

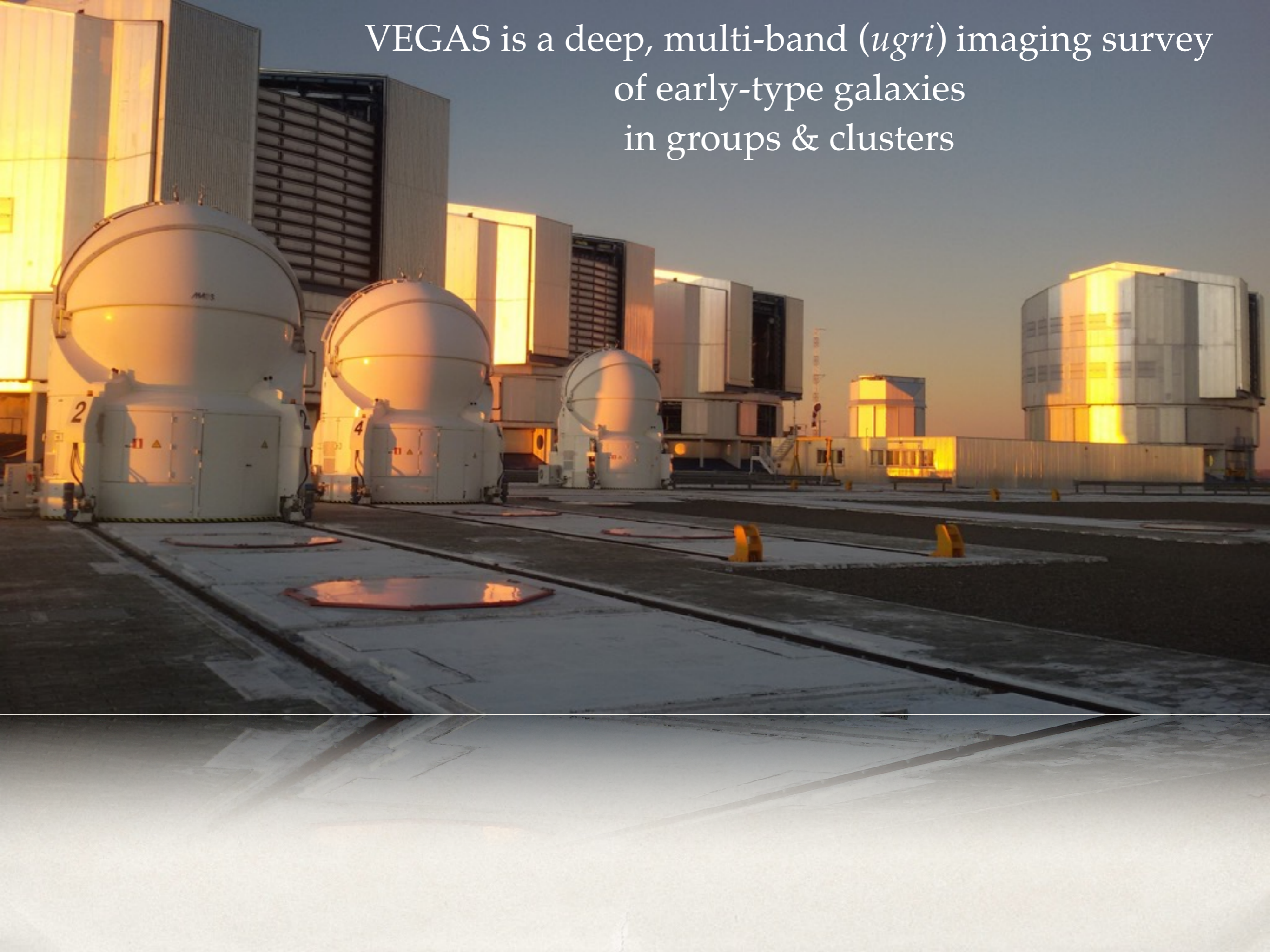
VST Early-type Galaxy Survey

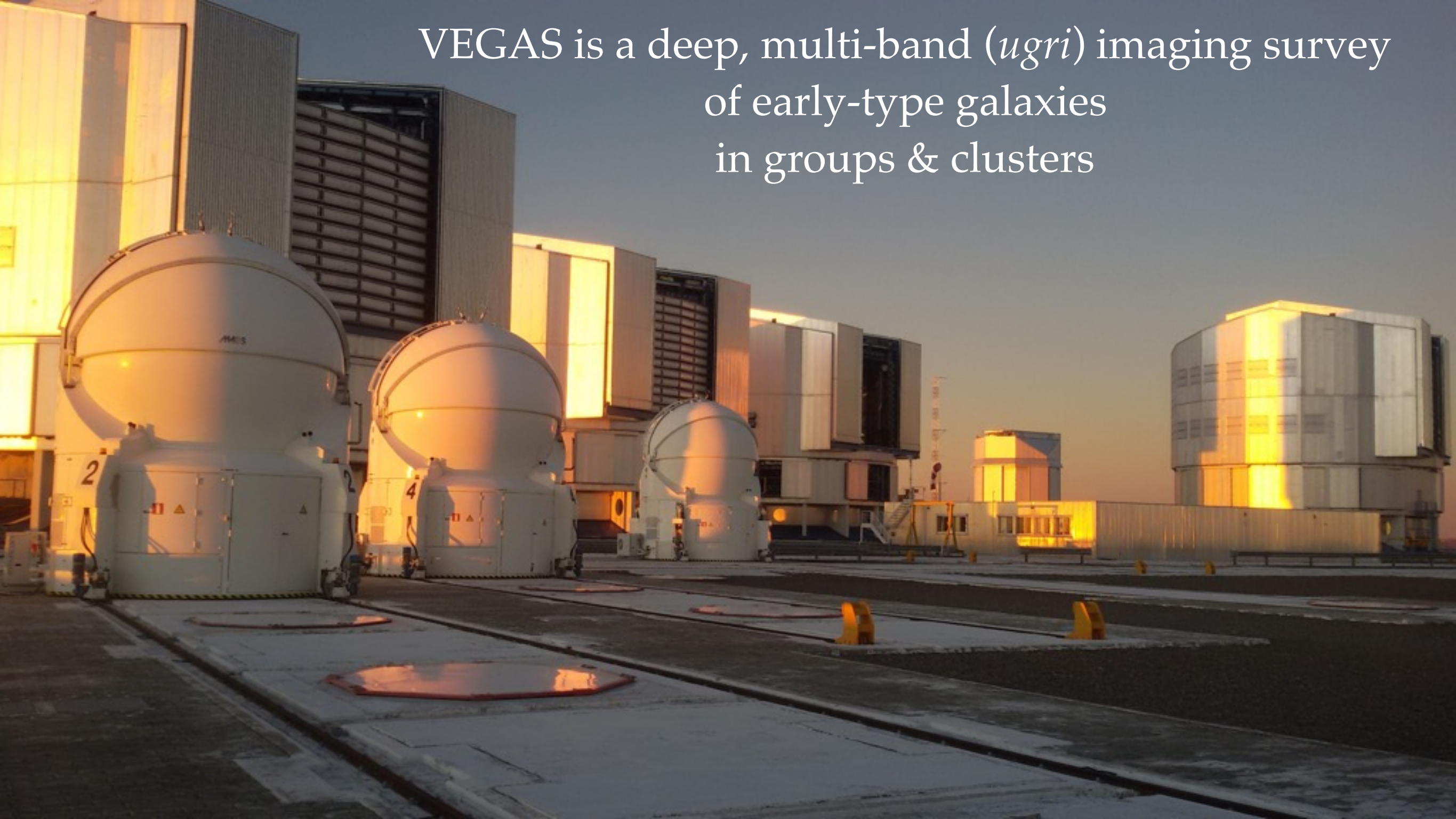
Enrichetta Iodice

INAF-Osservatorio Astronomico di Capodimonte, Napoli

June, 8th 2018

VEGAS is a deep, multi-band (*ugri*) imaging survey
of early-type galaxies
in groups & clusters





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of early-type galaxies
in groups & clusters

VEGAS is based on the GTO assigned at INAF

- 2011-2016, PI: M. Capaccioli, ~55n
- 2016-2021, PI: E. Iodice, ~62n

VEGAS science aims

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- * **map the light distribution and colors** out to 8-10 Re and down to the faint surface
brightness levels of $\mu_g \approx 31 \text{ mag/arcsec}^2$ $\mu_r \approx 28 \text{ mag/arcsec}^2$ $\mu_i \approx 27 \text{ mag/arcsec}^2$

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—> **Cantiello + Paolillo**

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- * the full sample proposed for VEGAS will provide essential **statistical constraints on theoretical models** and enable discrimination among competing galaxy formation theories —> **talk by Spavone**

The Fornax Deep Survey with VST

▶ joint project based on

VEGAS (P.I. E. Iodice)

&

OmegaCam GTO (FOCUS, P.I. R. Peletier)

▶ new, multi-imaging (u, g, r, i bands) survey of the Fornax Cluster

▶ FDS aims to cover 26 deg^2 around the core of the Fornax cluster out to the virial radius, including the region of Fornax A

VEGAS + FDS team

G. Busarello, Capodimonte
M. Cantiello, Teramo
G. D'Ago, Capodimonte
A. Grado, Capodimonte
L. Greggio, Padova
L. Limatola, Capodimonte
P. Merluzzi, Capodimonte
N.R. Napolitano, Capodimonte
R. Rampazzo, Padova
M. Ray, Capodimonte
P. Schipani, Capodimonte
M. Spavone, Capodimonte

INAF

**ISTITUTO NAZIONALE
DI ASTROFISICA**

**NATIONAL INSTITUTE
FOR ASTROPHYSICS**

VEGAS + FDS team

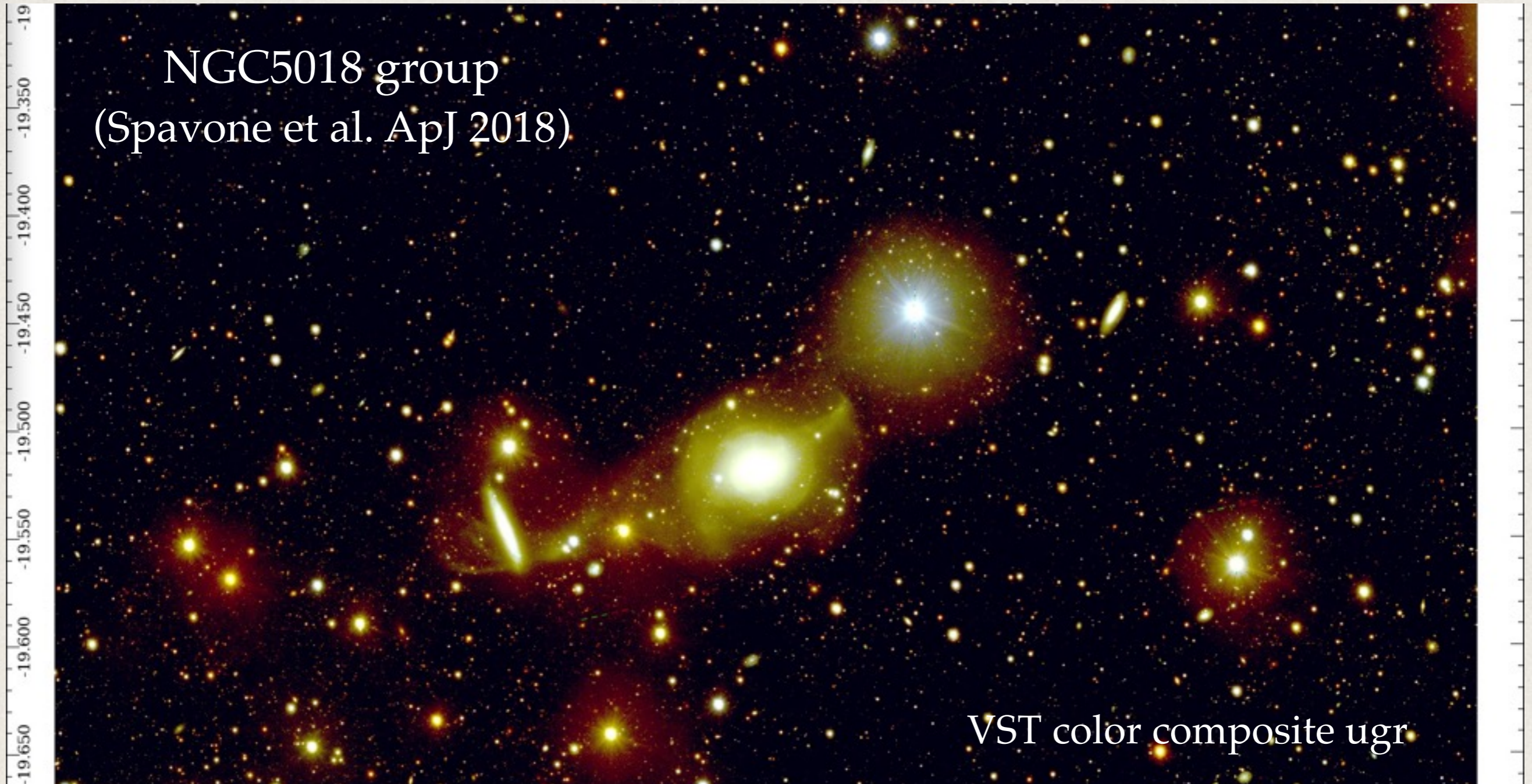
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M. Spavone, Capodimonte

M. Arnaboldi, ESO, D
A. Cooper, Durham, UK
M. Capaccioli, Univ. Naples, IT
R. D'Abrusco, Smithsonian Astr. Ob., US
D. De Cicco, Univ. Naples, IT
J. Falcon-Barroso, IAC, S
D. Forbes, Swinburne Univ., AU
E. Emsellem, ESO, D
D. Krajnović, AIP, D
T. Lisker, Heidelberg, D
M. Hilker, ESO, D
S. Mieske, ESO, Chile
M. Paolillo, Univ. Naples, IT
R. Peletier, Kapteyn, NL
A. Romanovsky, S. Josè Univ., US
C. Tortora, Kapteyn, NL
G. van de Ven, ESO, D

VEGAS + FDS publications

- ◆ **Spavone M., Iodice E., Capaccioli M. et al., 2018**, ApJ, submitted: *VEGAS: A VST Early-type GALaxy Survey III. Mapping the galaxy structure, interactions and intragroup light in the NGC5018 group*
- ◆ **Cantiello M., D'Abrusco R., Spavone M., et al., 2018**, A&A, 611, 93: *VEGAS-SSS II. Comparing the globular cluster systems in NGC3115 and NGC1399 using VEGAS and FDS survey data*
- ◆ **Iodice E., Spavone M., Capaccioli M., et al., 2017**, ApJ, 851, 75: *Intracluster Patches of Baryons in the Core of the Fornax Cluster*
- ◆ **Venhola A. et al., 2017**, A&A, 608,142: *The Fornax Deep Survey with VST. III. Low Surface Brightness (LSB) dwarfs and Ultra Diffuse Galaxies (UDGs) in the centre of the Fornax cluster*
- ◆ **Iodice E., Spavone M., Capaccioli M., et al., 2017**, ApJ, 839, 21: *The Fornax Deep Survey with VST. II. FornaxA: A Two-phase Assembly Caught in Act*
- ◆ **Spavone M., Capaccioli M., Napolitano N.R et al., 2017**, A&A, 603, 38: *VEGAS: A VST Early-type GALaxy Survey II. Photometric study of giant ellipticals and their stellar halos*
- ◆ **D'Abrusco R., Cantiello M., Paolillo M. et al., 2016**, ApJL, 819, 31: *The Extended Spatial Distribution of Globular Clusters in the Core of the Fornax Cluster*
- ◆ **Iodice E., Capaccioli M., Grado A. et al., 2016**, ApJ, 820, 42: *The Fornax Deep Survey with VST. I. The Extended and Diffuse Stellar Halo of NGC 1399 out to 192 kpc*
- ◆ **Cantiello M., Capaccioli M., Napolitano N.R., 2015**, A&A, 576, 14: *VEGAS-SSS. A VST early-type galaxy survey: analysis of small stellar systems. Testing the methodology on the globular cluster system in NGC 3115*
- ◆ **Capaccioli M., Spavone M., Grado A., et al. 2015**, A&A, 581, 10: *VEGAS: A VST Early-type GALaxy Survey. I. Presentation and test case on the field of NGC 4472*
- ◆ **Iodice E., Capaccioli M., Spavone M., et al. 2015**, A&A, 574, 111: *A forming wide polar-ring galaxy at $z \sim 0.05$ in the VST Deep Field of the Fornax cluster*

NGC5018 group
(Spavone et al. ApJ 2018)



VST color composite ugr

VEGAS ongoing projects

groups of galaxies

see talk by Marilena Spavone



NGC1533 group

VST color composite gr

VEGAS ongoing projects

groups of galaxies

see talk by Arianna Cattapan & poster by R. Rampazzo

IC1459 group

VEGAS

ongoing projects

groups of galaxies

in collaboration with Elena Bannikova

VST g band
1x2 sq²

VEGAS

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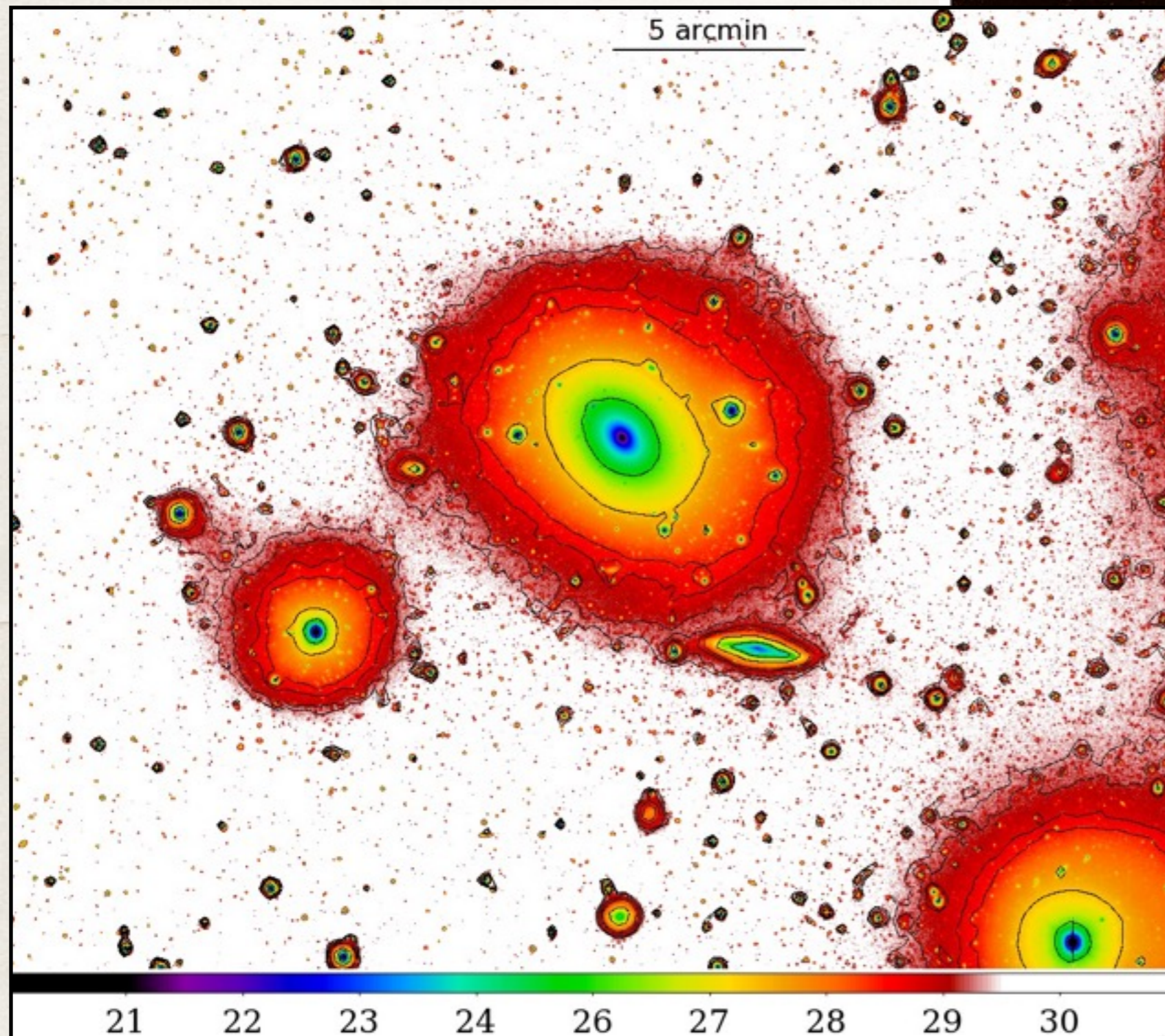
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IC1459 group



