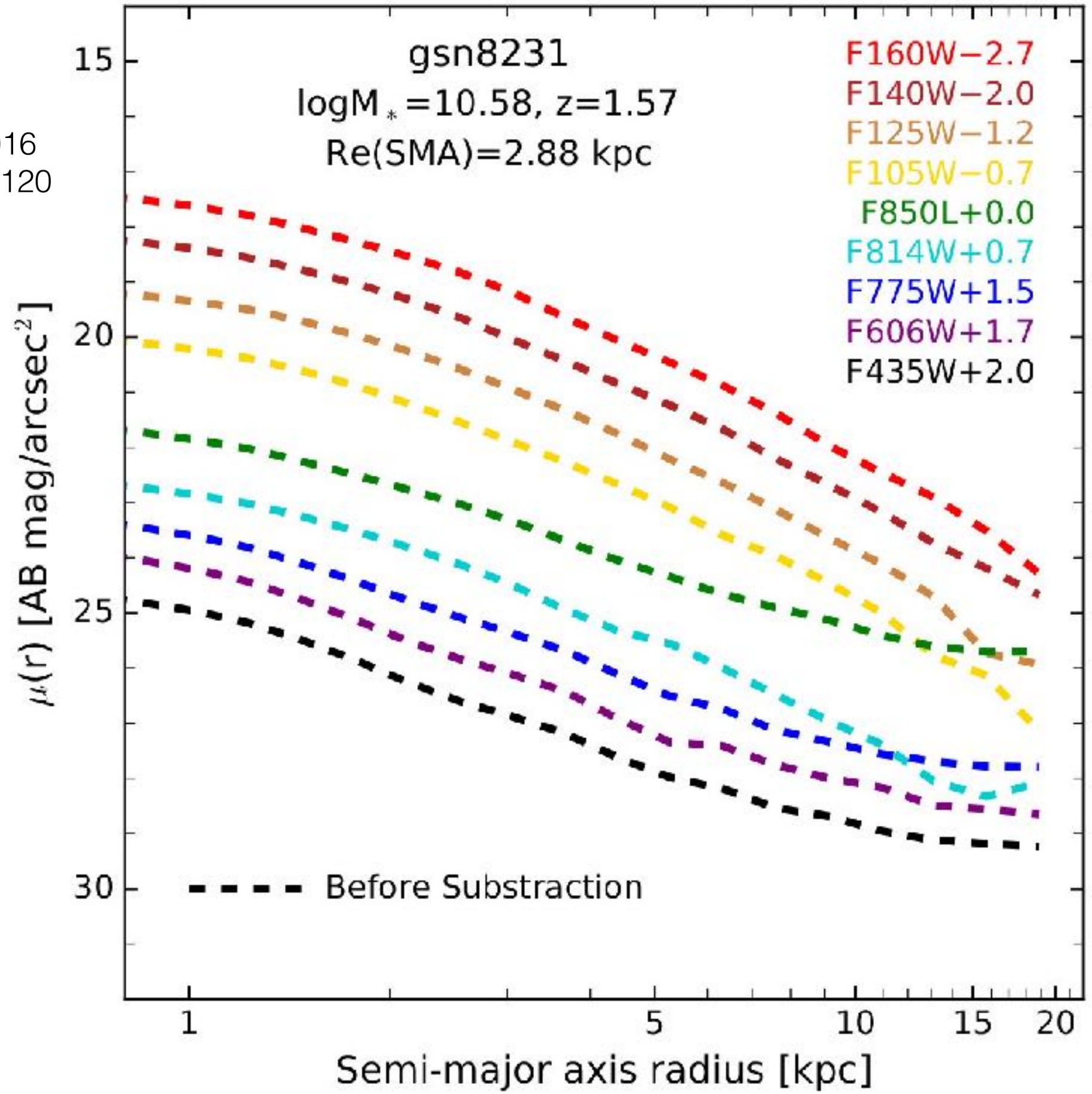


Barro+2016
ApJ, 820, 120



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