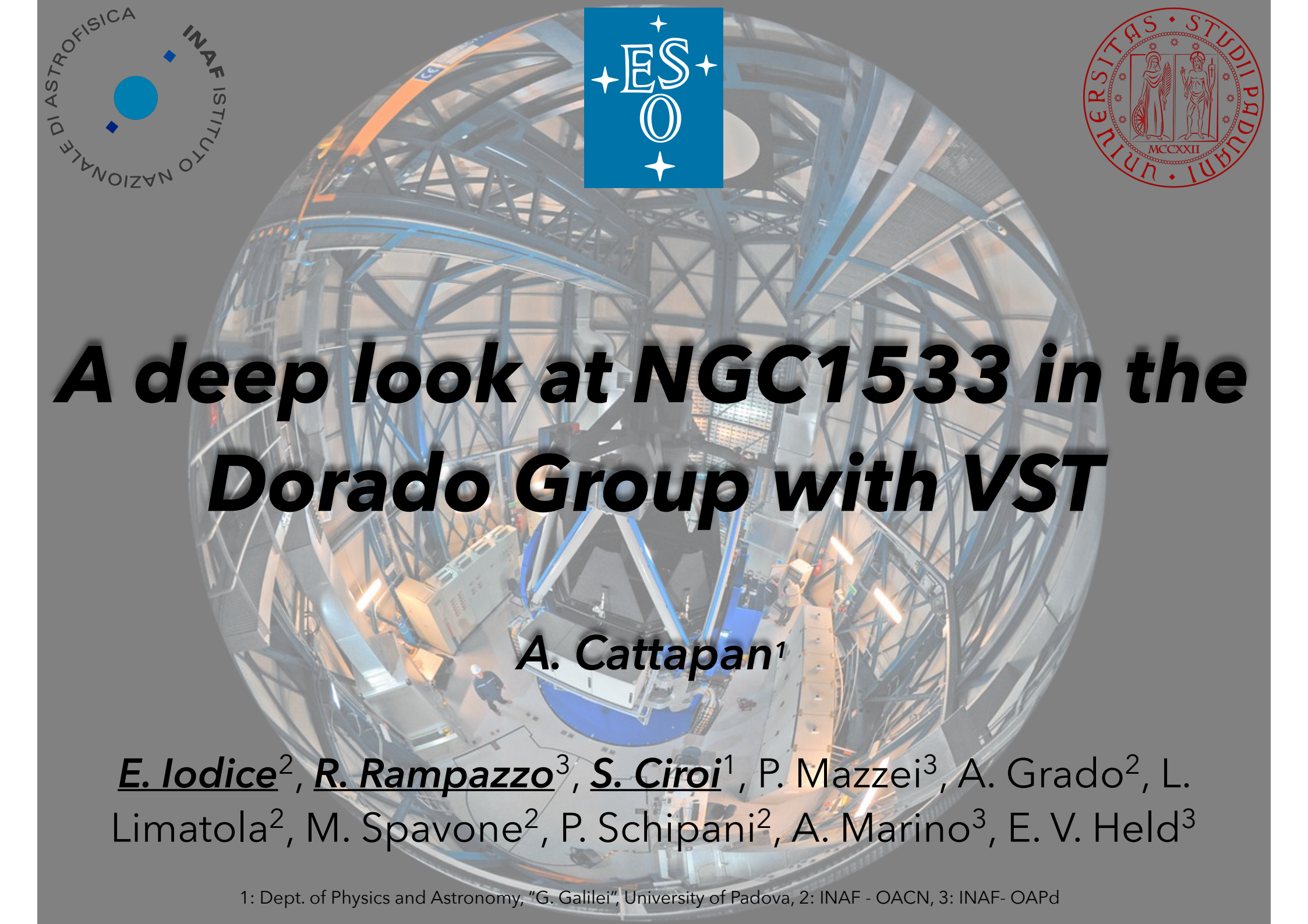


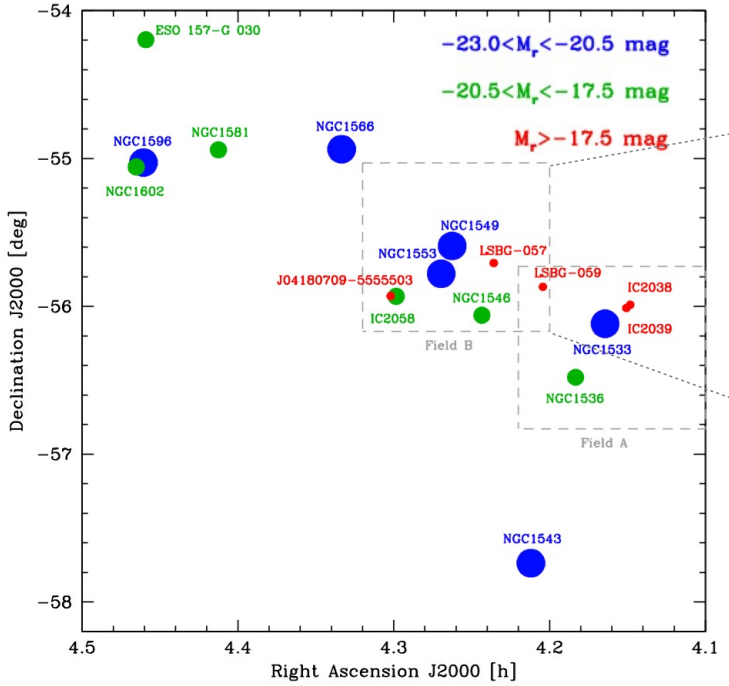
A deep look at NGC1533 in the Dorado Group with VST

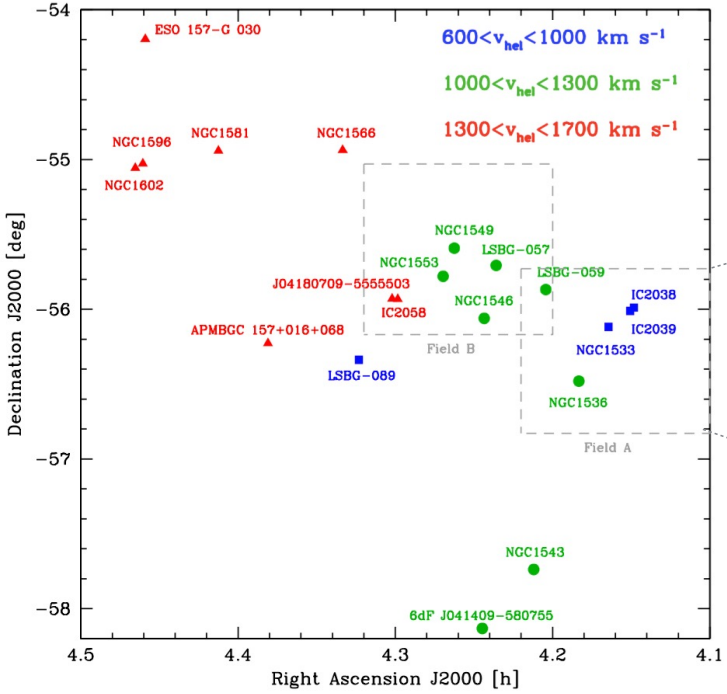
A. Cattapan[1]

E. Iodice[2], *R. Rampazzo*[3], *S. Ciroi*[1], P. Mazzei[3], A. Grado[2], L. Limatola[2], M. Spavone[2], P. Schipani[2], A. Marino[3], E. V. Held[3]

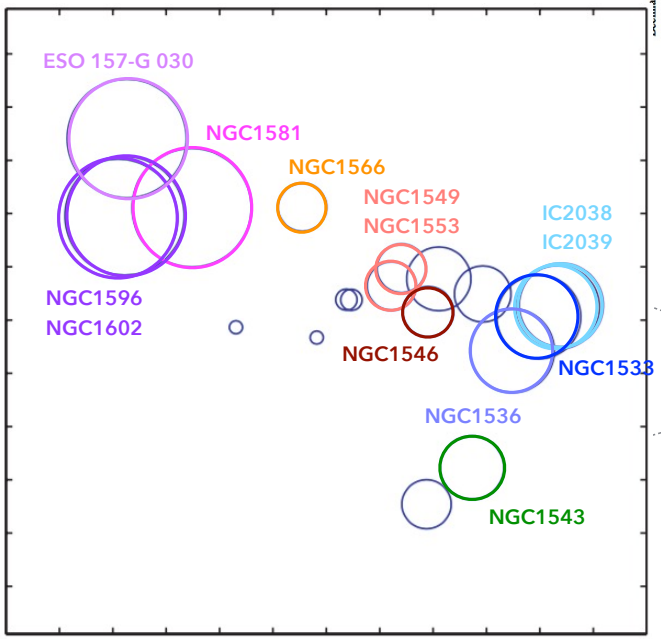
1: Dept. of Physics and Astronomy, "G. Galilei", University of Padova, 2: INAF - OACN, 3: INAF- OAPd

Dorado Group

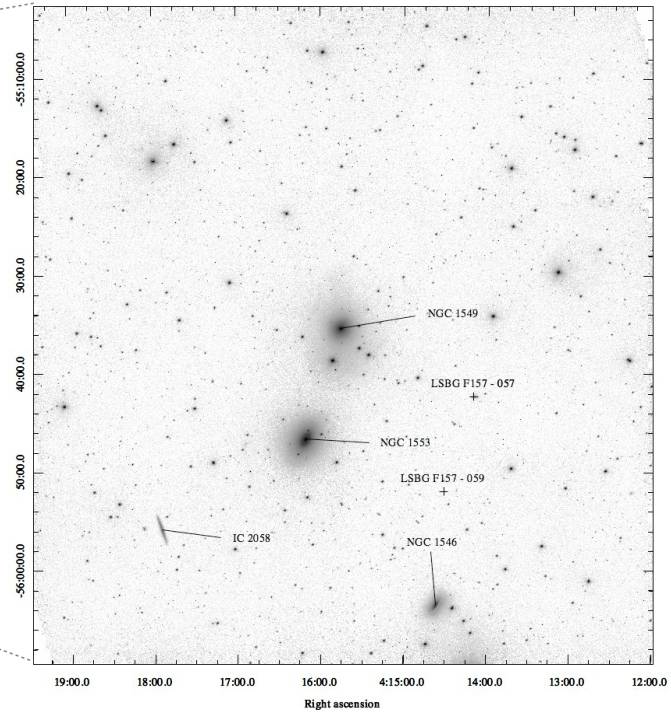


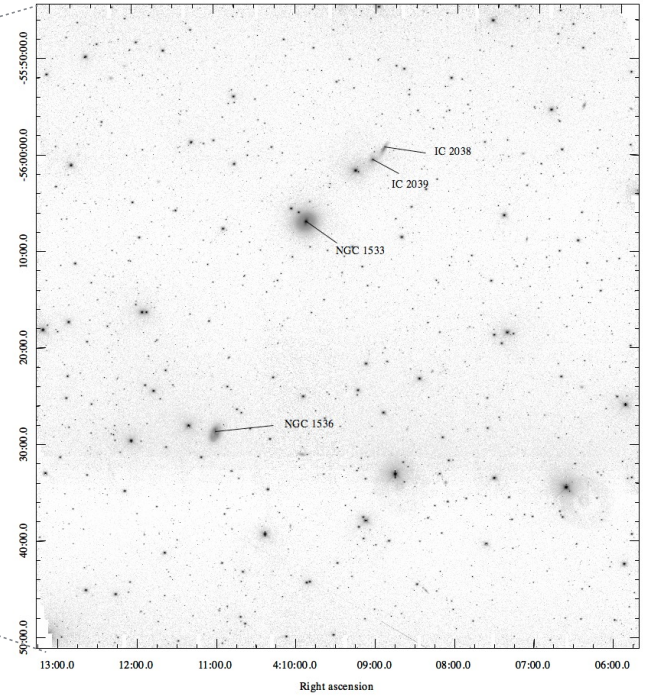


Bubble plots from the Dressler-Shectman test

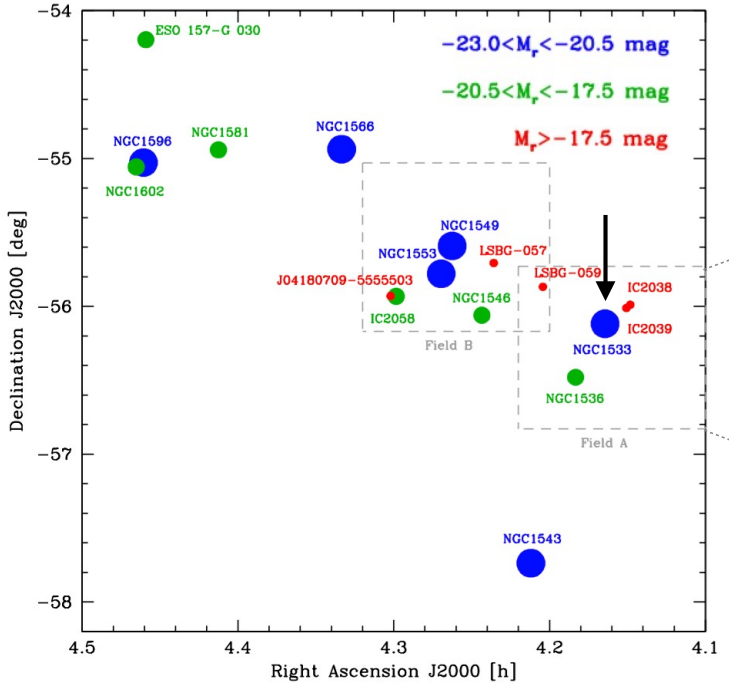


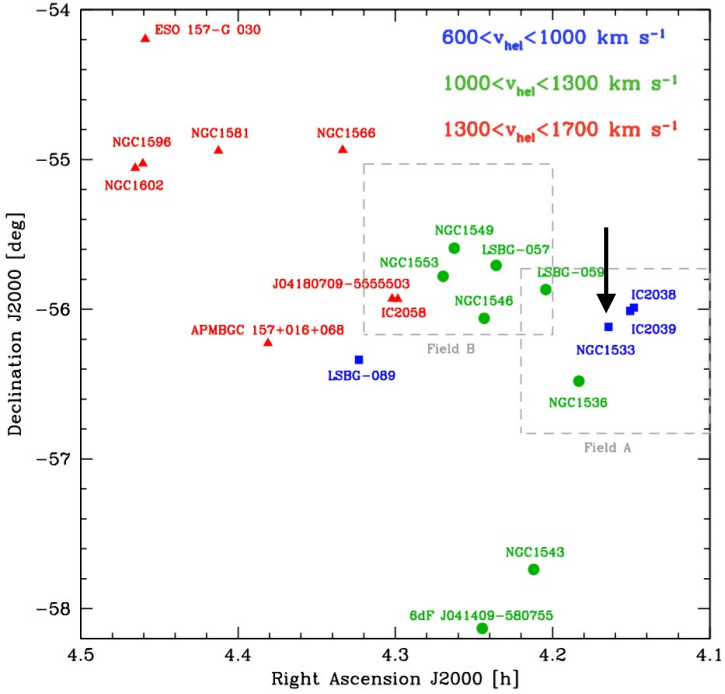
Firth et al. 2006



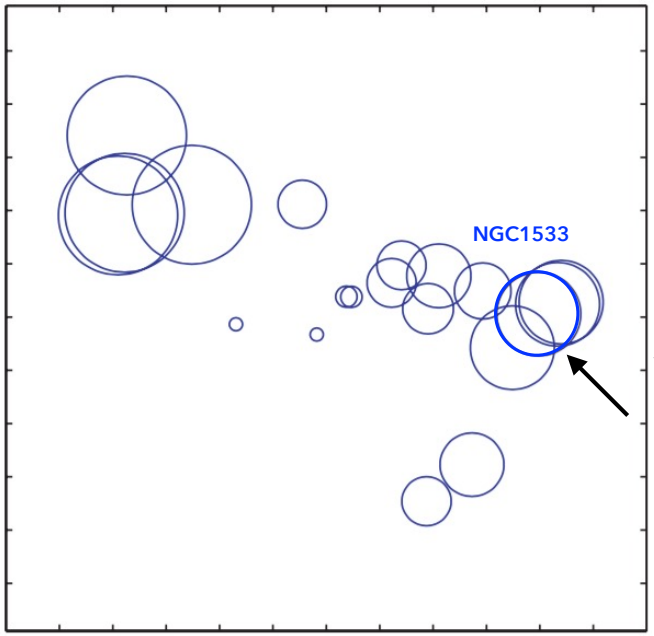


VEGAS target - NGC 1533

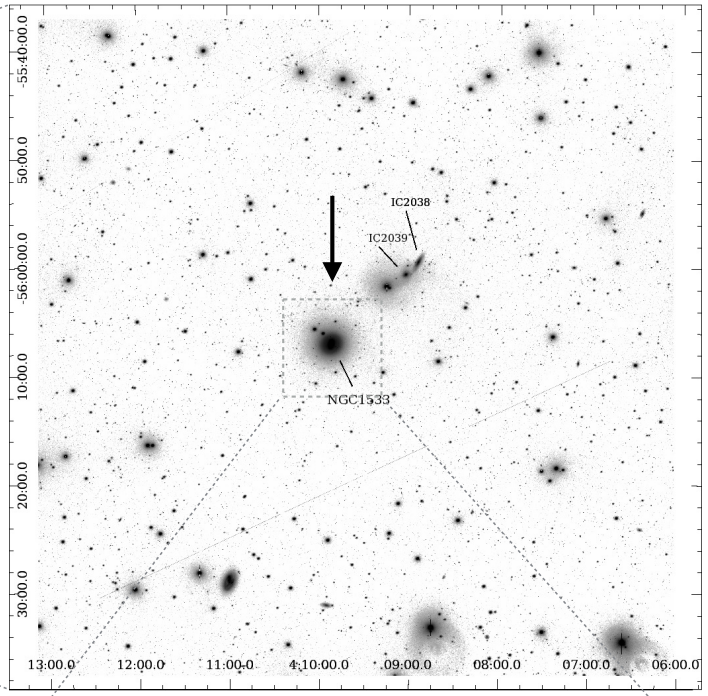


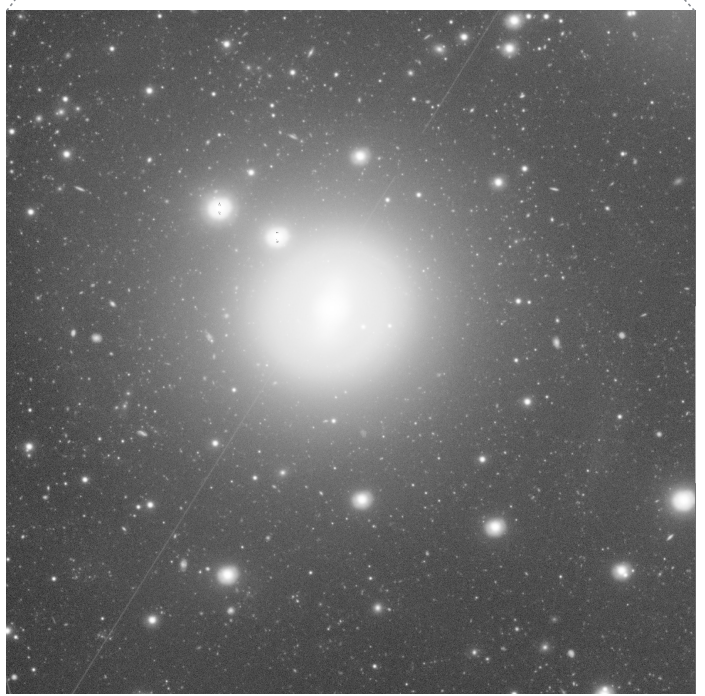


Bubble plots from the Dressler-Shectman test



Firth et al. 2006





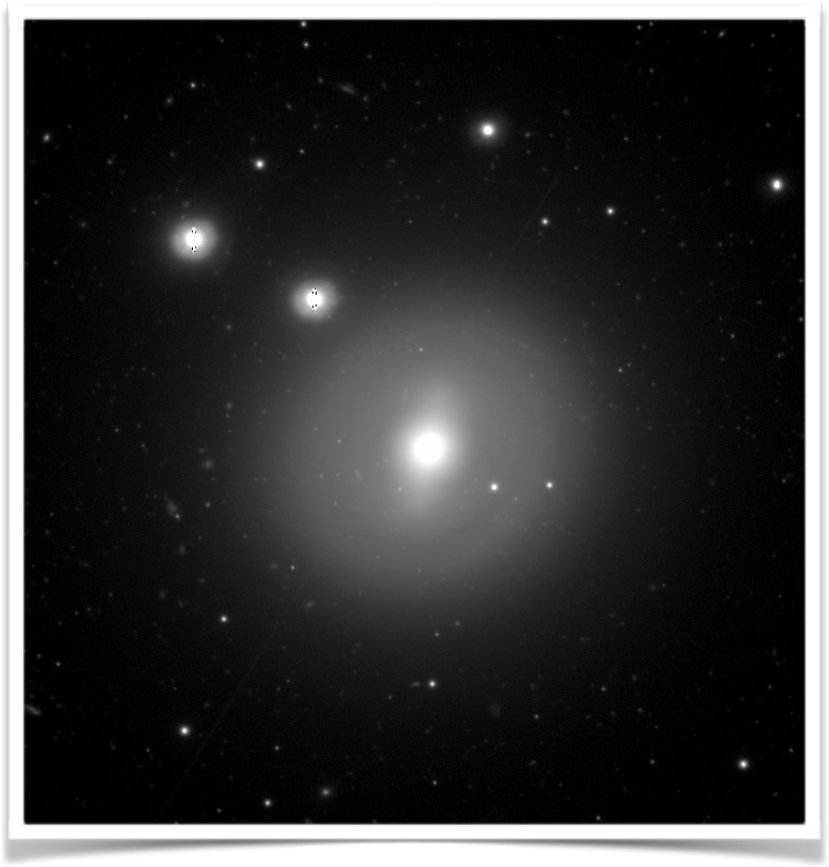
VEGAS target - NGC 1533

RA [h:m:s]	Dec [°:':'']	v_{hel} [km s^{-1}]	z
04:09:51.8	-56:07:06	790±5	0.002635±0.000017

Firth et al. 2006

Outline

1. *Previous works*
2. *Photometry*
3. *Decomposition*
4. *Conclusion*



g band image from VST

ARRAKIS classification:

(RL)SB0⁰

Comerón et al. (2014)

Band (SDSS)	RA pointing [deg]	Dec pointing [deg]	T_{exp} [s]	FWHM [arcsec]	Combined frames
g	62.444	-56.101	7800	0.7893	26
r	62.289	-56.114	4800	0.7852	16

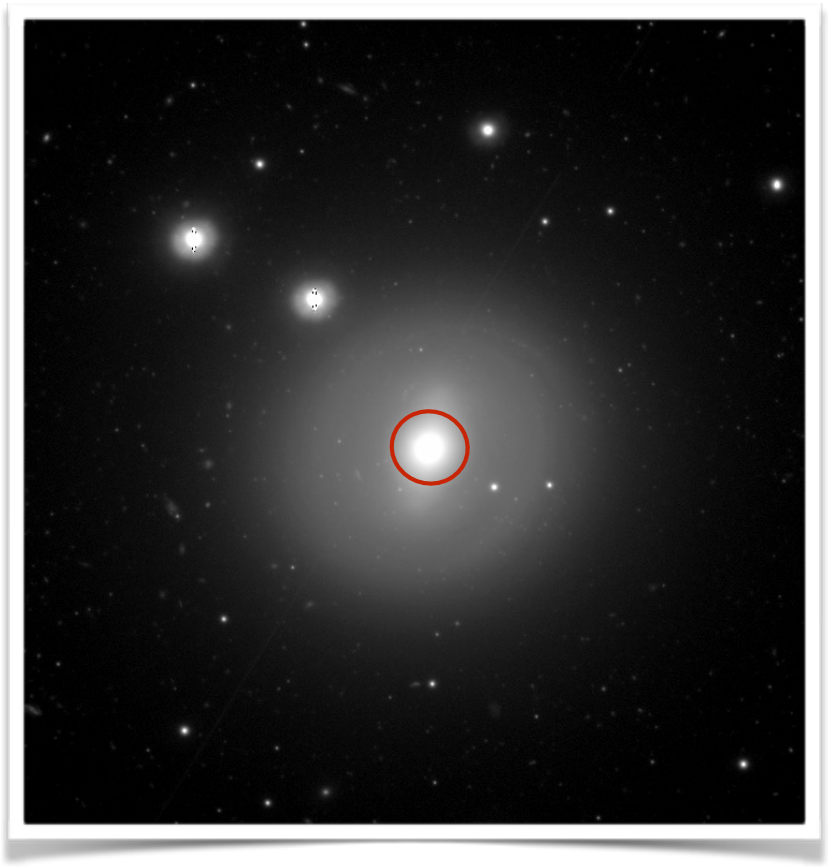
VEGAS target - NGC 1533

RA [h:m:s]	Dec [°:':'']	v_{hel} [km s^{-1}]	z
04:09:51.8	-56:07:06	790±5	0.002635±0.000017

Firth et al. 2006

Outline

1. *Previous works*
2. *Photometry*
3. *Decomposition*
4. *Conclusion*



g band image from VST

ARRAKIS classification:

$(RL)SB0^0$

Comerón et al. (2014)

Band (SDSS)	RA pointing [deg]	Dec pointing [deg]	T_{exp} [s]	FWHM [arcsec]	Combined frames
g	62.444	-56.101	7800	0.7893	26
r	62.289	-56.114	4800	0.7852	16