VST g band
1x2 sq²

IC1459 group



VST g band
1x2 sq²

Hydra I cluster

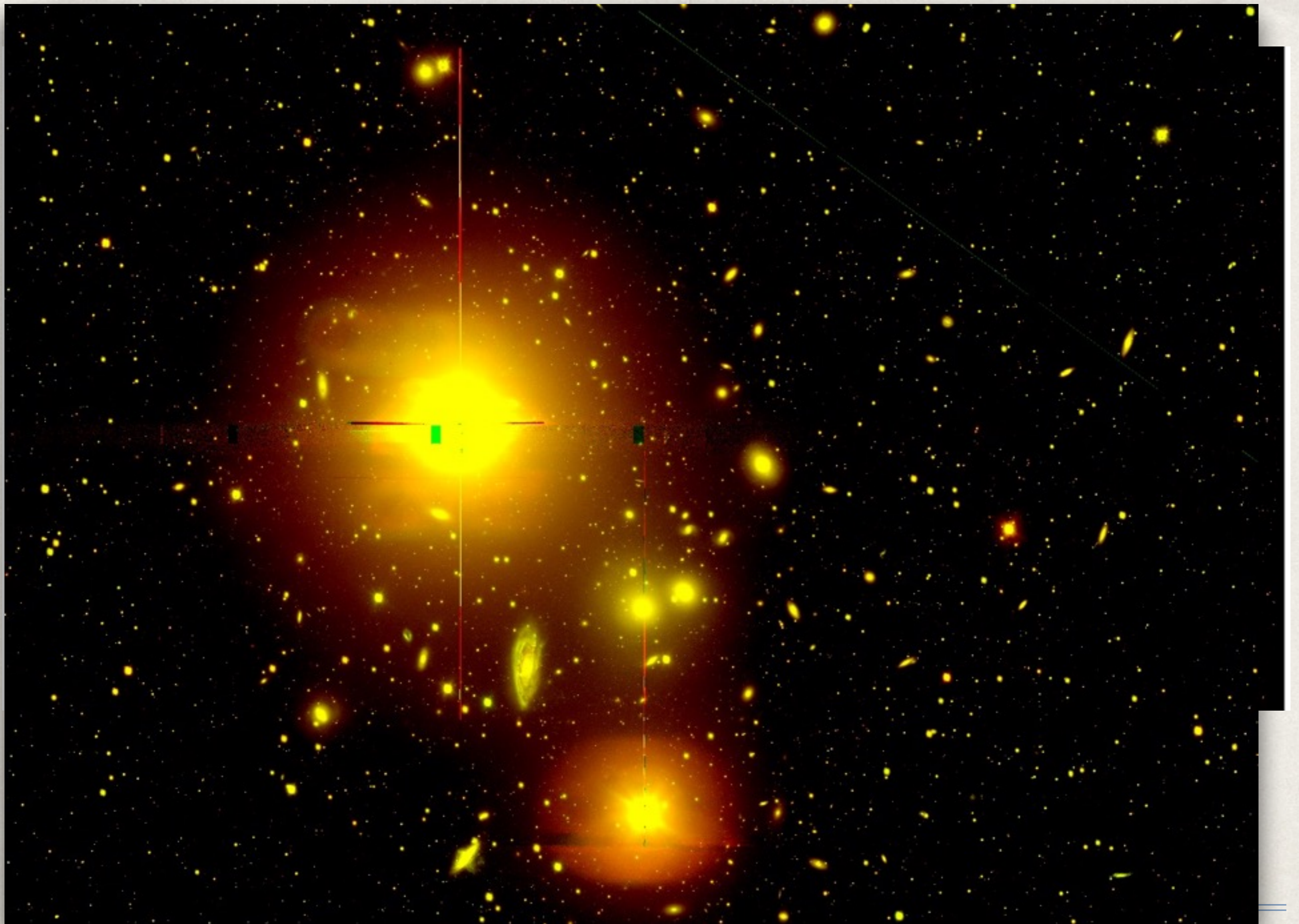


VST mosaic 2 x 1.5 sq²

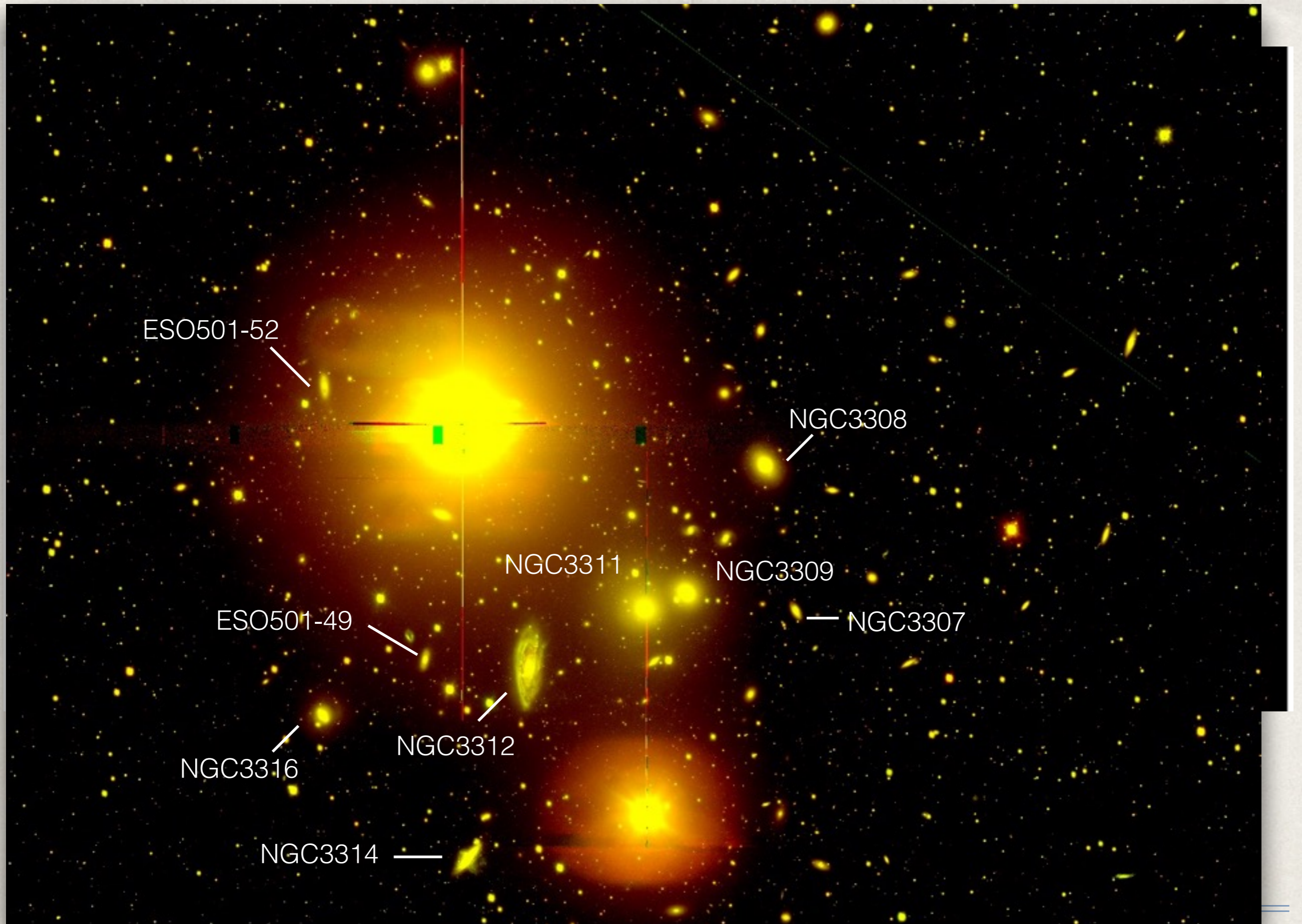
VEGAS ongoing projects

cluster of galaxies

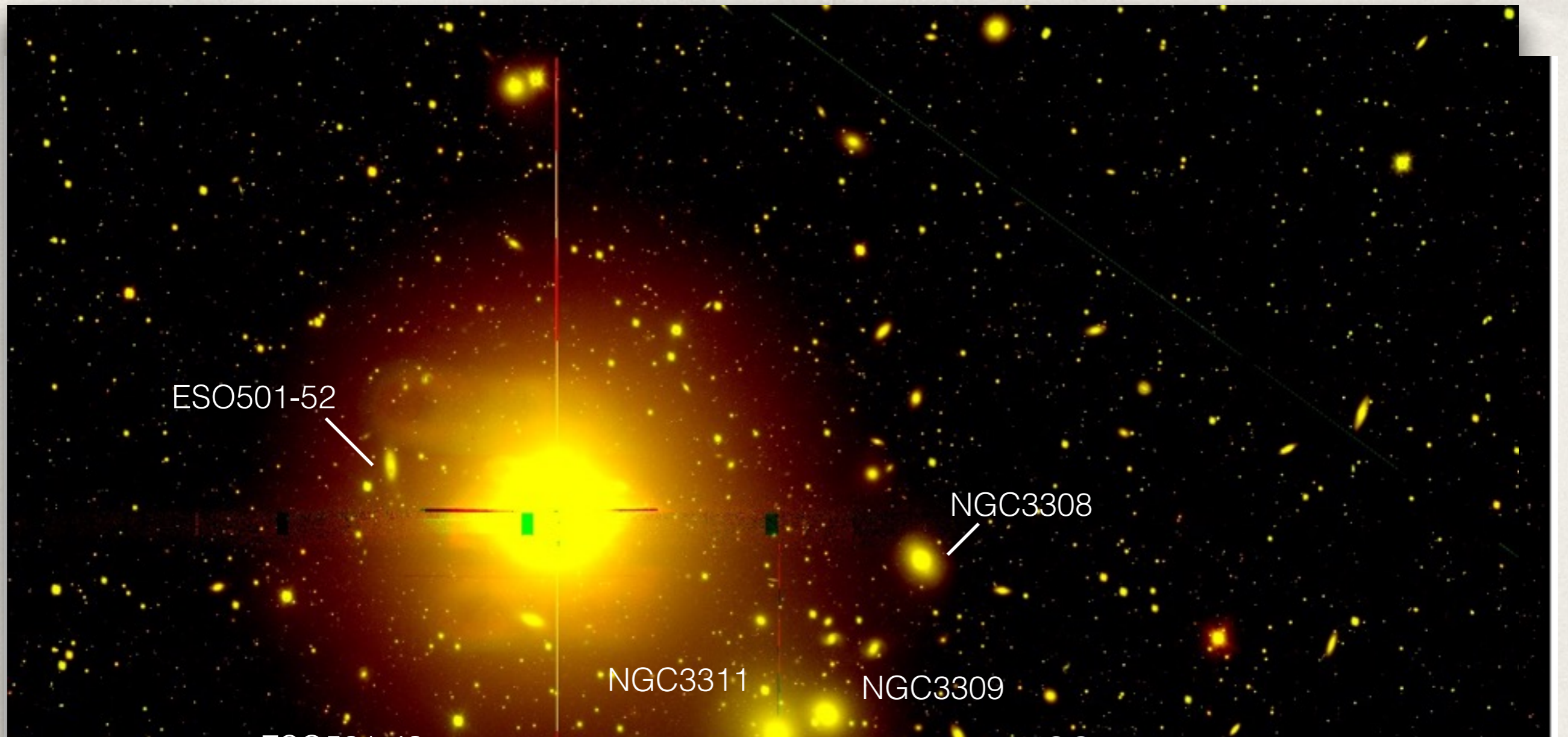
in collaboration with M. Hilker , M. Arnaboldi, S. Mieske



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The VST mosaic is the up-to-date largest mosaic of the Hydra cluster

- ~ to study the faintest regions of the central stellar halo that hosts several disrupting satellites (see Arnaboldi et al. 2012; Koch et al. 2012)
- ~ to obtain a full account of low surface brightness features in the whole cluster



Fornax Deep Survey with VST

Results & ongoing works

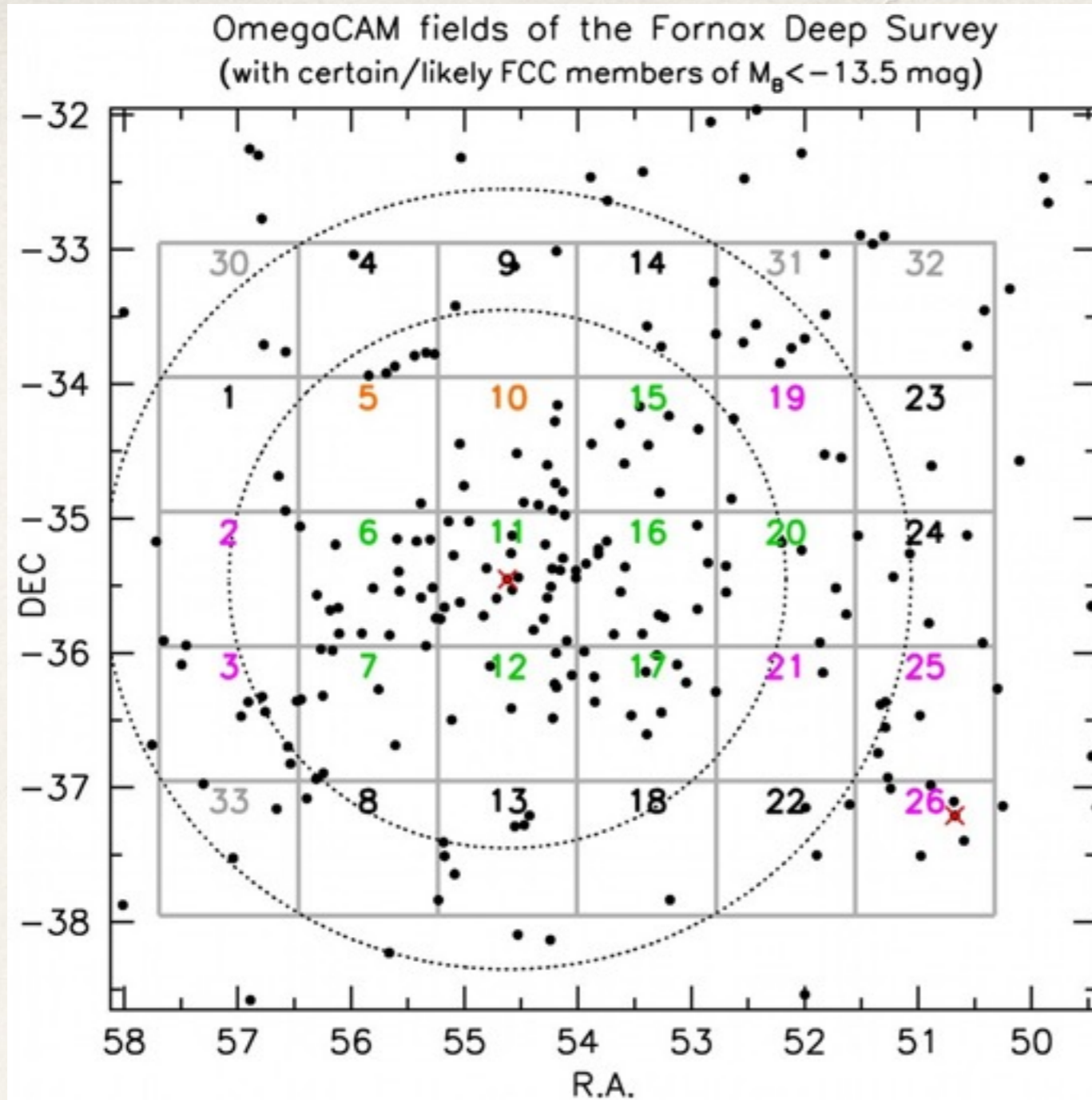
P.I.: R. Peletier & E. Iodice

- * structure of the bright galaxies ($m_B < 15 \text{ mag}$) inside $R < R_{\text{vir}}$ (ETGs, this talk, and LTGs see talk by Angela Ray)
- * stellar halos in ETGs, Spavone et al. in preparation
- * LSB & Dwarf galaxies, Venhola et al. in preparation (see talk by R. Peletier)
- * science on background objects (Napolitano et al.)
- * GCs distribution (see talks by Paolillo & Cantiello)

Fornax Deep Survey with VST

Results & ongoing works

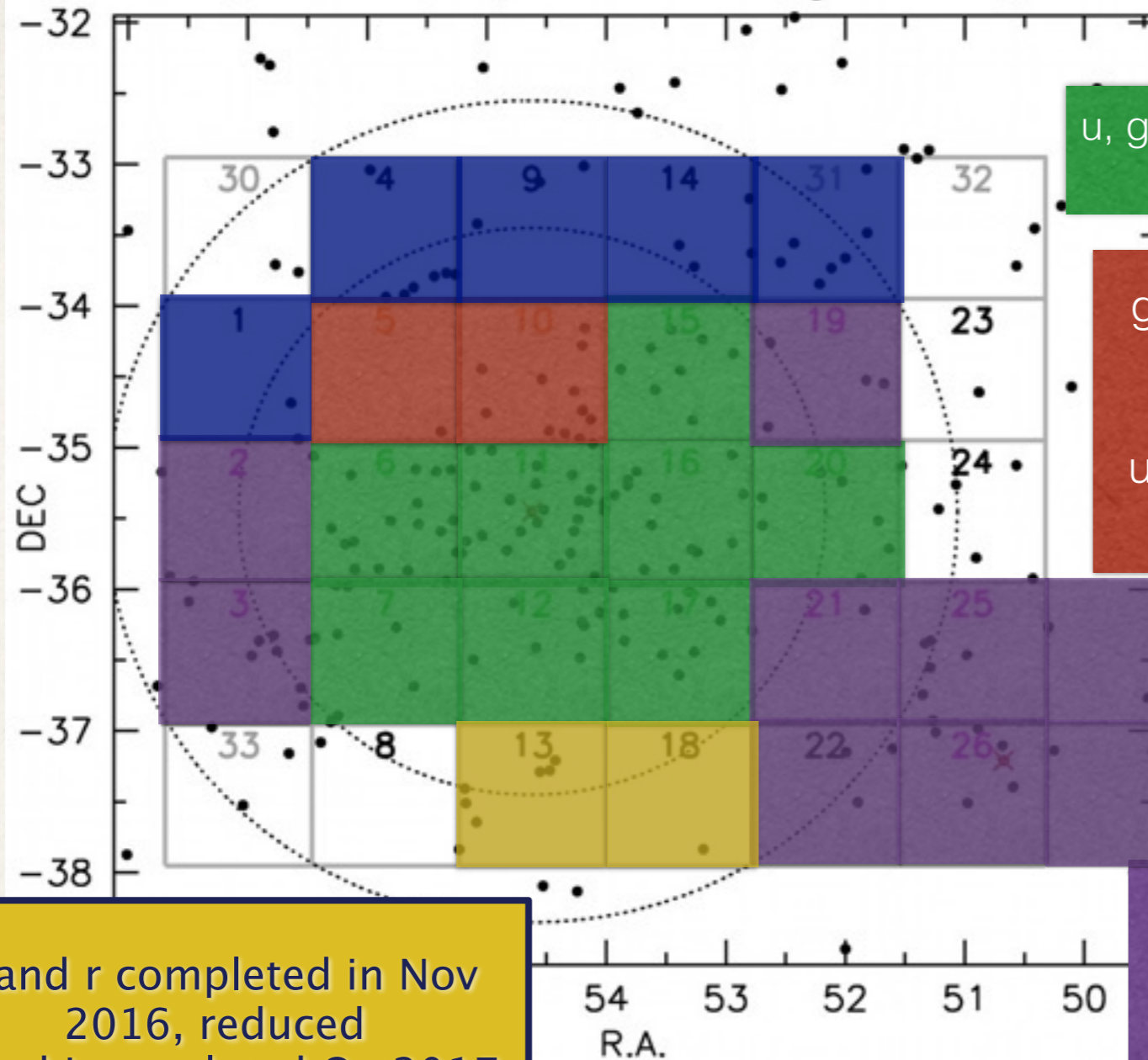
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Fornax Deep Survey with VST

observation plan: completed in Nov 2017!

OmegaCAM fields of the Fornax Deep Survey
(with certain/likely FCC members of $M_B < -13.5$ mag)



u, g, r and i: completed in 2013+2014
and reduced

g and i completed in 2014
and reduced
u and r completed in 2015
and reduced

g, r and i completed in Nov
2016, to be reduced
u completed in 2017

g and r completed in Nov
2016, reduced
u and i completed Oct2017

g and r completed in Nov 2015
and reduced
i completed in Nov2017

Fornax Deep Survey with VST

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Why Fornax?

Why Fornax?

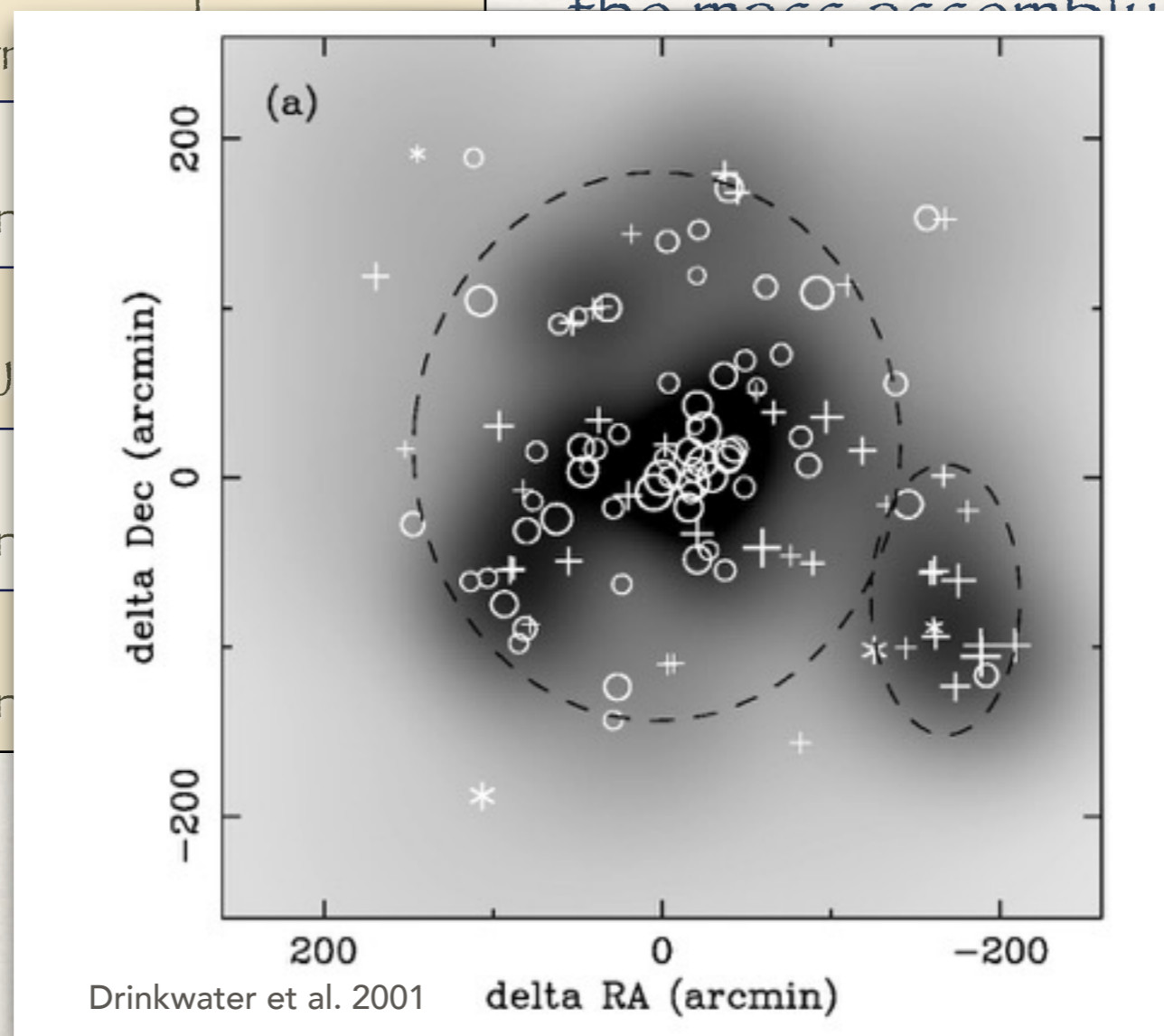
RA	03h 38m
DEC	-35d 30m
distance	20 Mpc (Ferrarese et al. 2000)
M_{dyn}	$7 \times 10^{13} M_{\odot}$ (Drinkwater et al. 2001)
L_x	5×10^{41} erg/s (Jones et al. 1997)
σ	370 km/s (Drinkwater et al. 2001)
R_{vir}	0.7 Mpc (Drinkwater et al. 2001)

- nearby, dense environment
- perfectly located for VST
- the mass assembly is still ongoing

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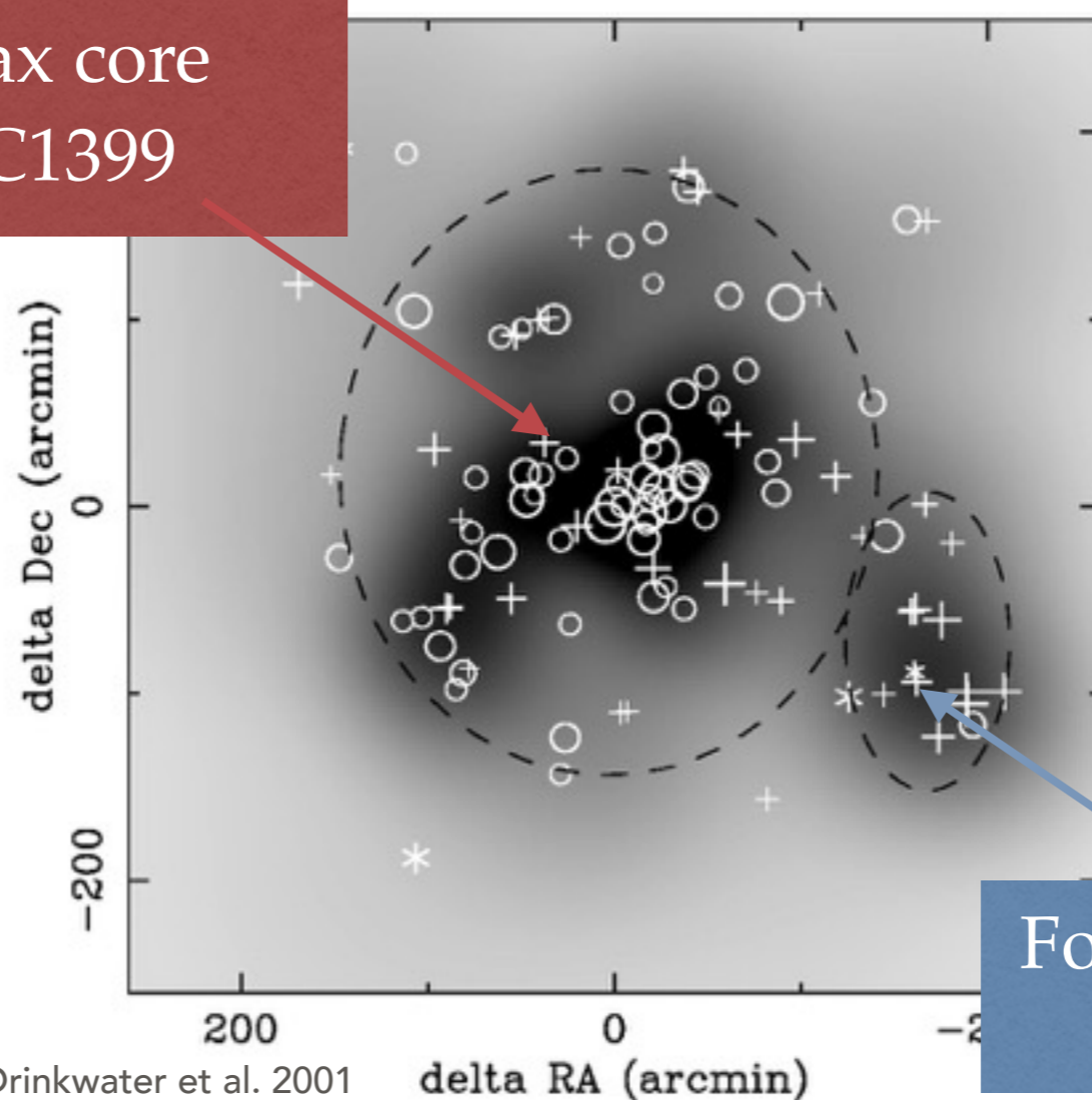


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Fornax core
NGC1399



Fornax SW group
NGC1316

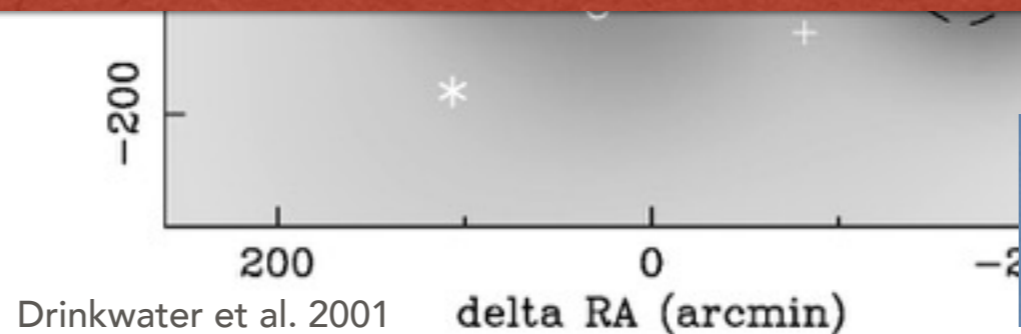
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Fornax core
NGC1399