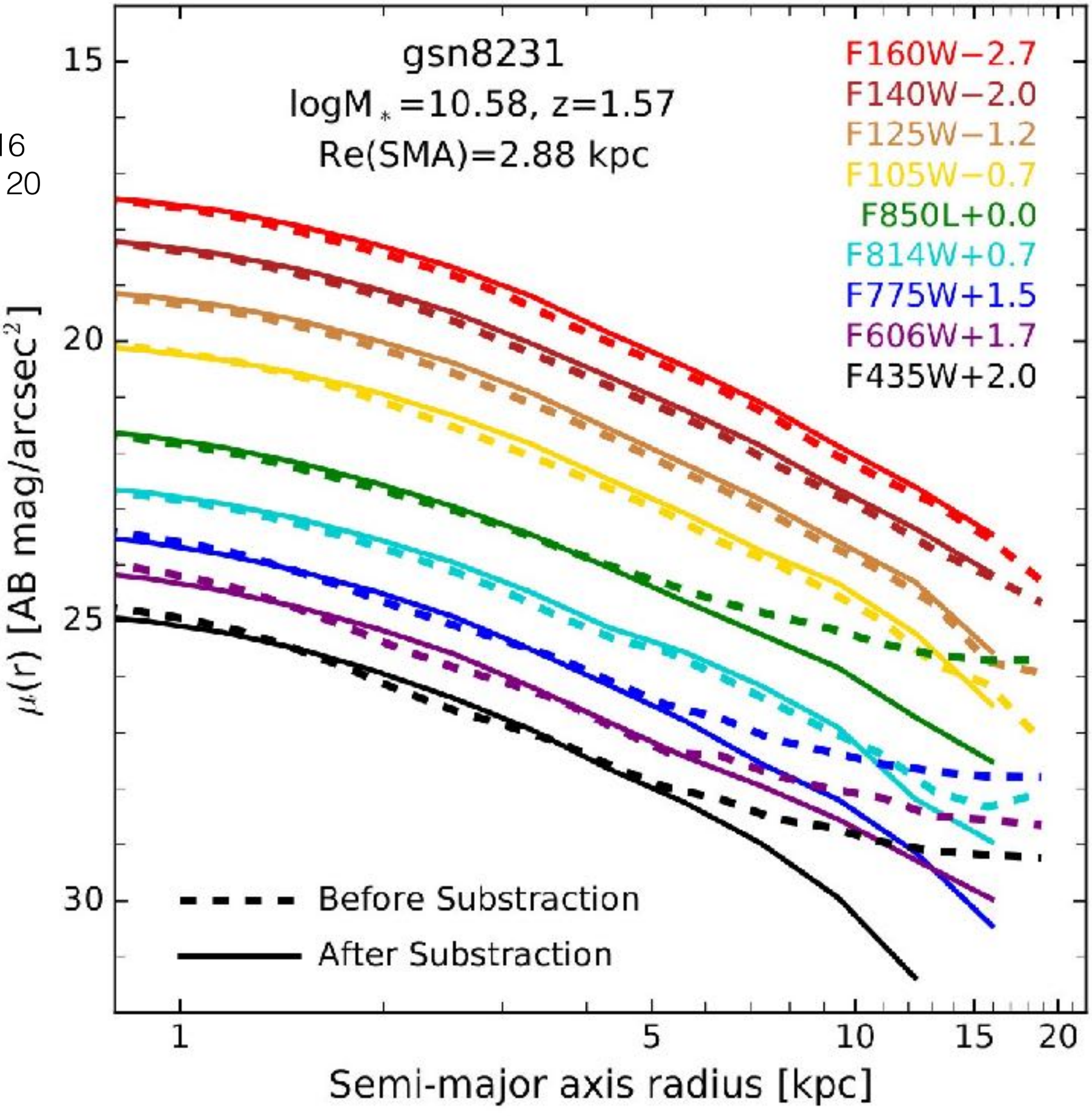
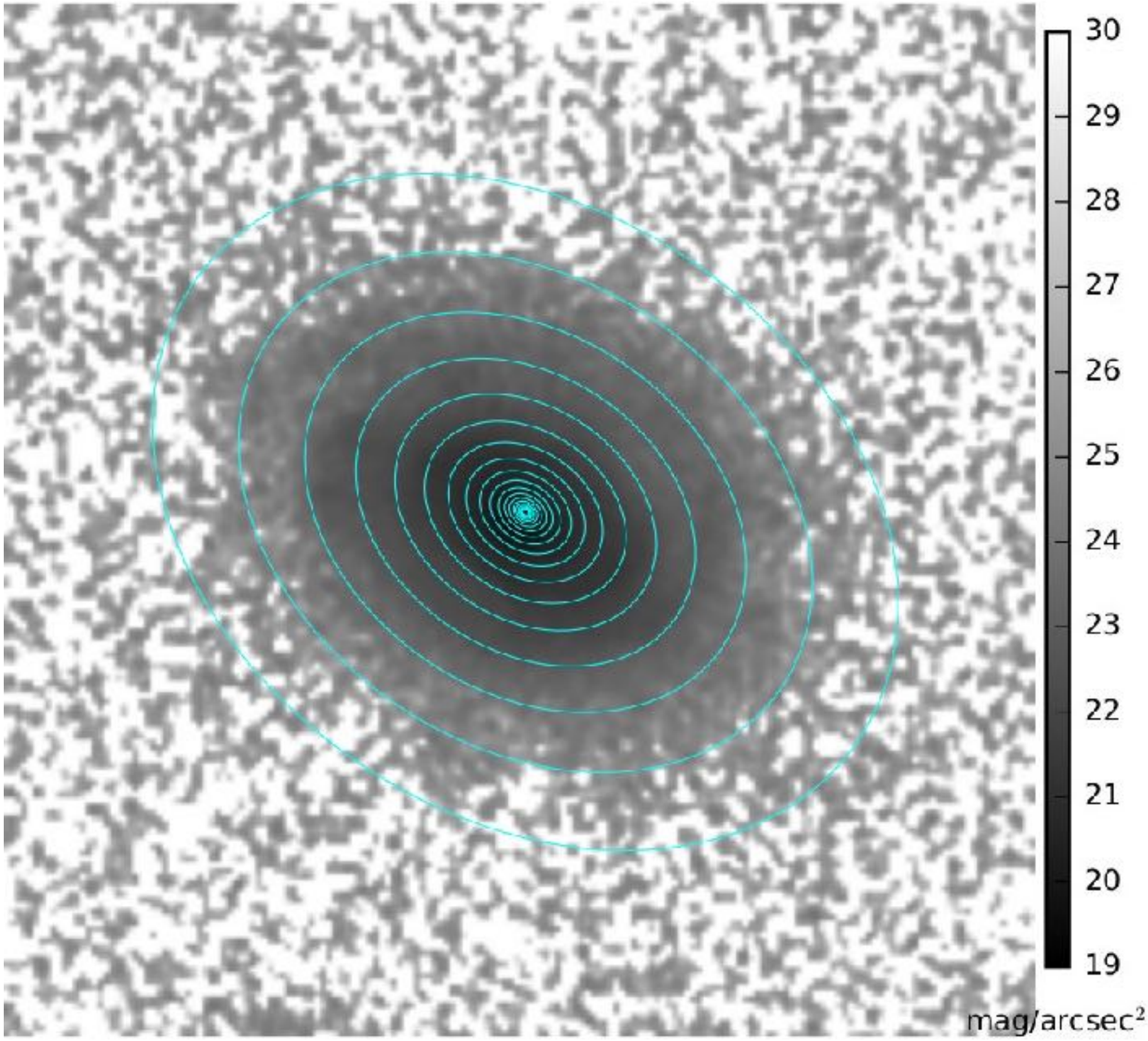
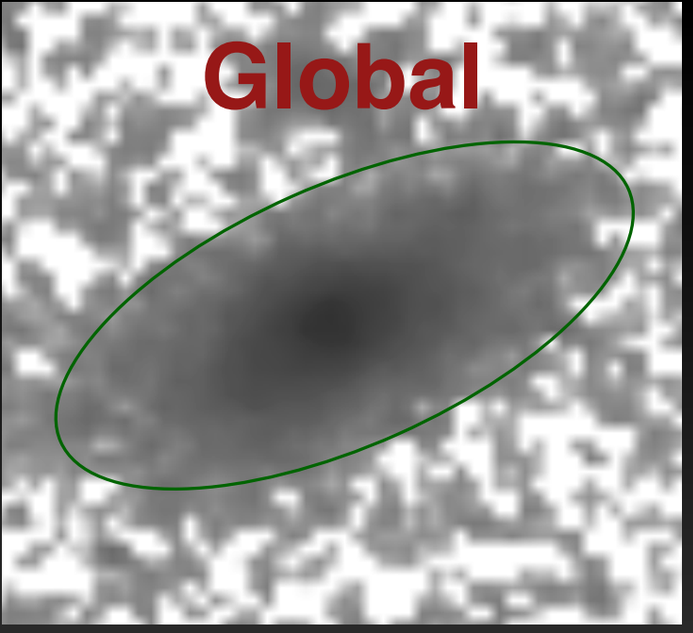