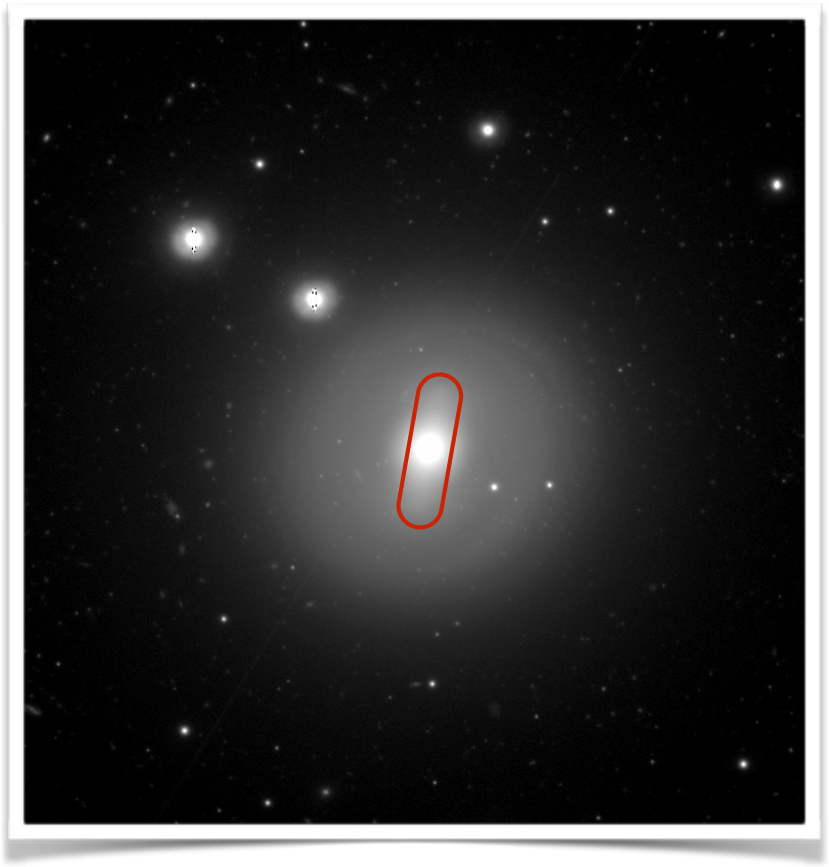
VEGAS target - NGC 1533

RA [h:m:s]	Dec [°:':'']	v_{hel} [km s^{-1}]	z
04:09:51.8	-56:07:06	790±5	0.002635±0.000017

Firth et al. 2006

Outline

1. *Previous works*
2. *Photometry*
3. *Decomposition*
4. *Conclusion*



g band image from VST

ARRAKIS classification:

(RL)SB0⁰

Comerón et al. (2014)

Band (SDSS)	RA pointing [deg]	Dec pointing [deg]	T_{exp} [s]	FWHM [arcsec]	Combined frames
g	62.444	-56.101	7800	0.7893	26
r	62.289	-56.114	4800	0.7852	16

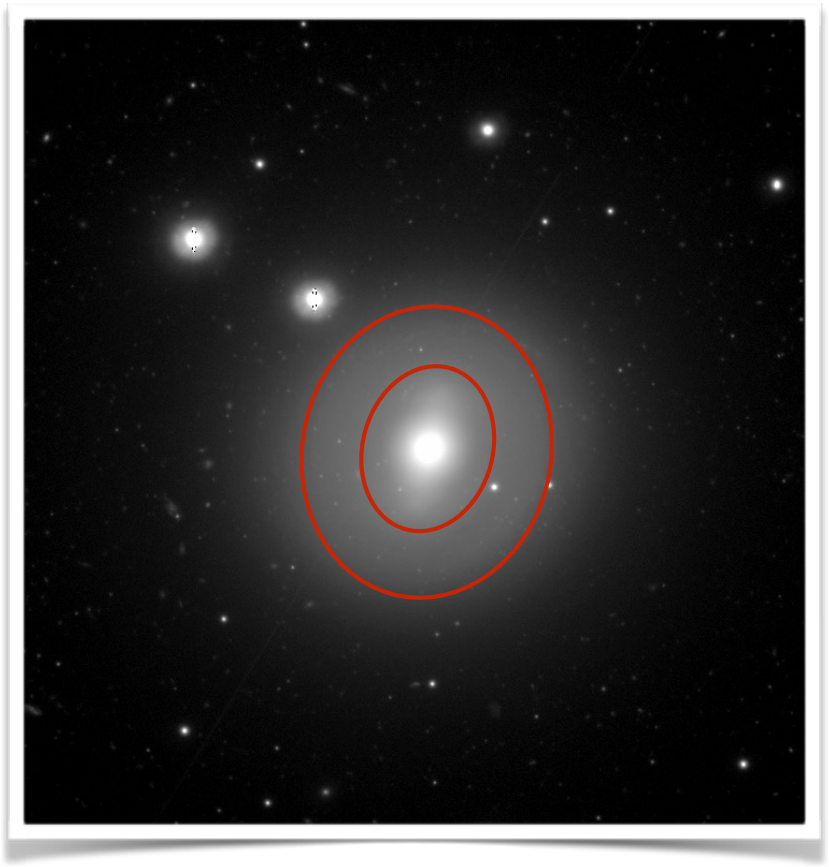
VEGAS target - NGC 1533

RA [h:m:s]	Dec [°:':'']	v_{hel} [km s^{-1}]	z
04:09:51.8	-56:07:06	790±5	0.002635±0.000017

Firth et al. 2006

Outline

1. *Previous works*
2. *Photometry*
3. *Decomposition*
4. *Conclusion*



g band image from VST

ARRAKIS classification:

(RL)SB0⁰

Comerón et al. (2014)

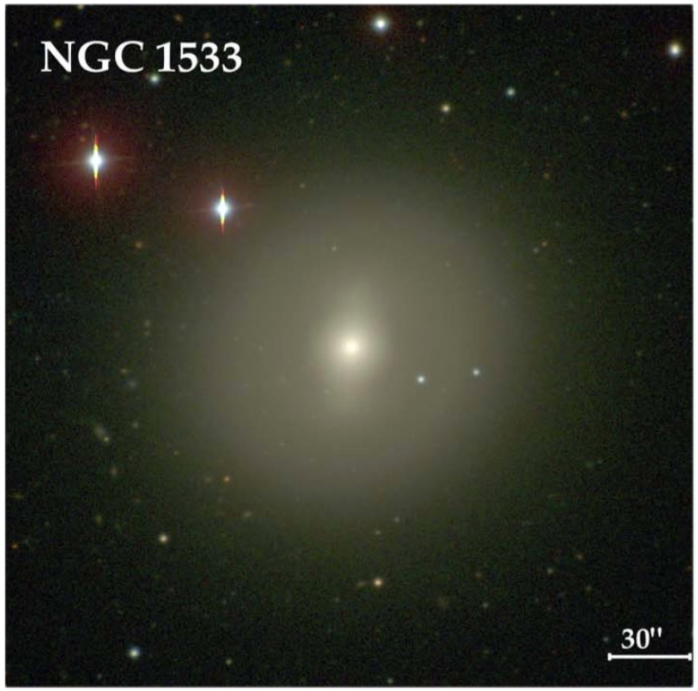
Band (SDSS)	RA pointing [deg]	Dec pointing [deg]	T_{exp} [s]	FWHM [arcsec]	Combined frames
g	62.444	-56.101	7800	0.7893	26
r	62.289	-56.114	4800	0.7852	16

From imaging previous works



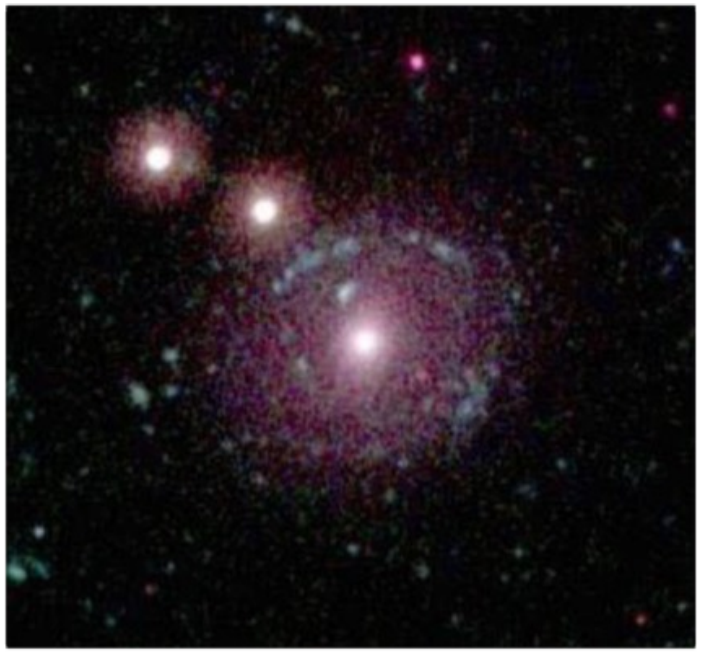
Direct K_s-band ($\lambda \sim 2.15\mu m$) image from NTT, image is in units of mag arcsec^{-2} and is displayed from μ_{Ks}=12.0 to 22.0 mag arcsec^{-2}. FoV=4′x4′

Laurikainen et al. 2006



du Pont telescope image, stacked image from Johnson B and V and Kron-Cousins R and I filters. FoV=4′.8x4′.8

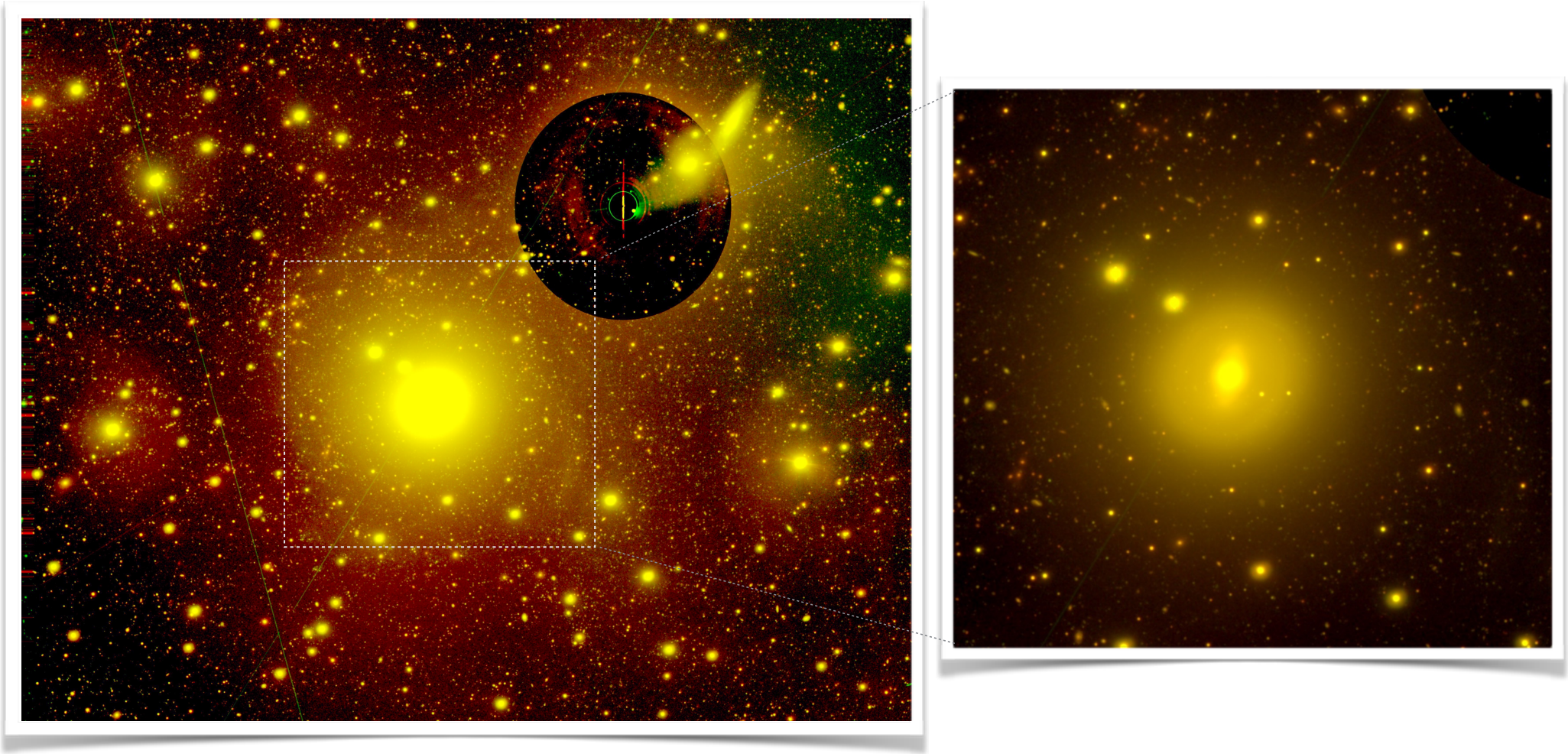
Ho et al. 2011



Swift-UVOT image, color composite image in the W2 (blue), M2 (green) and W1 (red) filters. FoV=5′x5′

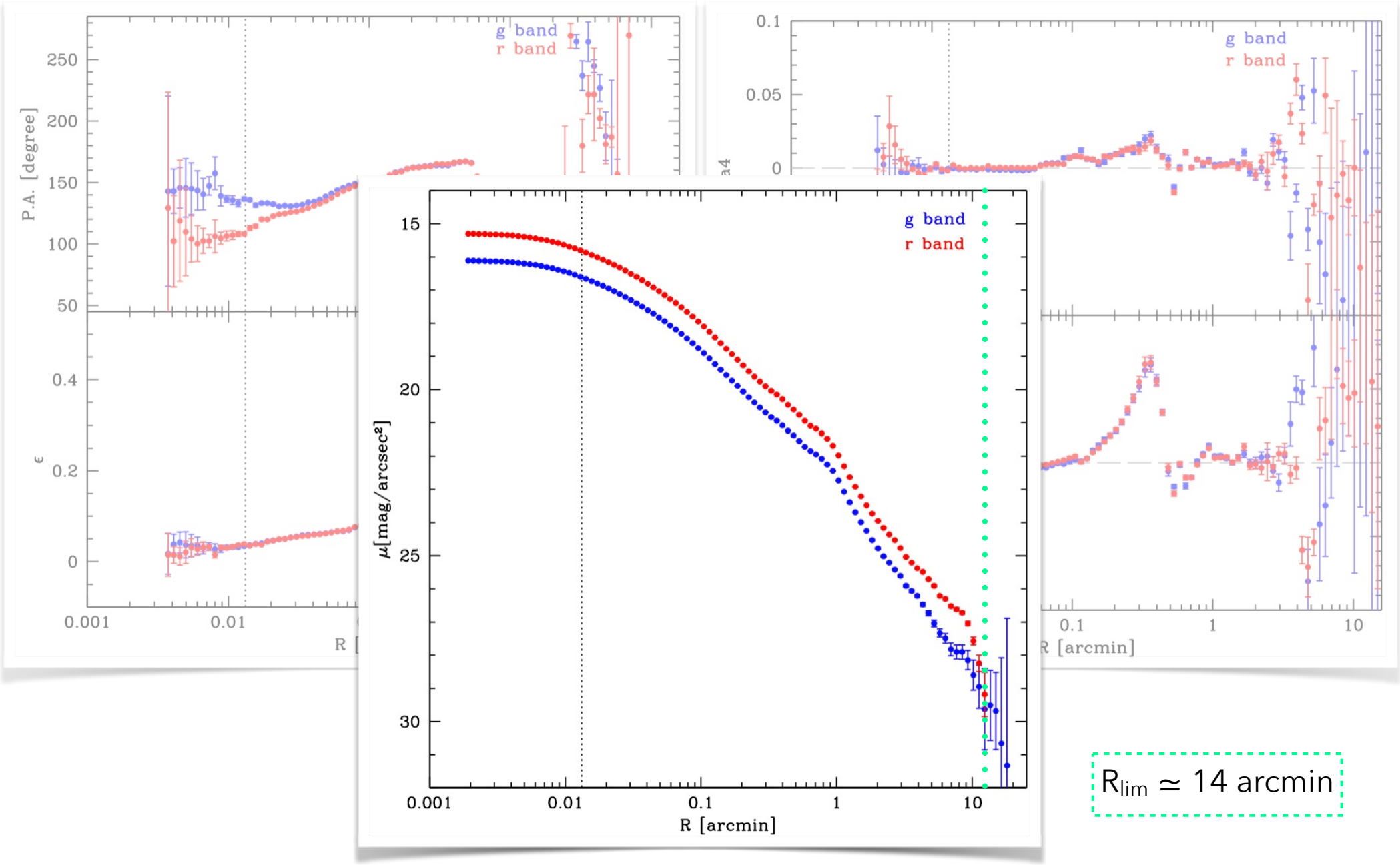
Rampazzo et al. 2017

Imaging with VST



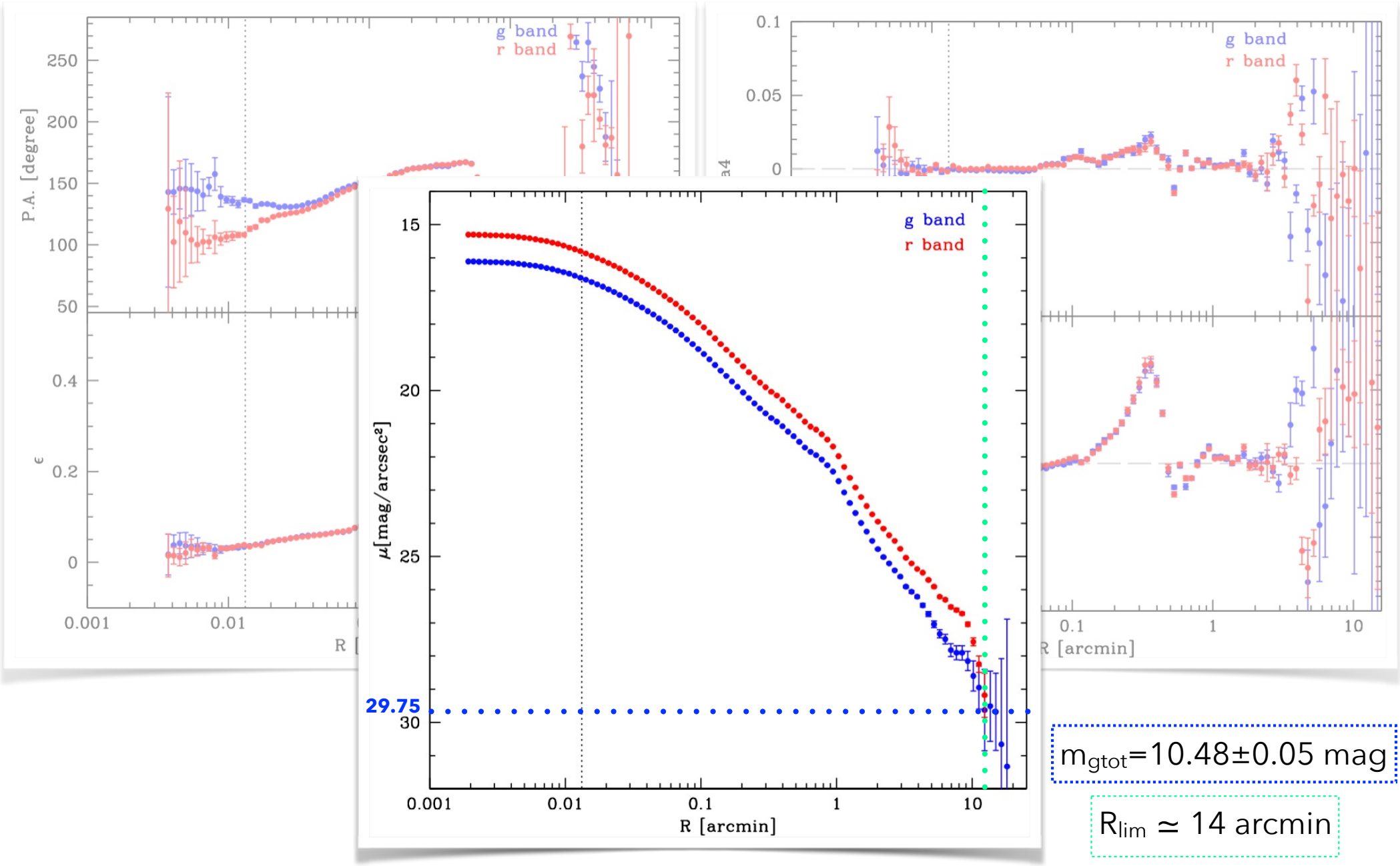
Colour composite image from g (green channel) and r (red channel) band VST image, 24.15x18.9 arcmin.