FDS covers the full region involved in this process of cluster grow



Fornax SW group
NGC1316

Why Fornax?

multi-wavelength observations available/upcoming

- * **Herschel survey**
- * **ALMA survey**
- * **SAMI integral field spectroscopy**
- * **MUSE survey**
- * **MUSE survey of dwarfs**
- * **VIMOS Survey of GCs**
- * **MeerKAT HI survey of Fornax**
- * **VISTA data**
- * **Archival data: Chandra, HST, GALEX**

FDS:

galaxy structure, stellar halo & ICL

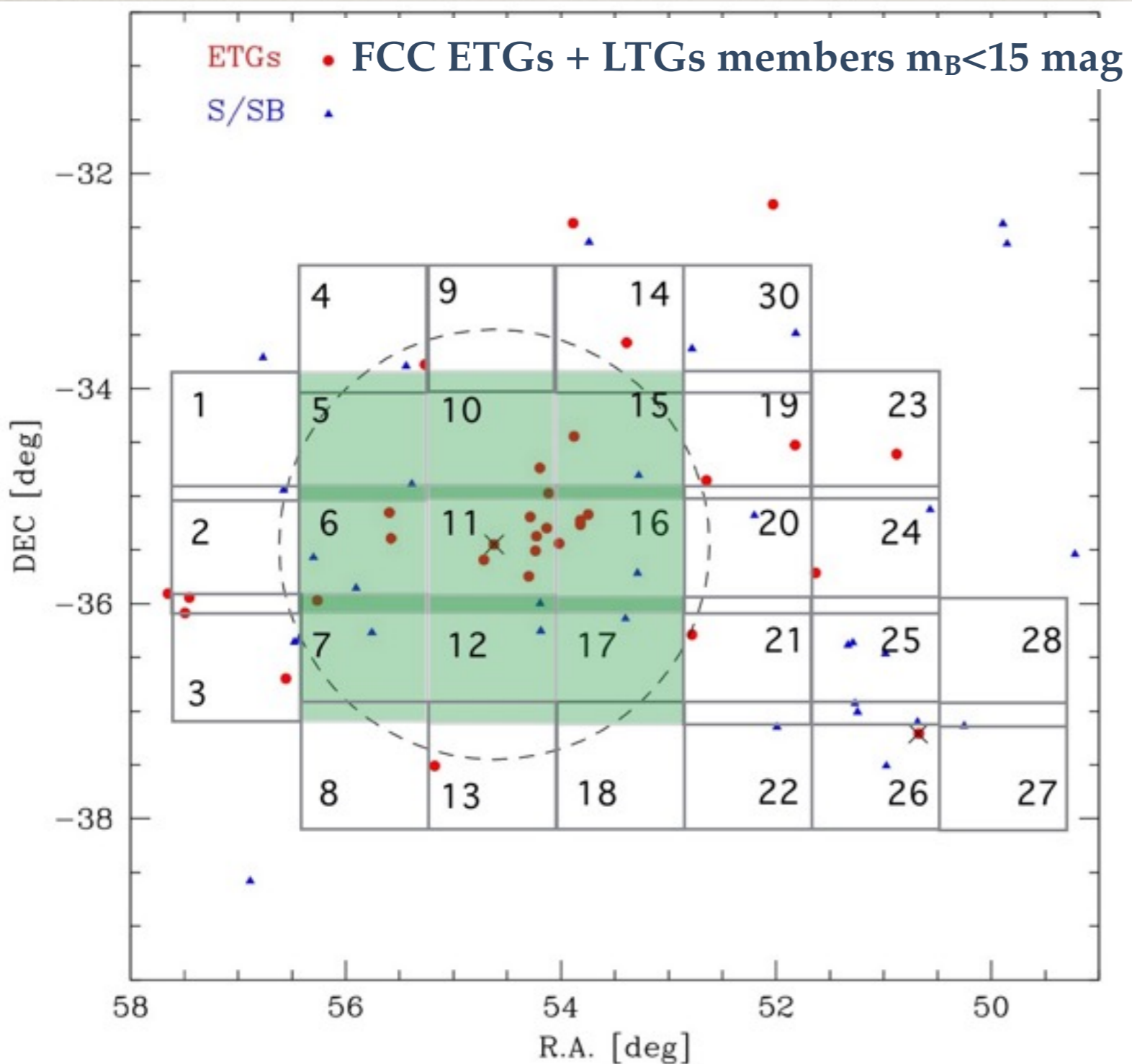
- * **Iodice et al. 2016, ApJ 820, 42:** *The Fornax Deep Survey with VST. I. The extended and diffuse stellar halo of NGC1399 out to 192 kpc*
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- * **Iodice et al. 2018, in preparation:** *The Fornax Deep Survey with VST. IV. Surface photometry of the bright early-type galaxies inside the virial radius*
- * **Ray et al. 2018, in preparation:** *The Fornax Deep Survey with VST. VI. Surface photometry of the bright late-type galaxies inside the virial radius*
- * **Spavone et al. 2018, in preparation:** *The Fornax Deep Survey with VST. VII. Stellar Halos of the bright early-type galaxies inside the virial radius*

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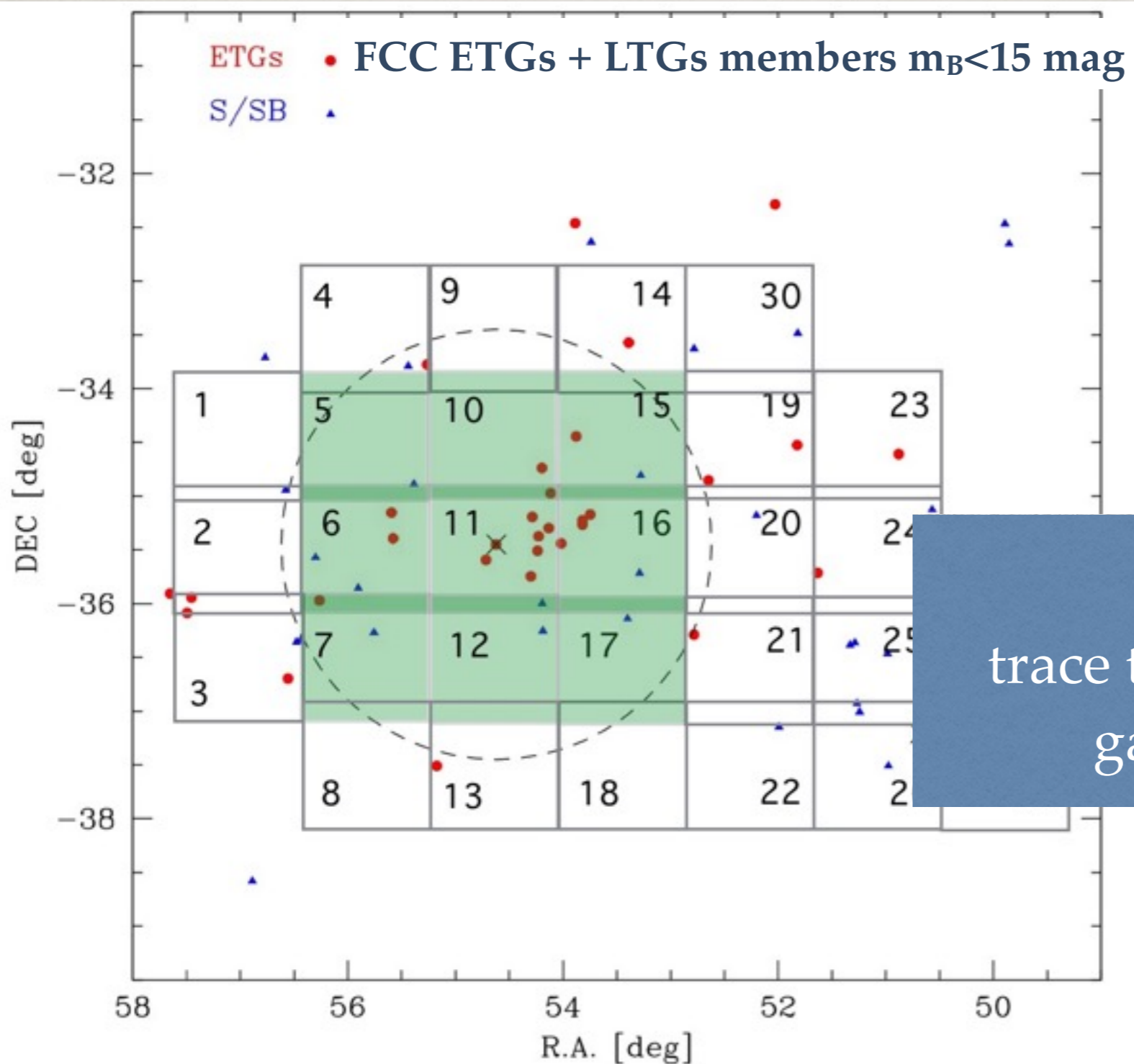
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FDS: the ETGs inside R_{vir}



for $R < R_{\text{vir}}$
there are ~ 20 ETGs & ~ 10 LTGs

FDS: the ETGs inside R_{vir}



for $R < R_{\text{vir}}$
there are ~ 20 ETGs & ~ 10 LTGs

main science goal:
trace the assembly history of the
galaxies & of the cluster

the VST mosaic of the Fornax cluster $R < R_{\text{vir}}$ ($\sim 3 \times 3 \text{ sq}^\circ$)

FI

DEC [deg]

-32

-34

-36

-38

-34.000
-34.500
-35.000
-35.500
-36.000
-36.500
-37.000

56.500

56.000

55.500

55.000

54.500

54.000

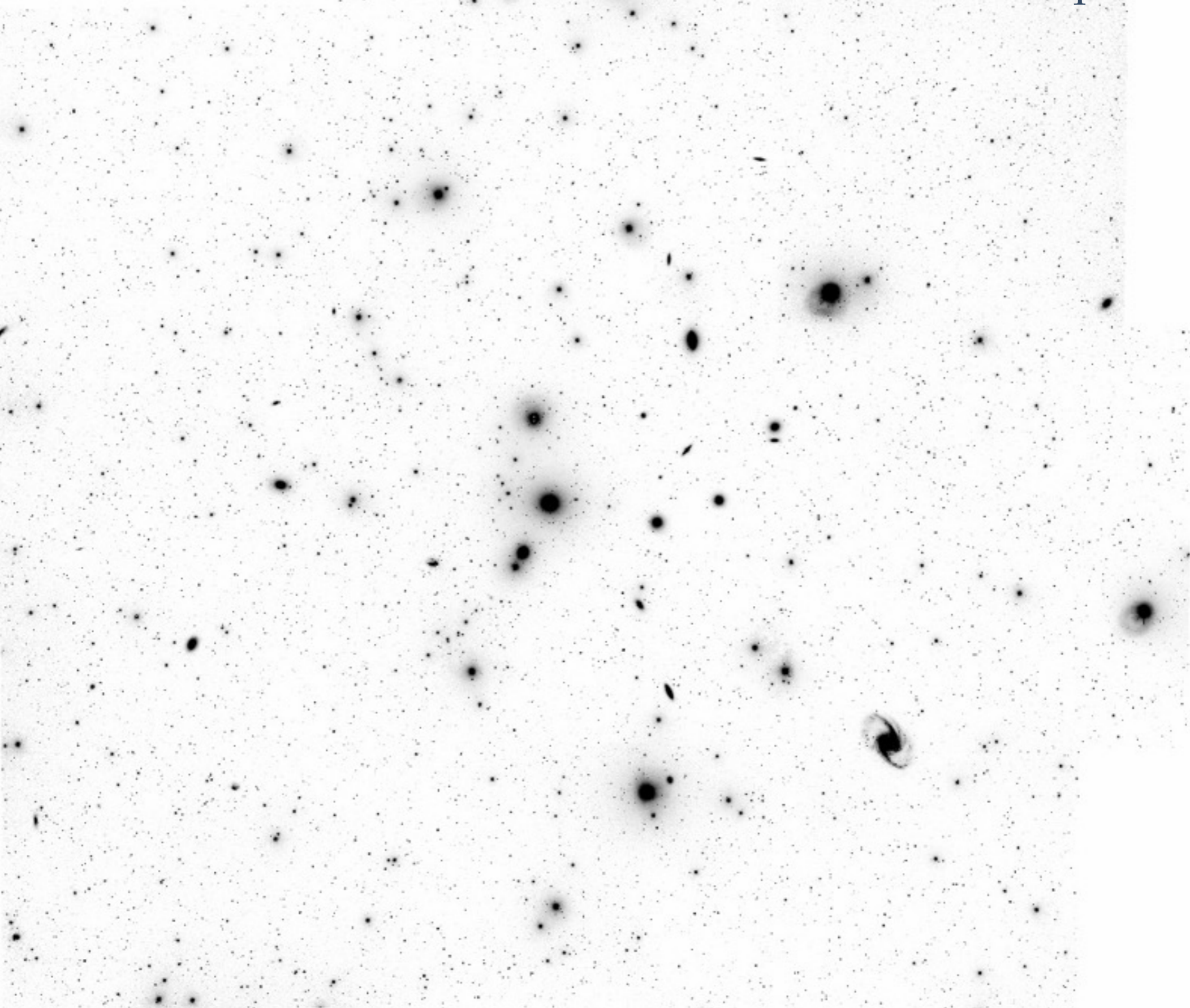
53.500

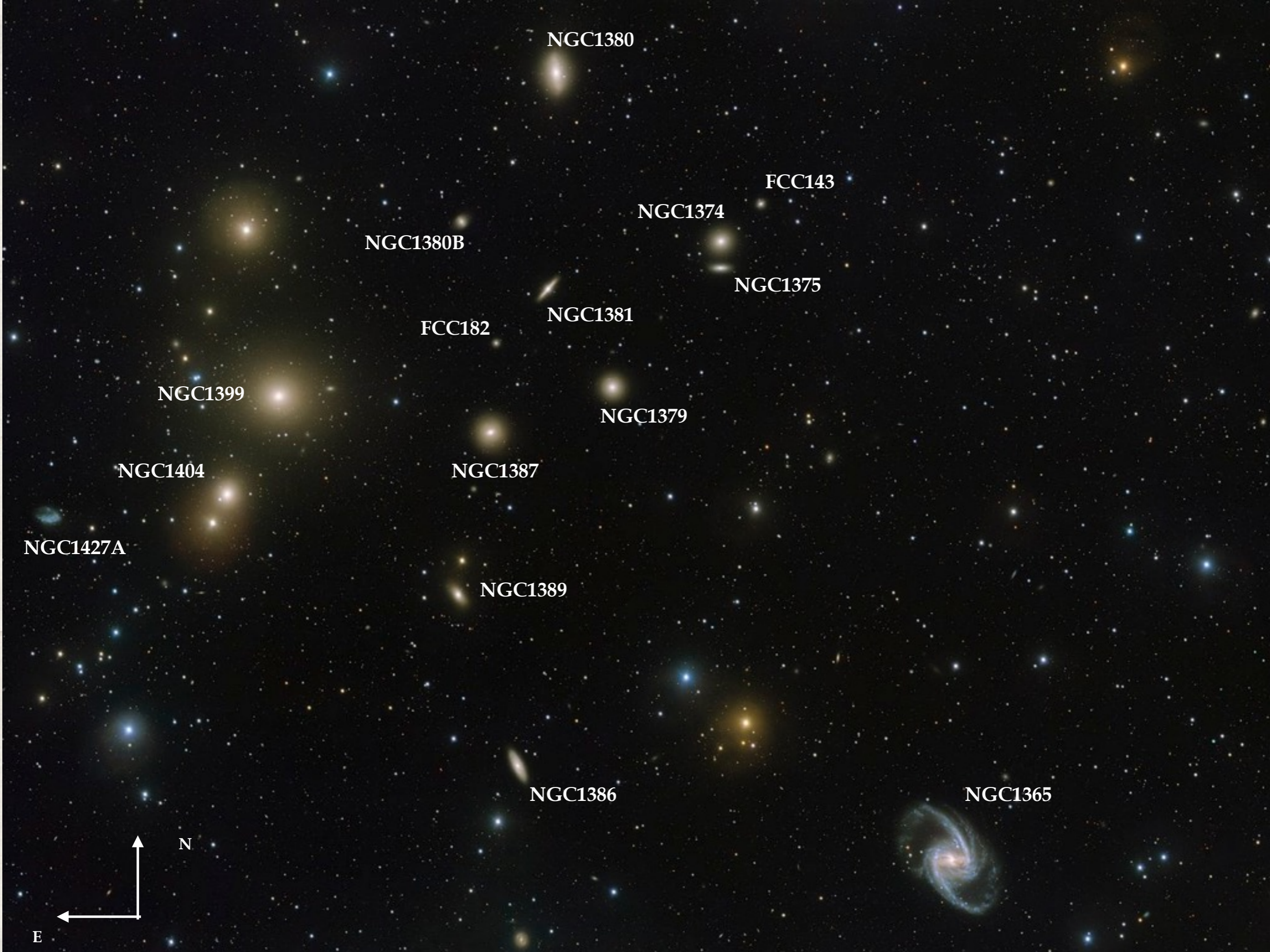
53.000

52.500

0 LTGs

he





NGC1380

FCC143

NGC1374

NGC1380B

NGC1375

FCC182

NGC1381

NGC1379

NGC1399

NGC1404

NGC1387

NGC1427A

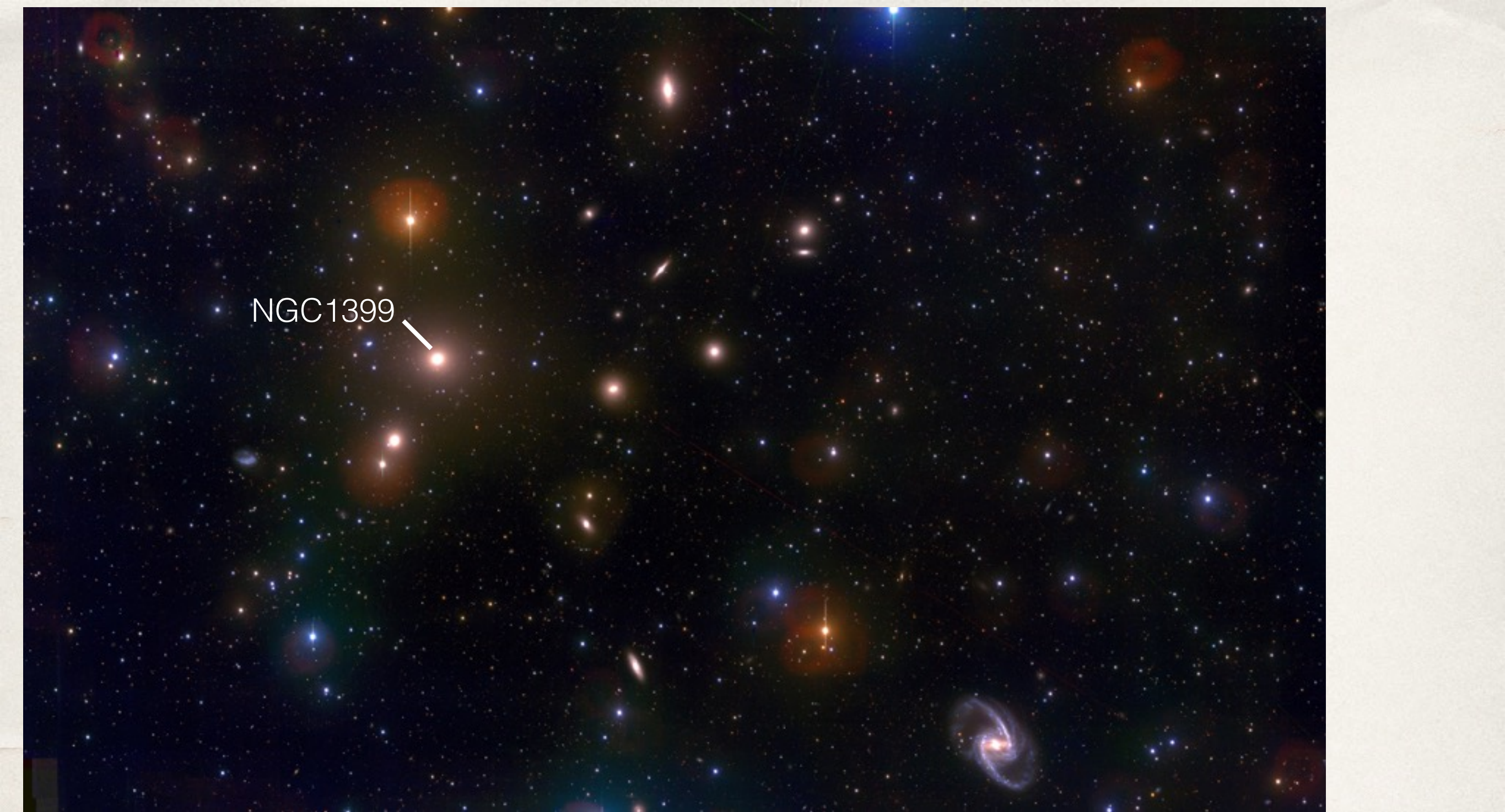
NGC1389

NGC1386

NGC1365

N

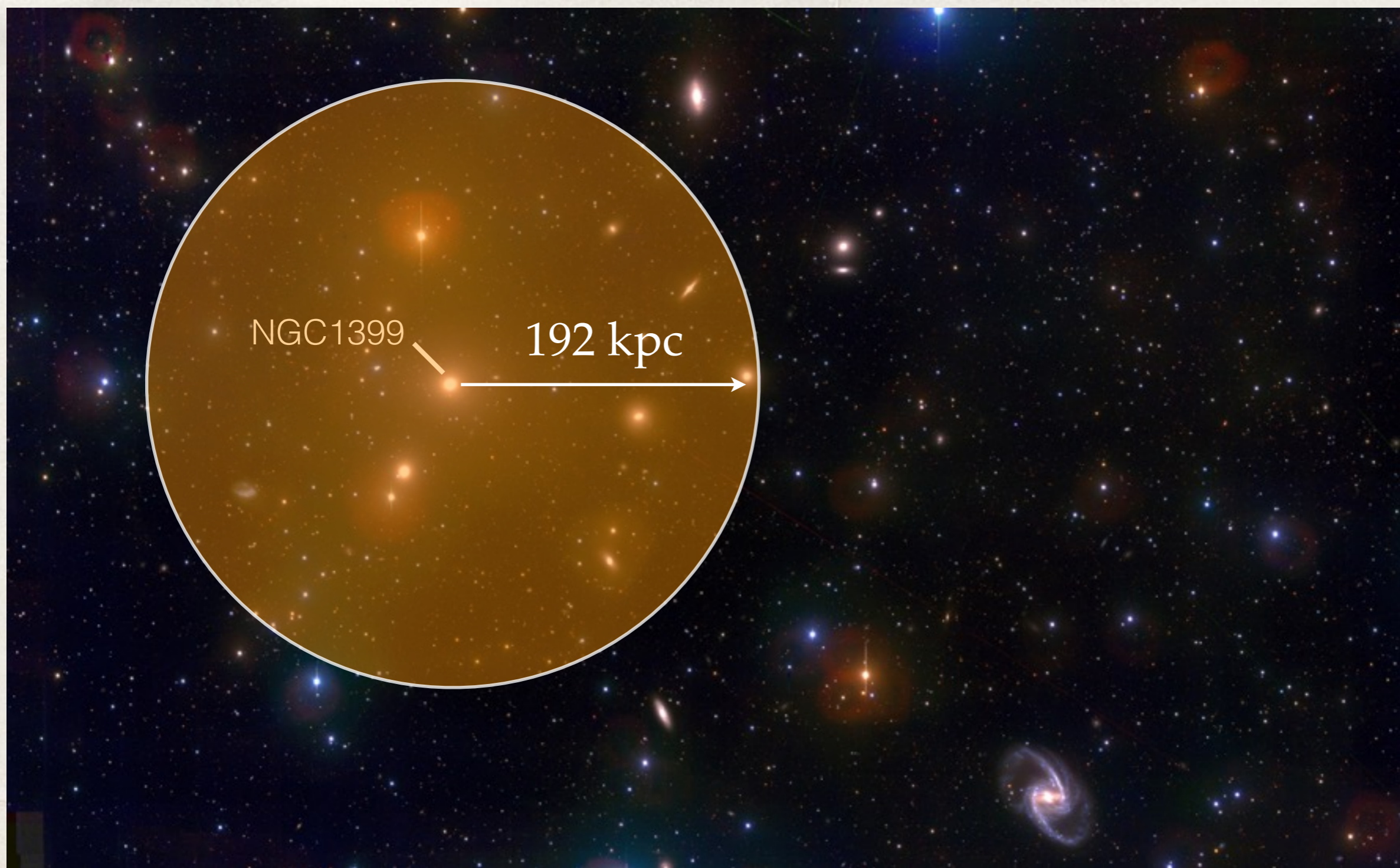
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NGC 1399