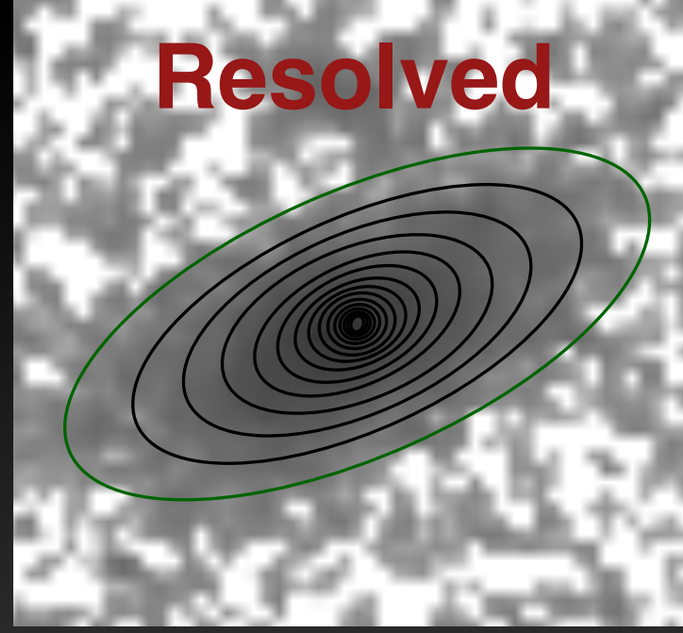
Applying a logarithmic step of 0.3 (*IRAF/Ellipse*, Jedrzejewski et al. 1987)