Photometry - Surface Brightness Profile



$R_{lim} \simeq 14$ arcmin

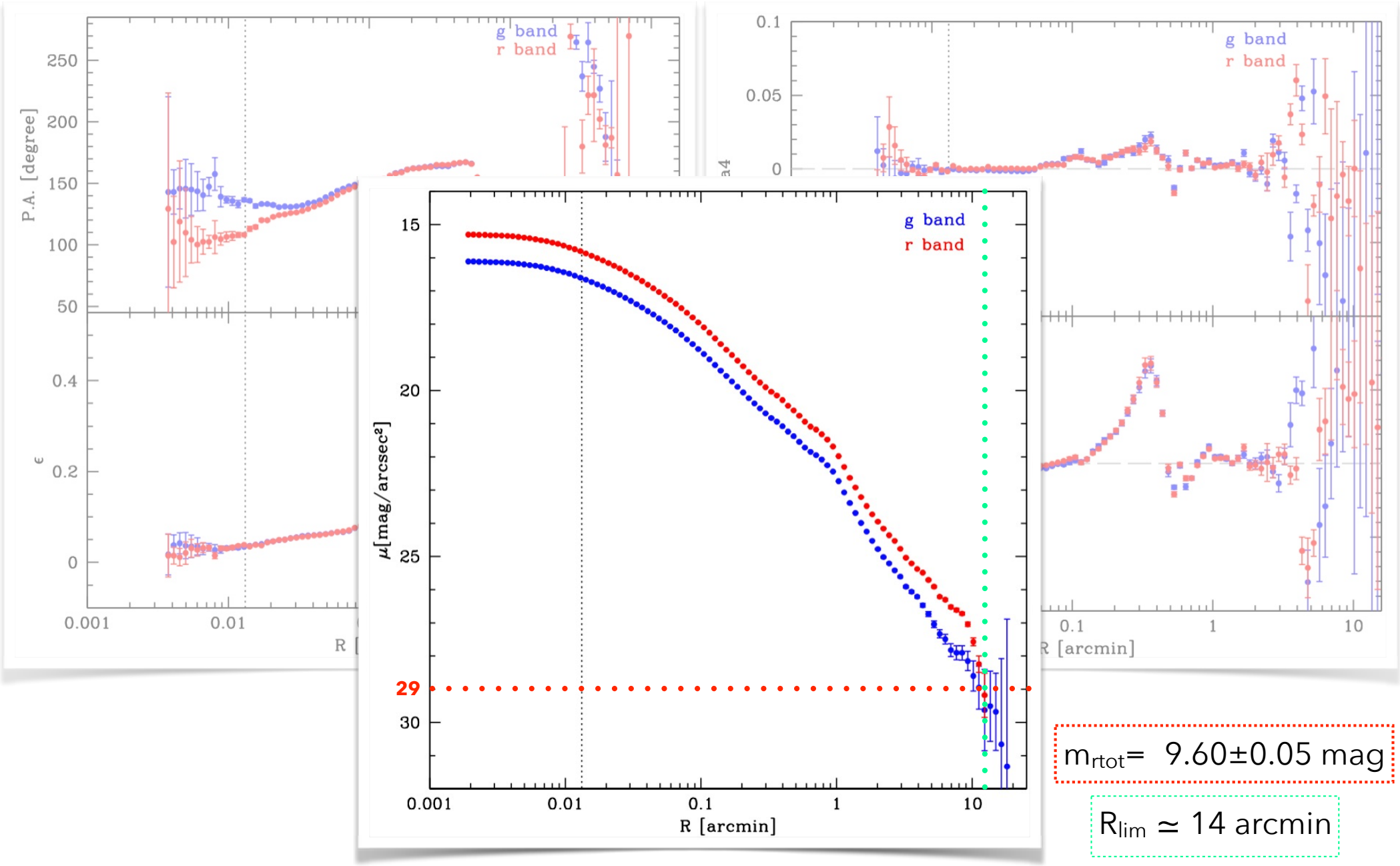
Photometry - Surface Brightness Profile



m_{gtot}=10.48±0.05 mag

$R_{lim} \simeq$ 14 arcmin

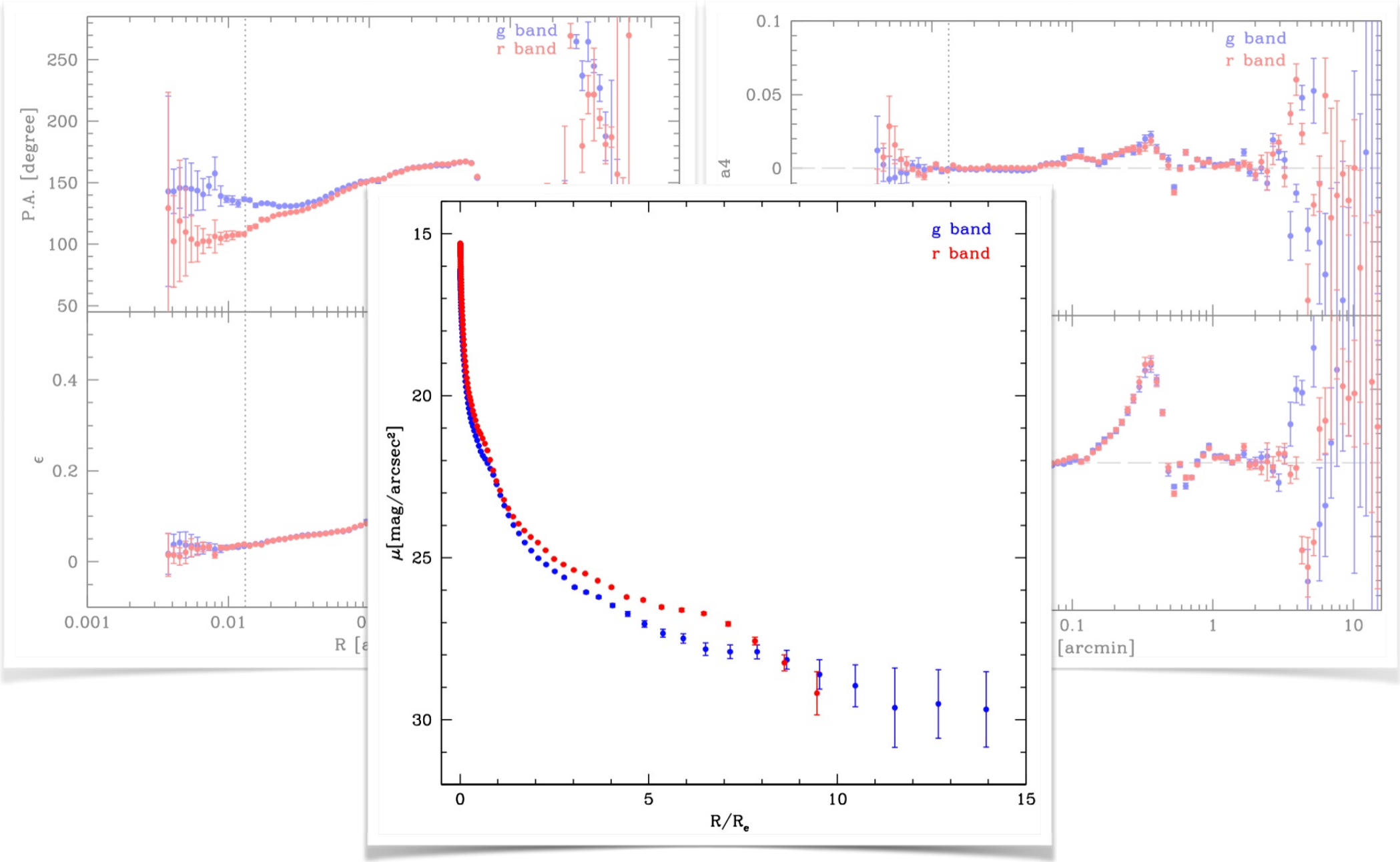
Photometry - Surface Brightness Profile



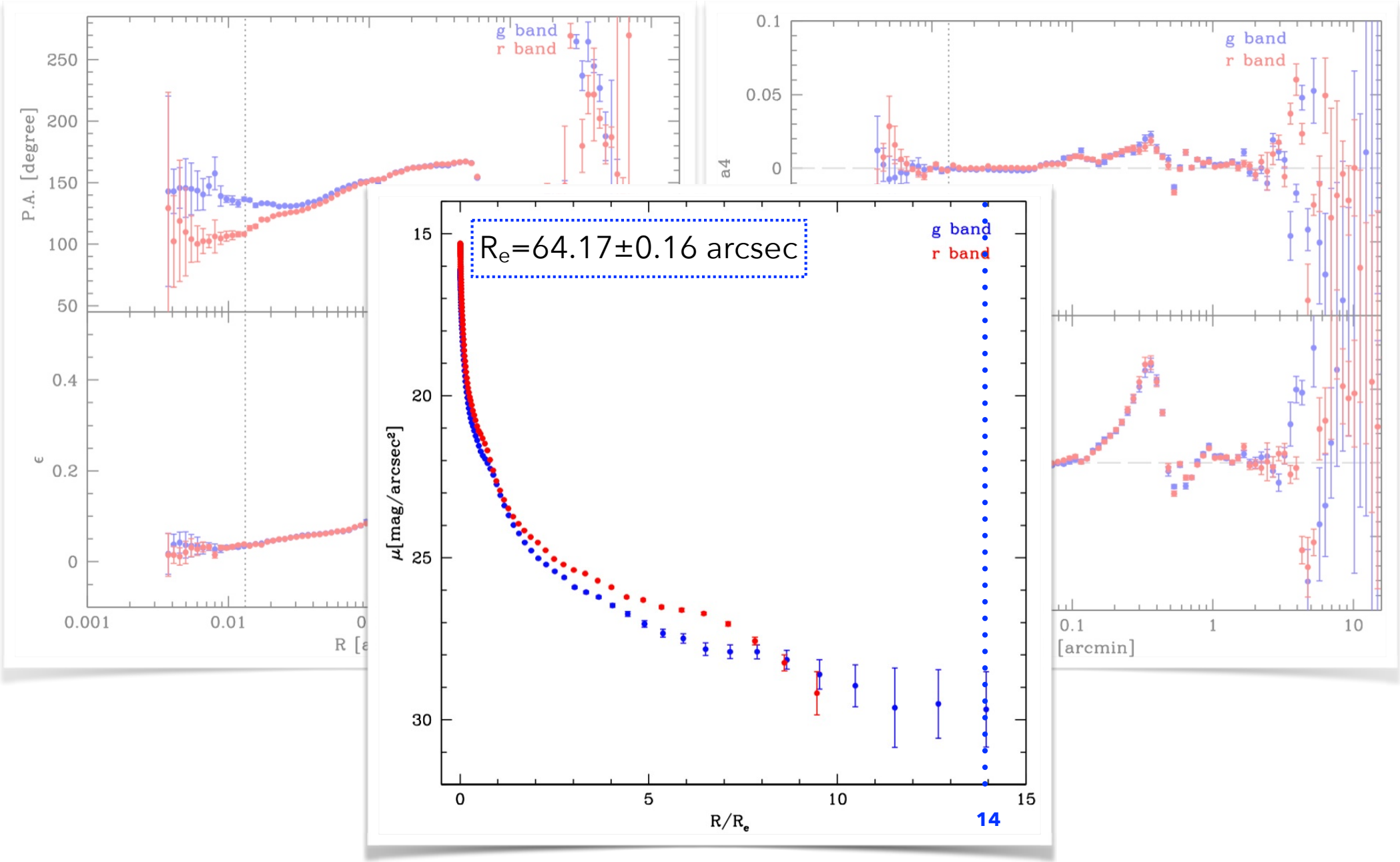
m_{rtot}= 9.60±0.05 mag

$R_{lim} \simeq$ 14 arcmin

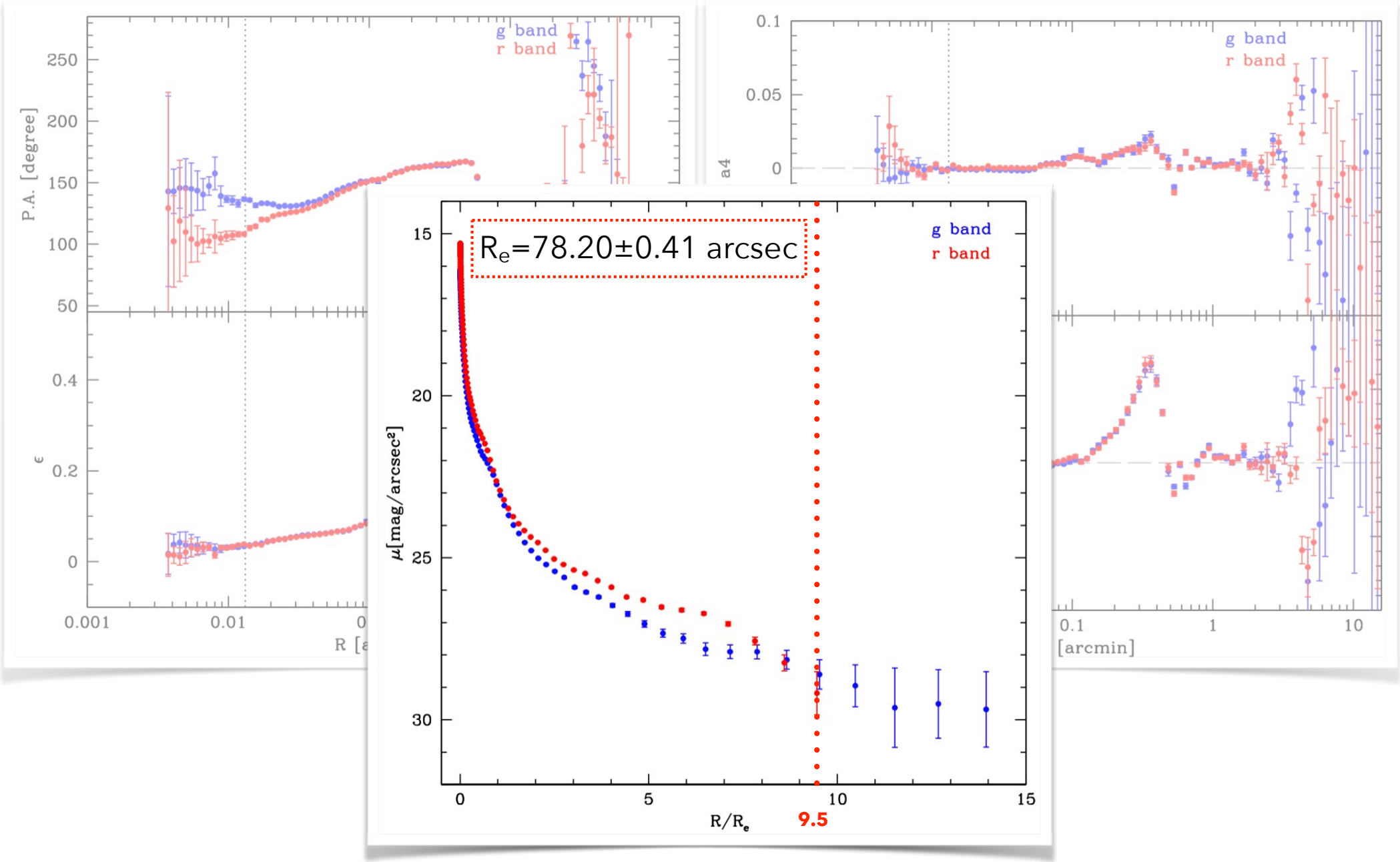
Photometry - Surface Brightness Profile



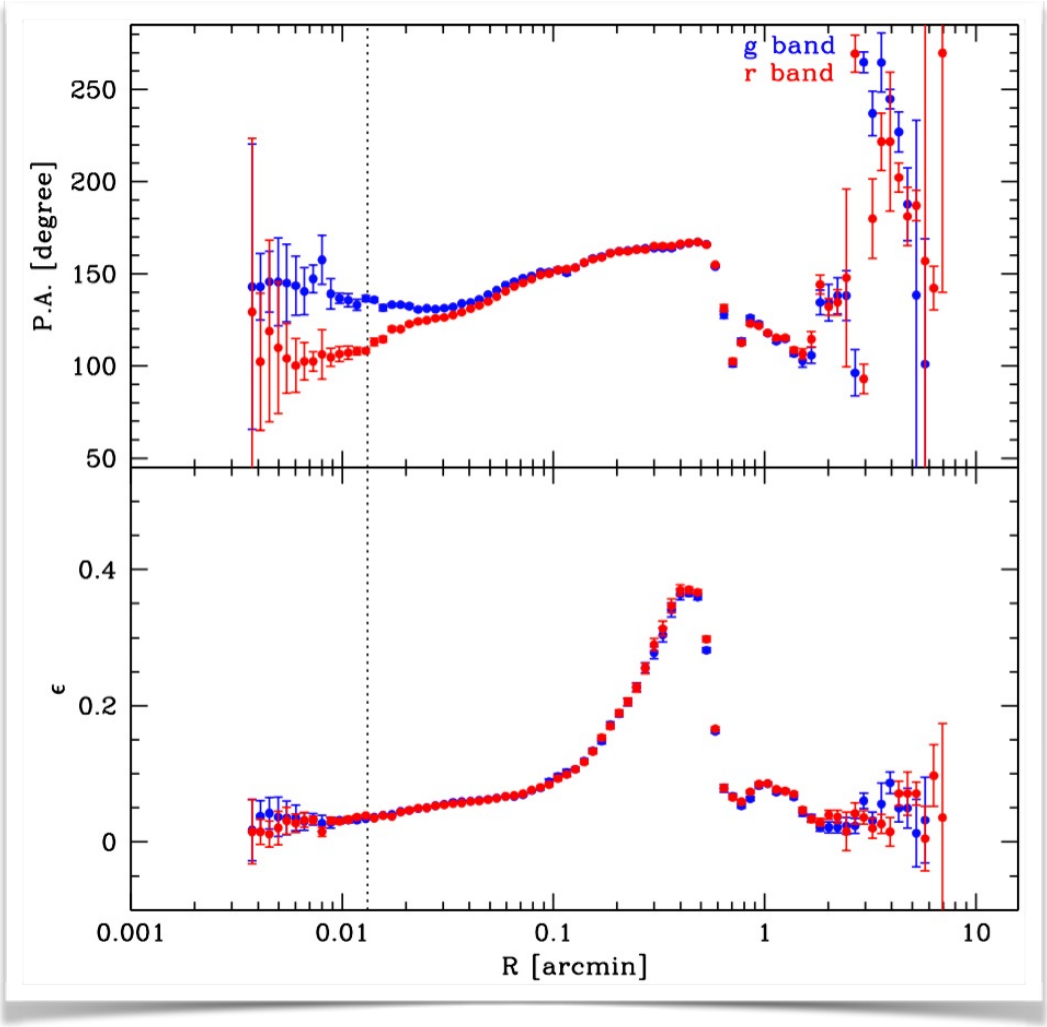
Photometry - Surface Brightness Profile

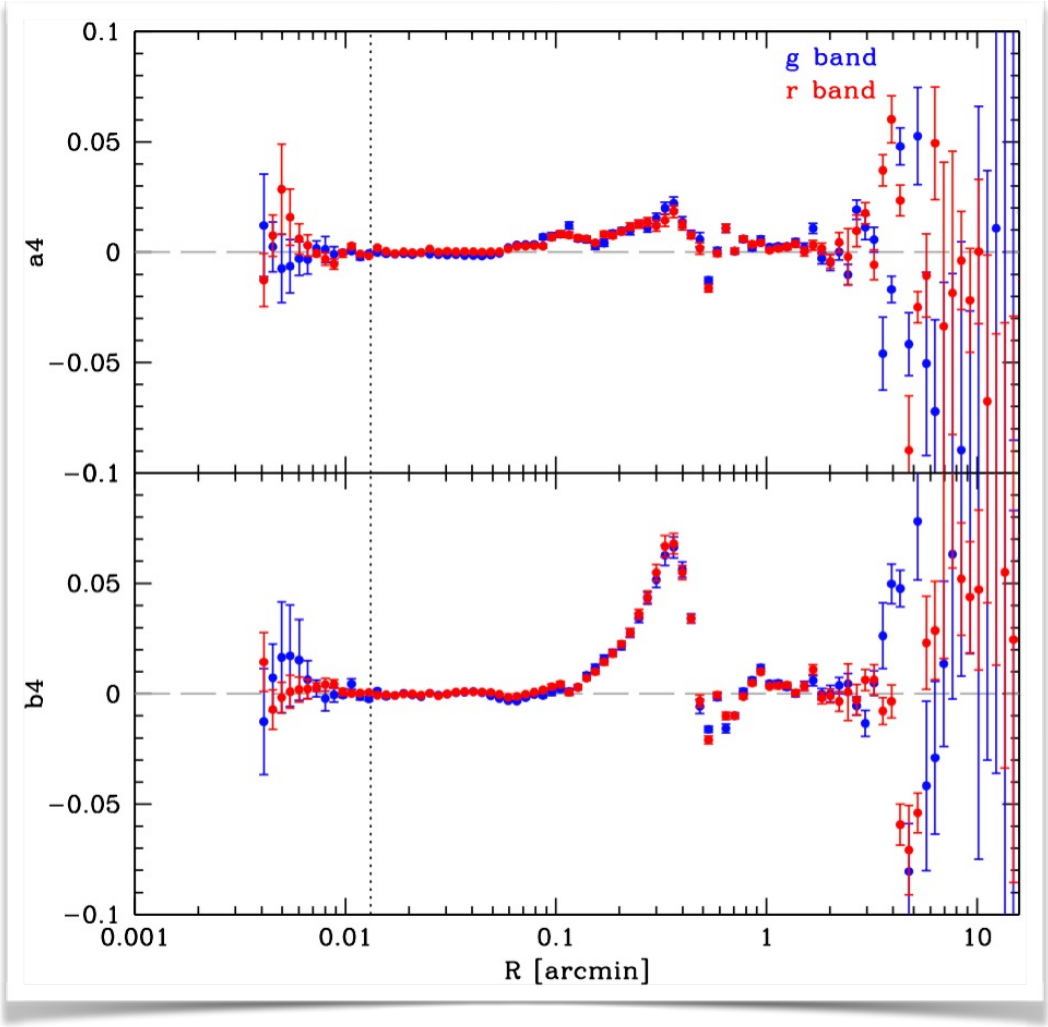


Photometry - Surface Brightness Profile



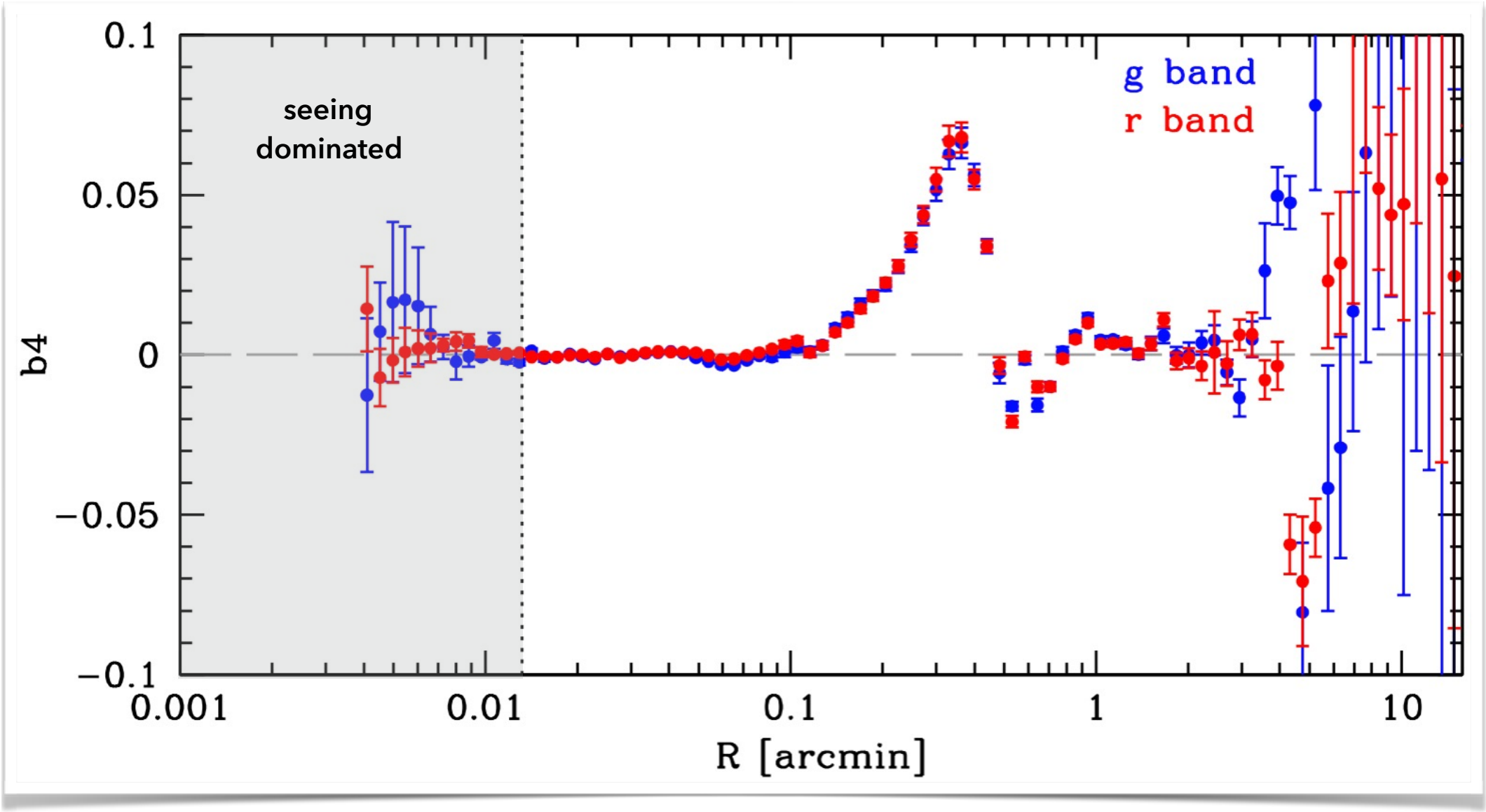
Photometry - Geometrical Parameters





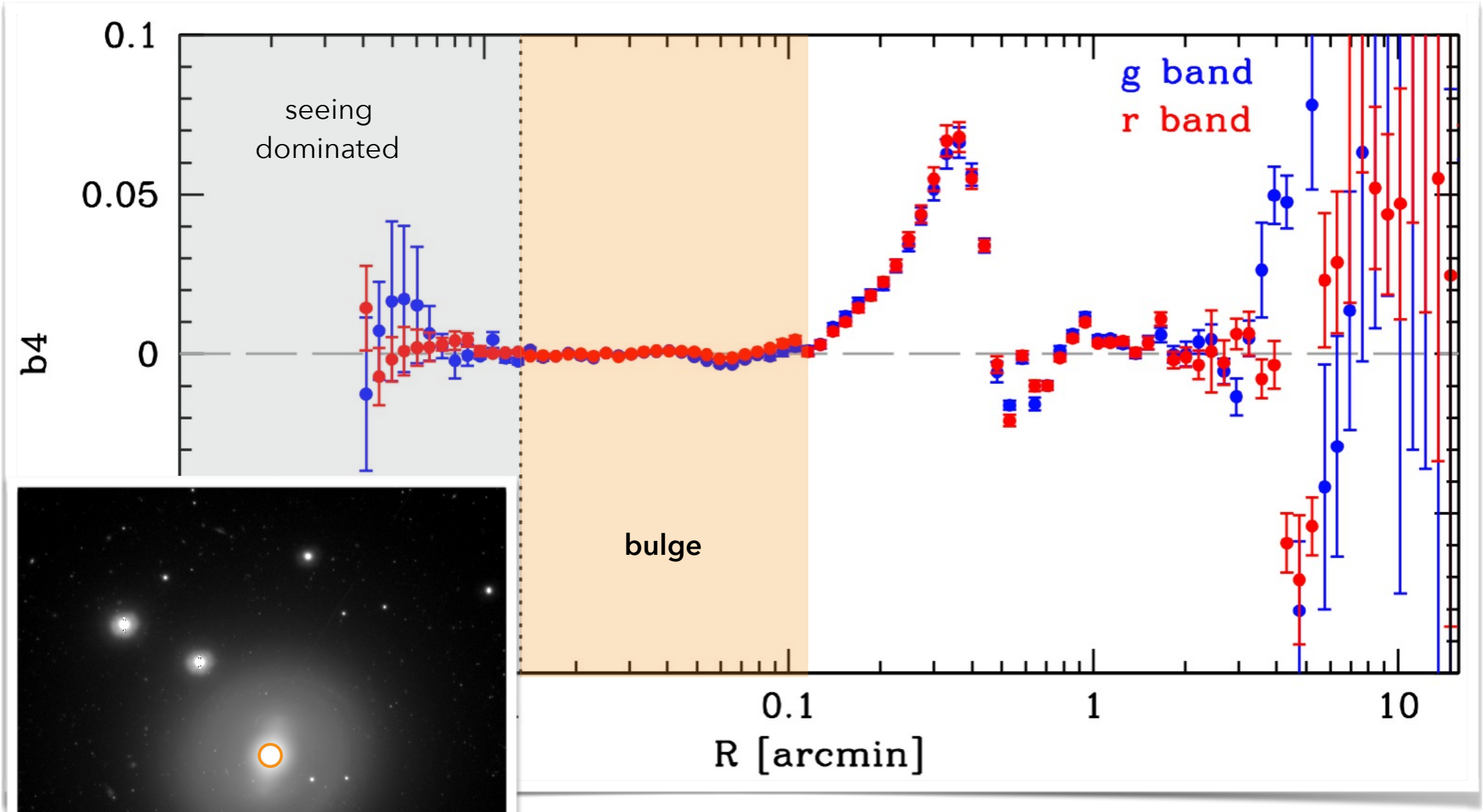
Jedrzejezski, 1987: $I(\alpha,\vartheta) = I_0 + \sum_k \left[a_k \sin(k\vartheta) + b_k \cos(k\vartheta) \right]$