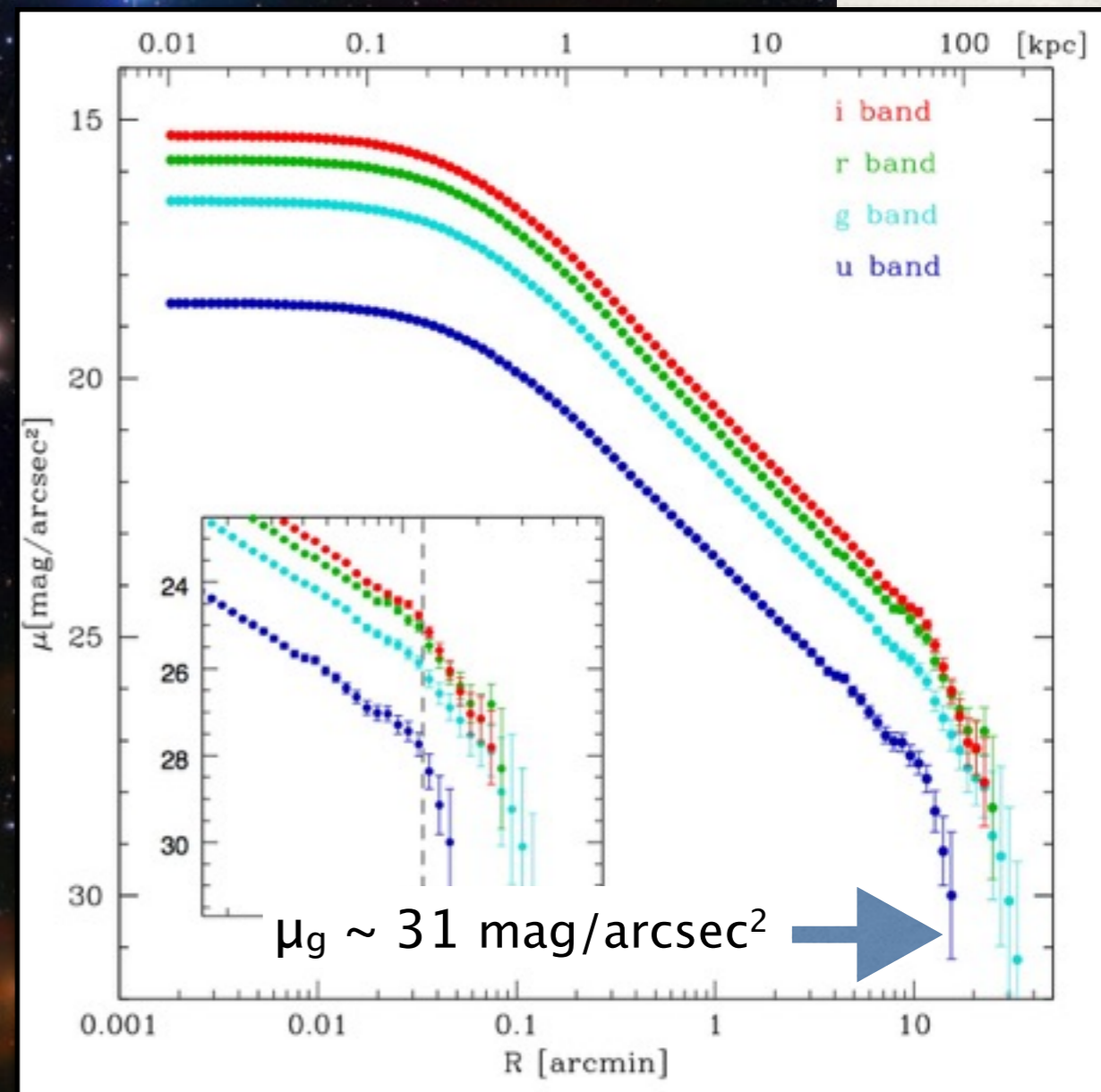
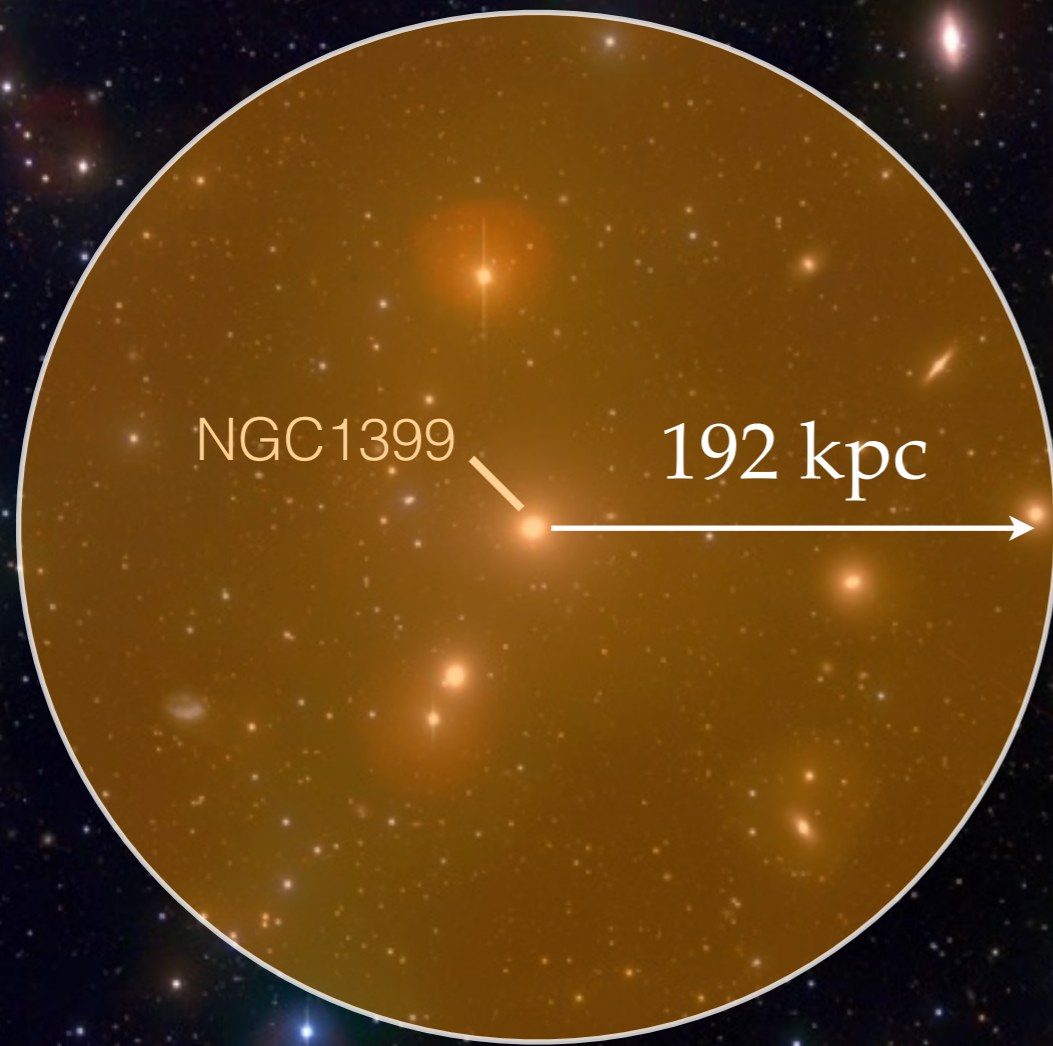
The extended stellar halo of NGC 1399

Iodice et al. 2016, ApJ, 820, 42

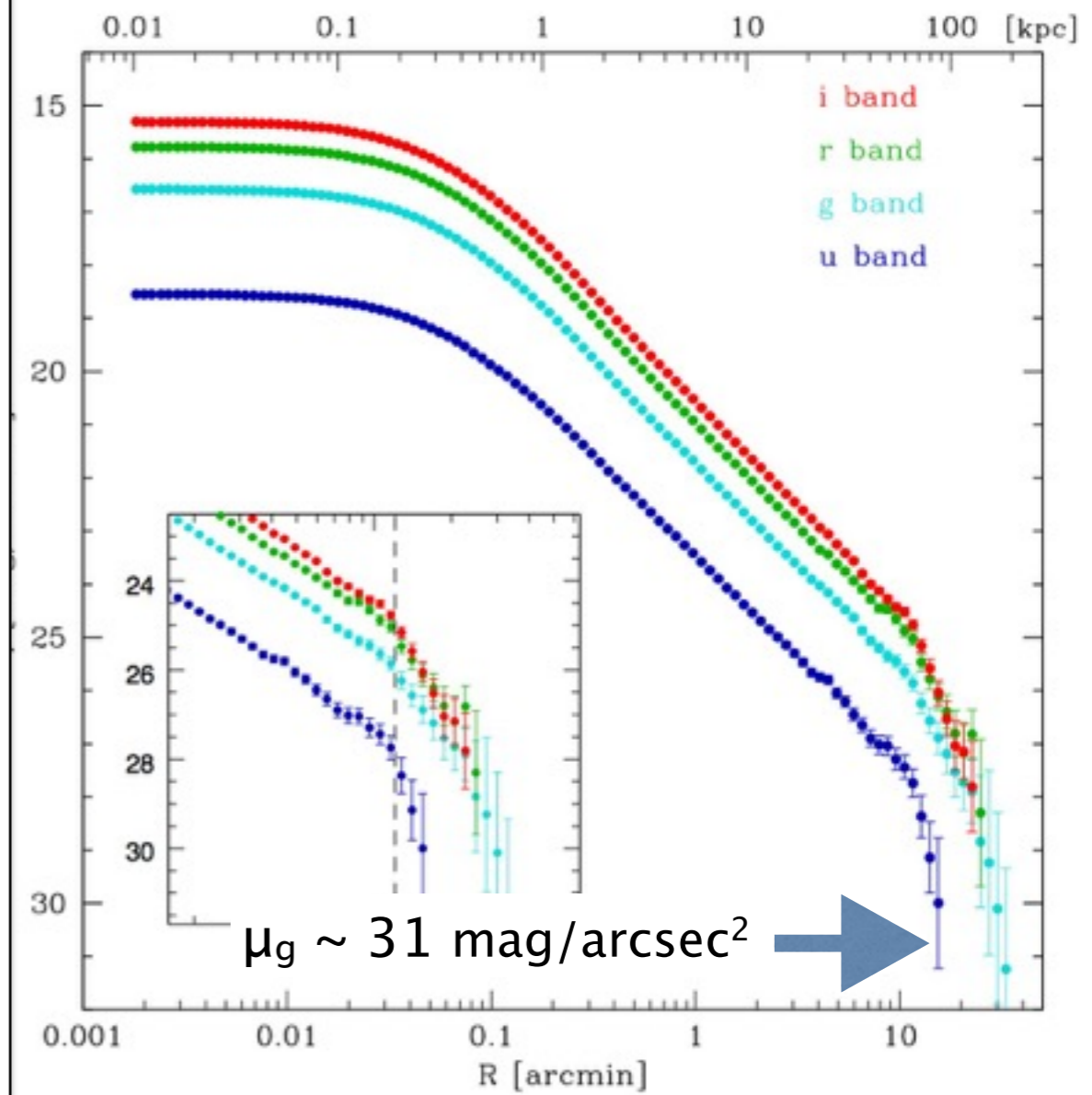
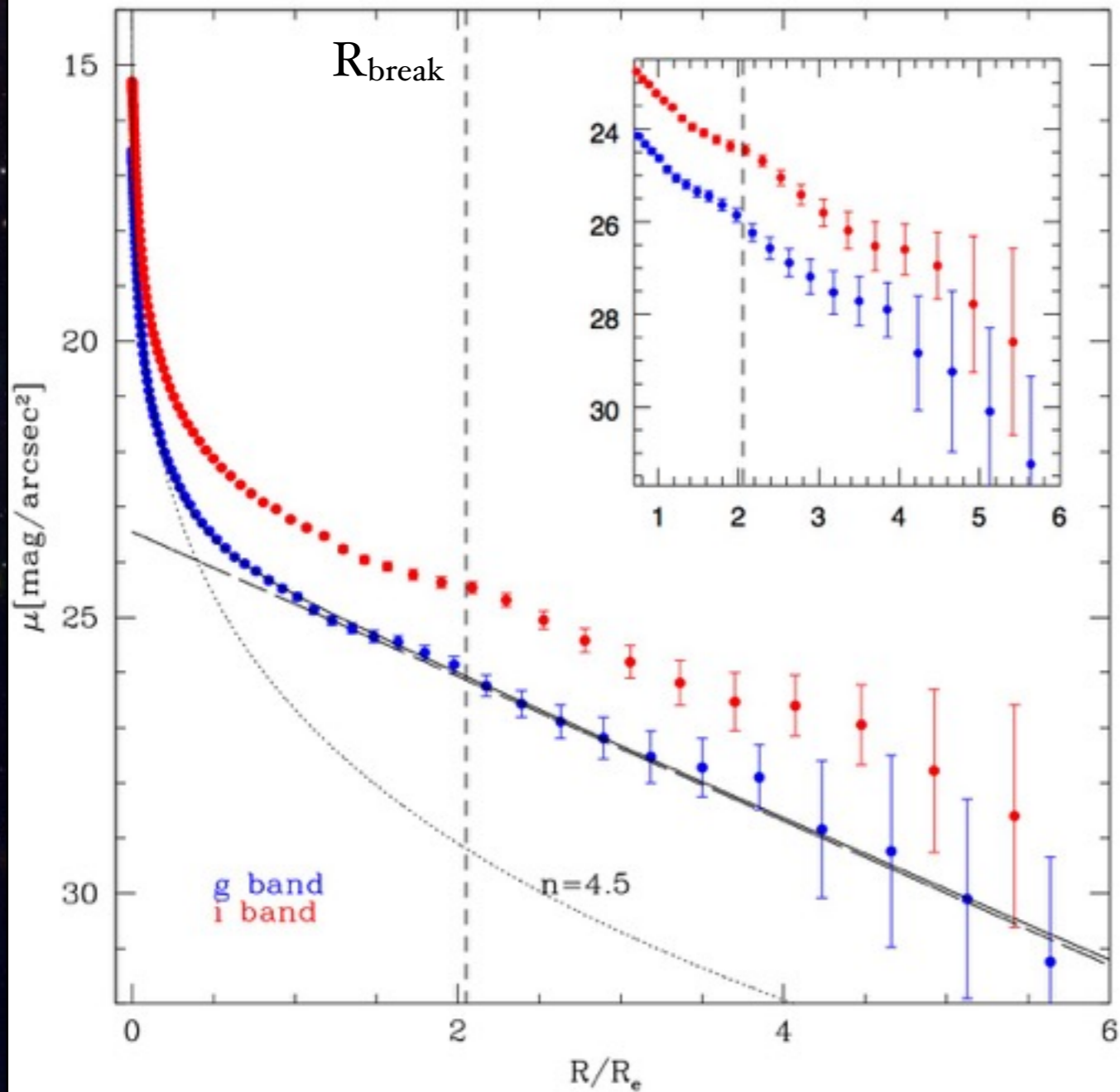


The extended stellar halo of NGC1399

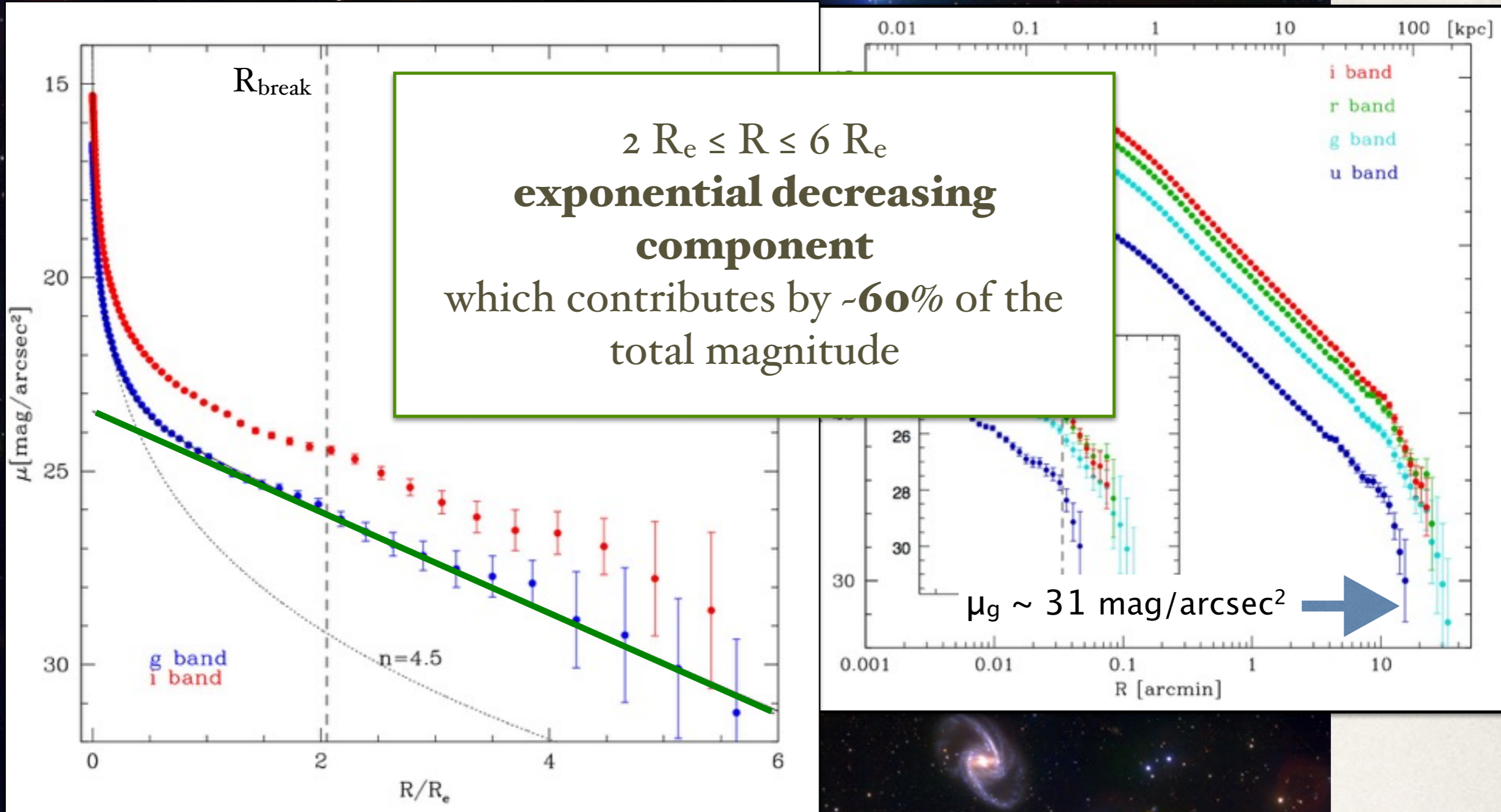
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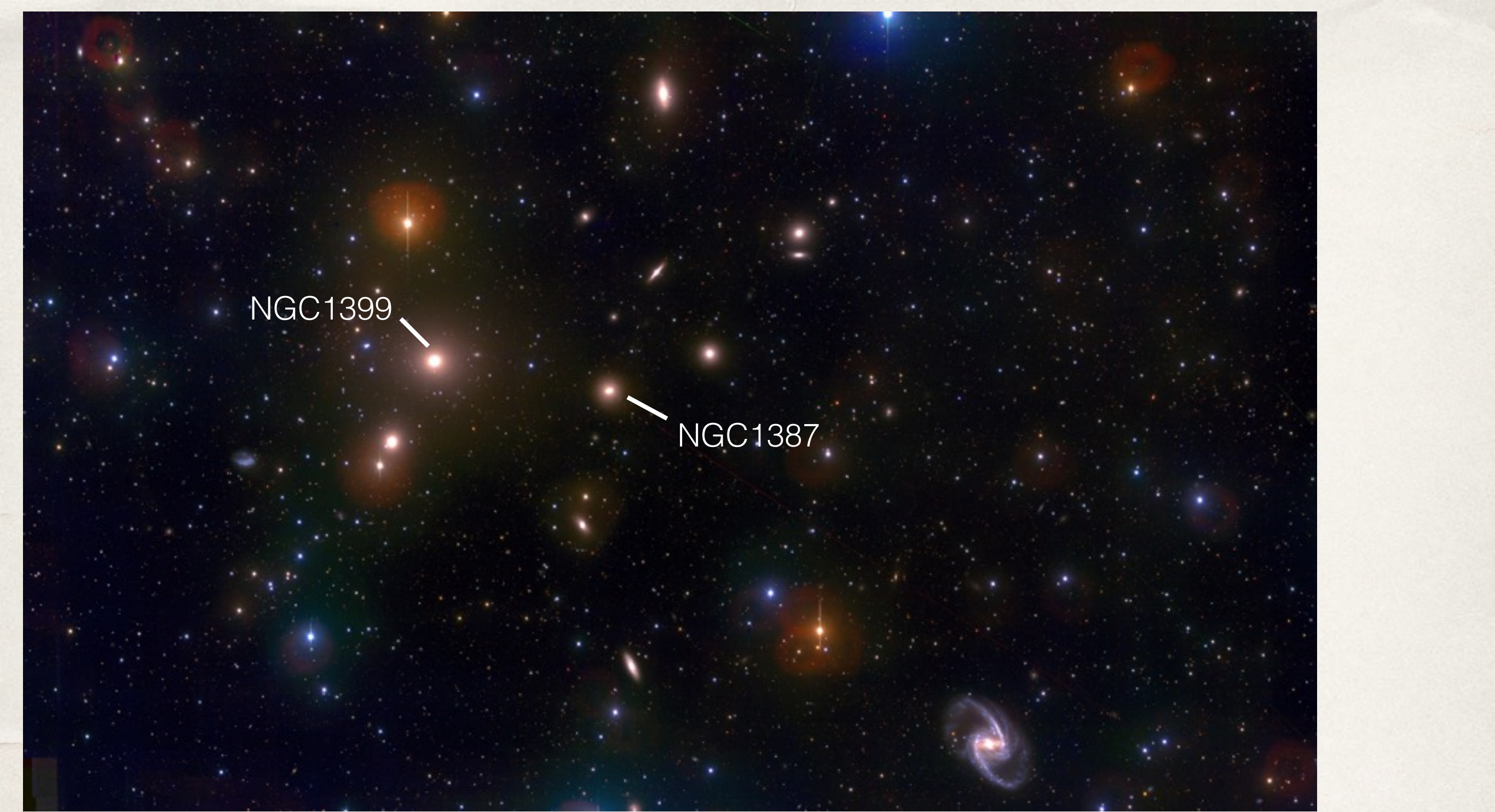
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The extended stellar halo of NGC1399