CANDELS-VAPC: HST Multi-Aperture Photometry Catalogs

(*Fengshan Liu, Dongfei Jiang, David C. Koo, S. M. Faber, Yicheng Guo, and CANDELS Team*)



Part I : Isophotal Aperture Photometry (Fourier Expansion)

Axis ratio, Boxy/Disky A_4, PAs,… as a function of radius (F160w and F125w)

Part II: Elliptical Aperture Photometry

(the fixed centre, axis ratio, and PA)

1. **Multi-wavelength surface brightness profiles**
2. **Rest-frame colour profiles from EAZY code**
3. **Stellar mass & SFR profiles from FAST code**
4. **Cumulative magnitude and mass profiles**

(GOODS-S & GOODS-N: 5 ACS + 4 WFC3 bands
UDS,COSMOS,EGS: 2 ACS + 3 WFC3 bands)

v0.8 available soon!

Shenyang Normal Univ.
& UC Santa Cruz

Contact: fengshan.liu@yahoo.com

Current catalogs

UDS	wide	v,i_{814} ,J, JH, H	23642/35932	v0.5
GOODS-S	deep,wide	B,V,i,i_{814}, z,Y_{105}, J, JH, H	21796/34930	v0.5
COSMOS	wide	v,i_{814} ,J, JH, H	18183/38671	v0.5
EGS	wide	v,i_{814} ,J, JH, H	24979/41457	v0.5
GOODS-N	deep,wide	B,V,i,i_{814}, z,Y_{105}, J, JH, H	23412/35445	v0.5

- CANDELS Value-Added Photometry Catalogs (CANDELS-VAPC): HST Multi-wavelength Multi-aperture Catalogs in all five CANDELS Fields (F. S. Liu et al. in preparation)

Access to v0.5:

https://www.dropbox.com/sh/ybhfm1qs8afkhwl/AAA9TQQ6u6eZAfVZuzibF9t-a?dl=0

What we have done & What we plan to do

1. Jiang Dongfei, Liu F. S., et al. 2017a, submitted to ApJ, “The Isophotal Structure of Star-Forming Galaxies at 0.5<z<1.8 in CANDELS: Tracing the Buildups of Central Bulges and Outer Stellar Halos”

2. Jiang Dongfei, Liu F. S., et al. 2017b, in preparation, “The Resolved Stellar Population of the Outskirts of Star-Forming Galaxies at z~1”

3. Jia Men, Liu F. S., et al. 2017, in preparation, “Spatially-resolved Star Formation and Structural Changes from the Blue Cloud to the Red Sequence at 0.5<z<1.4”

4. Liu F. S., Jiang Dongfei, Faber S. M., et al. 2017, ApJL, 844, 1, “The Origins of UV-optical Color Gradients in Star-forming Galaxies at z~2: Predominant Dust Gradients But Negligible sSFR Gradients”

5. Liu F. S., Jiang Dongfei, Guo Y., 2016, ApJL, 822, 25, “The UV-Optical Color Gradients in Star-forming Galaxies at 0.5 < z < 1.5: Origins and Link to Galaxy Assembly”

6. Wang Weichen, Faber S. M., Liu F. S., et al. 2017, MNRAS, 469, 4063, “UVI colour gradients of 0.4 < z < 1.4 star-forming main-sequence galaxies in CANDELS: dust extinction and star formation profiles”

7. Barro G., Faber S. M., Koo David C., et al. 2017, ApJ, 840, 47, “Structural and Star-forming Relations since z ~ 3: Connecting Compact Star-forming and Quiescent Galaxies”

8. Barro G., Faber S. M., Dekel Avishai, et al. 2016, 820, 120, “Caught in the Act: Gas and Stellar Velocity Dispersions in a Fast Quenching Compact Star-Forming Galaxy at z~1.7”

These spatially-resolved datasets would be potentially a valuable and new resource to study galaxy evolution over cosmic time with the CANDELS, which will be useful for a wide range of science!

Welcome to use!