Photometry - Geometrical Parameters



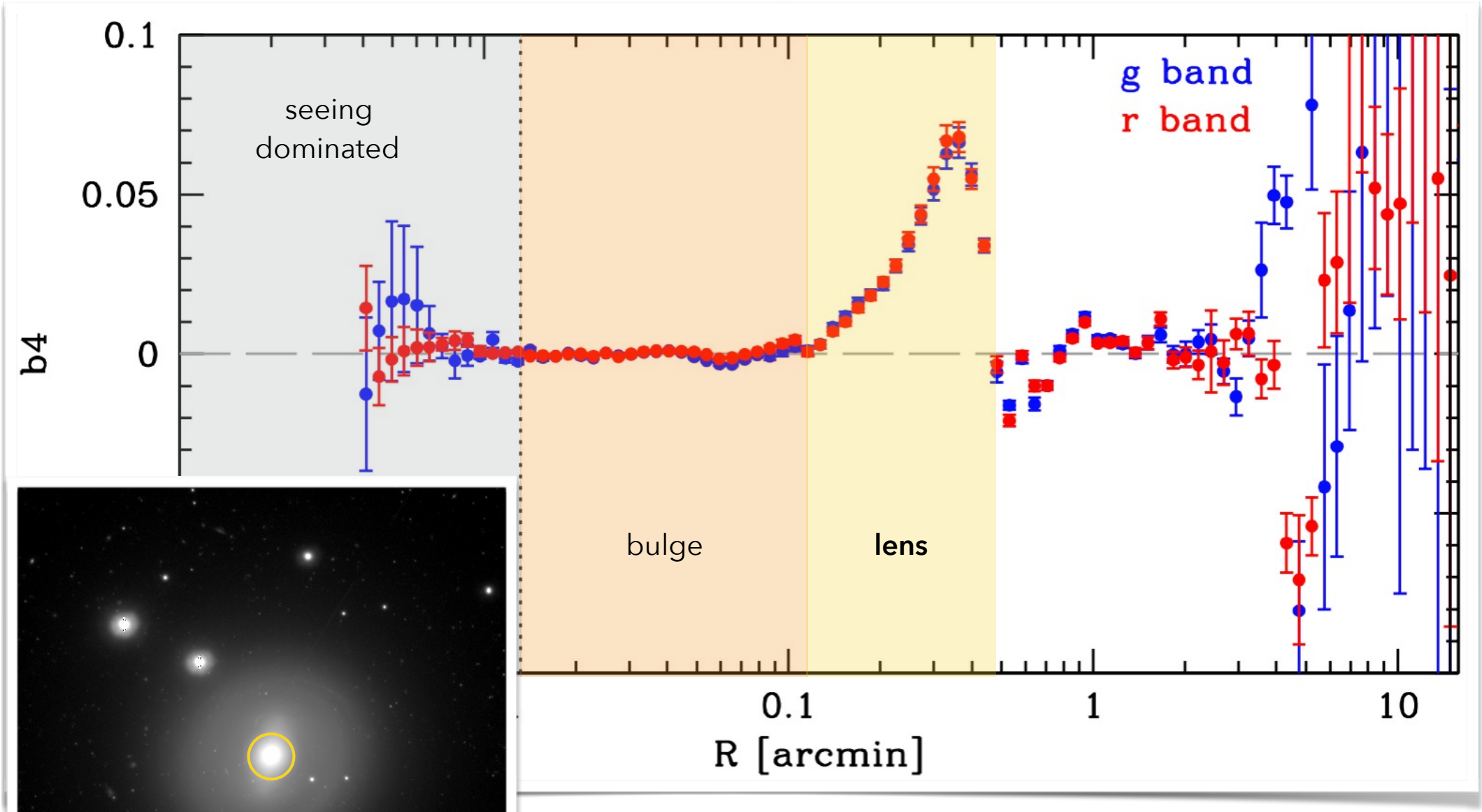
$R \lesssim 0.79$ arcsec

Photometry - Geometrical Parameters



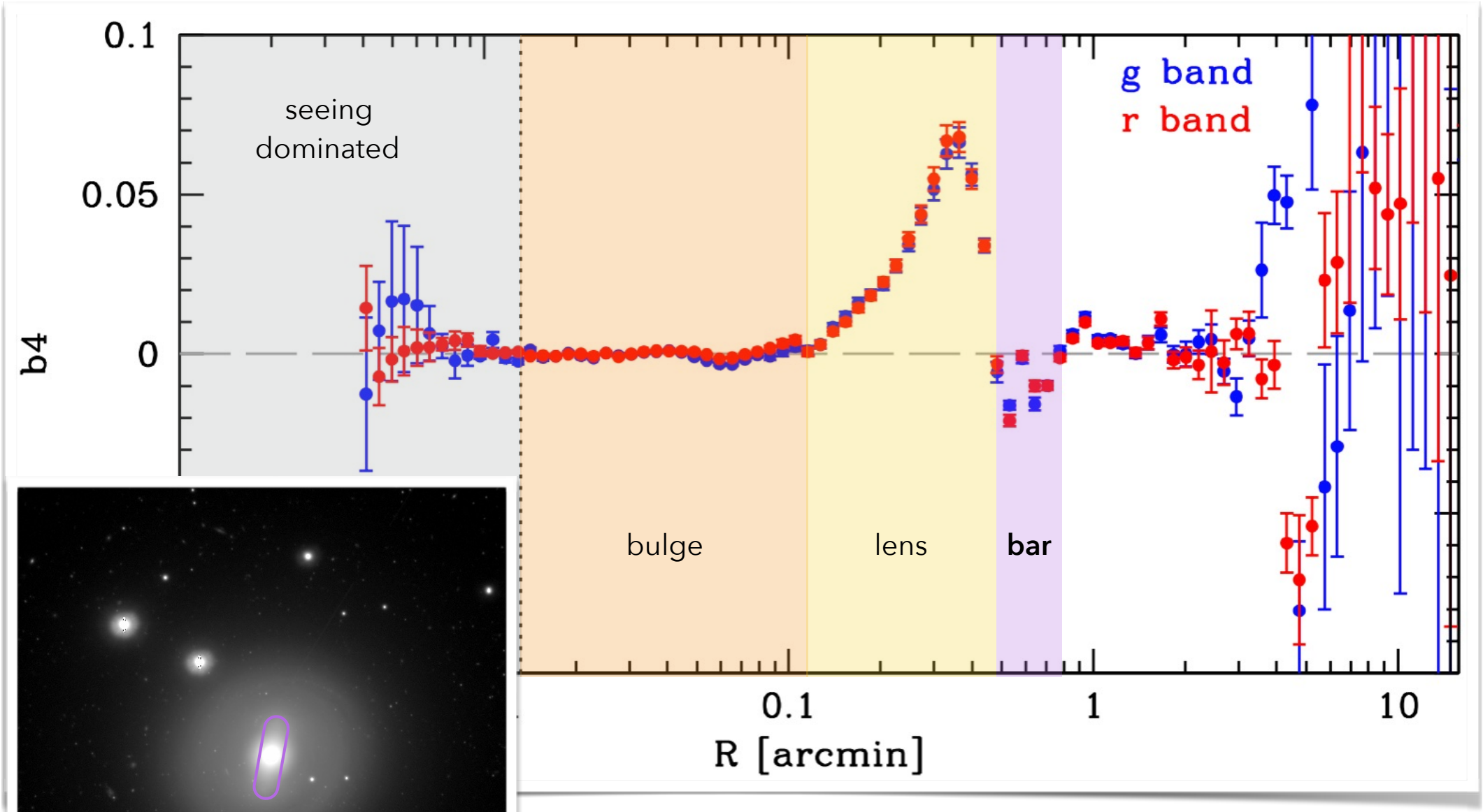
$0.79 \lesssim R \lesssim 6.95$ arcsec

Photometry - Geometrical Parameters



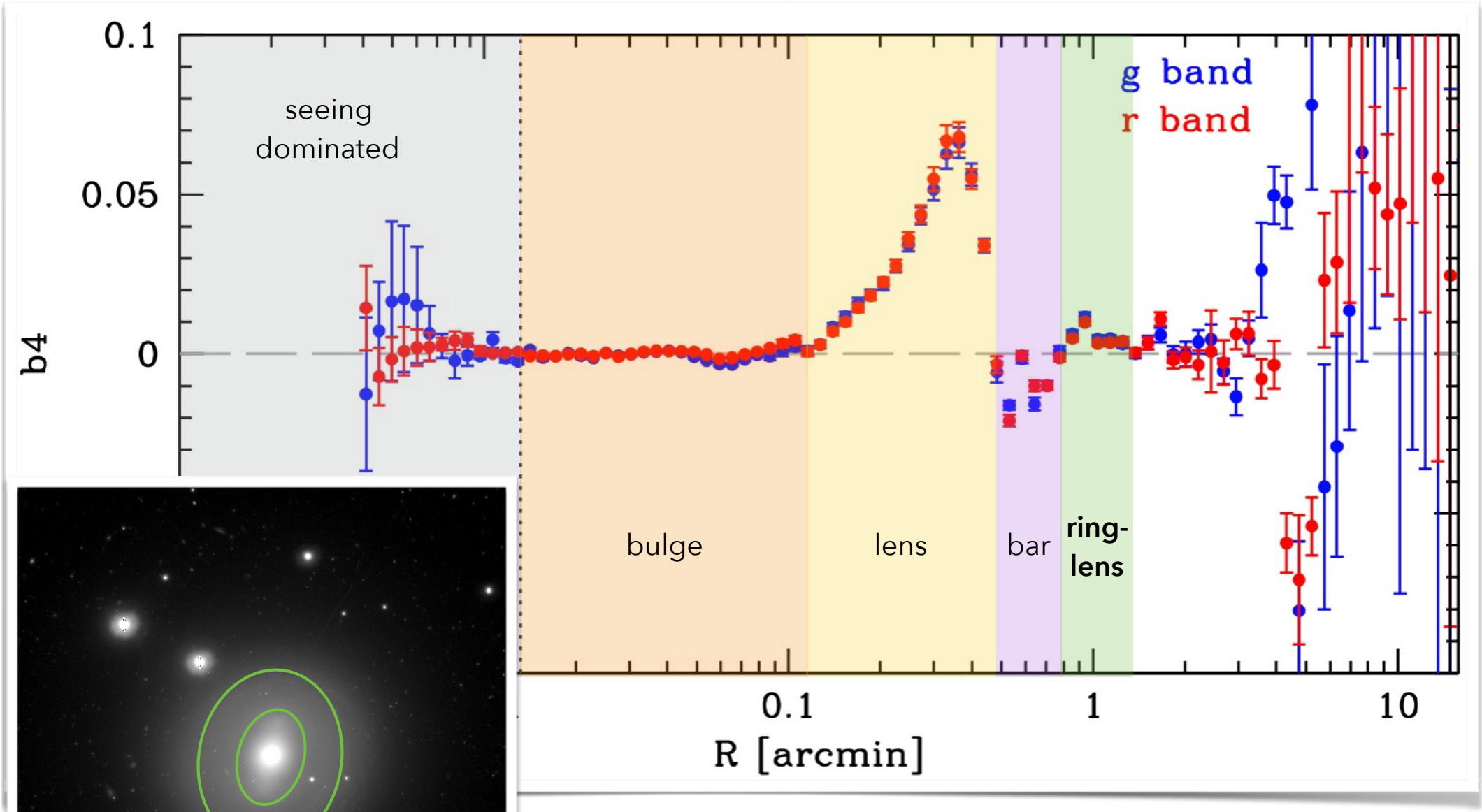
$6.95 \lesssim R \lesssim 29.00$ arcsec

Photometry - Geometrical Parameters



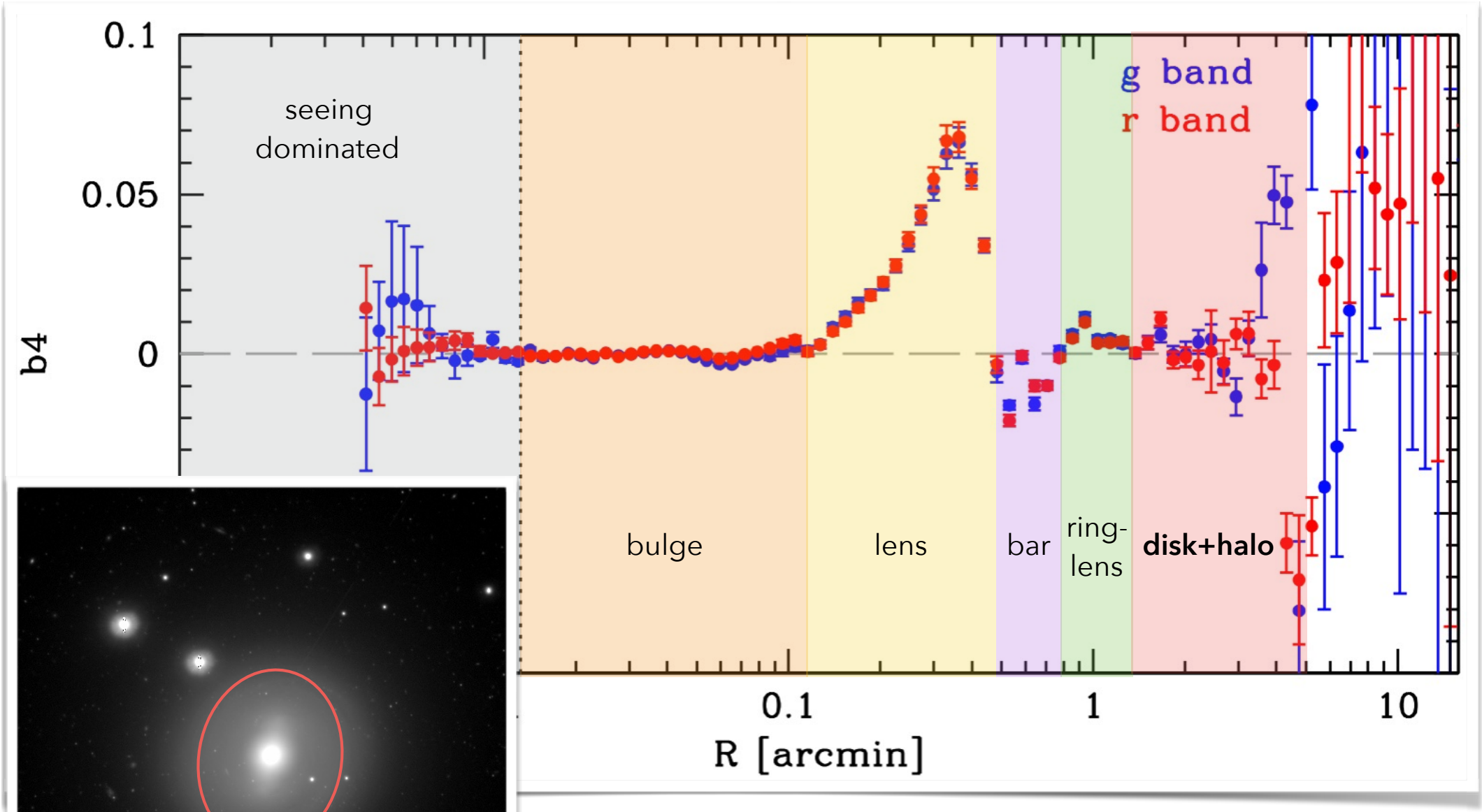
$29.00 \lesssim R \lesssim 46.70$ arcsec

Photometry - Geometrical Parameters



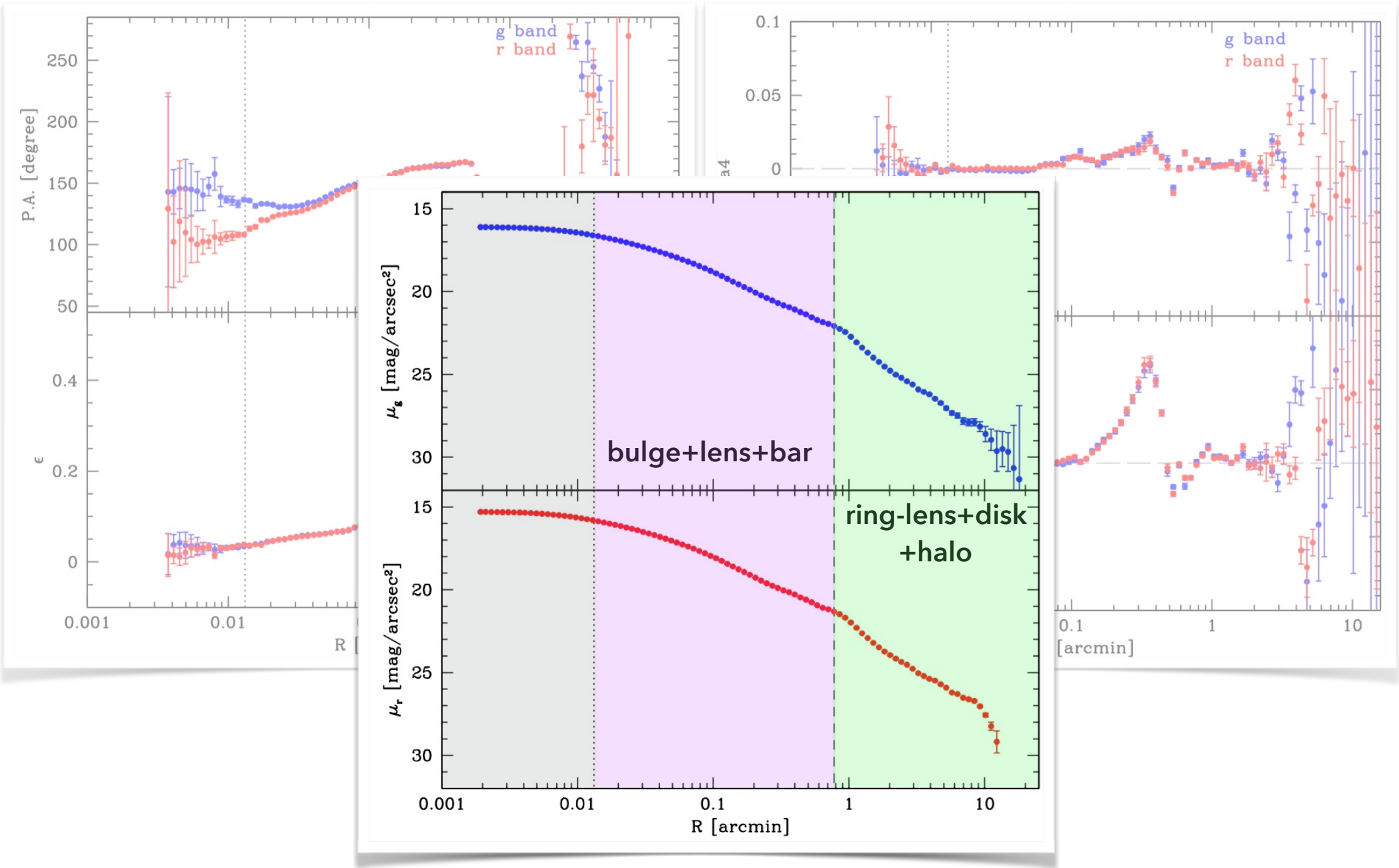
$46.70 \lesssim R \lesssim 82.58$ arcsec