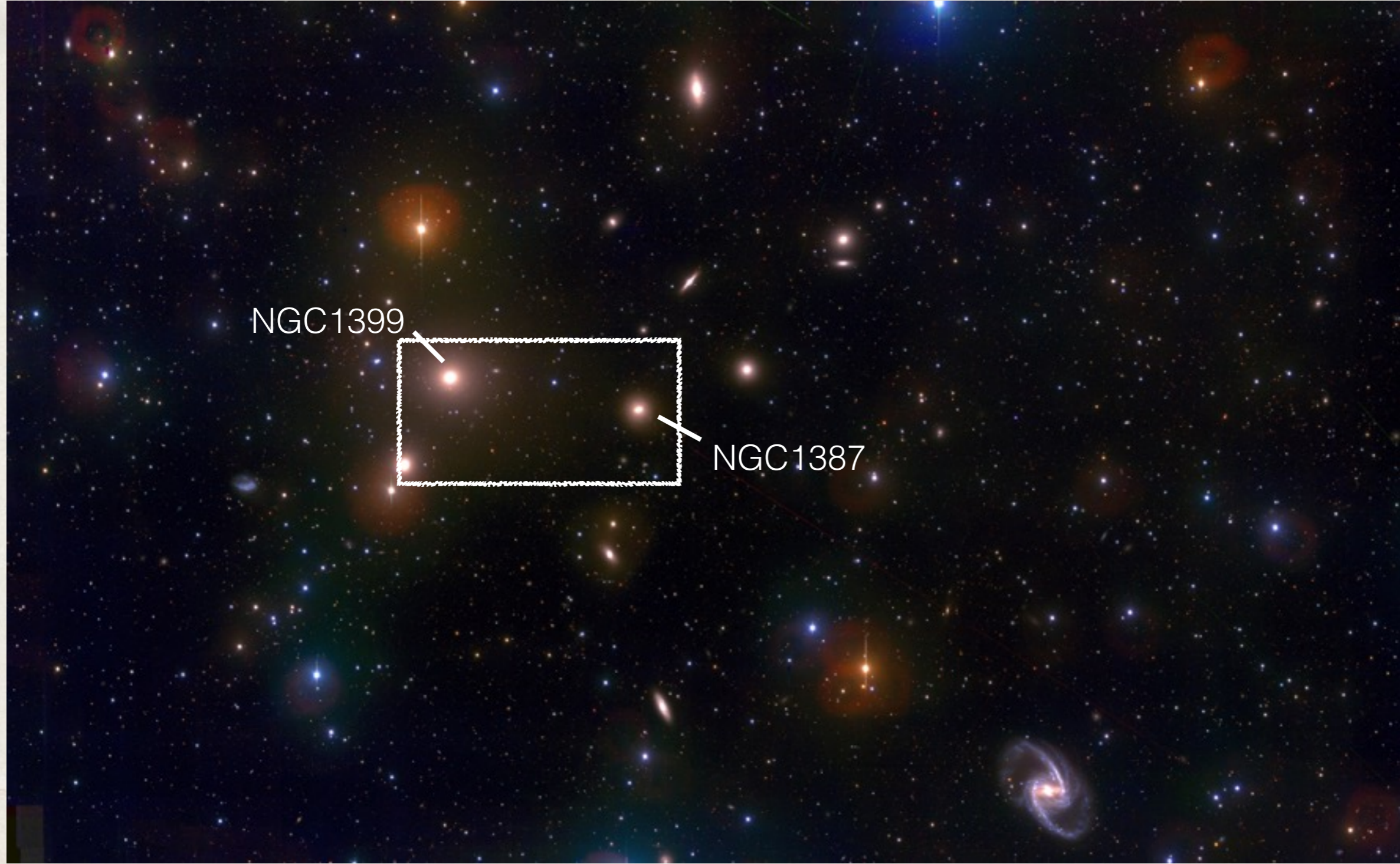
The extended stellar halo of NGC1399



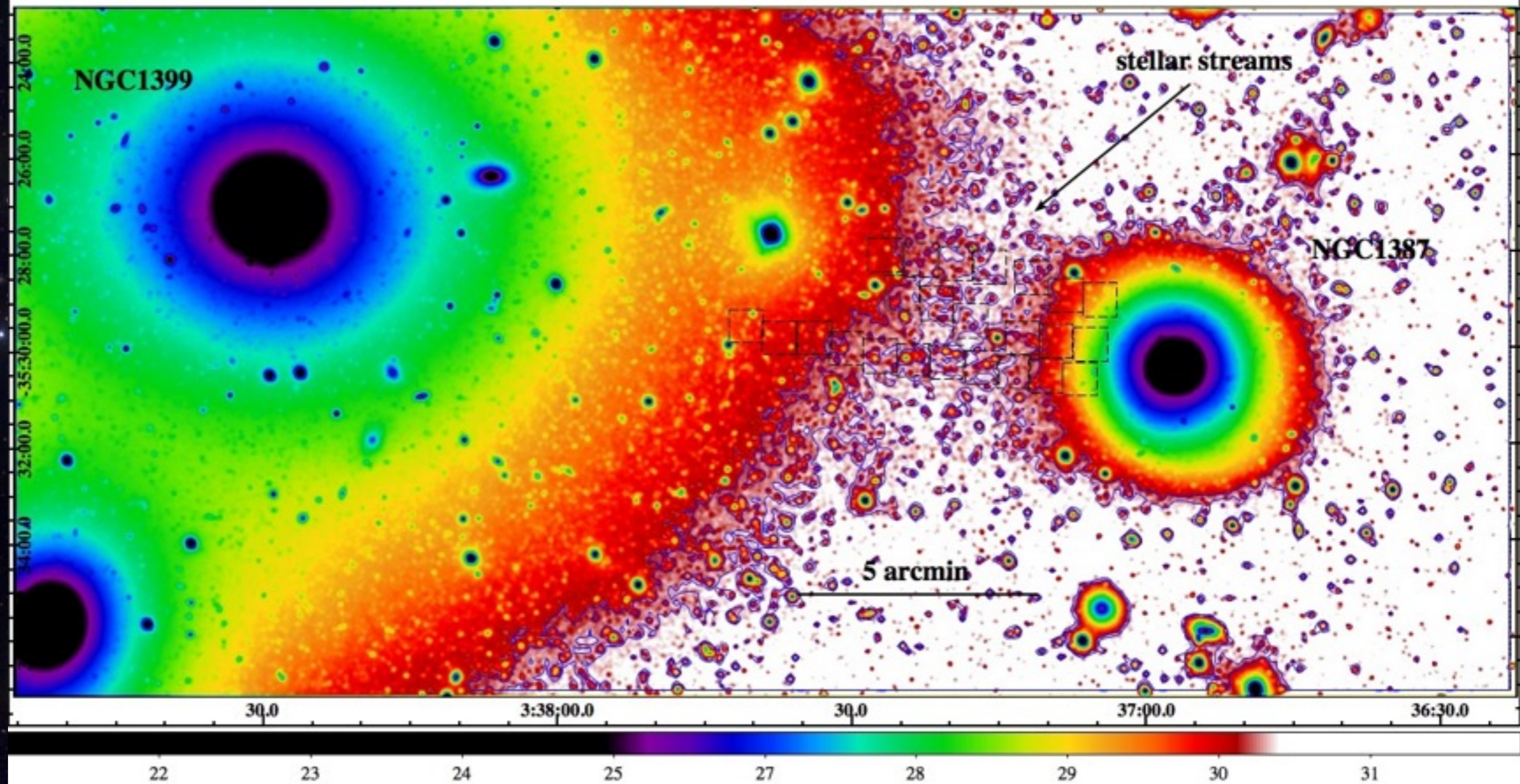
NGC1399

NGC1387

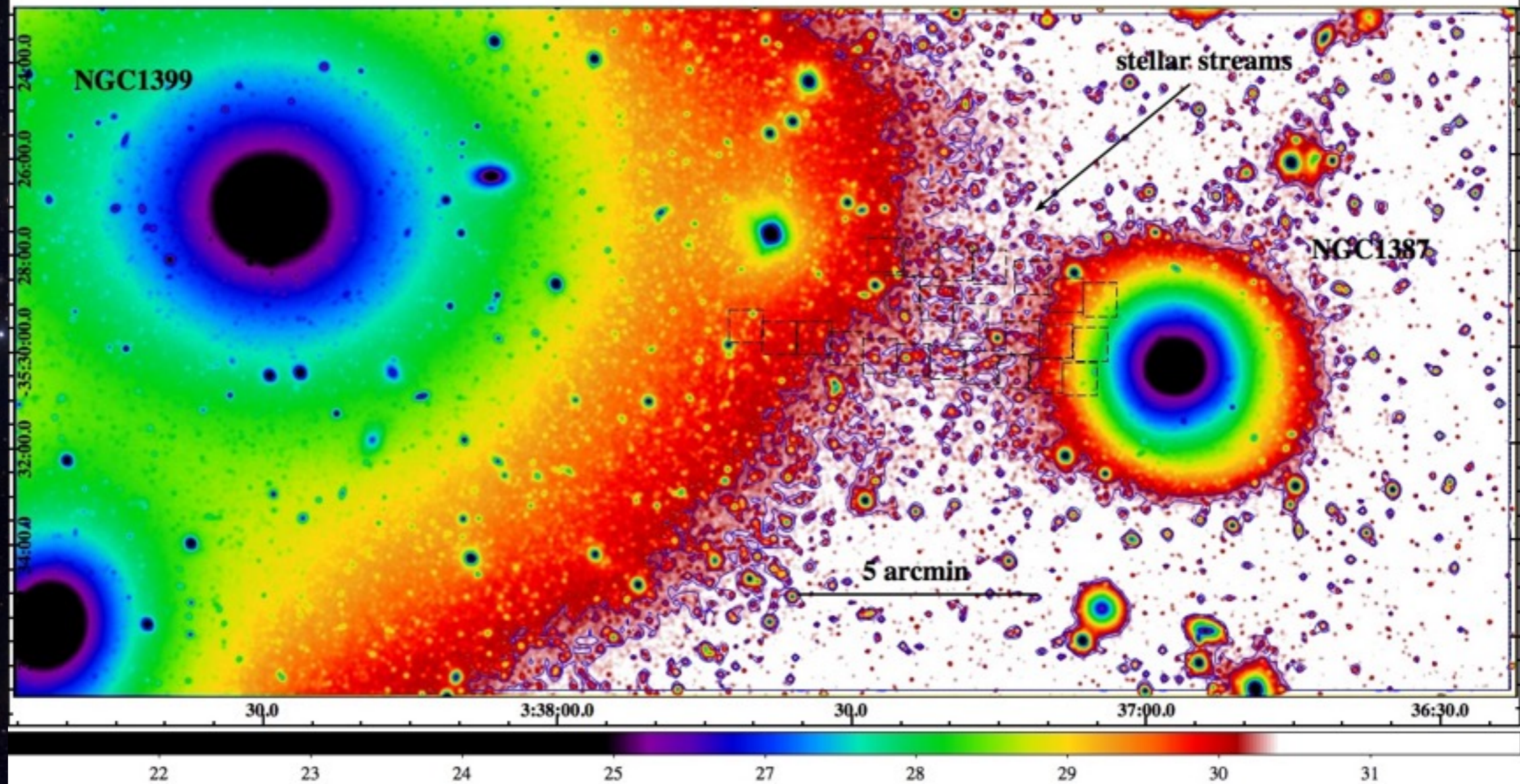
The intracluster regions: the stellar bridge between
NGC1399 & NGC1387



The intracluster regions: the stellar bridge between NGC1399 & NGC1387

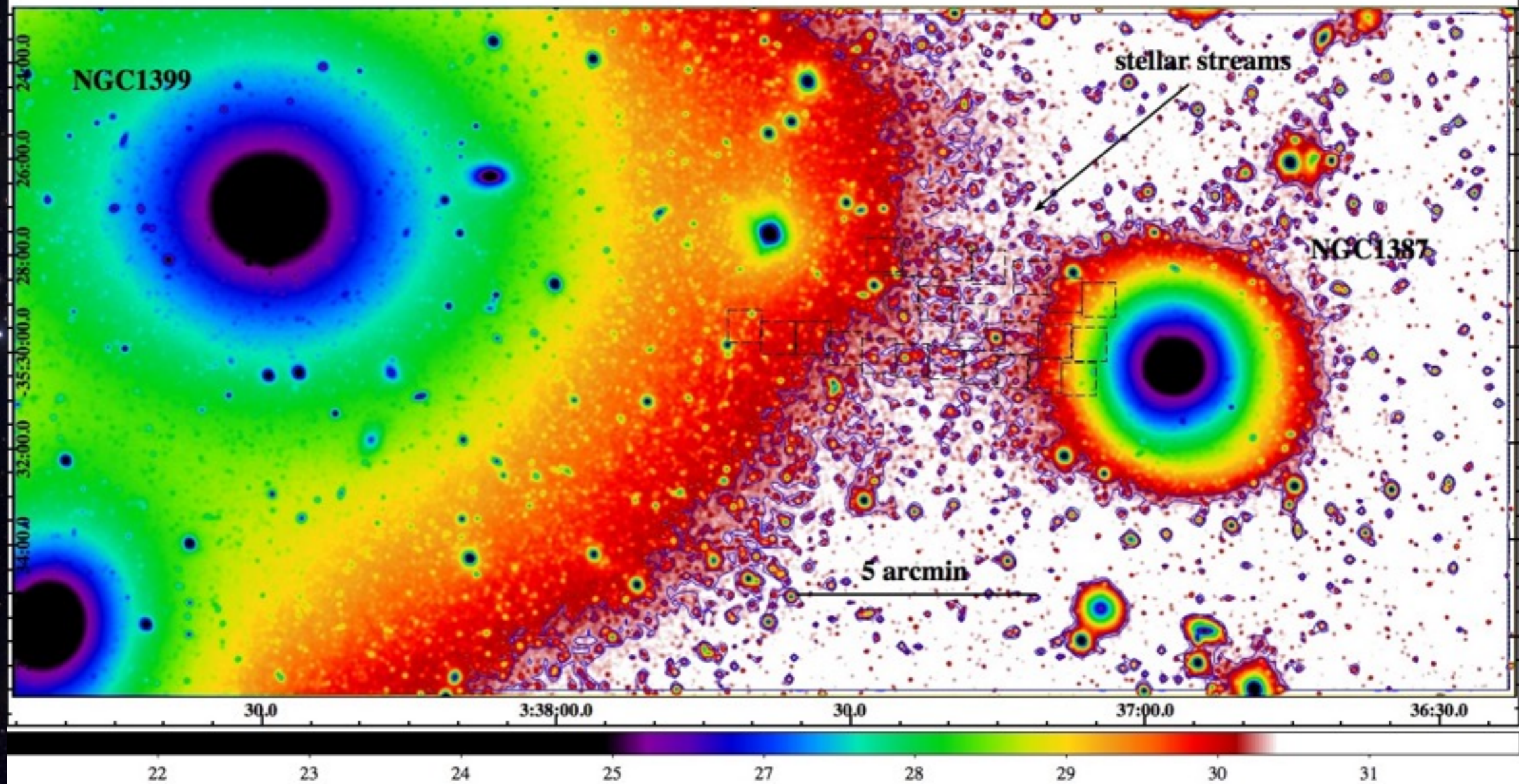


The intracluster regions: the stellar bridge between NGC1399 & NGC1387



The average colors in the streams are consistent with those in the outer envelope on the west side of NGC1387

The intracluster regions: the stellar bridge between NGC1399 & NGC1387

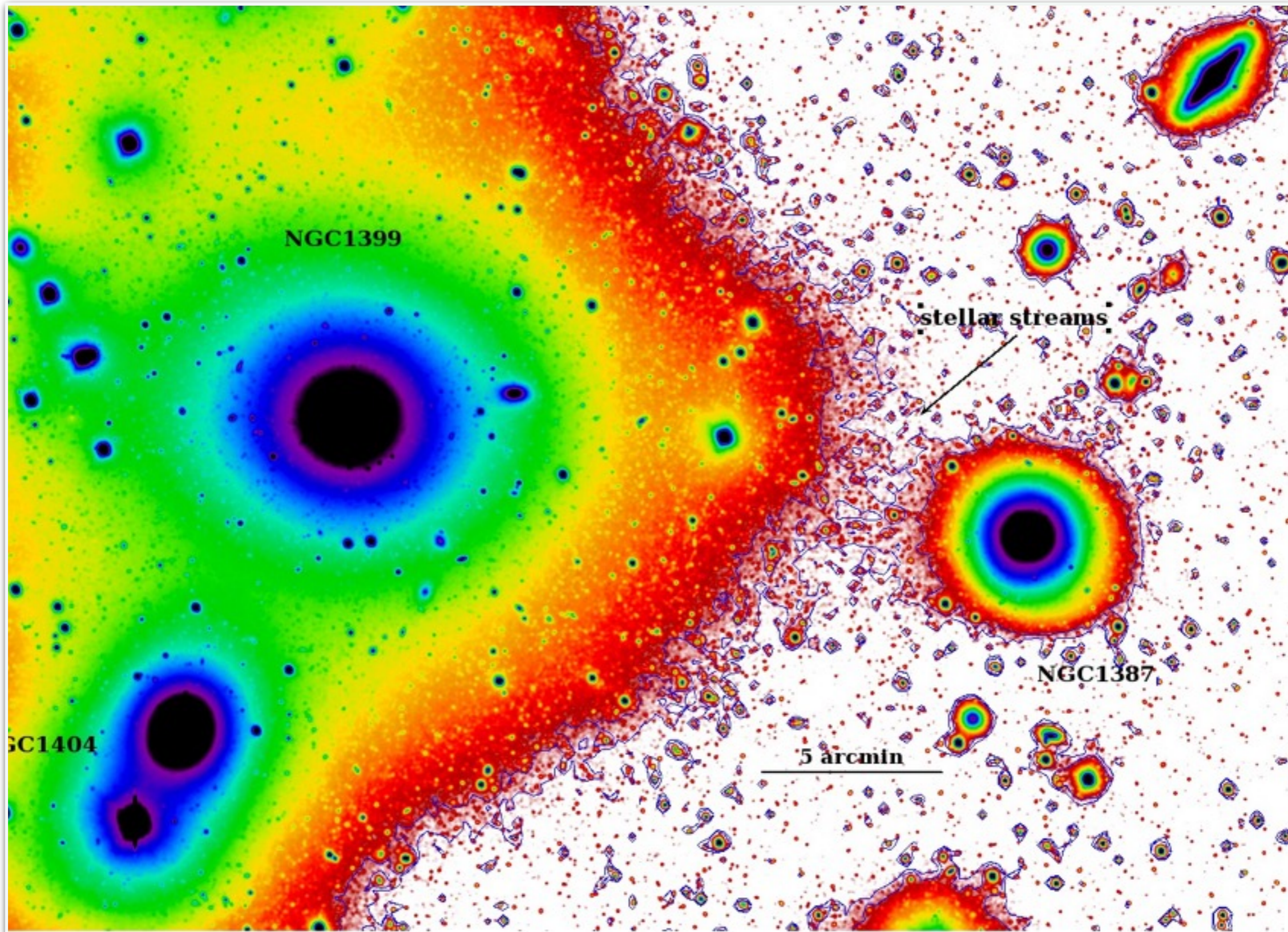


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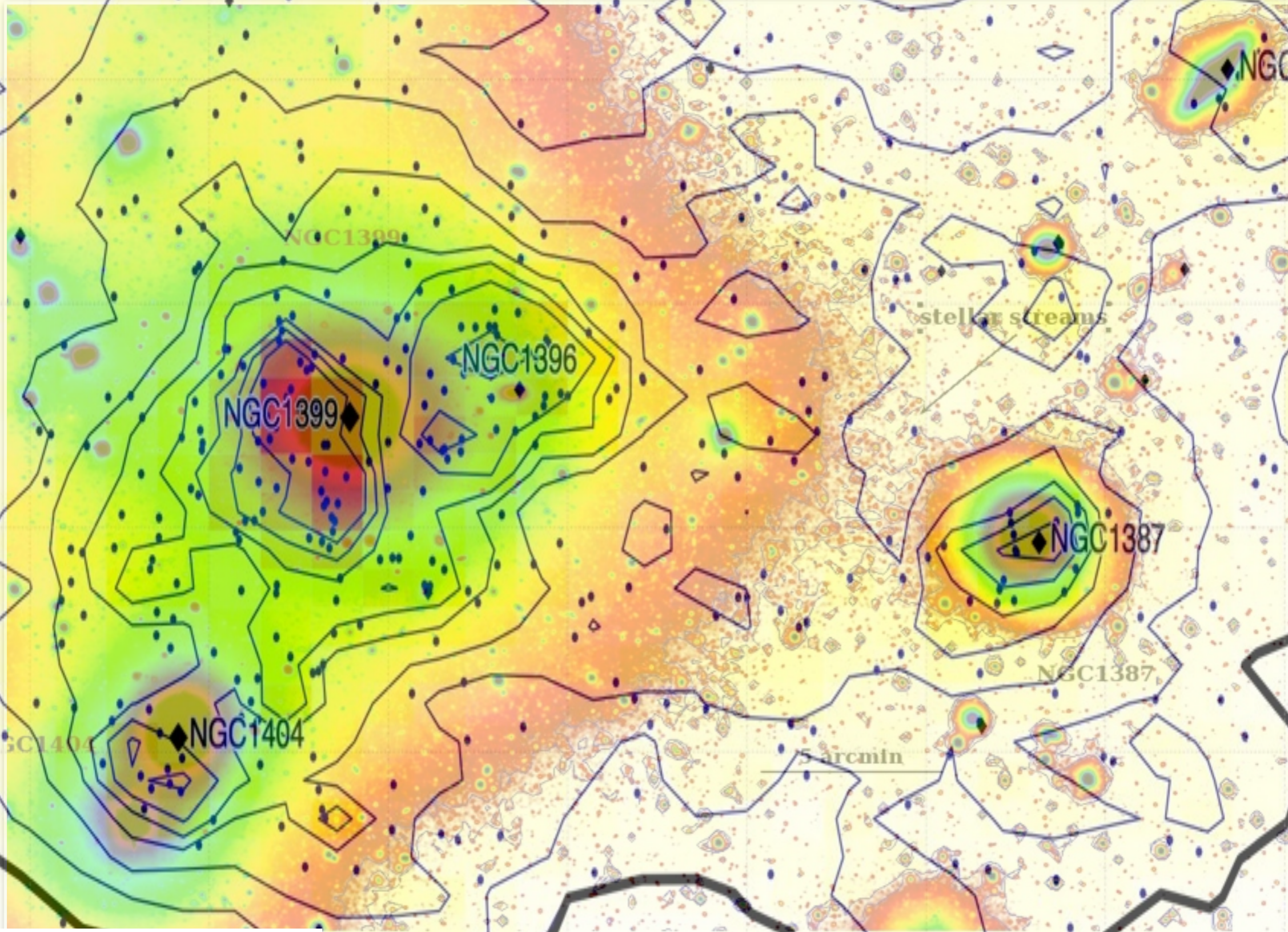
The intracluster regions: the stellar bridge between NGC1399 & NGC1387