Photometry - Geometrical Parameters

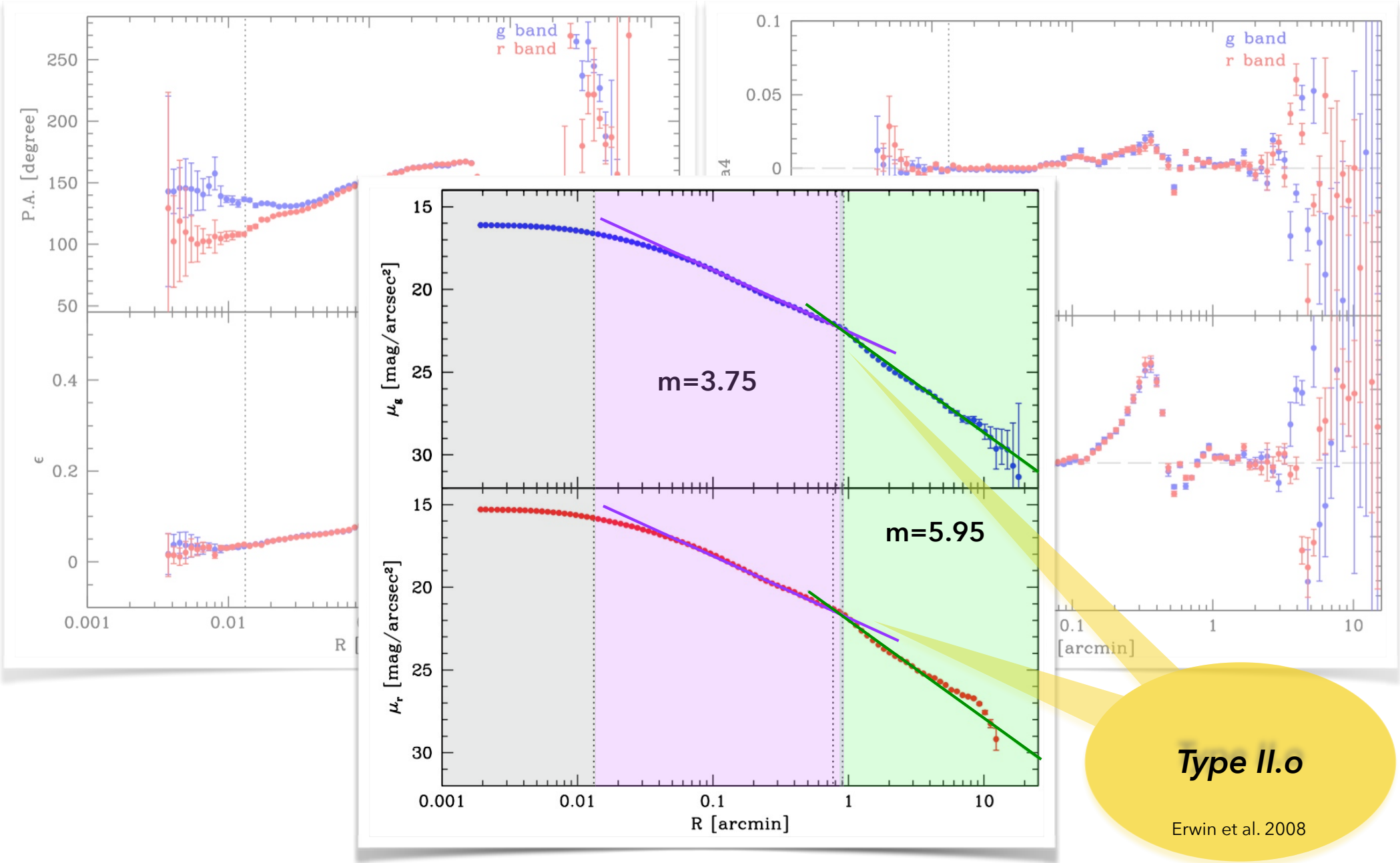


$82.58 \lesssim R \lesssim 300$ arcsec

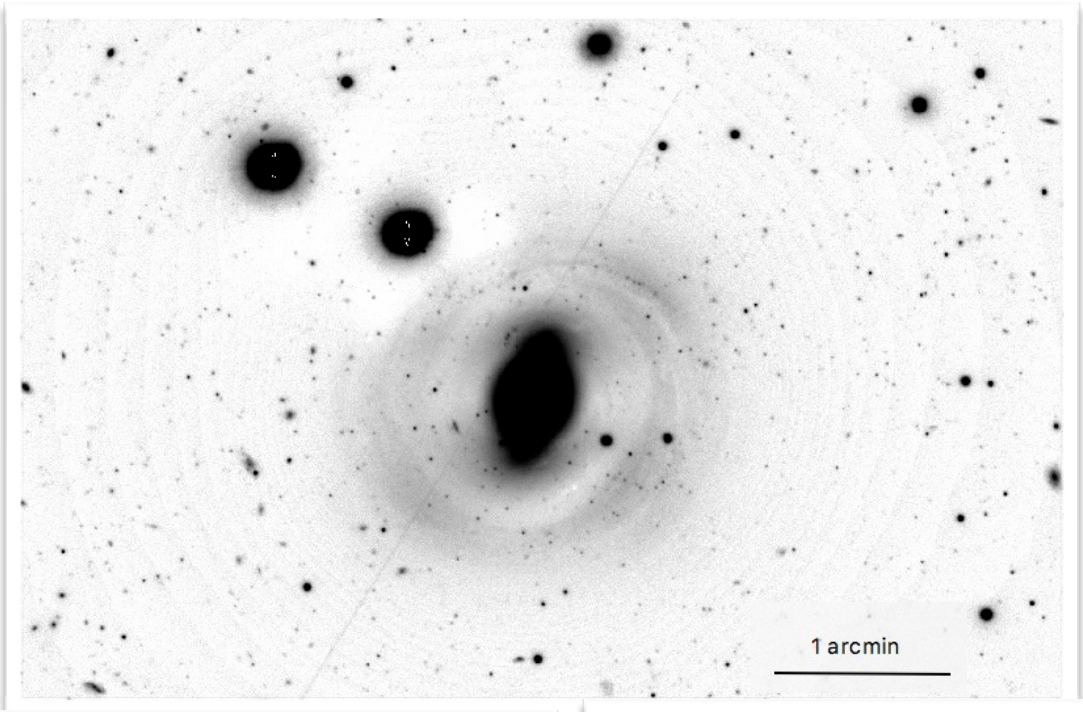
Photometry - Surface Brightness Profile



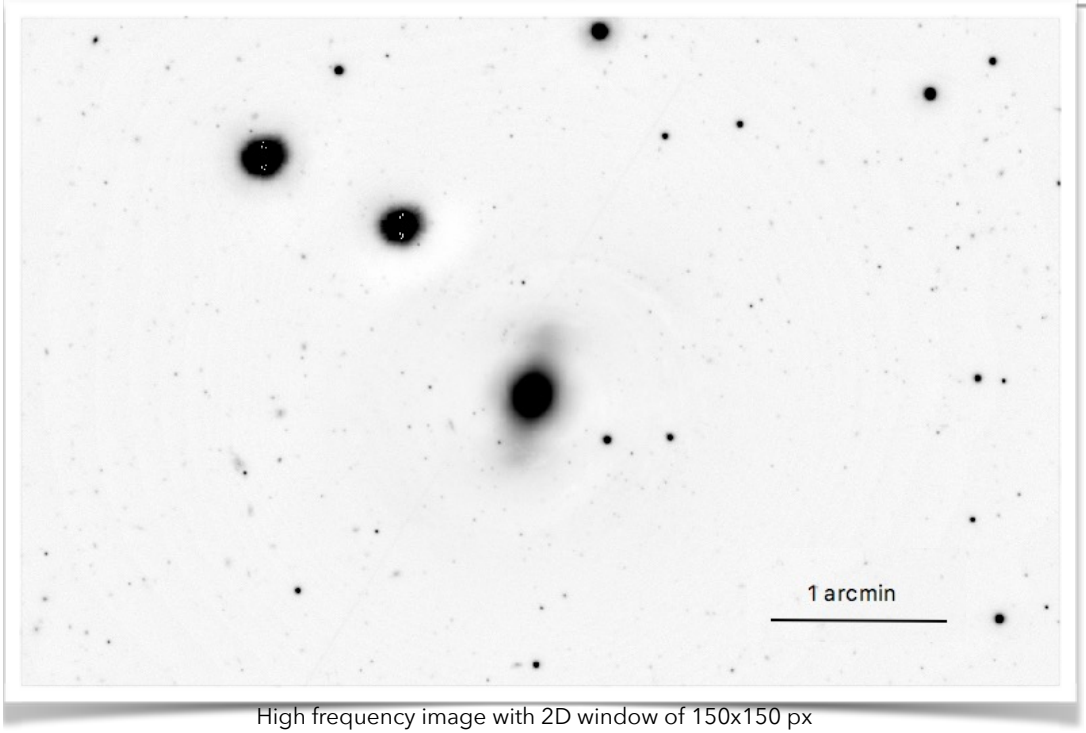
Photometry - Surface Brightness Profile



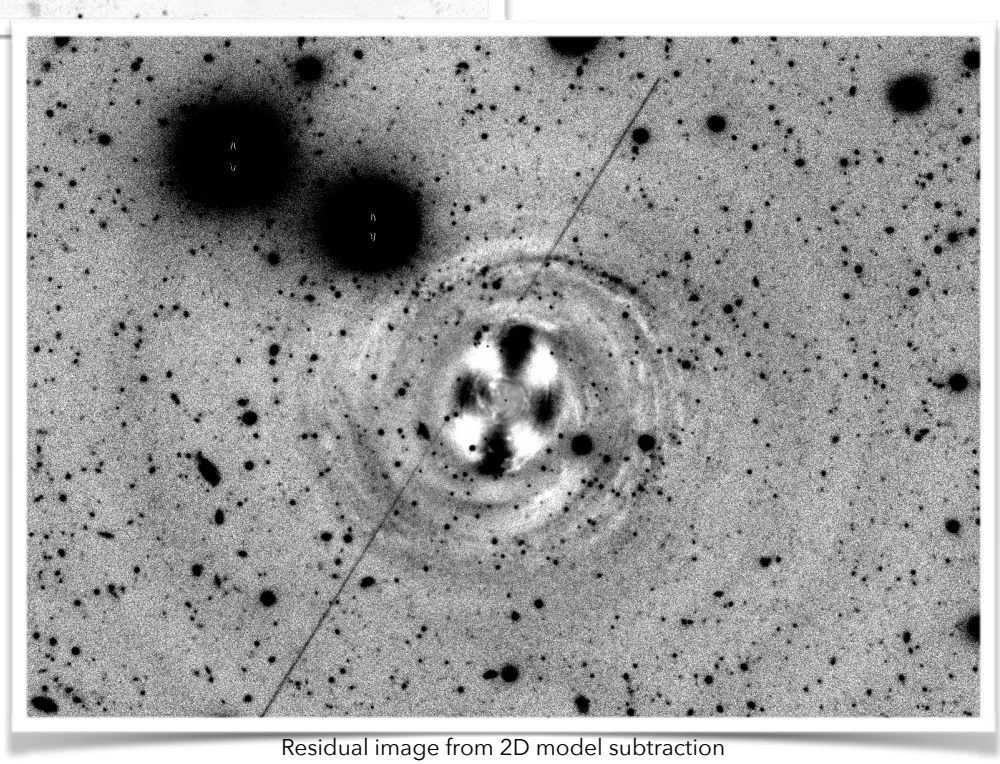
Photometry - Structures



High frequency image with
2D window of 300x300 px

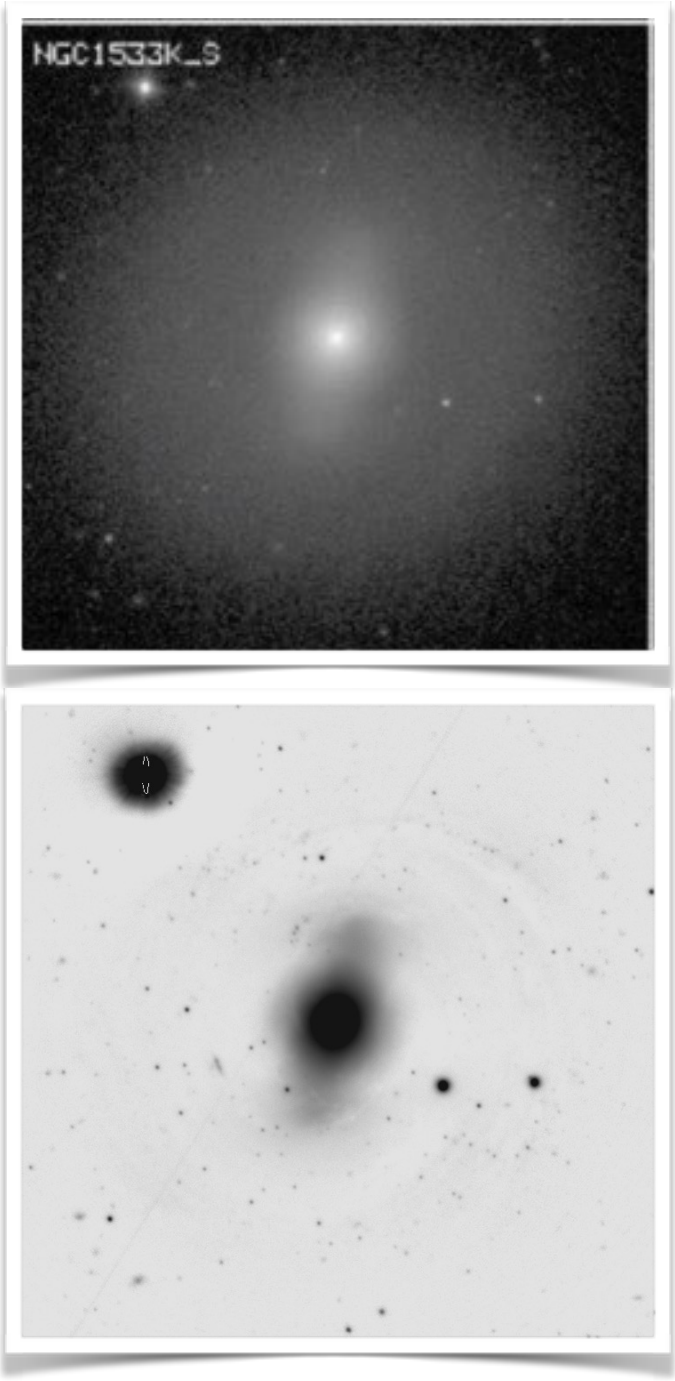


High frequency image with 2D window of 150x150 px



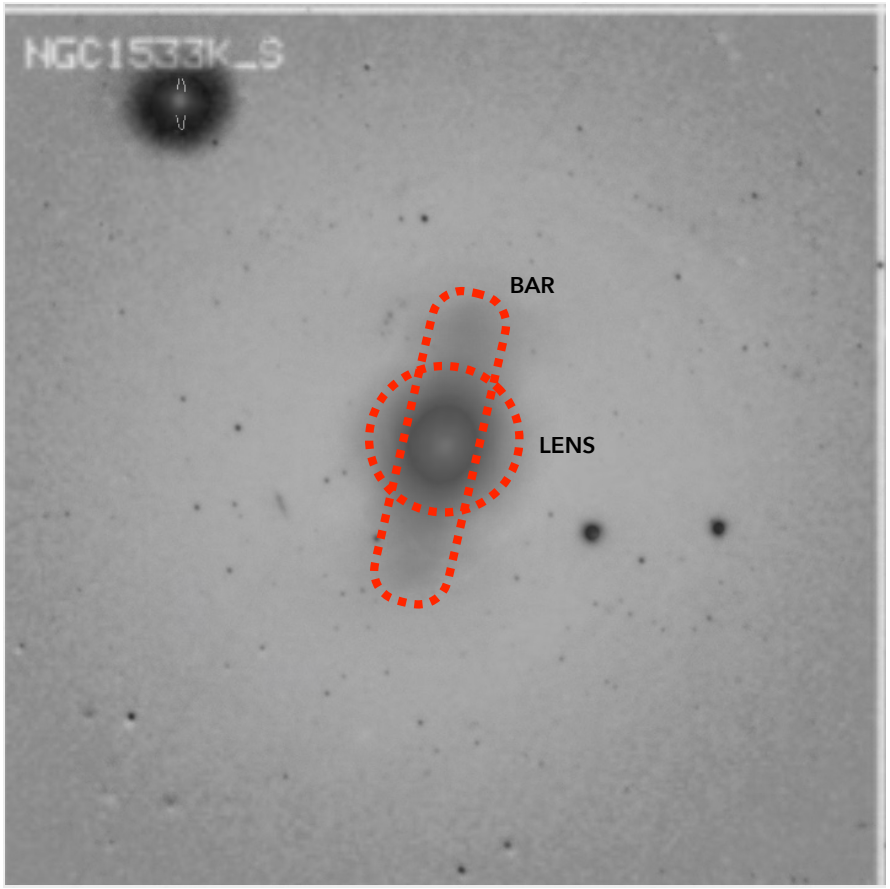
Residual image from 2D model subtraction

Photometry - Structures

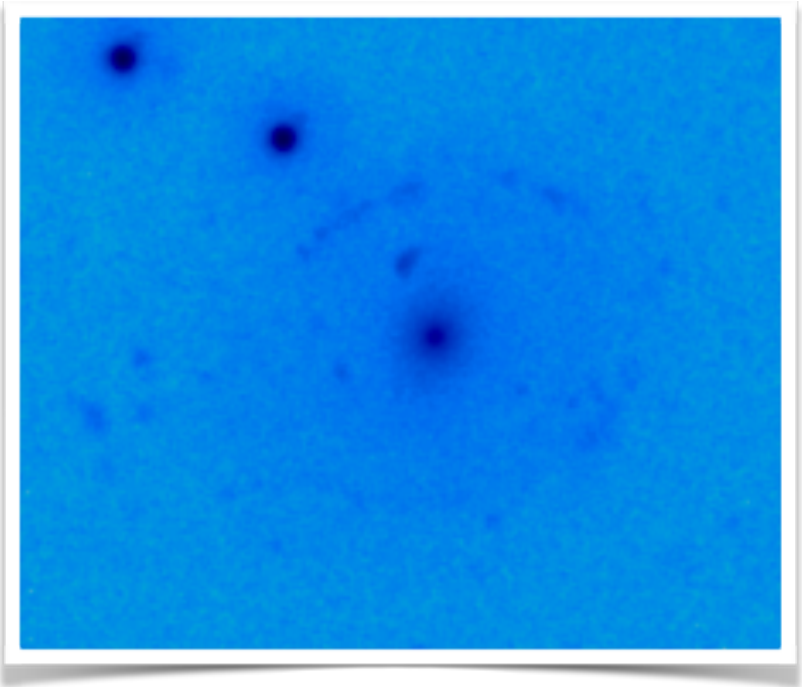


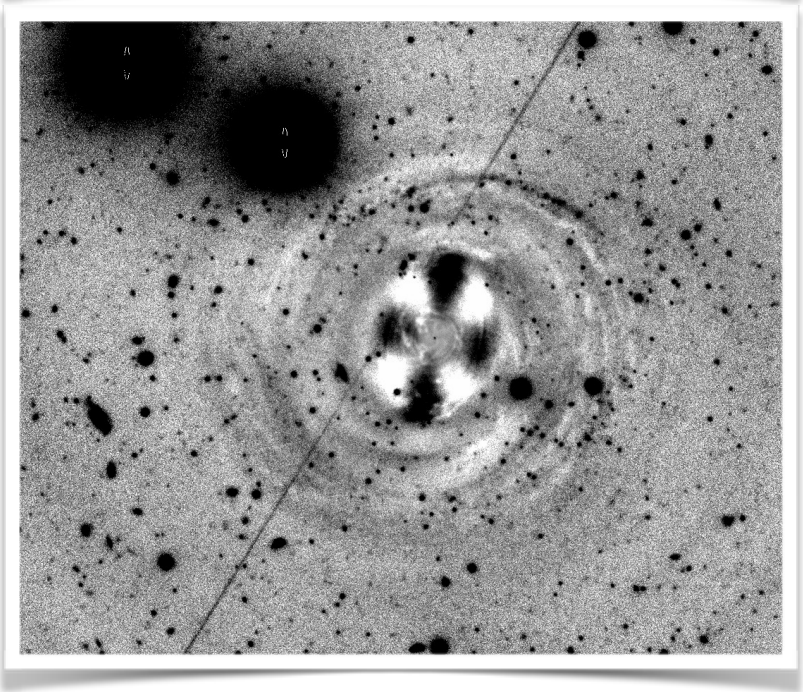
NTT K_s image

overlapped by **high frequency image** with 2D window of 150x150 pxs



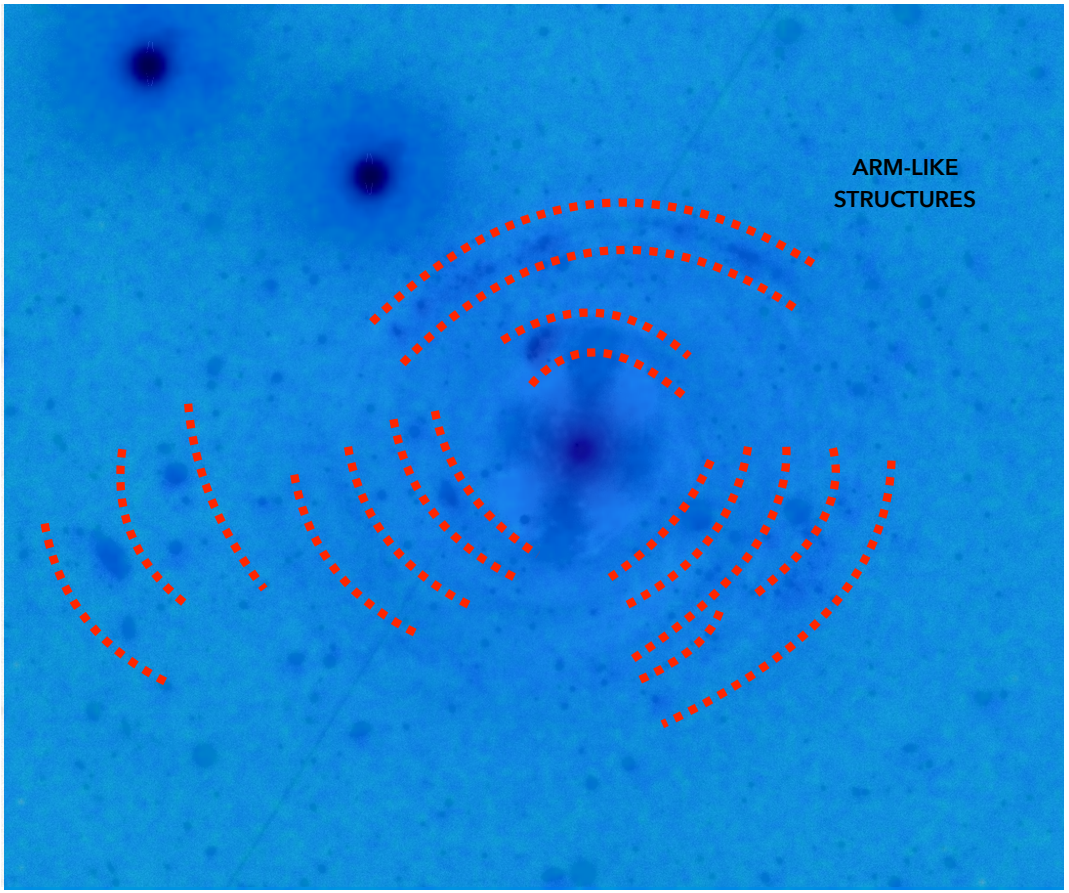
Photometry - Structures





Swift-UVOT W2 image

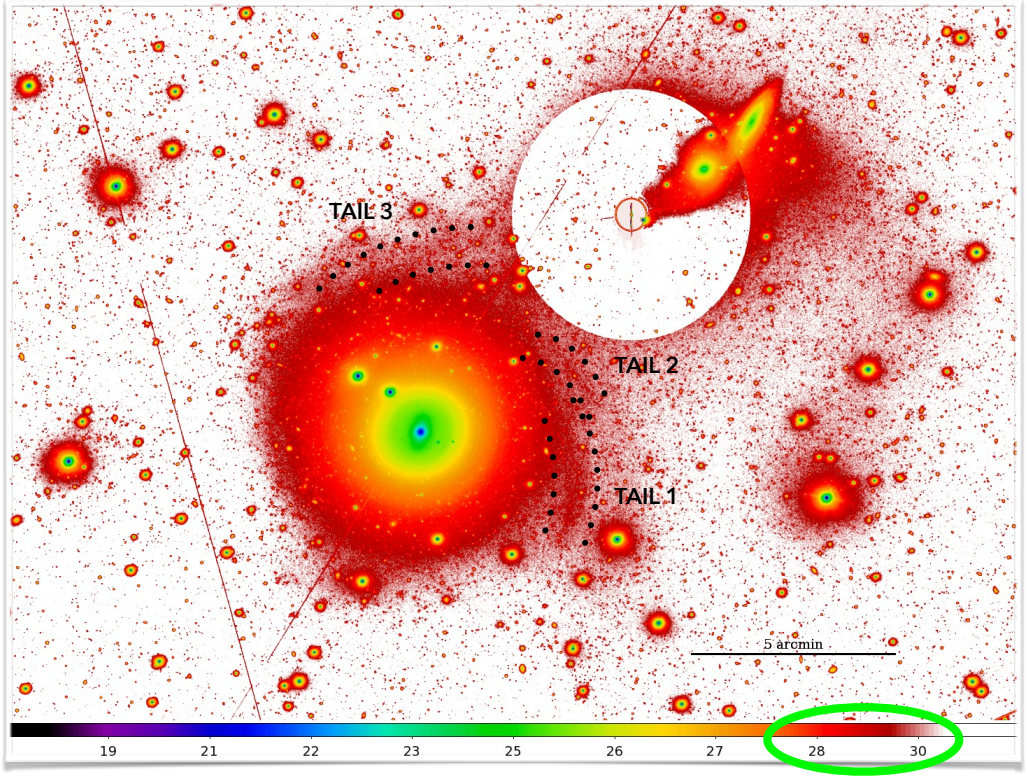
overlapped by **residual g-band image** from subtraction of 2D model



Photometry - Structures

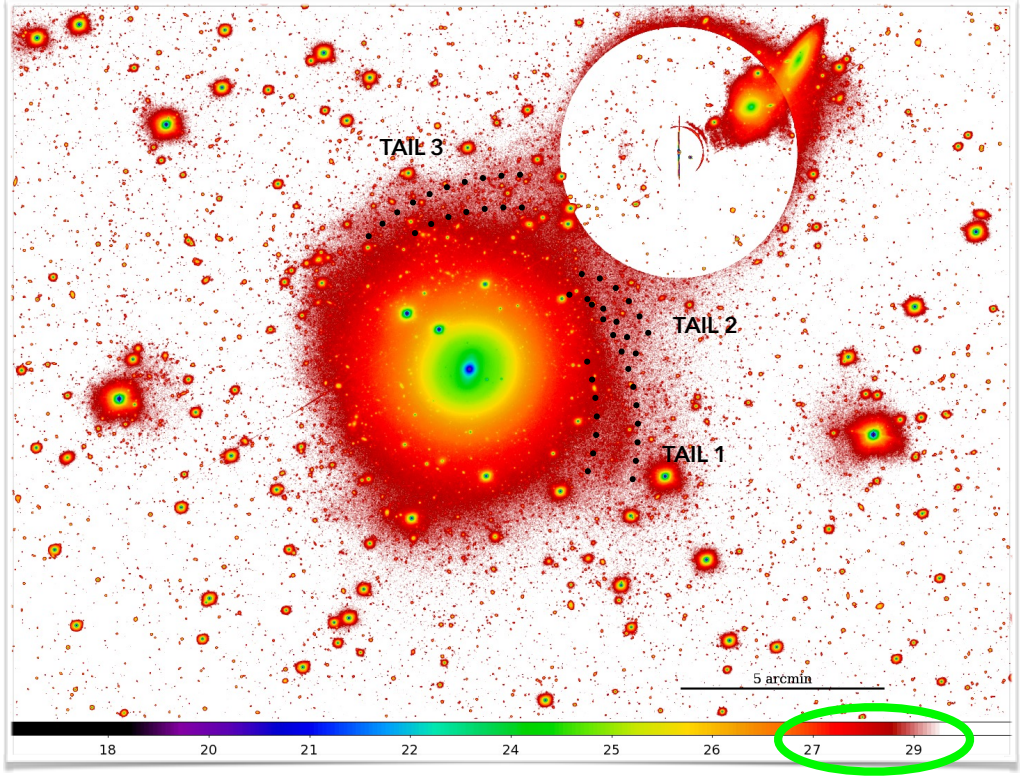
g band

image in units of magnitude, with sky subtraction and subtracted star by 2D model



r band

image in units of magnitude, with sky subtraction and subtracted star by 2D model

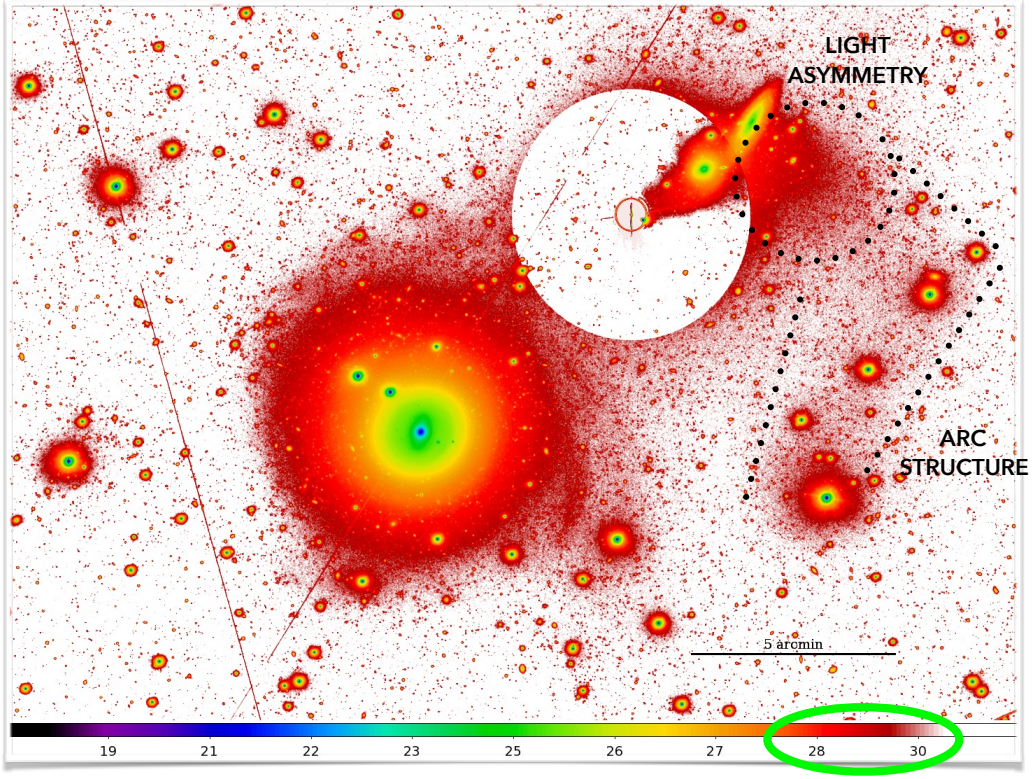


Tail	*Centre distance* *[arcsec]*
1	229.27
2	237.02
3	220.34

Photometry - Structures

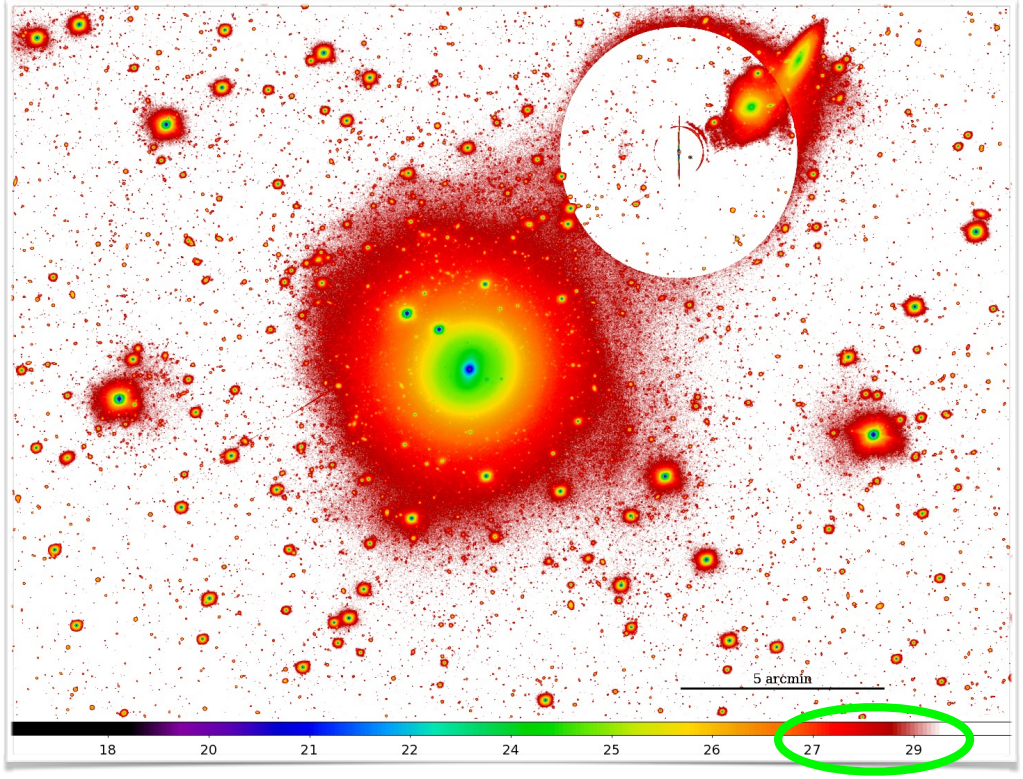
g band

image in units of magnitude, with sky subtraction and subtracted star by 2D model

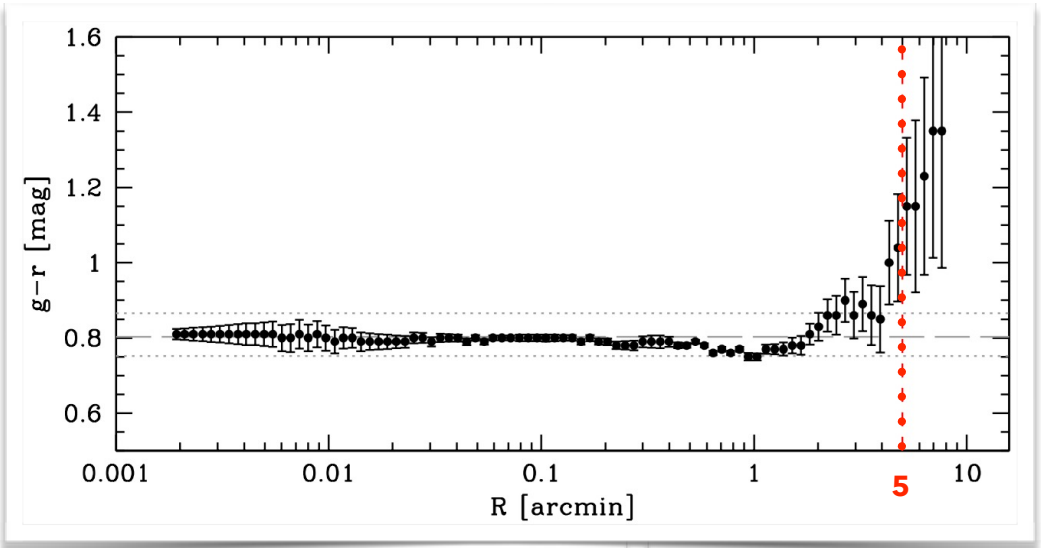


r band

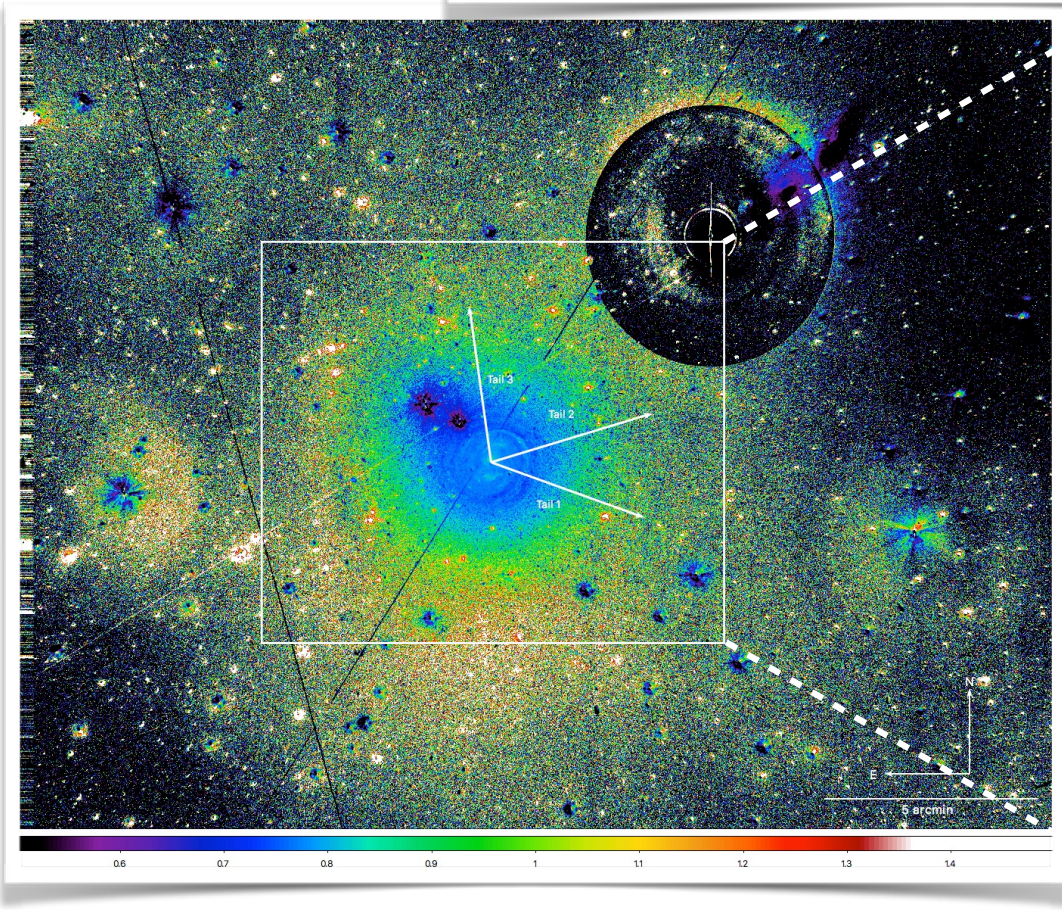
image in units of magnitude, with sky subtraction and subtracted star by 2D model