it's consistent with the formation by the stripping from NGC1387 halo

Projected distribution of GCs (red+blue) vs light

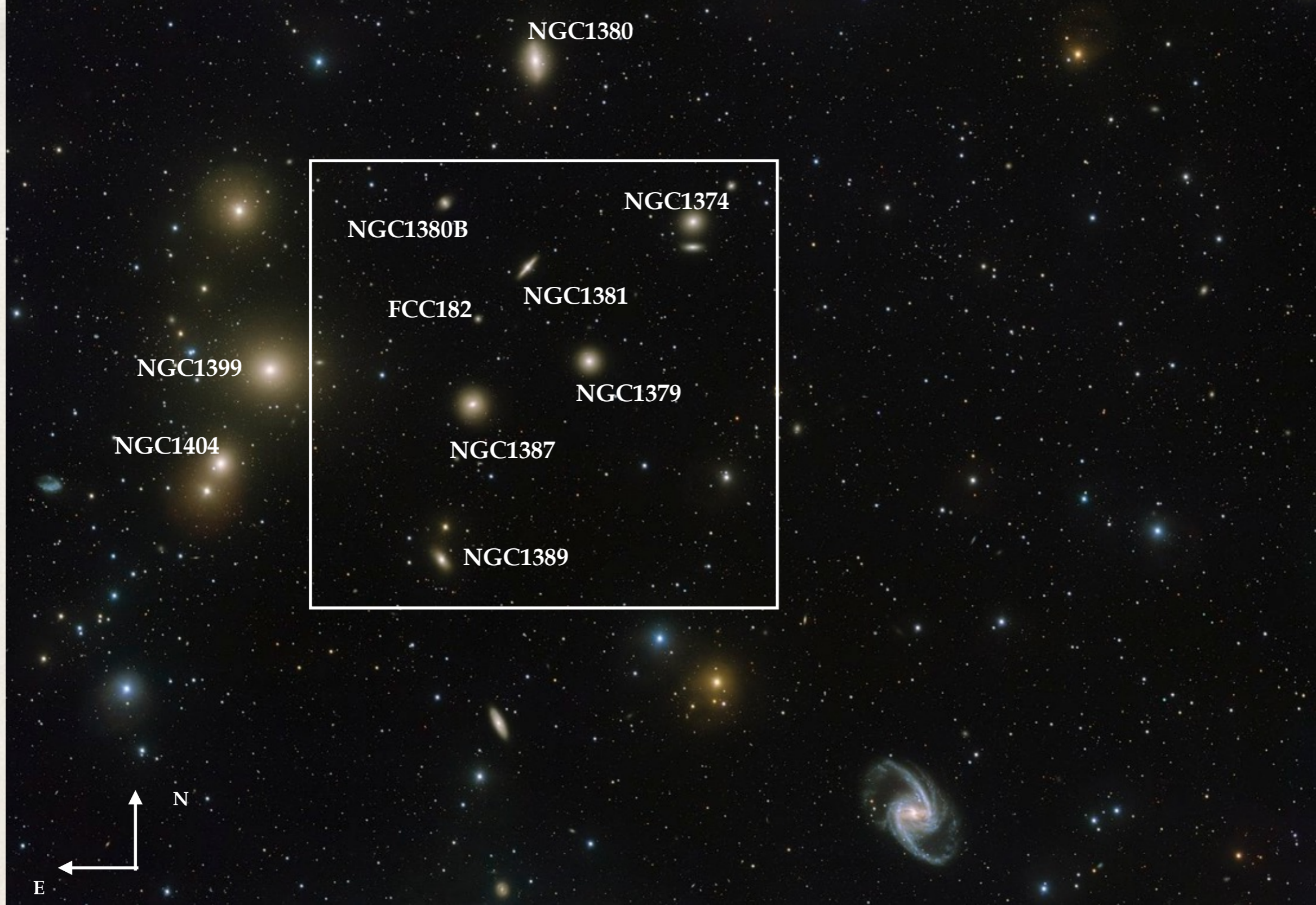


Projected distribution of GCs (red+blue) vs light



D'Abrusco et al. 2016

◆ B_T
◆ B_T
◆ B_T



The intracluster regions: the ICL

NGC1380B

NGC1374

NGC1381

FCC182

NGC1387

NGC1379

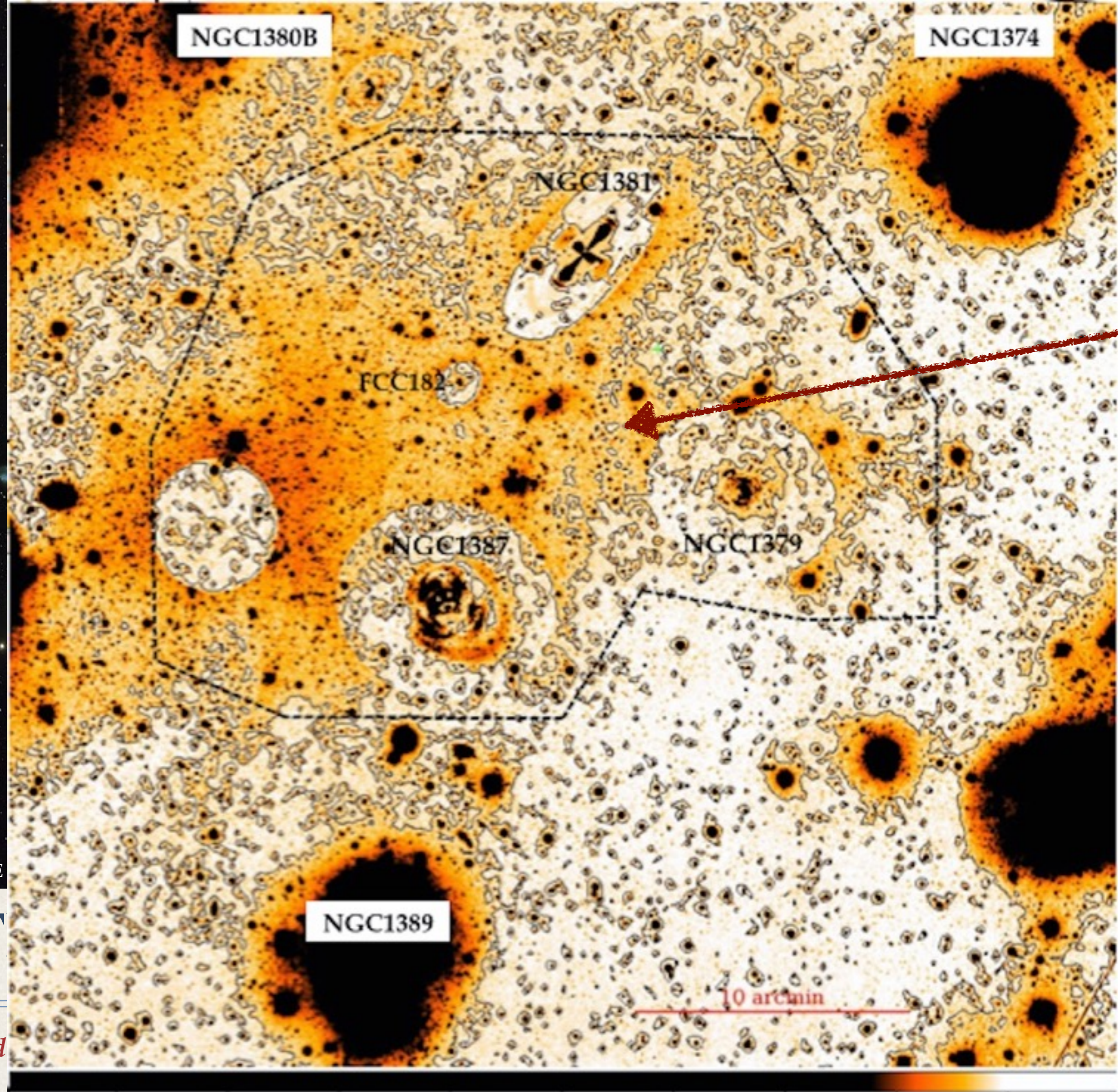
NGC1389

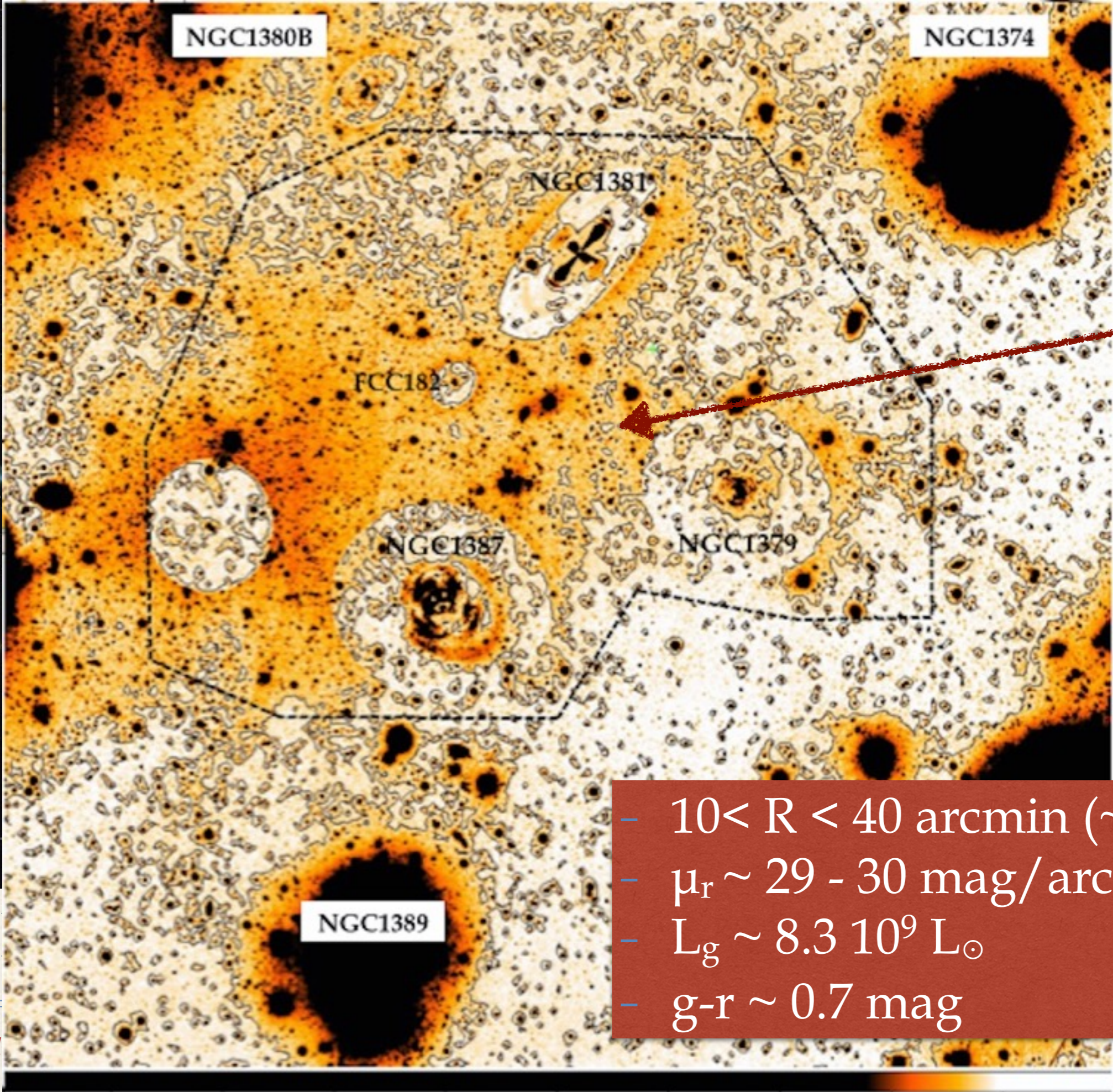
10 arcmin

ICL

23.8 24.6 25.4 26.2 27 27.8 28.6 29.4 30.2

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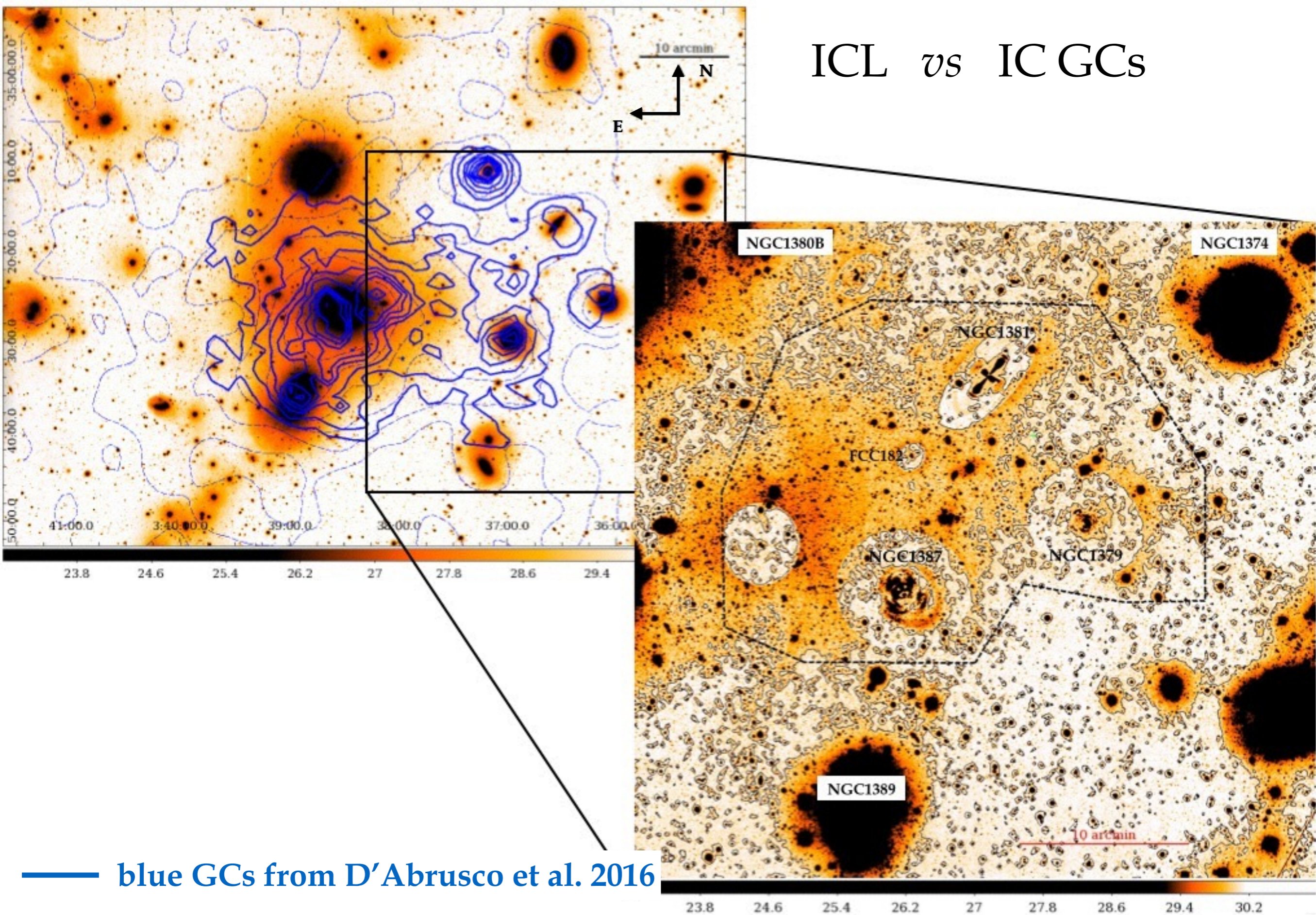
ICL

- $10 < R < 40$ arcmin ($\sim 58-230$ kpc)
- $\mu_r \sim 29 - 30$ mag/arcsec²
- $L_g \sim 8.3 \cdot 10^9 L_\odot$
- $g-r \sim 0.7$ mag

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Iod

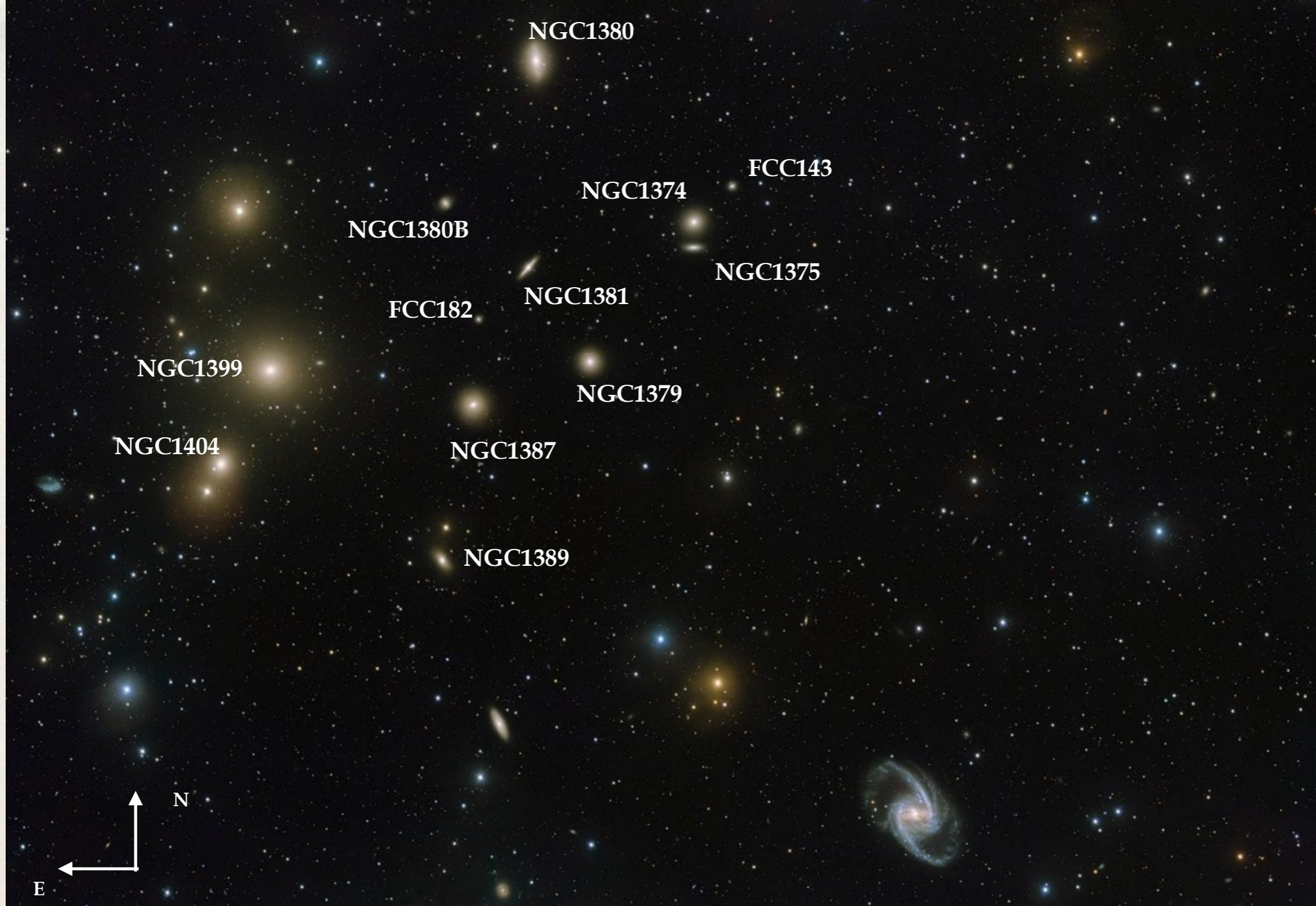
23.8 24.6 25.4 26.2 27 27.8 28.6 29.4 30.2

ICL *vs* IC GCs



— blue GCs from D'Abrusco et al. 2016

- - - blue GCs from Cantiello et al. 2017



The bright ETGs in the R_{vir} of the cluster

Table 2. Early-type galaxies inside the virial radius ($R_{vir} \sim 0.7$ Mpc) of the Fornax cluster, brighter than $m_B < 15$ mag.

object	α	δ	Morph Type	radial velocity	m_B	FDS field	Names
(1)	h:m:s	d:m:s	(4)	km/s	mag	(7)	(8)
FCC083	03 30 35.1	-34 51 14	E5	1543	12.3	F15-F19	NGC1351, ESO0358-G21
FCC090	03 31 08.1	-36 17 19	E4 pec	1916	15.0	F16-F17	
FCC143	03 34 59.1	-35 10 10	E3	1376	14.3	F16	NGC1373, ESO358-G21
FCC147	03 35 16.8	-35 13 34	E0	1386	11.9	F16	NGC1374, ESO358-G23
FCC148	03 35 16.8	-35 15 56	S0	730	13.6	F16	NGC1375, ESO358-G24
FCC153	03 35 30.9	-34 26 45	S0	1639	13.0	F10-F15	IC1963, ESO358-G26
FCC161	03 36 04.0	-35 26 30	E0	1405	11.7	F11-F16	NGC1379, ESO358-G37
FCC167	03 36 27.5	-34 58 31	S0/a	1827	11.3	F10-F11	NGC1380, ESO358-G28
FCC170	03 36 31.6	-35 17 43	S0	1793	13.0	F11	NGC1381, ESO358-G29
FCC177	03 36 47.4	-34 44 17	S0	1495	13.2	F10	NGC1380A, ESO358-G33
FCC182	03 36 54.3	-35 22 23	SB0 pec	1823	14.9	F11	
FCC184	03 36 56.9	-35 30 24	SB0	1337	12.3	F11	NGC1387, ESO358-G36
FCC190	03 37 08.9	-35 11 37	SB0	1784	13.5	F11	NGC1380B, ESO358-G37
FCC193	03 37 11.7	-35 44 40	SB0	999	12.8	F11	NGC1389, ESO358-G38
FCC213	03 38 29.2	-35 27 02	E0	1430	10.6	F11	NGC1399, ESO358-G45
FCC219	03 38 52.1	-35 35 38	E2	1944	10.9	F11	NGC1404, ESO358-G46
FCC276	03 42 19.2	-35 23 36	E4	1454	11.8	F6	NGC1427, ESO358-G52
FCC277	03 42 22.6	-35 09 10	E5	1620	13.8	F6	NGC1428, ESO358-G53
FCC301	03 45 03.5	-35 58 17	E4	1020	14.2	F7	ESO358-G59
FCC310	03 46 13.7	-36 41 43	SB0	1352	13.5	F3-F7	NGC1460, ESO358-G62

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The bright ETGs in the R_{vir} of the cluster

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	h:m:s	d:m:s		km/s	mag		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
FCC083	03 30 35.1	-34 51 14					
FCC090	03 31 08.1	-36 17 19					
FCC143	03 34 59.1	-35 10 10					
FCC147	03 35 16.8	-35 13 34					
FCC148	03 35 16.8	-35 15 56					
FCC153	03 35 30.9	-34 26 45					
FCC161	03 36 04.0	-35 26 30					
FCC167	03 36 27.5	-34 58 31					
FCC170	03 36 31.6	-35 17 43					
FCC177	03 36 47.4	-34 44 17					
FCC182	03 36 54.3	-35 22 23					
FCC184	03 36 56.9	-35 30 24					
FCC190	03 37 08.9	-35 11 37					
FCC193	03 37 11.7	-35 44 40					
FCC213	03 38 29.2	-35 27 02					
FCC219	03 38 52.1	-35 35 38					
FCC276	03 42 19.2	-35 23 36					
FCC277	03 42 22.6	-35 09 10					
FCC301	03 45 03.5	-35 58 17					
FCC310	03 46 13.7	-36 41 43					

Surface photometry:

Notes. *Col.1* - Fornax cluster members from Ferguson (1989). *Col.2 and Col.3* - Right ascension and declination. *Col.4, Col.5 and Col.6* - Morphological type, Heliocentric radial velocity and total magnitude in the B band given by Ferguson (1989). *Col.7* - Location in the FDS field (see Fig.1). *Col.8* - Other catalogue name.

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FCC153	03 35 30.9	-34 26 45					
FCC161	03 36 04.0	-35 26 30					
FCC167	03 36 27.5	-34 58 31					
FCC170	03 36 31.6	-35 17 43					
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FCC184	03 36 56.9	-35 30 24					
FCC190	03 37 08.9	-35 11 37					
FCC193	03 37 11.7	-35 44 40					
FCC213	03 38 29.2	-35 27 02					
FCC219	03 38 52.1	-35 35 38					
FCC276	03 42 19.2	-35 23 36					
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FCC148	03 35 16.8	-35 15 56					
FCC153	03 35 30.9	-34 26 45					
FCC161	03 36 04.0	-35 26 30					
FCC167	03 36 27.5	-34 58 31					
FCC170	03 36 31.6	-35 17 43					
FCC177	03 36 47.4	-34 44 17					
FCC182	03 36 54.3	-35 22 23					
FCC184	03 36 56.9	-35 30 24					
FCC190	03 37 08.9	-35 11 37					
FCC193	03 37 11.7	-35 44 40					
FCC213	03 38 29.2	-35 27 02					
FCC219	03 38 52.1	-35 35 38					
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✦ total magnitudes & R_e in *ugri*

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FCC090	03 31 08.1	-36 17 19					
FCC143	03 34 59.1	-35 10 10					
FCC147	03 35 16.8	-35 13 34					
FCC148	03 35 16.8	-35 15 56					
FCC153	03 35 30.9	-34 26 45					
FCC161	03 36 04.0	-35 26 30					
FCC167	03 36 27.5	-34 58 31					
FCC170	03 36 31.6	-35 17 43					
FCC177	03 36 47.4	-34 44 17					
FCC182	03 36 54.3	-35 22 23					
FCC184	03 36 56.9	-35 30 24					
FCC190	03 37 08.9	-35 11 37					
FCC193	03 37 11.7	-35 44 40					
FCC213	03 38 29.2	-35 27 02					
FCC219	03 38 52.1	-35 35 38					
FCC276	03 42 19.2	-35 23 36					
FCC277	03 42 22.6	-35 09 10					
FCC301	03 45 03.5	-35 58 17					
FCC310	03 46 13.7	-36 41 43					

Surface photometry:

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- ❖ *g-r* & *g-i* integrated colors, color profiles & 2D colormaps

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FCC153	03 35 30.9	-34 26 45					
FCC161	03 36 04.0	-35 26 30					
FCC167	03 36 27.5	-34 58 31					
FCC170	03 36 31.6	-35 17 43					
FCC177	03 36 47.4	-34 44 17					
FCC182	03 36 54.3	-35 22 23					
FCC184	03 36 56.9	-35 30 24					
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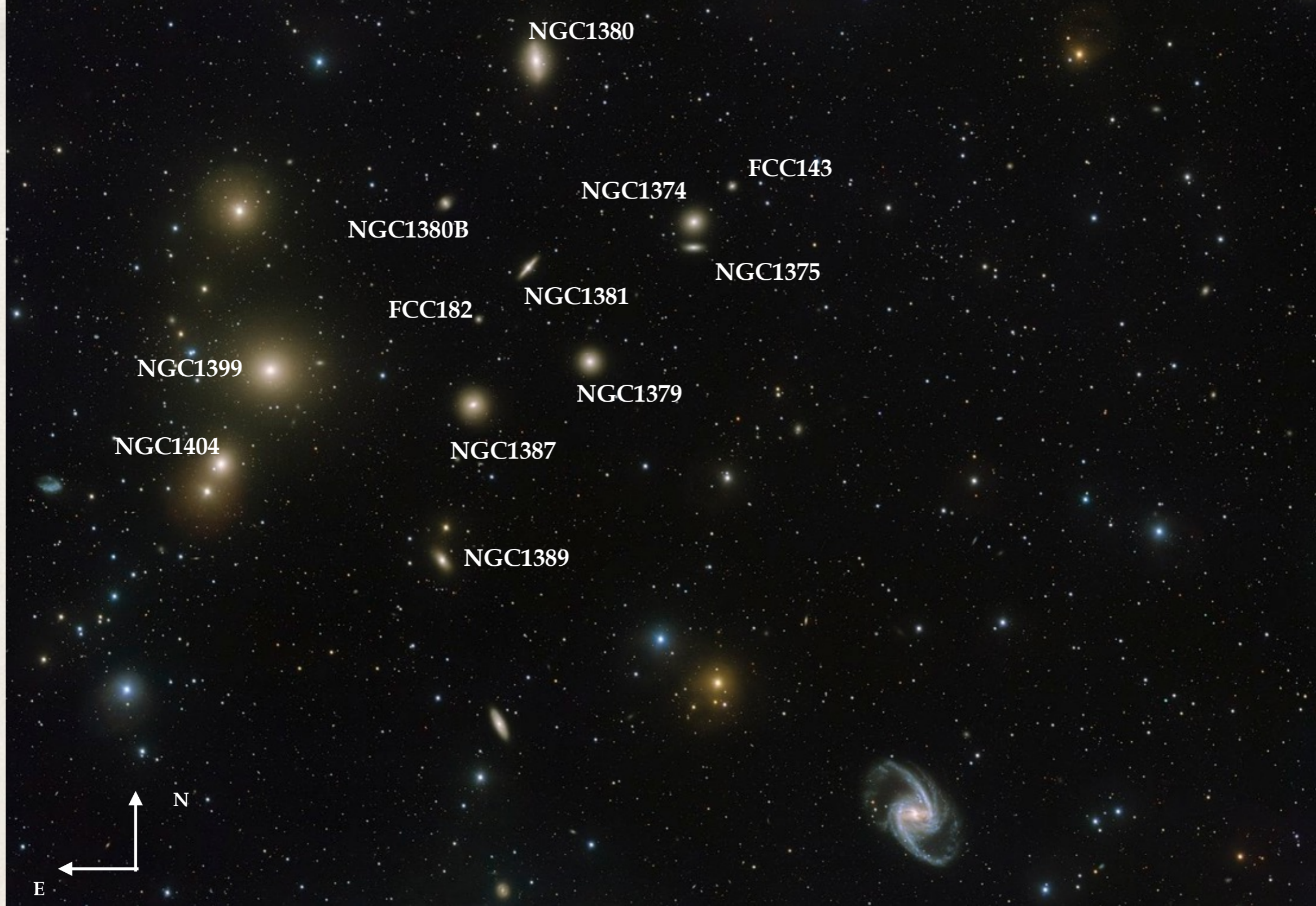
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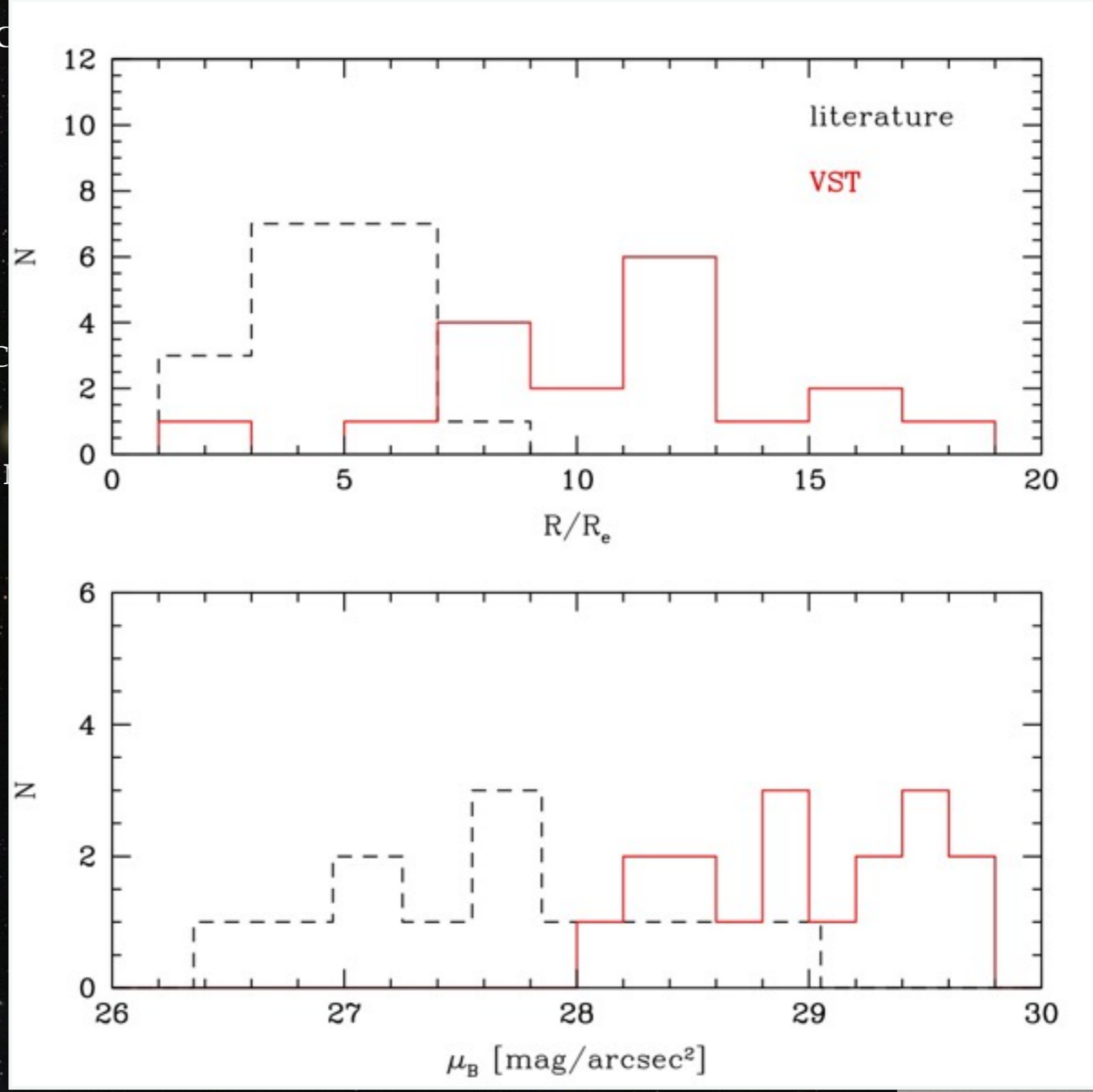
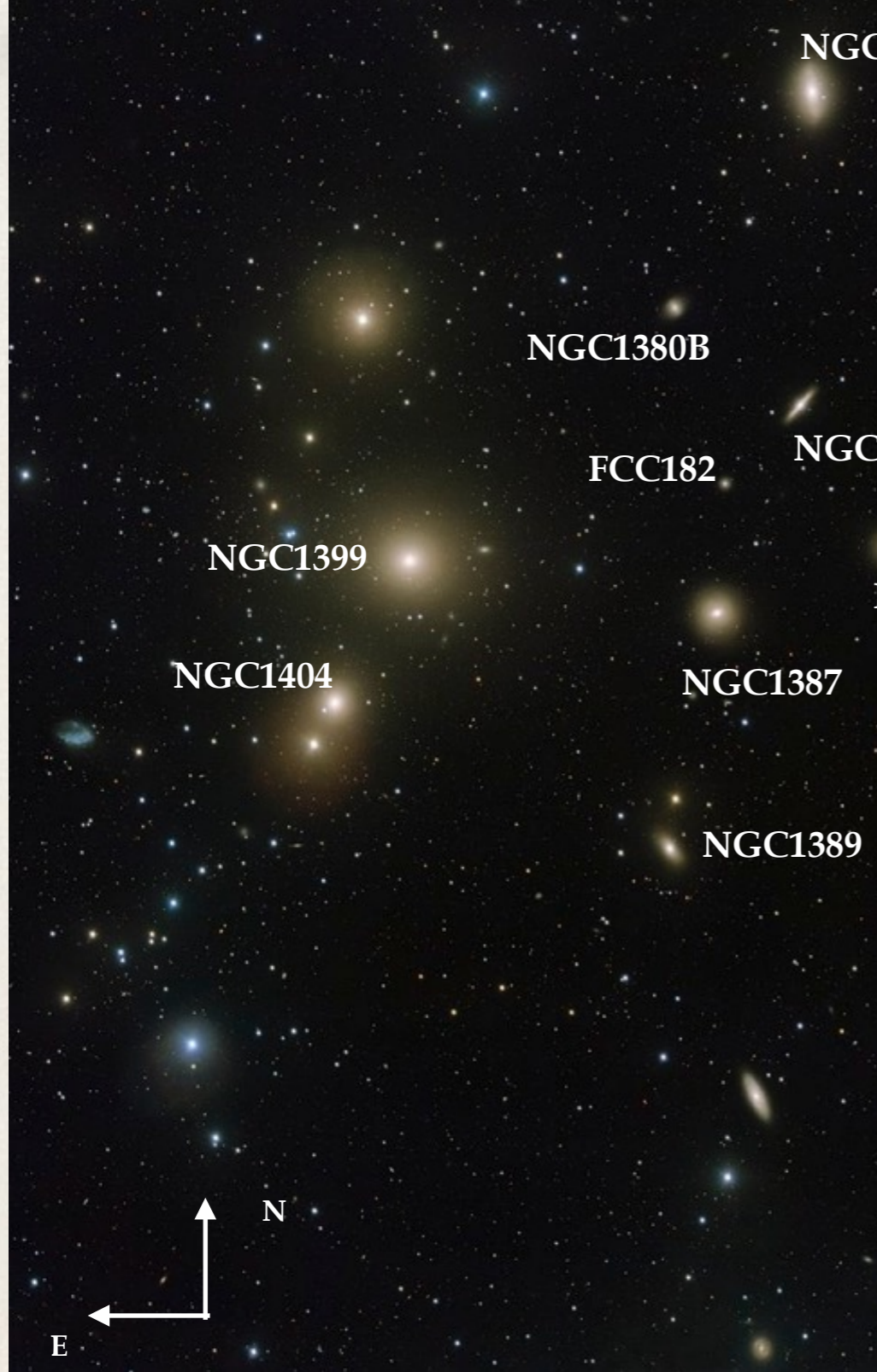
Notes. *Col.1* - Fornax cluster members from Ferguson (1989). *Col.2 and Col.3* - Right ascension and declination. *Col.4, Col.5 and Col.6* - Morphological type, Heliocentric radial velocity and total magnitude in the B band given by Ferguson (1989). *Col.7* - Location in the FDS field (see Fig.1). *Col.8* - Other catalogue name.

The bright ETGs in the R_{vir} of the cluster

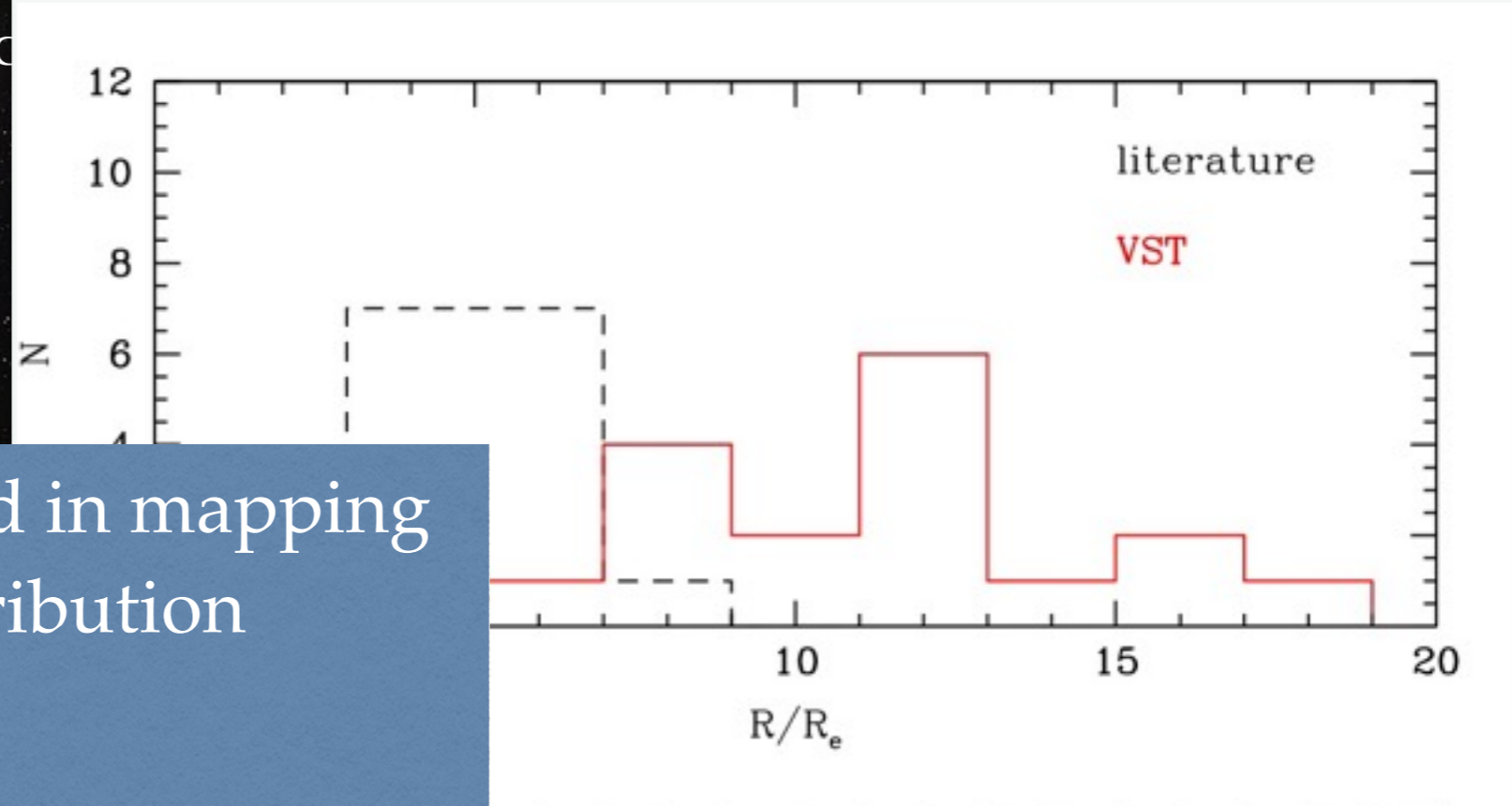


What is the main and new contribution from the FDS?

Iodice et al. 2018, A&A, to be submitted



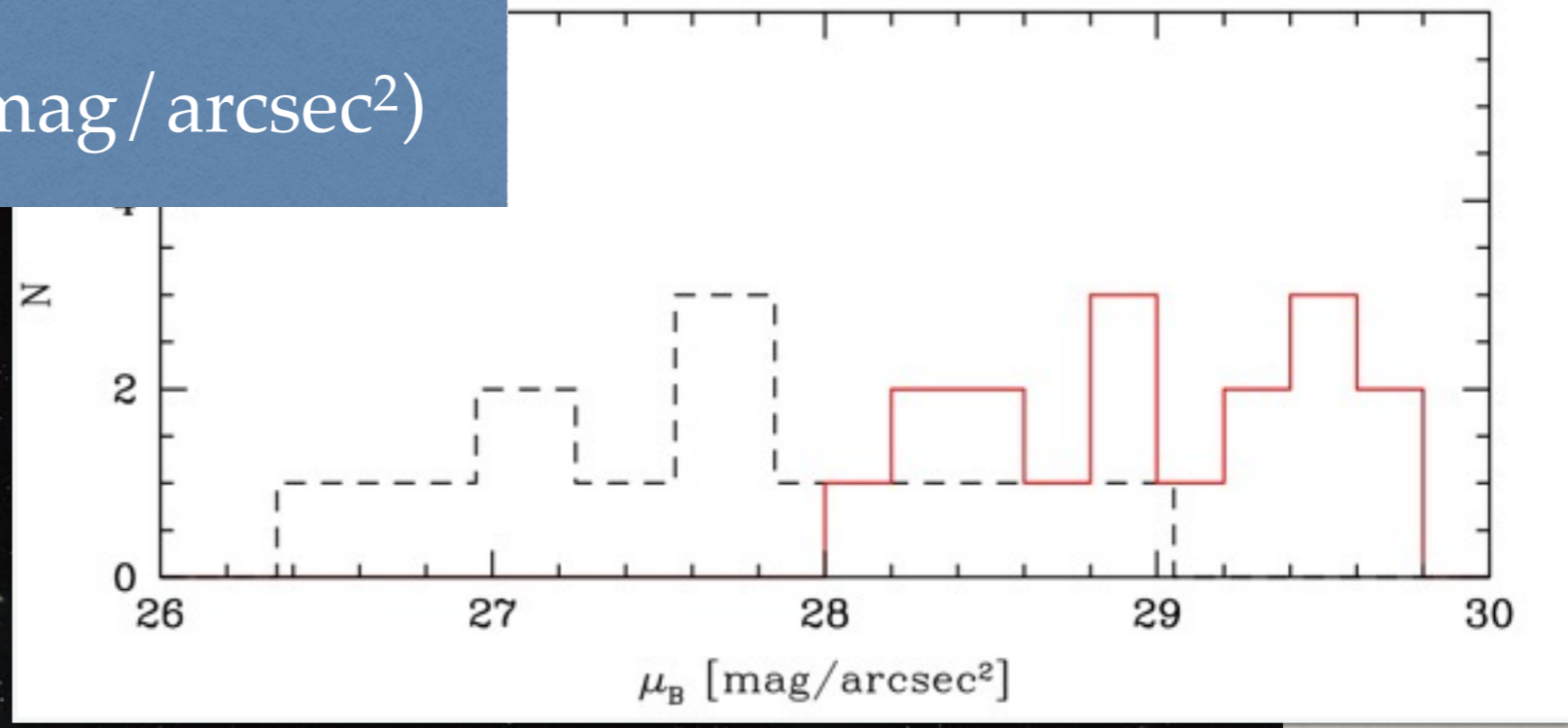
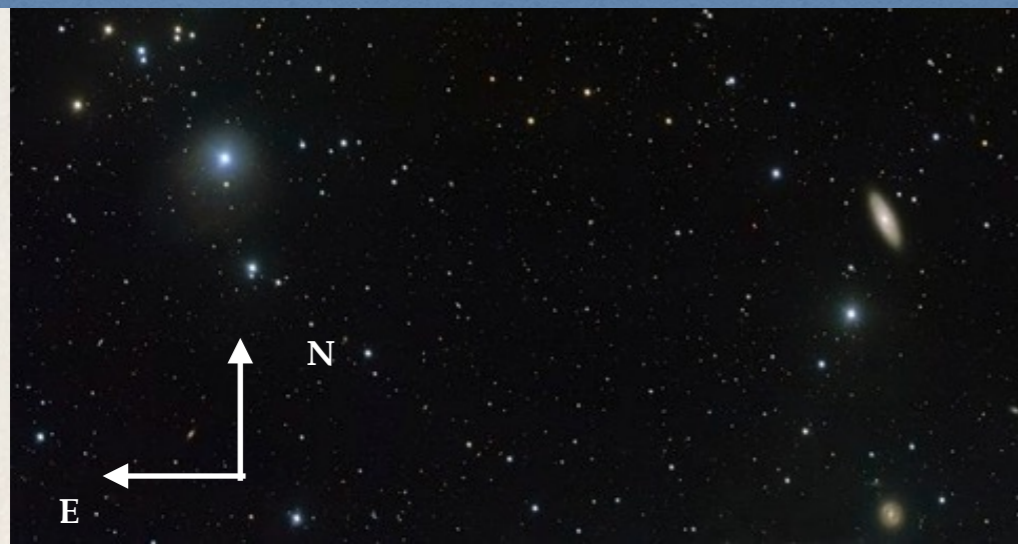
What is the main and new contribution from the FDS?



unprecedented limits reached in mapping the light and color distribution

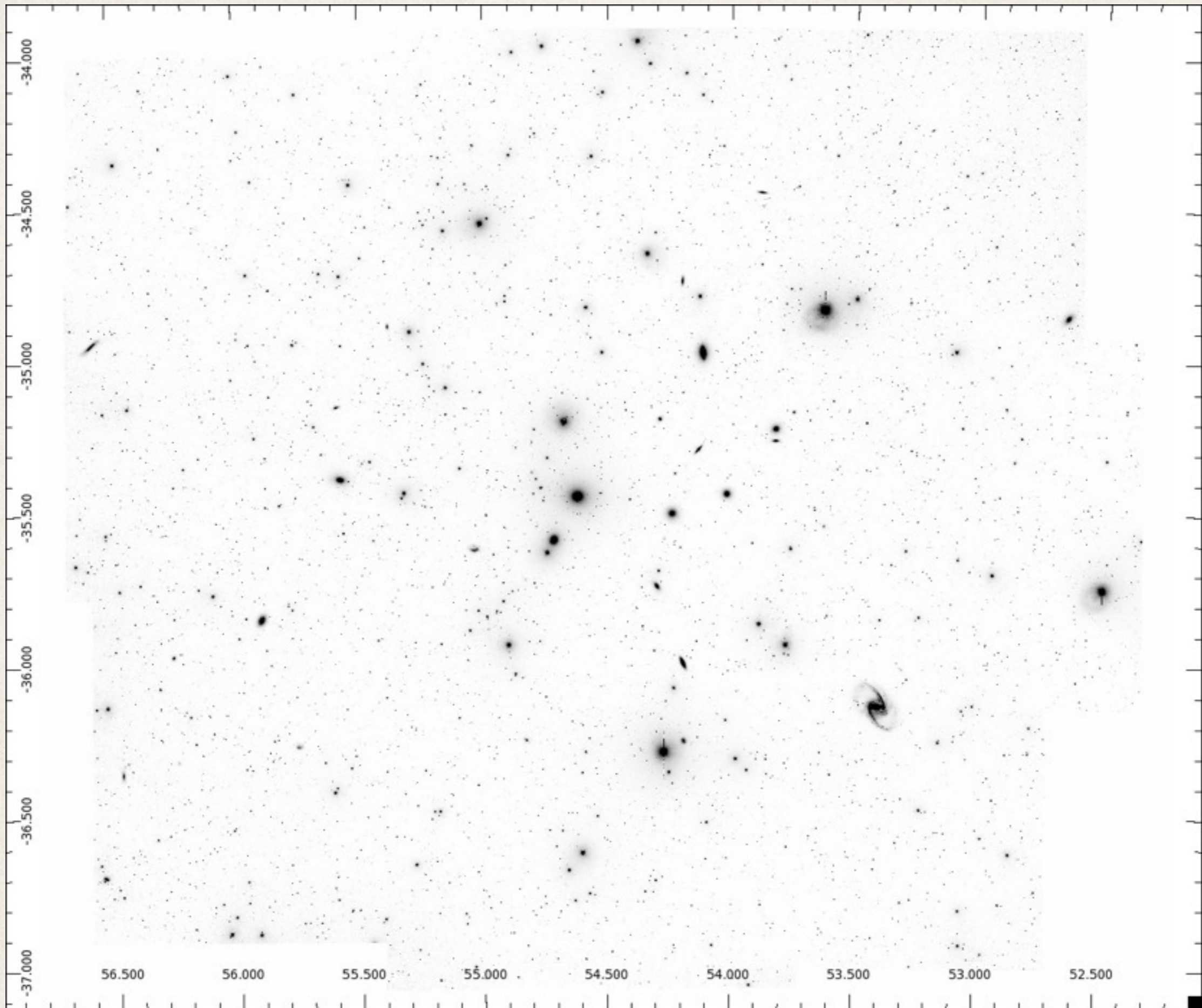
$\sim 10 - 15R_e$

$\mu_r \geq 27 \text{ mag/arcsec}^2$ ($\mu_B \geq 28 \text{ mag/arcsec}^2$)

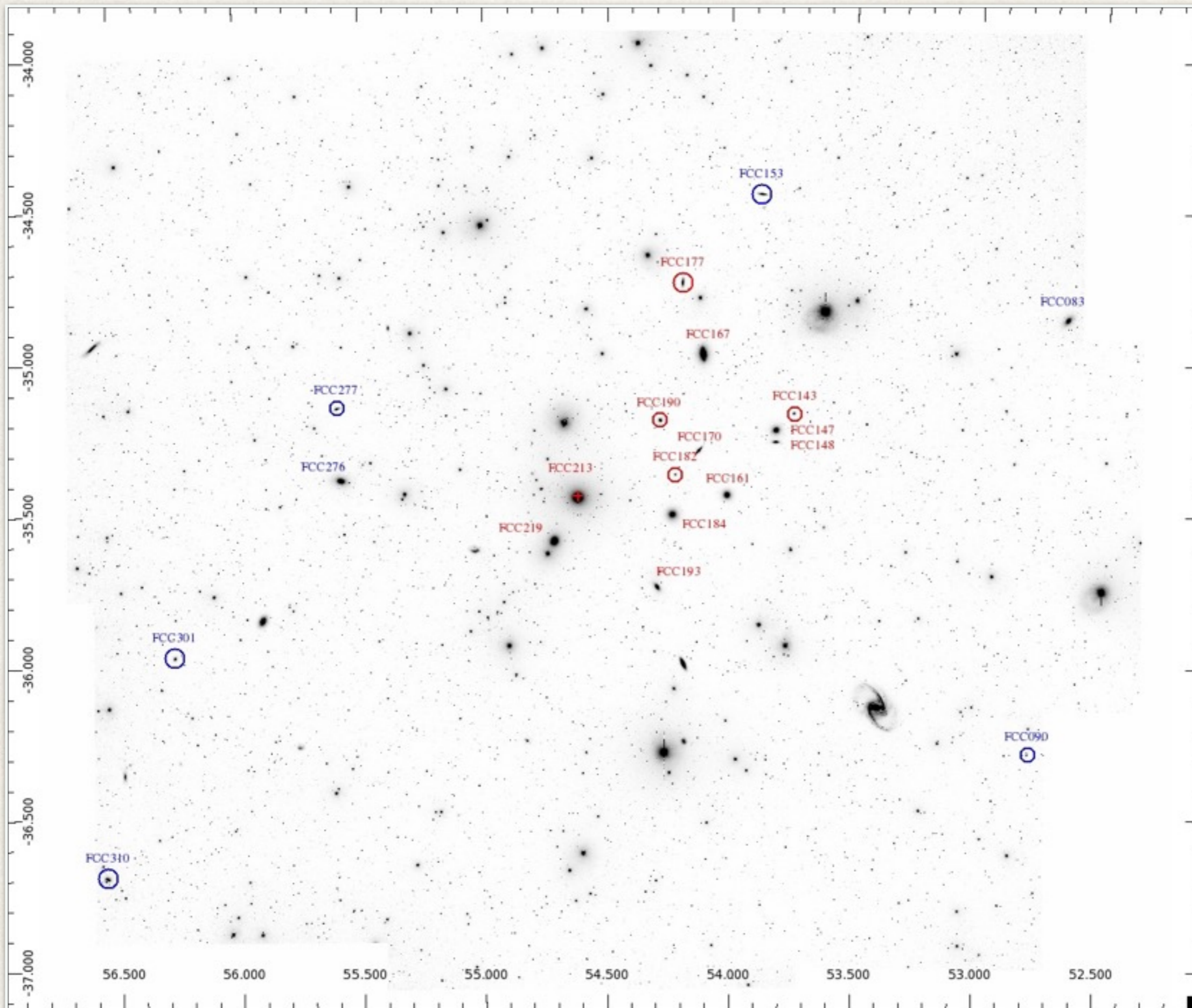


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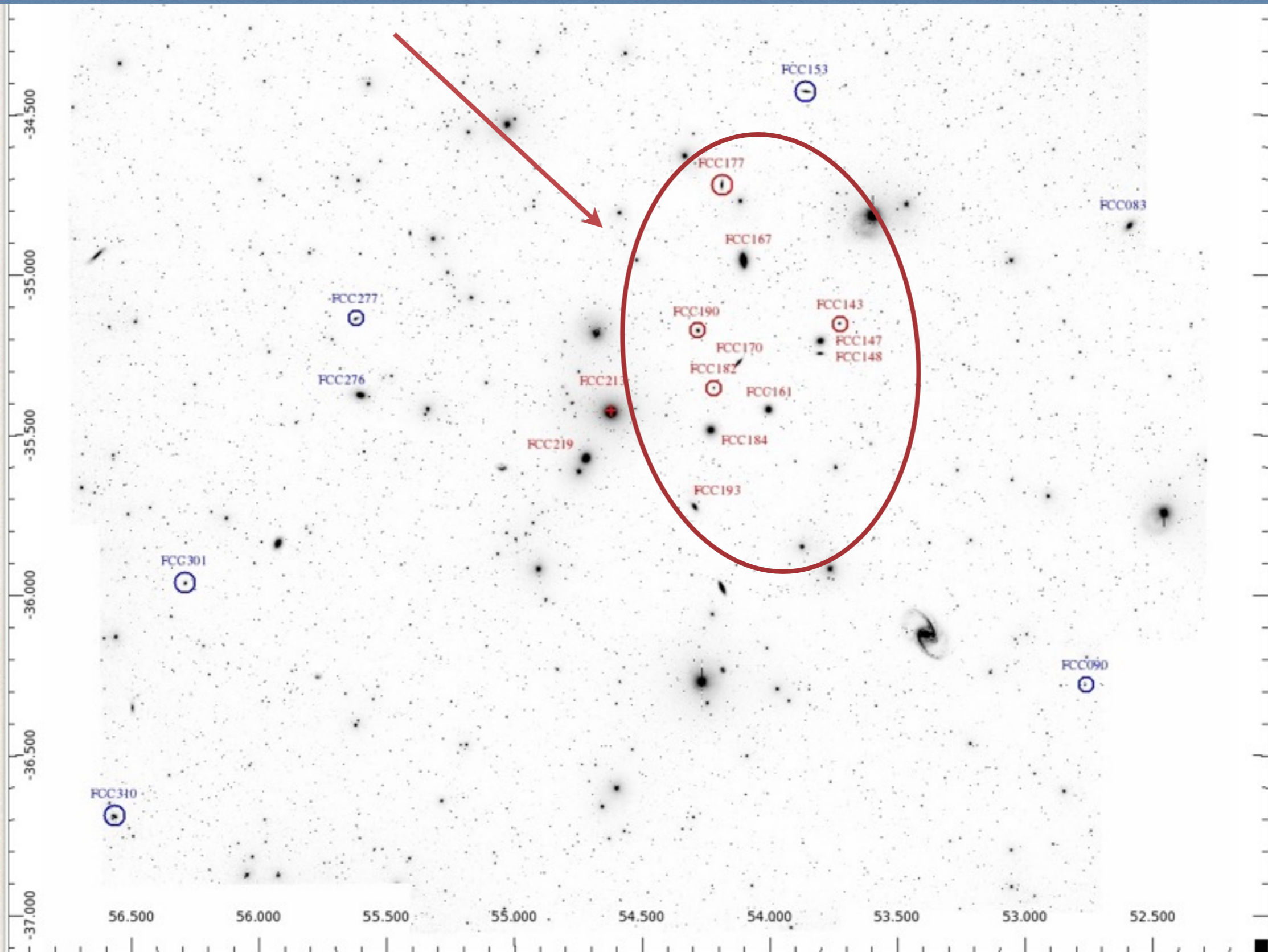
The bright ETGs in the R_{vir} of the cluster: RESULTS