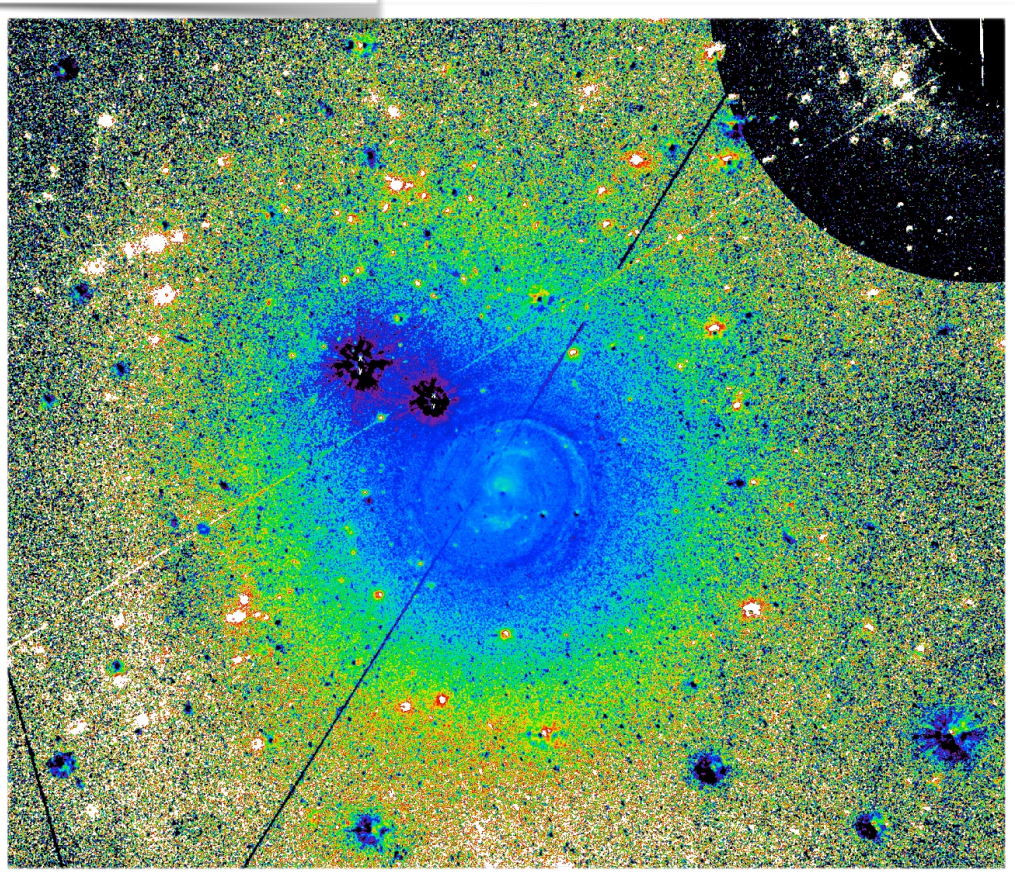


Photometry - Colour profile

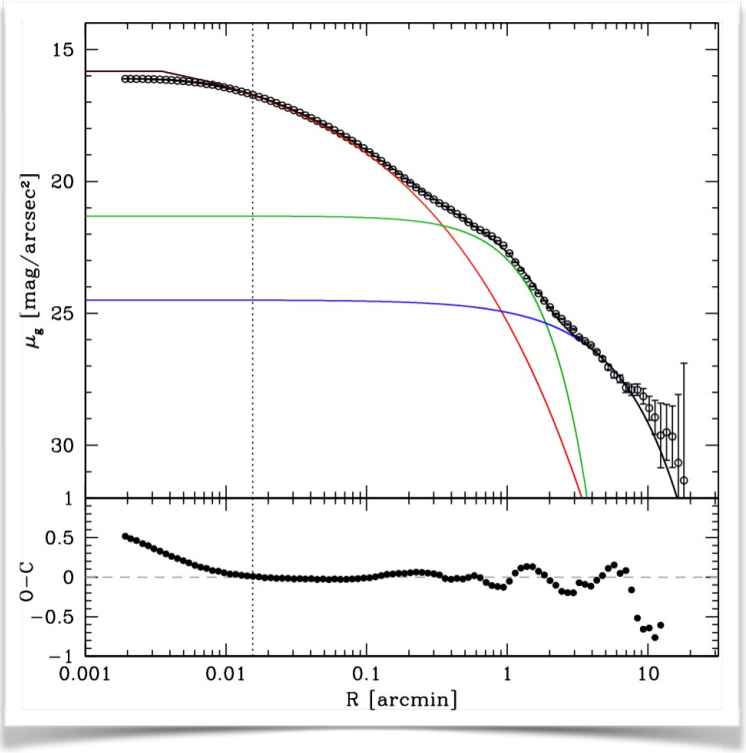


(g-r)=0.809±0.057 mag





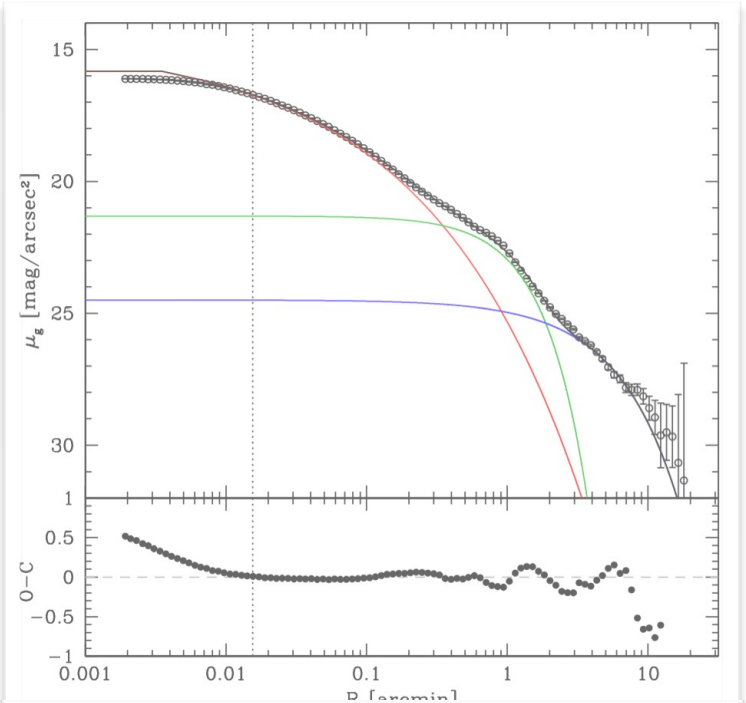
Decomposition



1D decomposition in g band

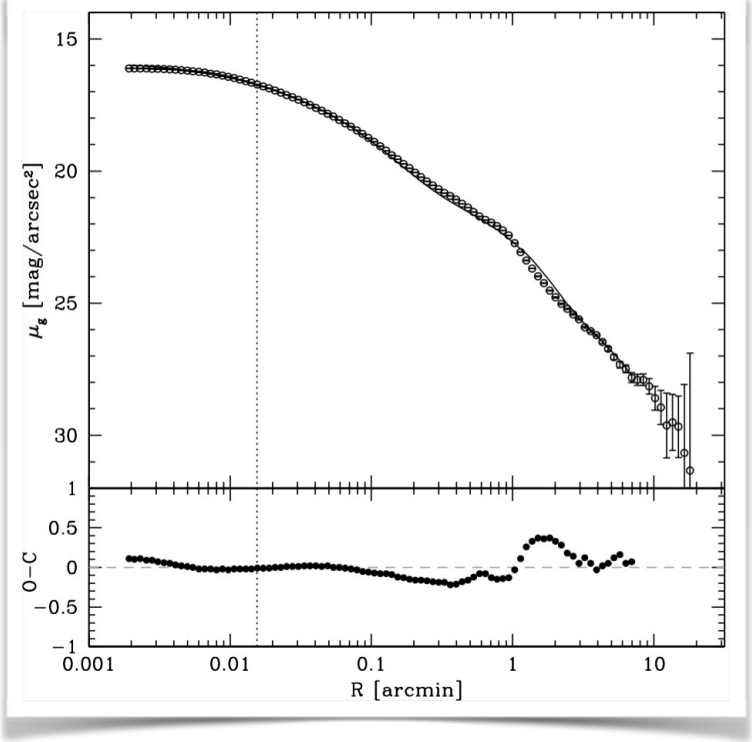
Function	***Index***	*[arcsec]*	*[mag arcsec^{-2}]*
Sérsic	2.5	r_e=9.5	μ_e =19.8
Sérsic	0.7	r_e=47.0	μ_e =22.48
Exponential		r_0=140.0	μ_0 =24.5

Decomposition



1D decomposition in g band

Function	Index	[arcsec]	[mag arcsec^{-2}]
Sérsic	2.5	r_e=9.5	μ_e =19.8
Sérsic	0.7	r_e=47.0	μ_e =22.48
Exponential		r_0=140.0	μ_0 =24.5

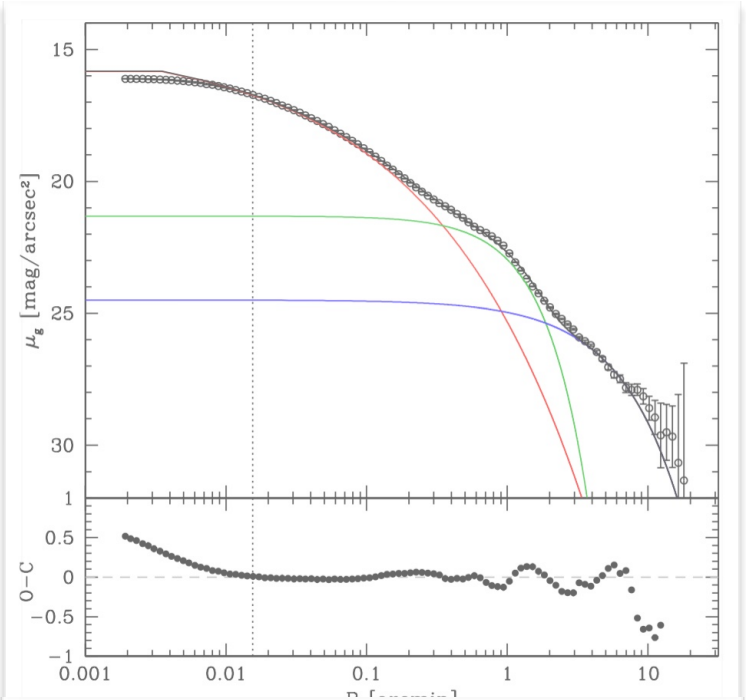


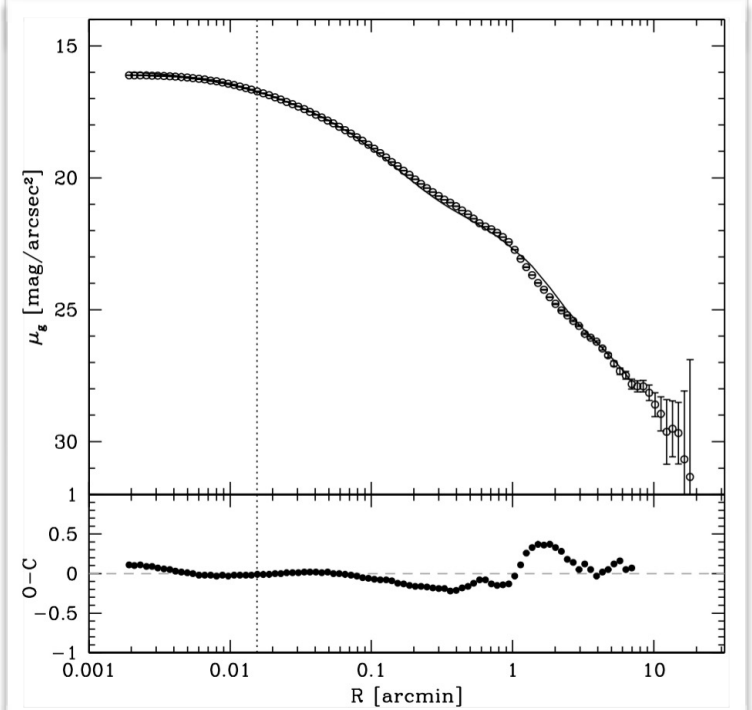
2D decomposition in g band using GALFIT

Function	Index	[arcsec]	[mag]
Sérsic	1.7	r_e=5.76	m_e=12.31
Exponential		r_0=30.32	m_0=11.32
Exponential (fix)		r_0=140.00	m_0=11.77

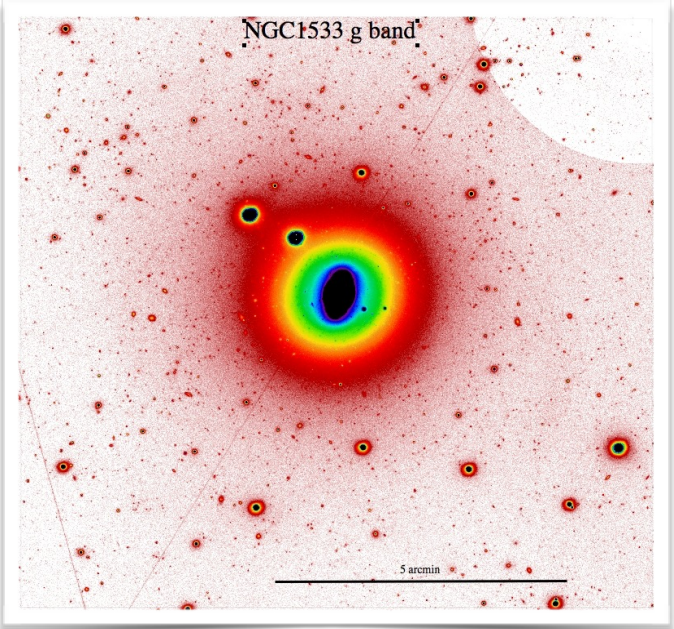
Using a mask and considering the mean value of the residual sky-subtraction fluctuations

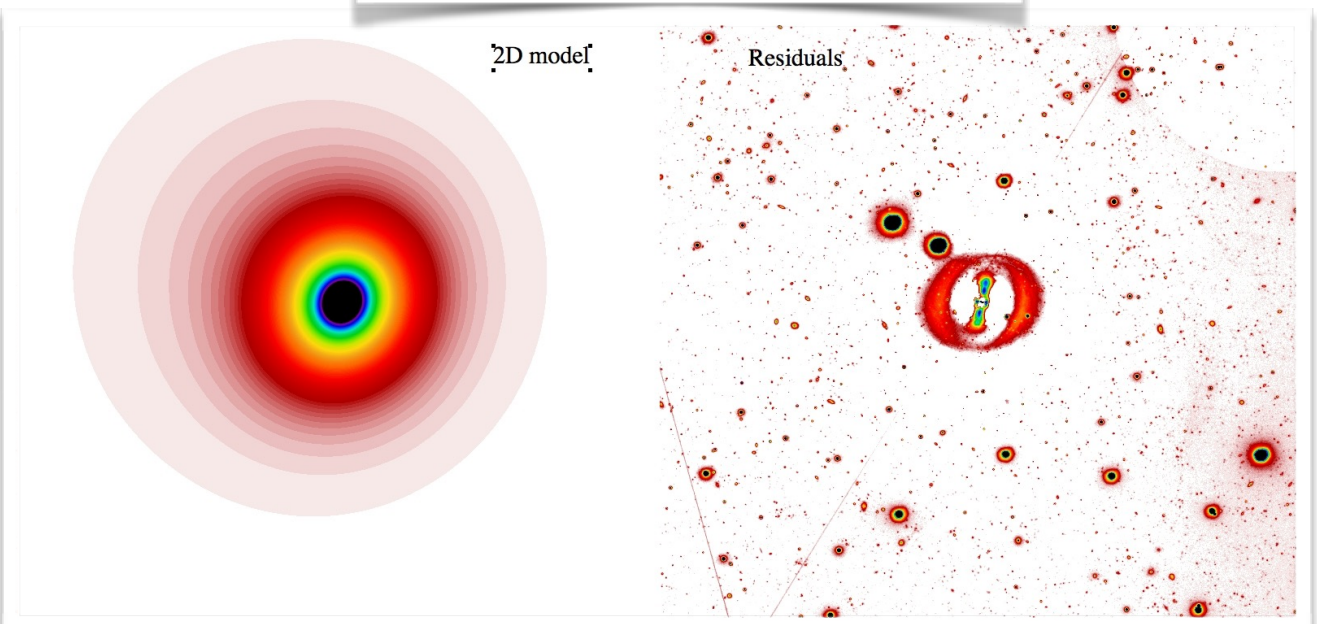
Decomposition



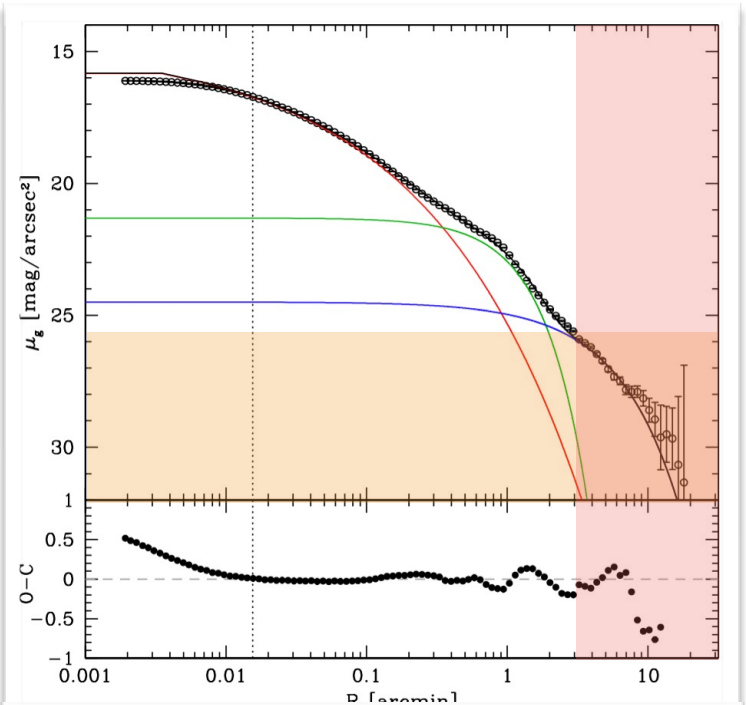


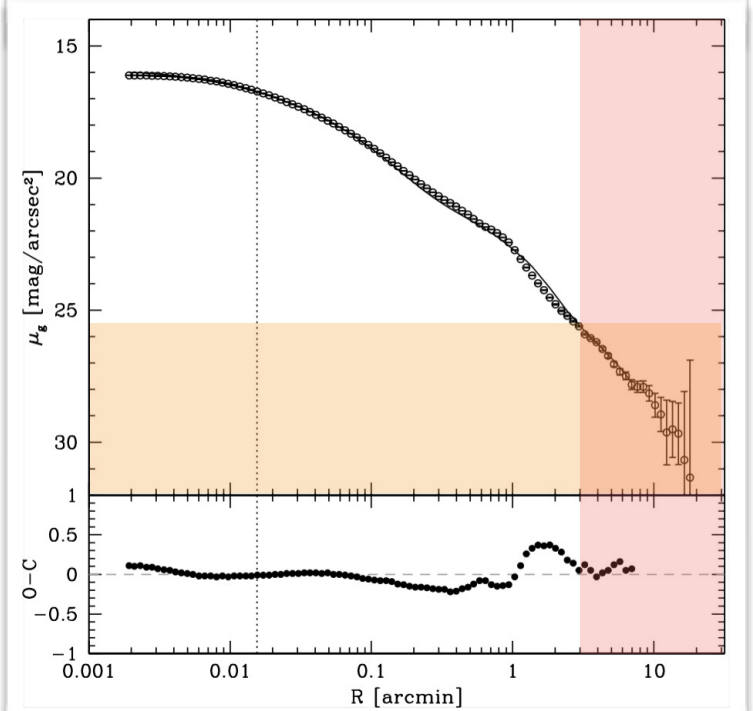
2D decomposition in g band using GALFIT





Decomposition





1D decomposition in g band

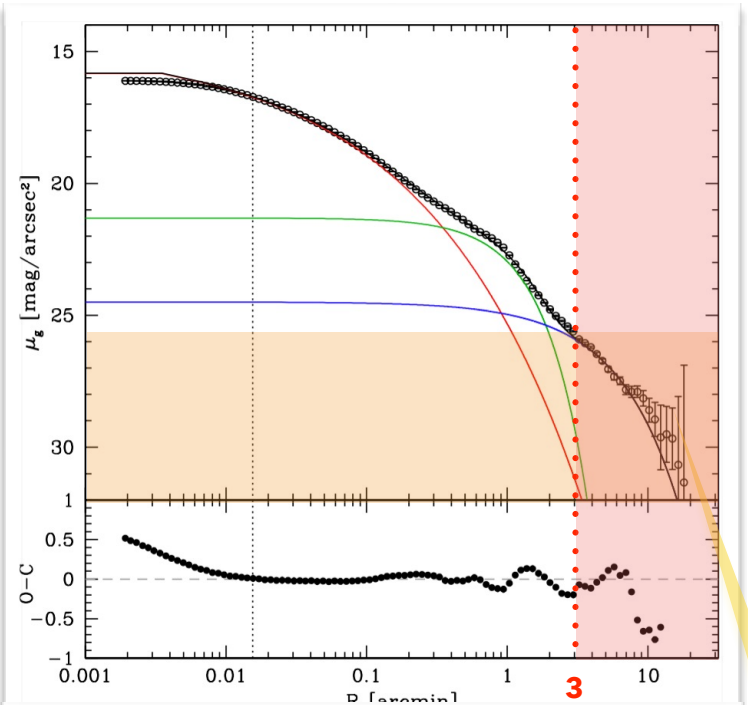
Function	Index	[arcsec]	[mag arcsec^{-2}]
Sérsic	2.5	r_e=9.5	μ_e =19.8
Sérsic	0.7	r_e=47.0	μ_e =22.48
Exponential		r_0=140.0	μ_0 =24.5

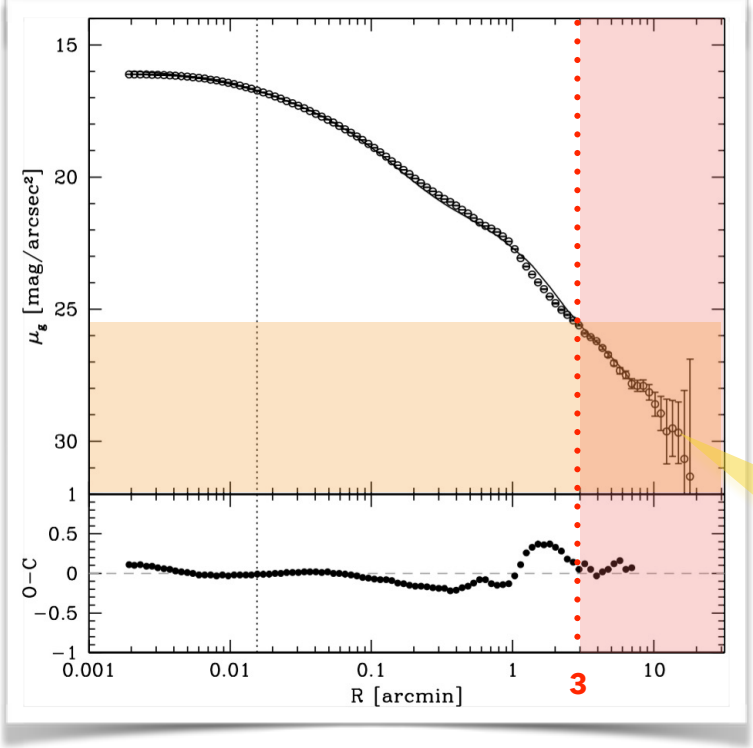
2D decomposition in g band using GALFIT

Function	Index	[arcsec]	[mag]
Sérsic	1.7	r_e=5.76	m_e=12.31
Exponential		r_0=30.32	m_0=11.32
Exponential (fix)		r_0=140.00	m_0=11.77

Using a mask and considering the mean value of the residual sky-subtraction fluctuations

Decomposition





1D decomposition in g band

Function	Index	[arcsec]	[mag arcsec^{-2}]
Sérsic	2.5	r_e=9.5	μ_e =19.8
Sérsic	0.7	r_e=47.0	μ_e =22.48
Exponential		r_0=140.0	μ_0 =24.5

2D decomposition in g band using GALFIT

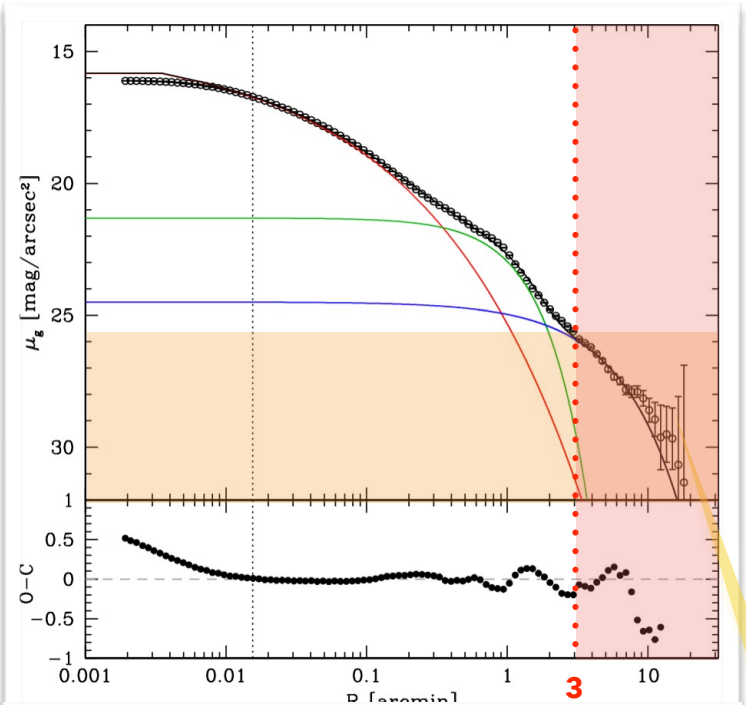
Function	Index	[arcsec]	[mag]
Sérsic	1.7	r_e=5.76	m_e=12.31
Exponential		r_0=30.32	m_0=11.32
Exponential (fix)		r_0=140.00	m_0=11.77

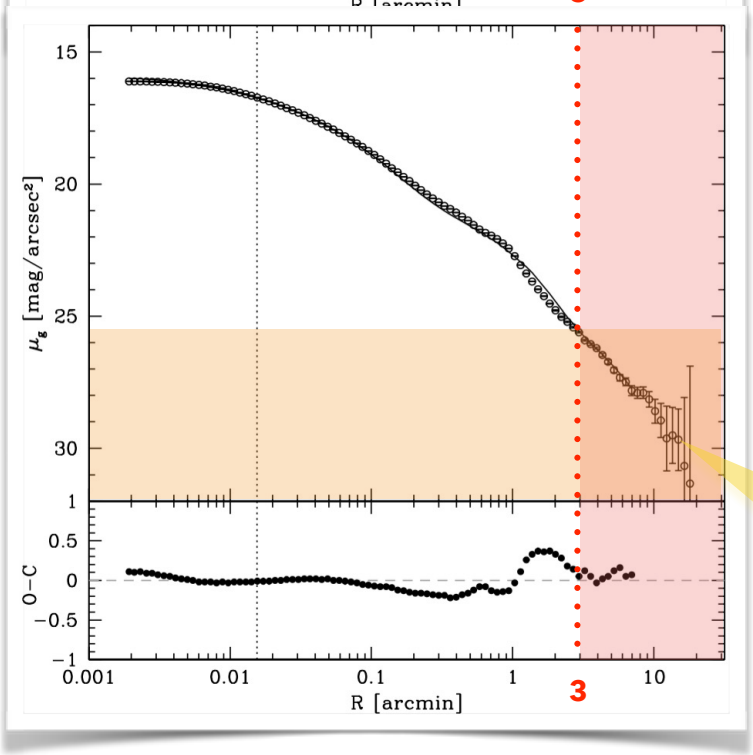
Using a mask and considering the mean value of the residual sky-subtraction fluctuations

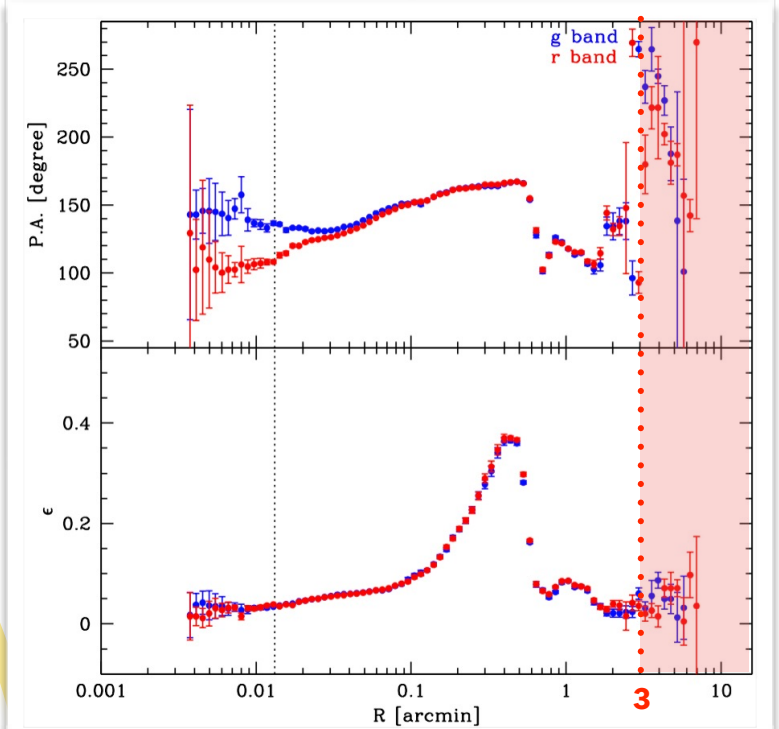
Stellar halo component!

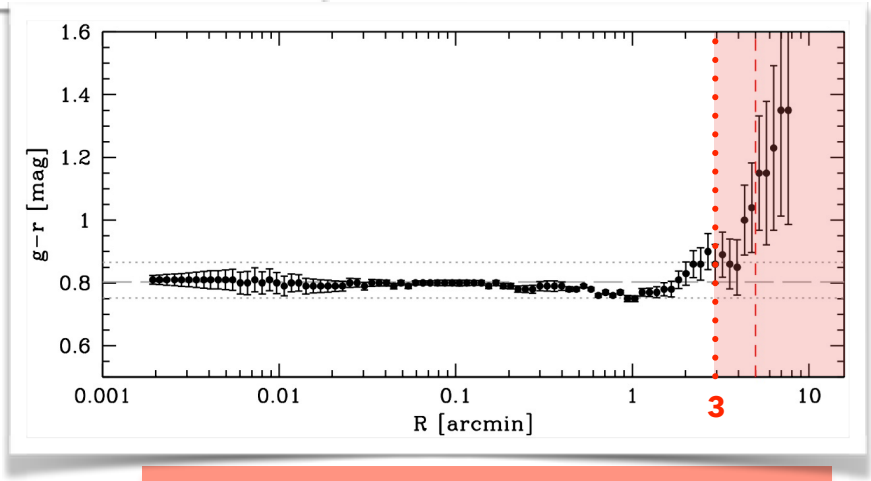
Iodice et al. 2016

Decomposition









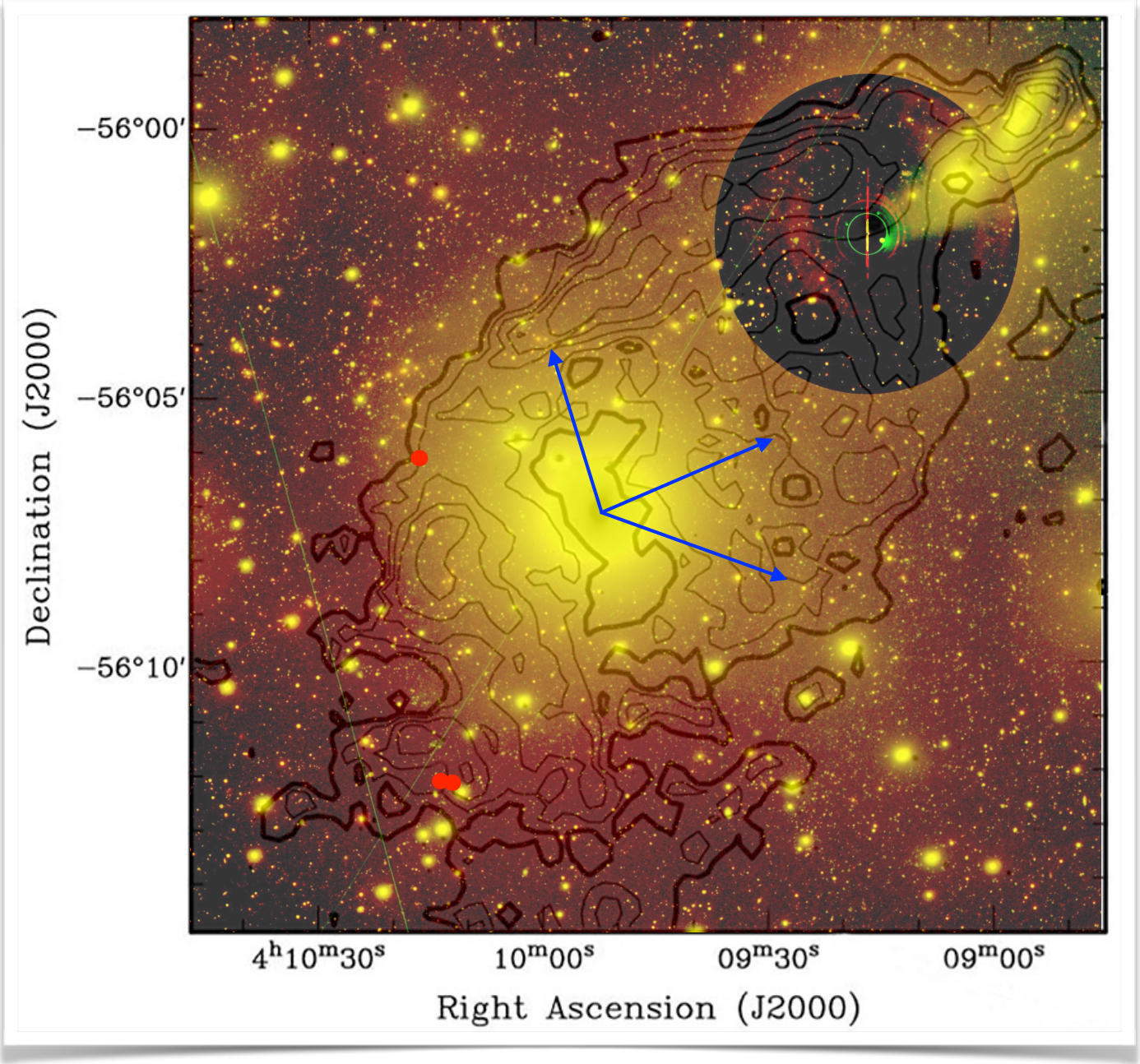
Stellar halo component!

Iodice et al. 2016

~~Type II-o~~ **Type II+III-s**

Erwin et al. 2008

Conclusion - Colour composite and HI map



ATCA HI contours are 1.0 (bold), 1.5, 2.0, 2.5 and 3.0x10^{20} cm^{-2} and have a resolution of about 1′

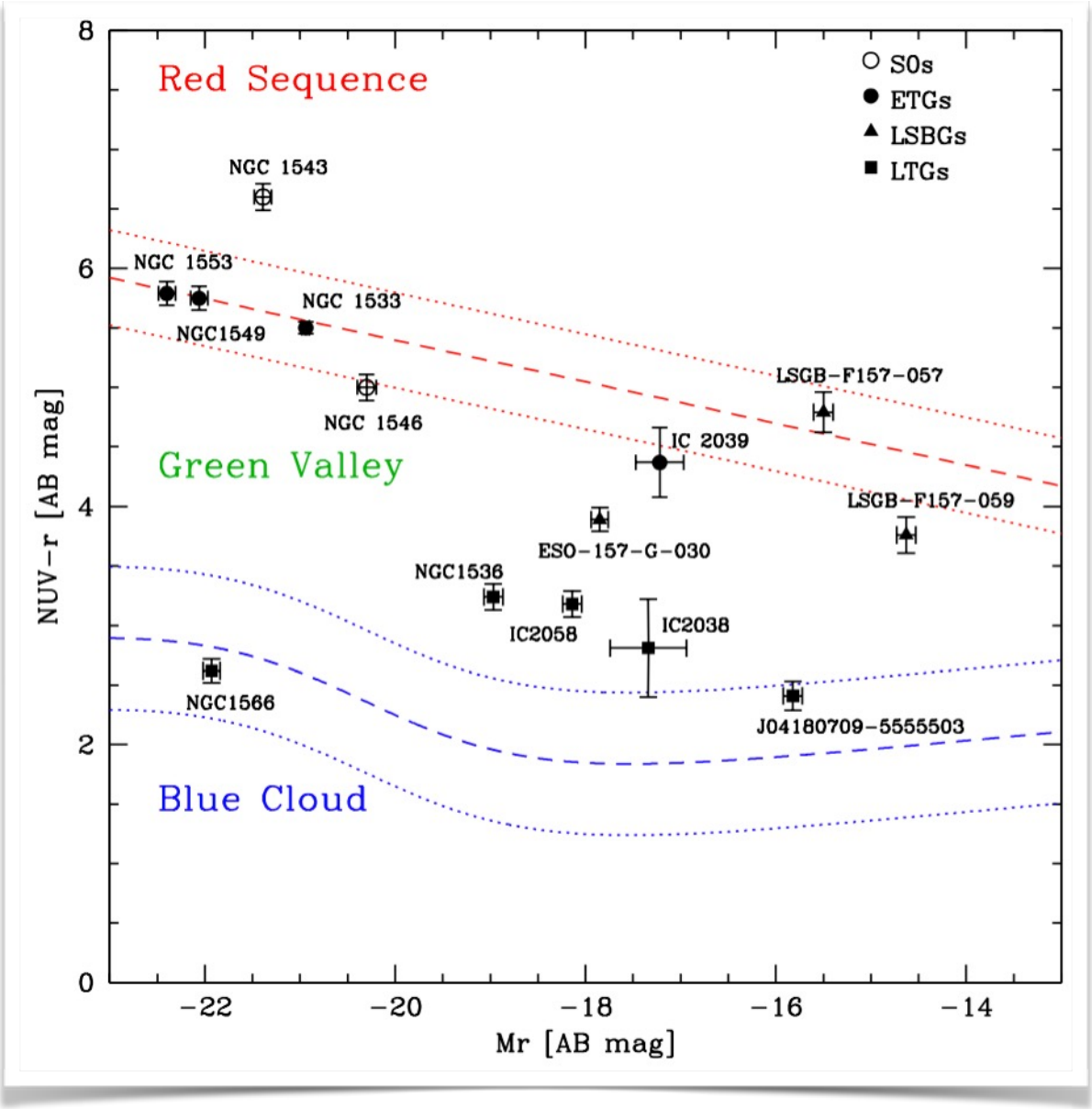
Werk et al, 2008

- NGC 1533 imaged in 21-cm with the ATCA
- HI associates with IC2038 (northern companion)
- NW and SE cloud
- Total HI mass of the system is 7x10^9 $M_\odot$
- Radius of HI ring is from 2′ to 11.7′ from the optical center of NGC 1533
- 3 confirmed Hα very small isolated emission line regions in SE part (red dots); from SINGG

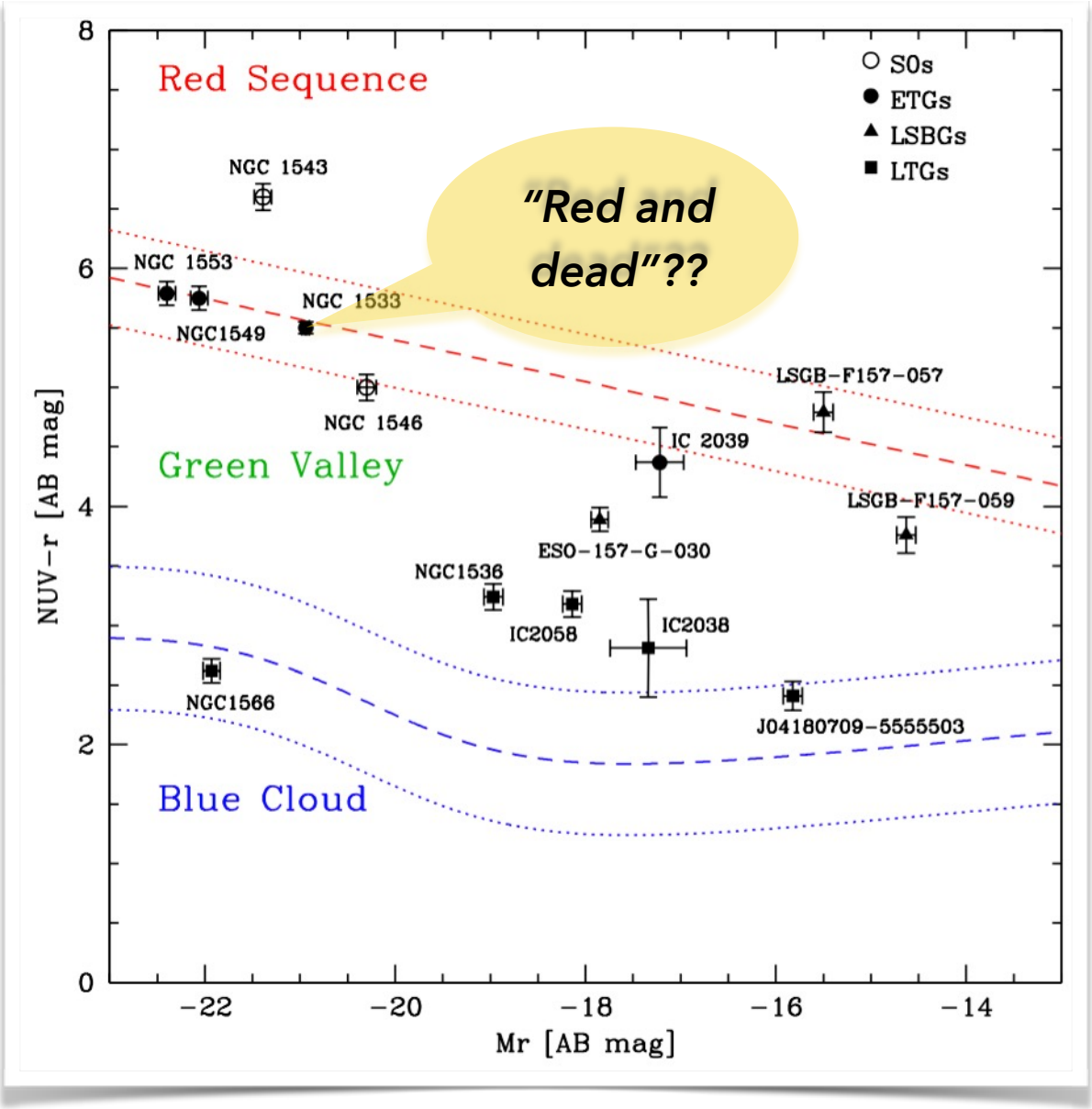
Galactic recycling: the HI ring around NGC 1533

Ryan-Weber, Webster & Bekki, 2003

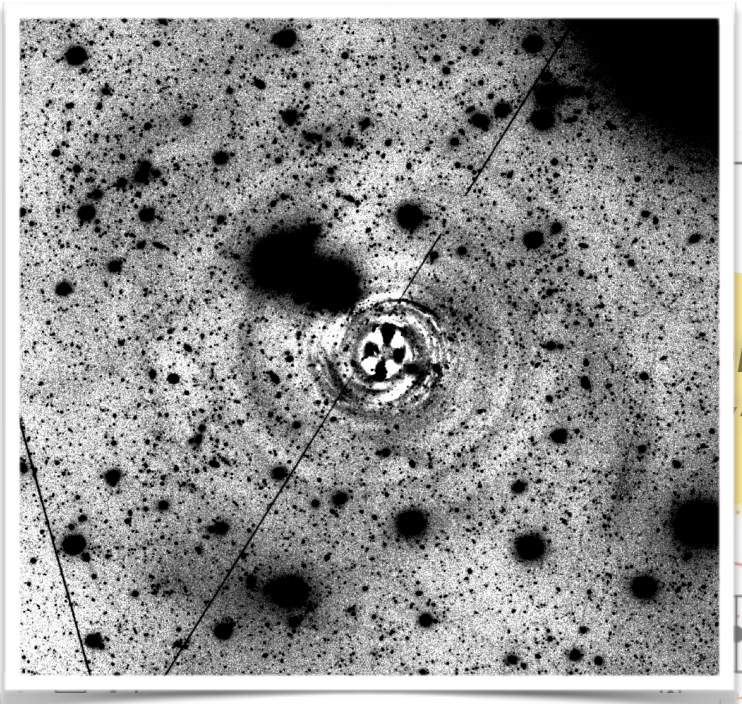
Conclusion - Colour Magnitude Diagram

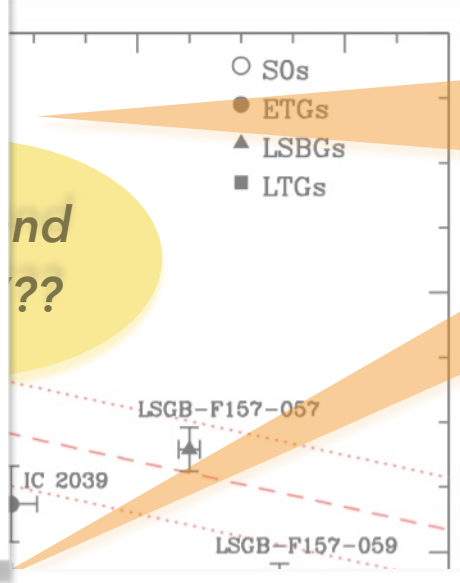


Conclusion - Colour Magnitude Diagram

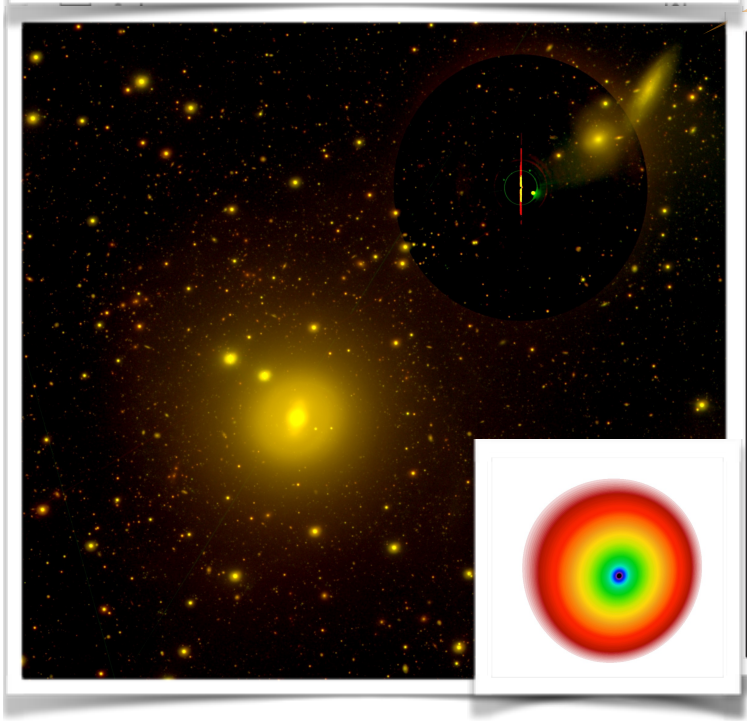


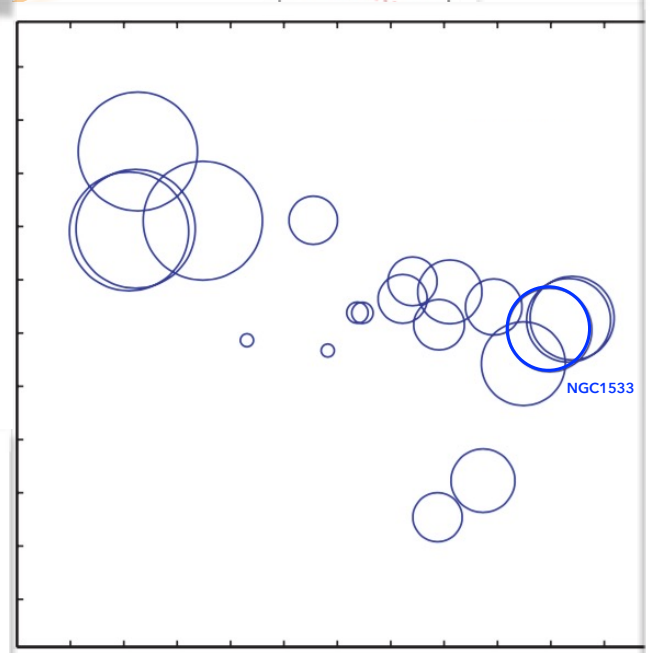
Conclusion - Colour Magnitude Diagram

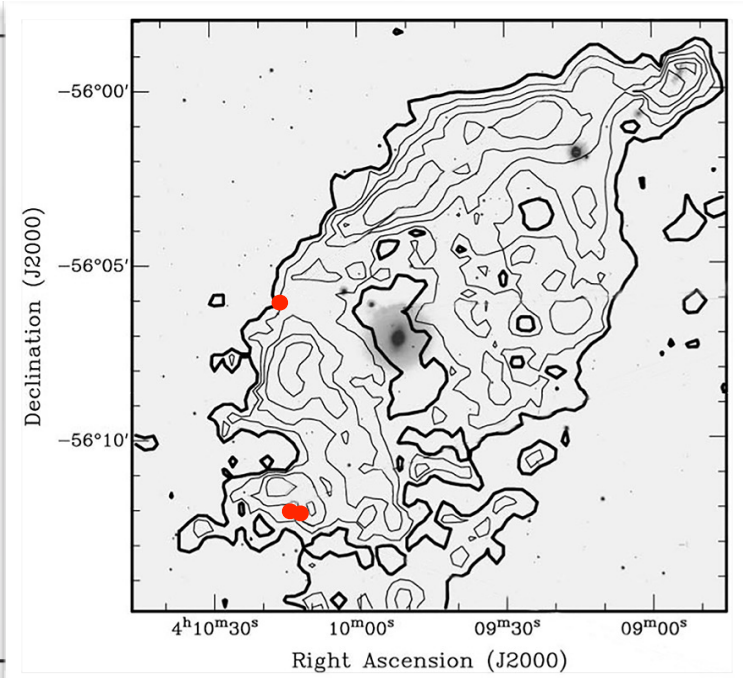




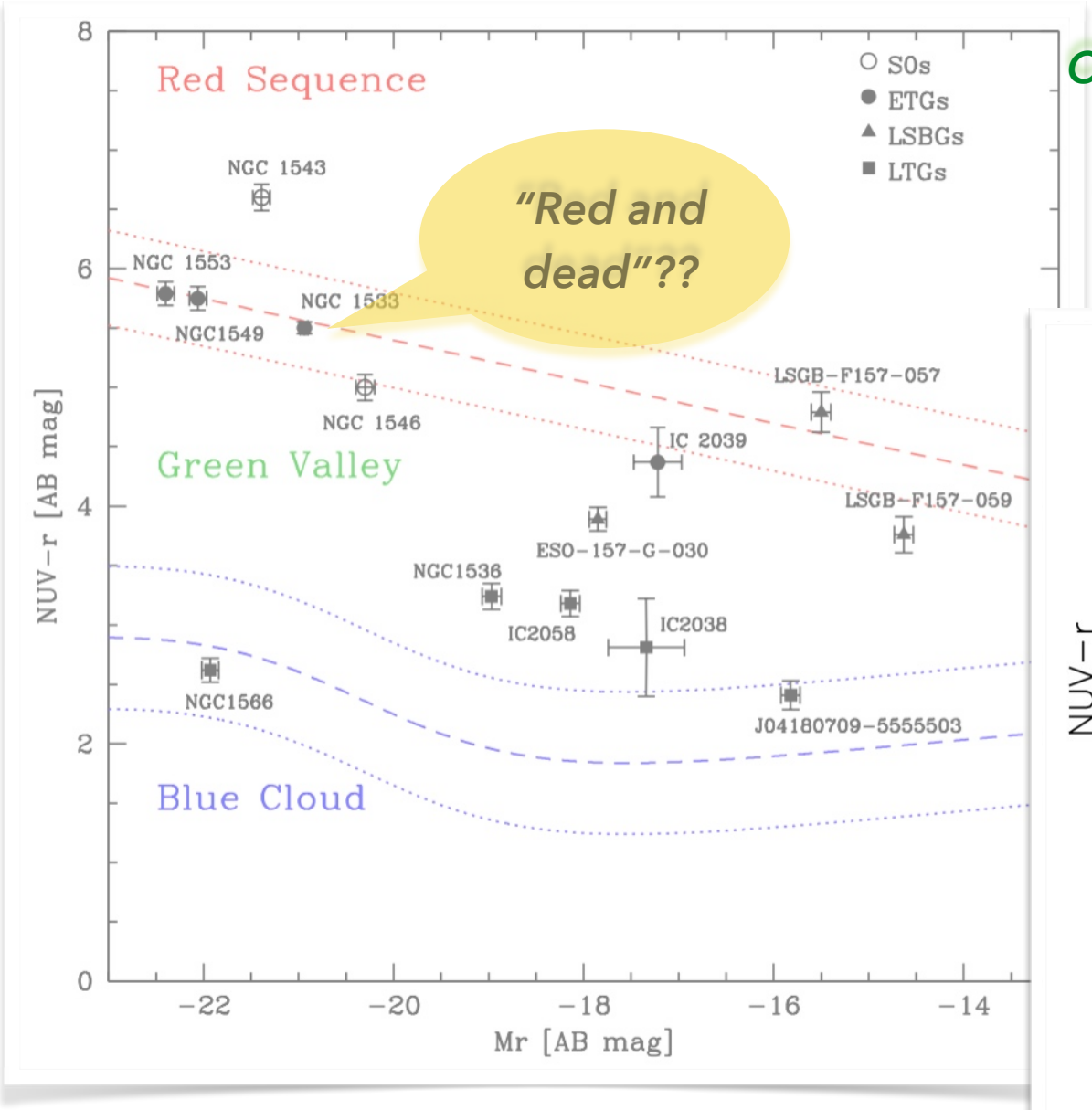
- *Light asymmetries*
- *Faint spiral-like structures*
- *UV emission regions*
- *HI ring*
- *Connection with IC2038*





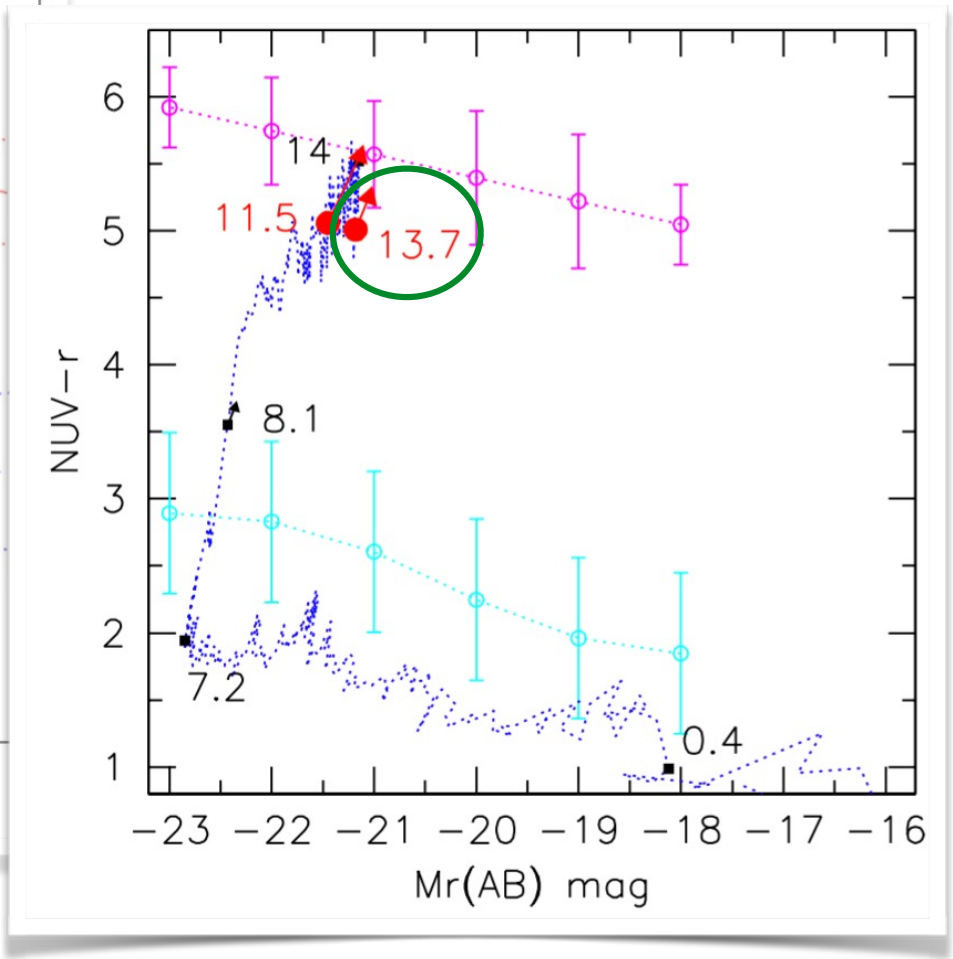


Conclusion - Colour Magnitude Diagram



Catching Spiral-S0 transition in groups? Insights from SPH simulations with chemo-photometric implementation

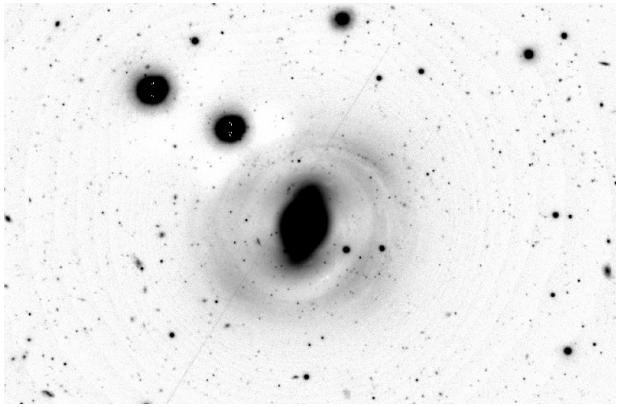
Mazzei et al, 2014

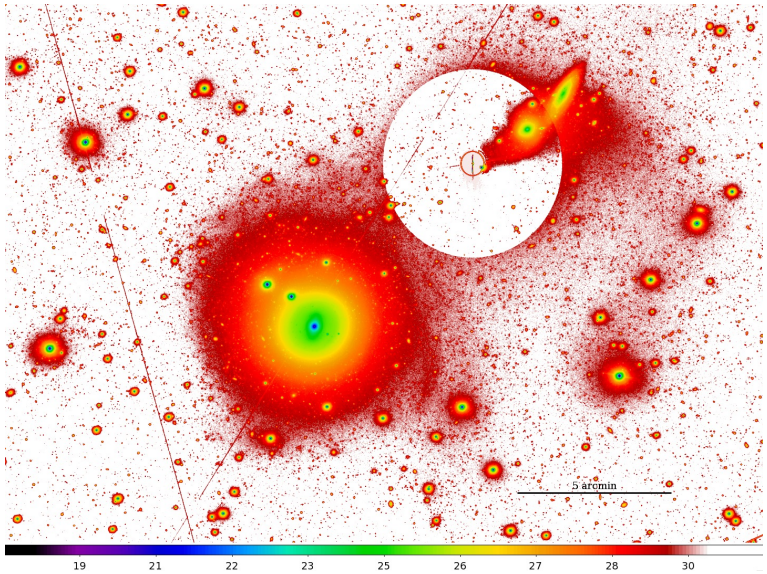


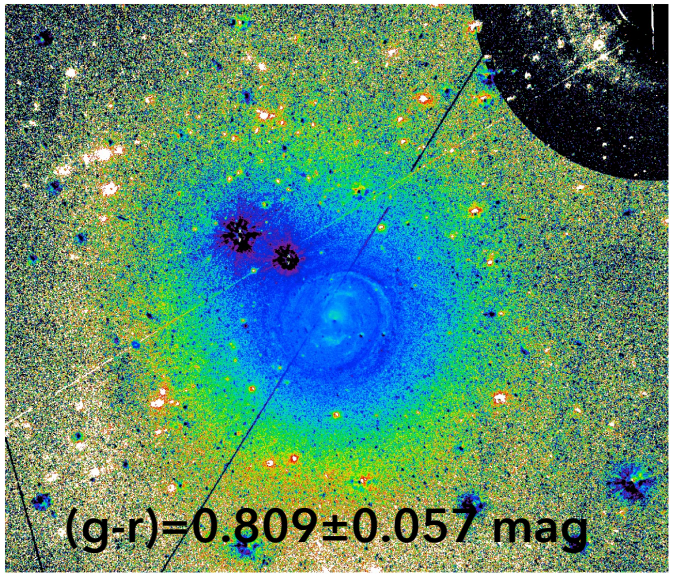

Thanks for
your attention!

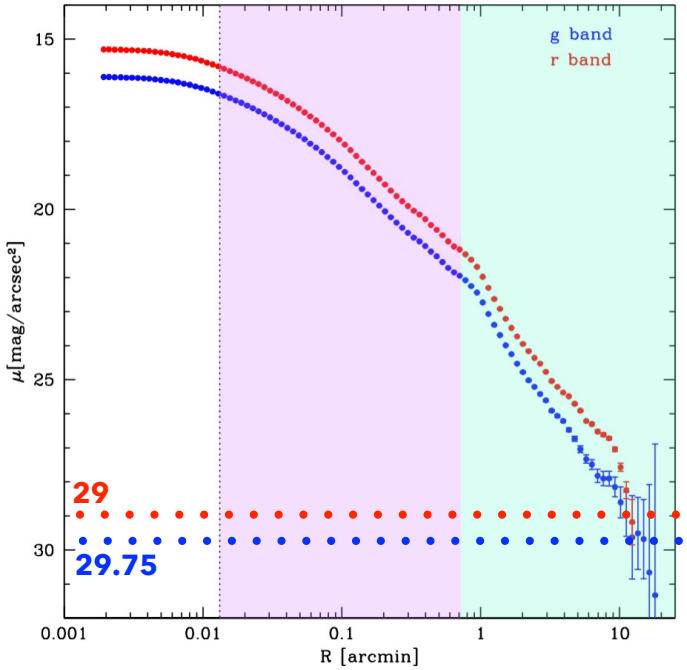
Conclusion - Results

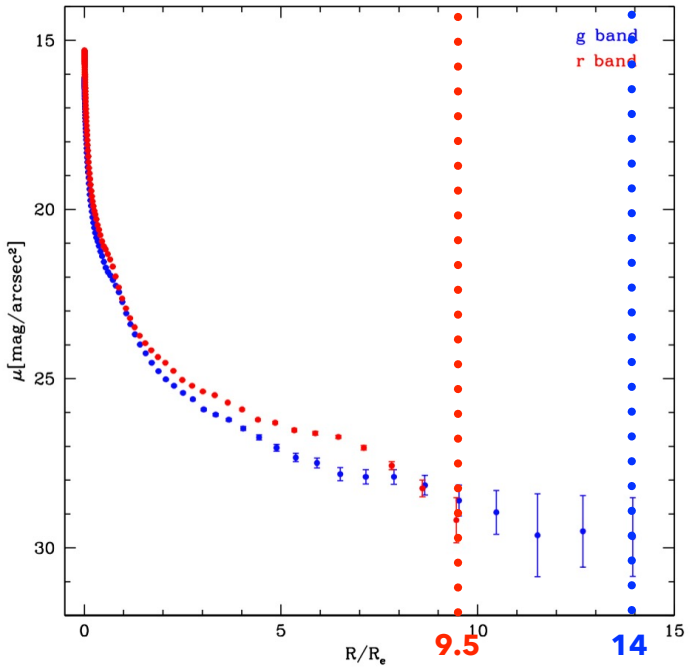
(RL)SB0^0

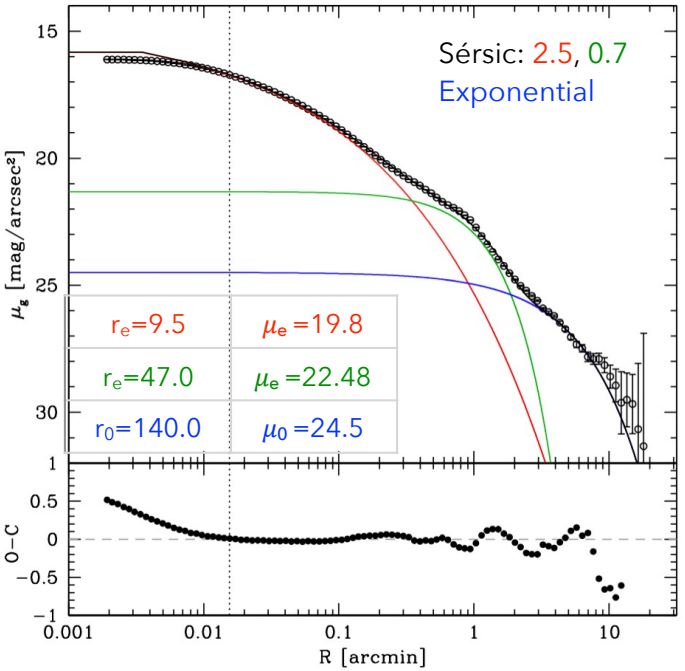












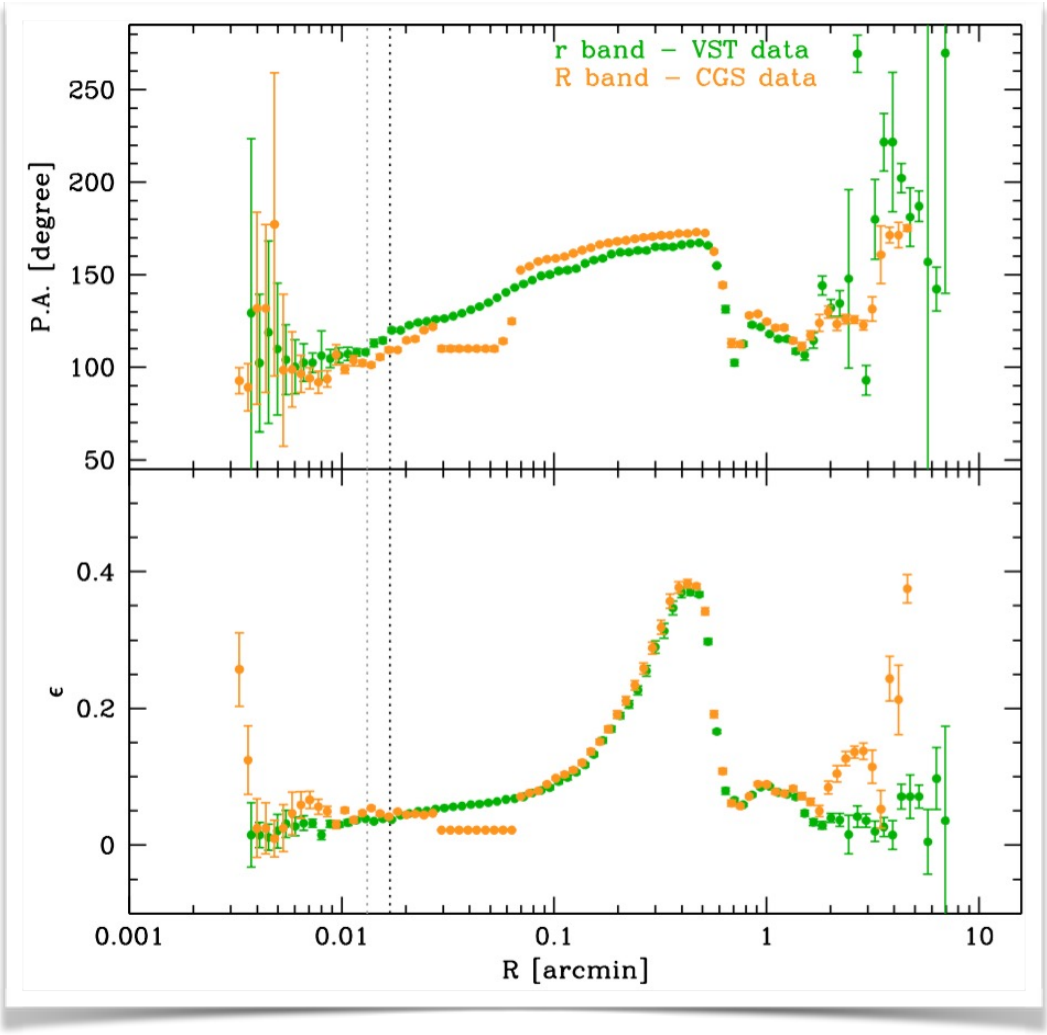
m_{tot}=10.48±0.05 mag

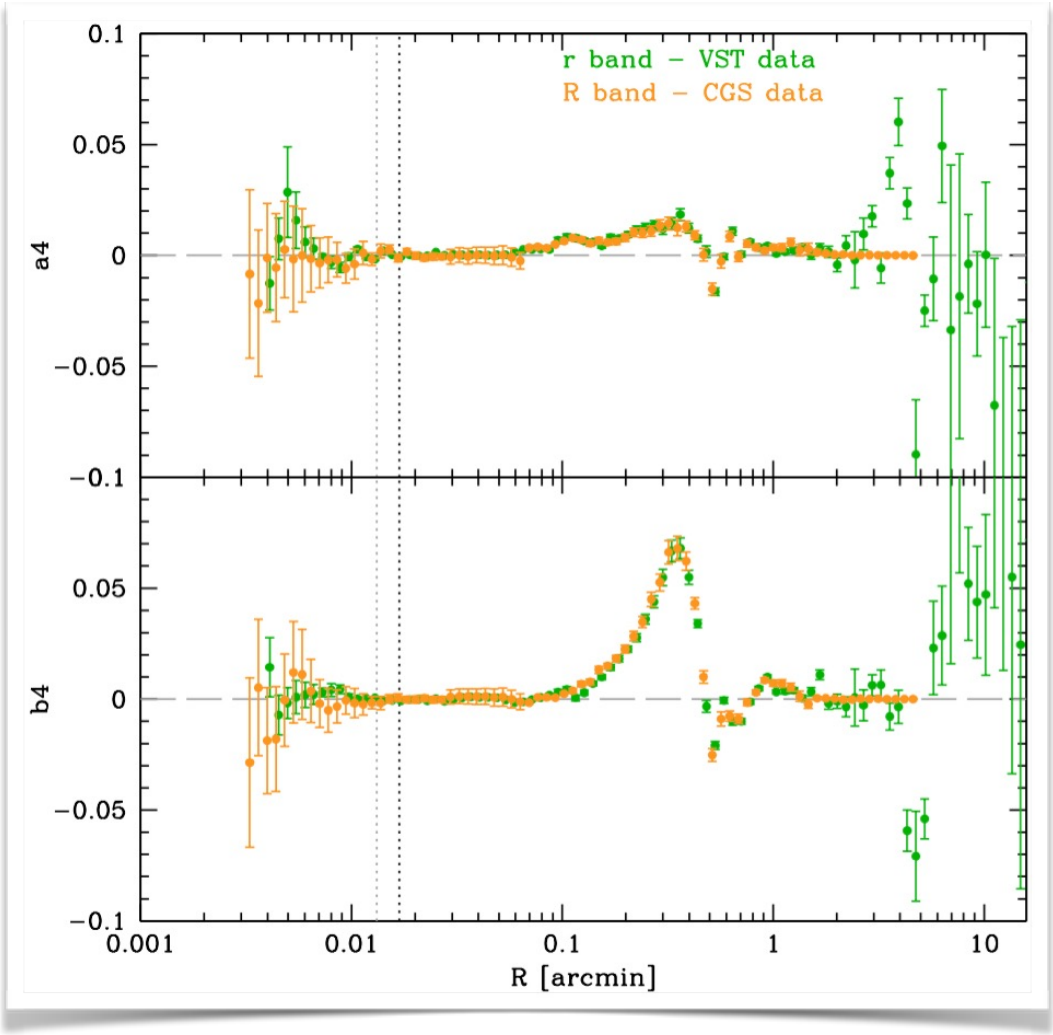
m_{tot}= 9.60±0.05 mag

R_e=64.17±0.16 arcsec

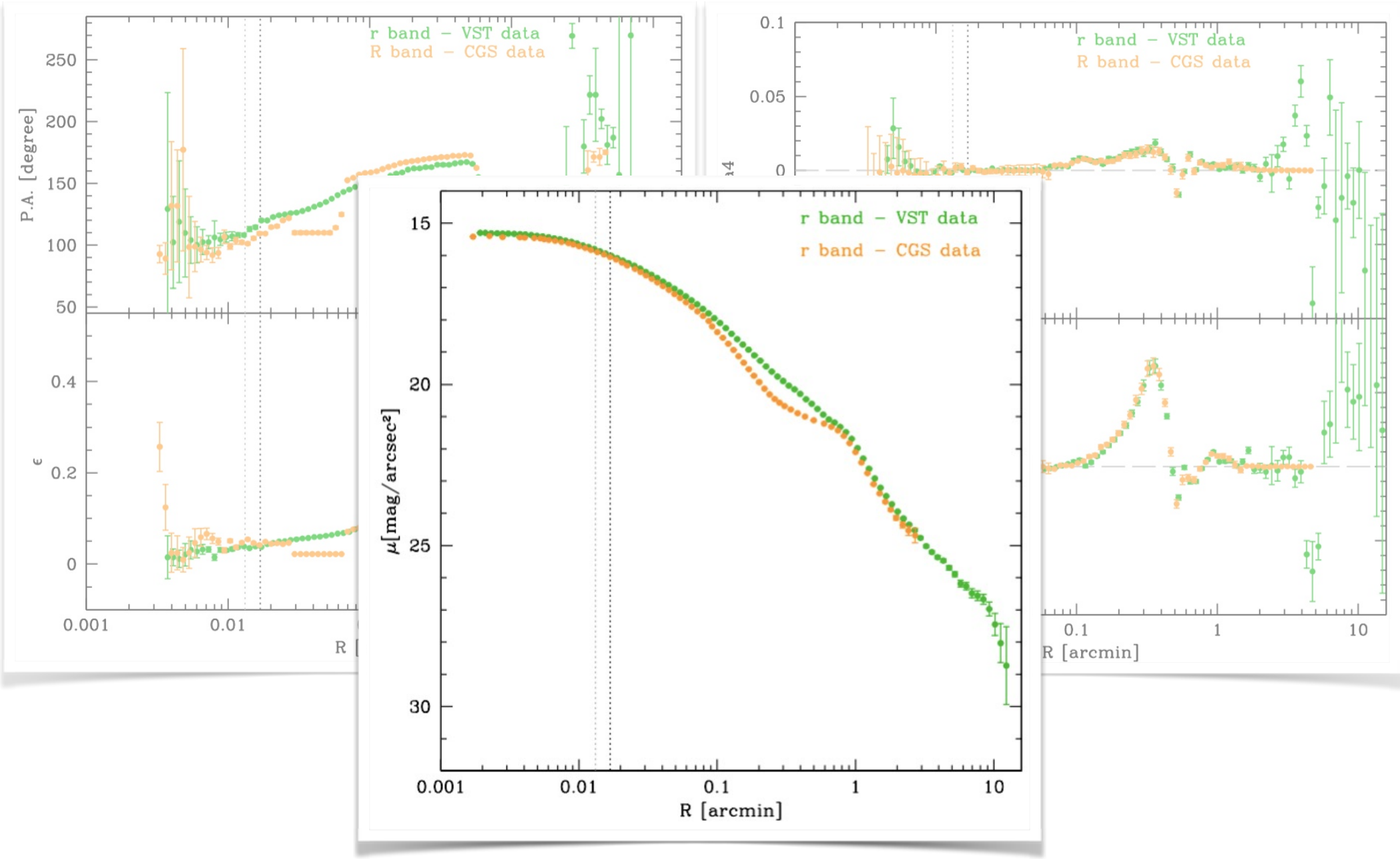
R_e=78.20±0.41 arcsec

Photometry - Geometrical Parameters





Photometry - Surface Brightness Profile



Photometry - Surface Brightness Profile