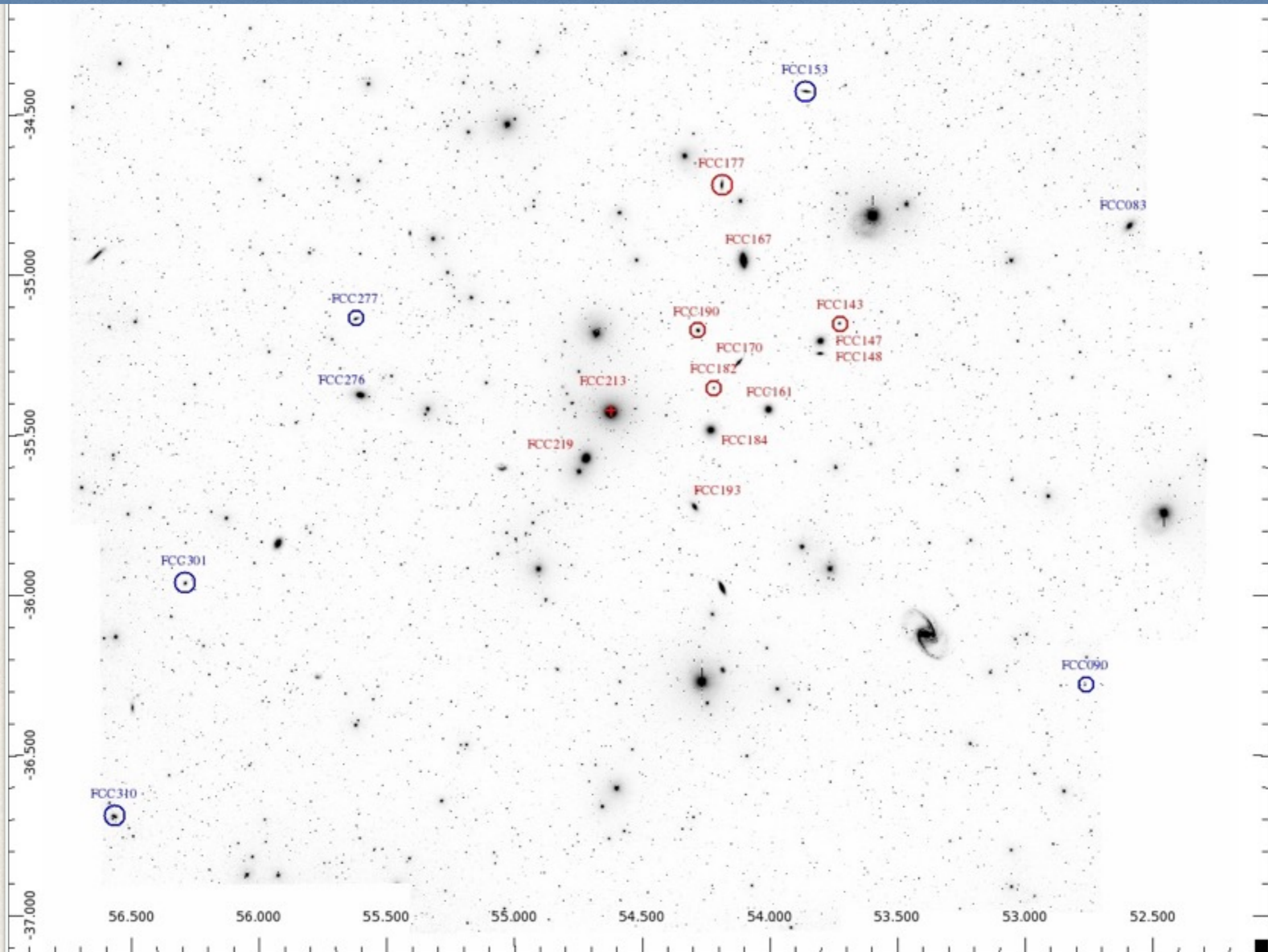
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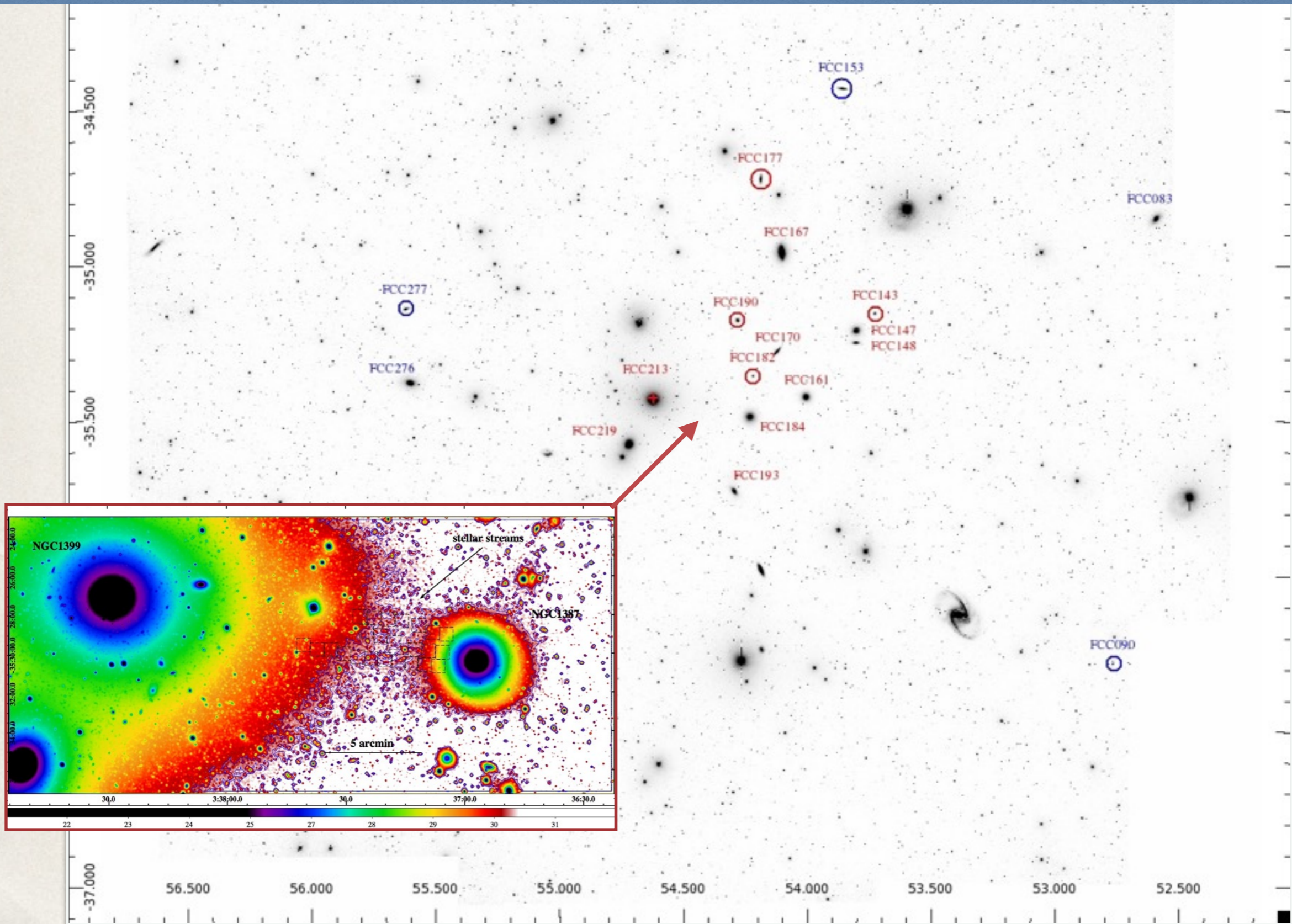
the bulk of the gravitational interactions between galaxies should have happened on the W-NW side of the cluster, where most of the bright ETGs are located and where the intra-cluster baryons are found



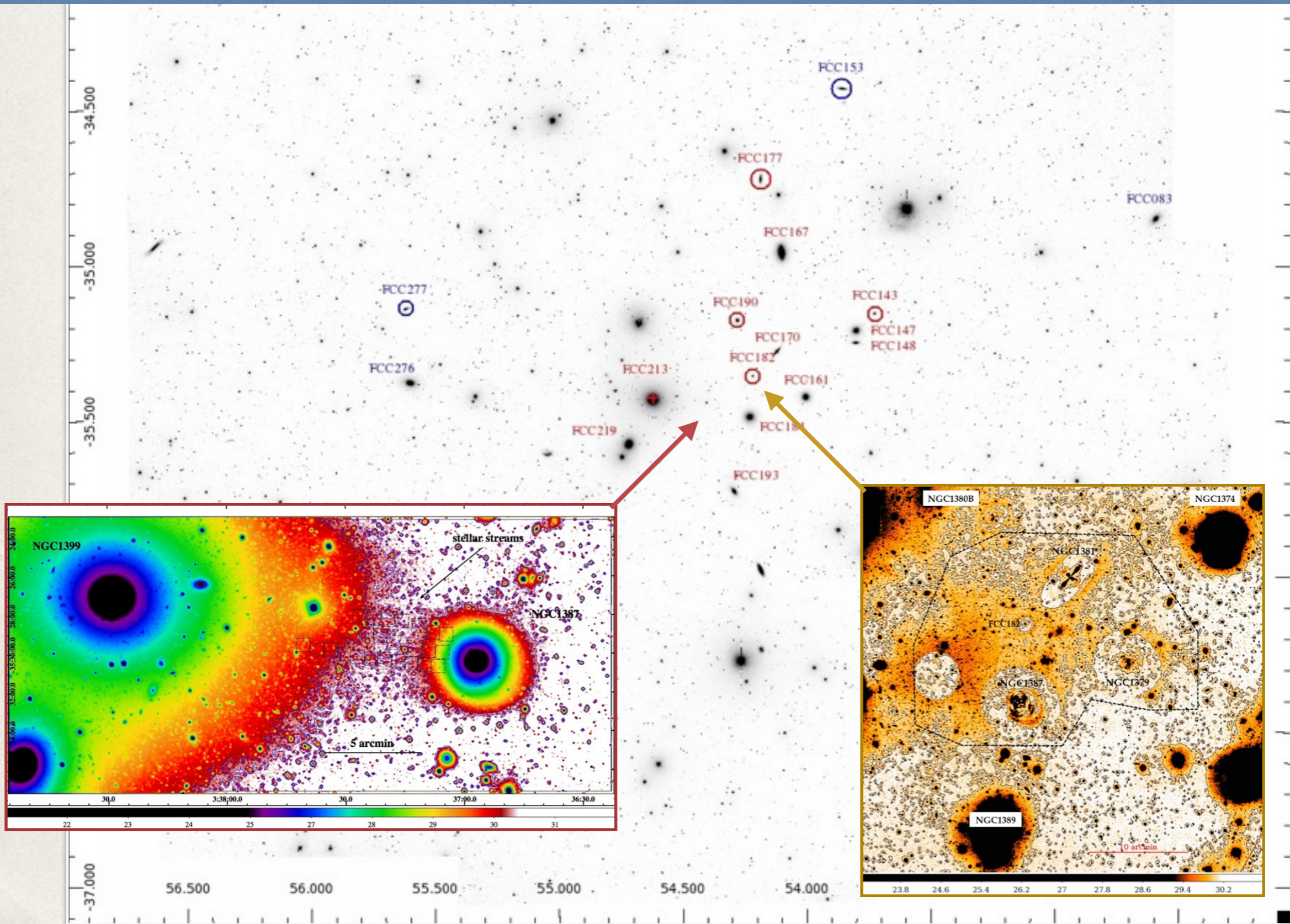
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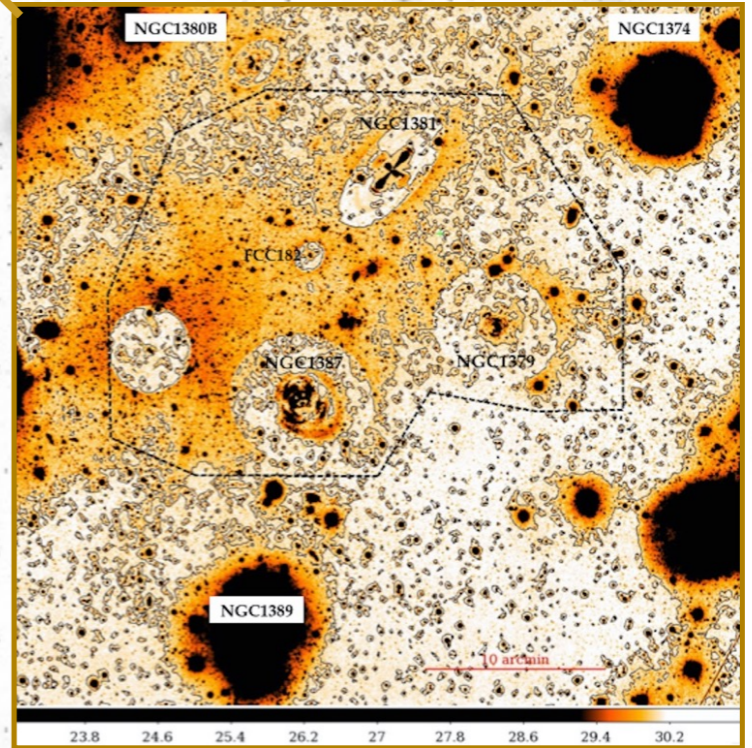
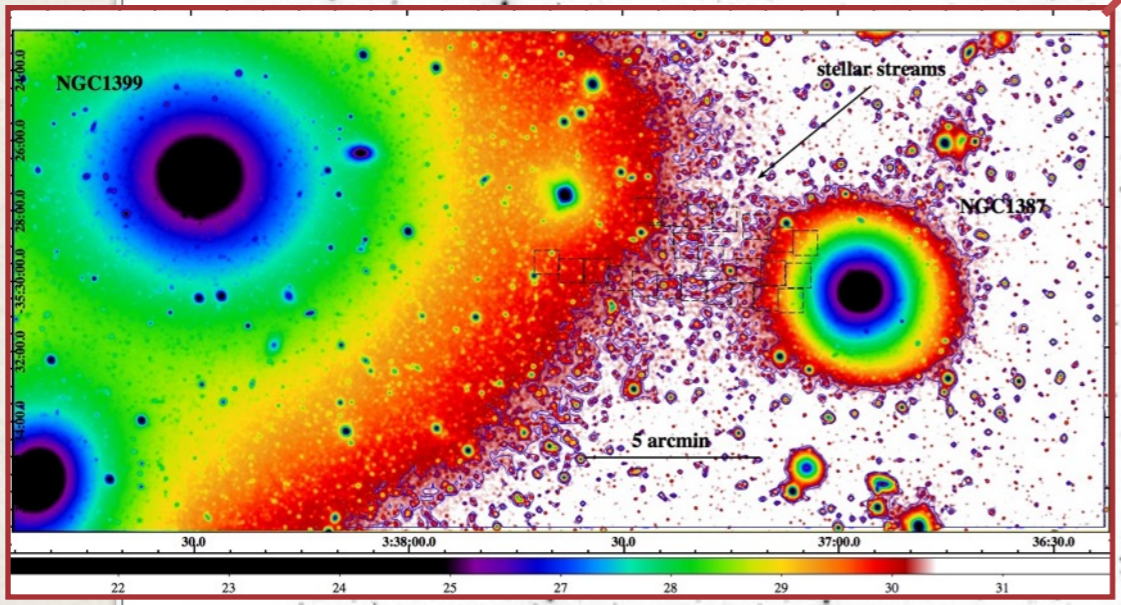
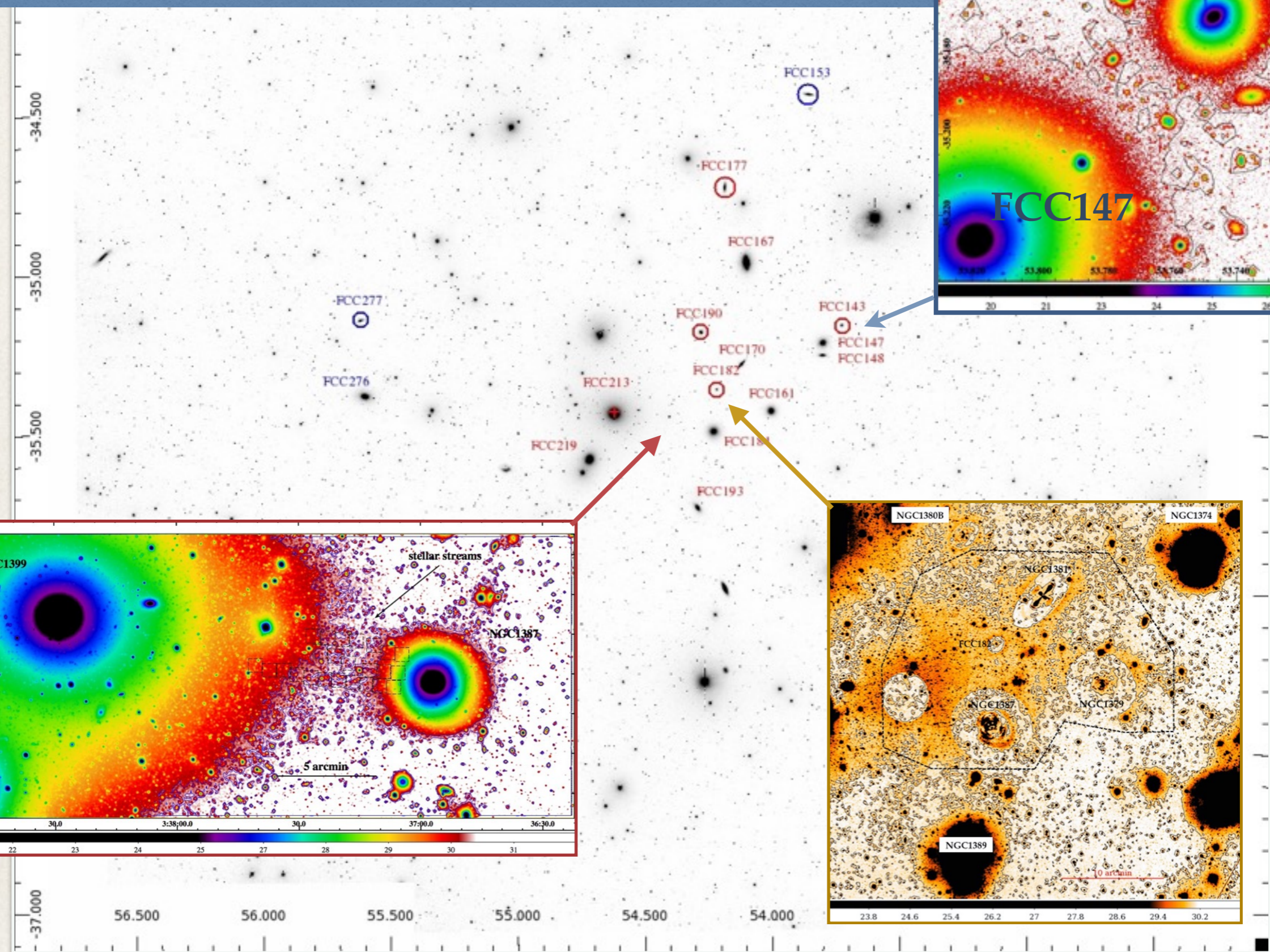
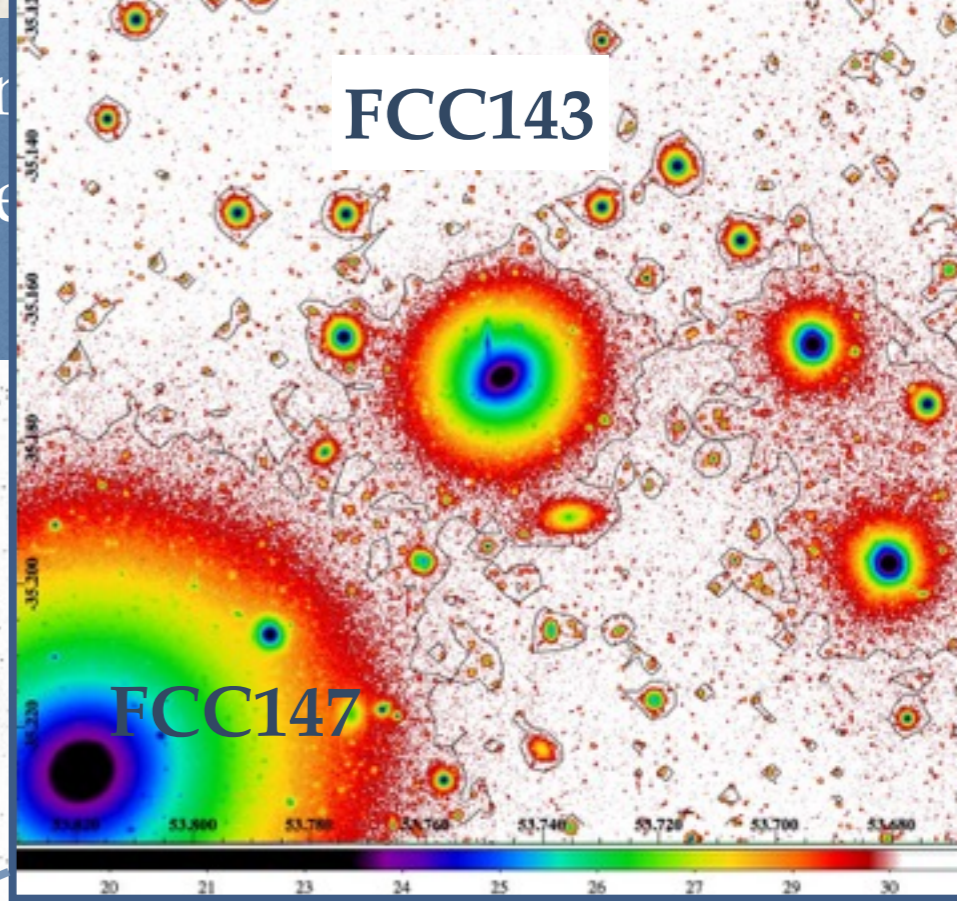
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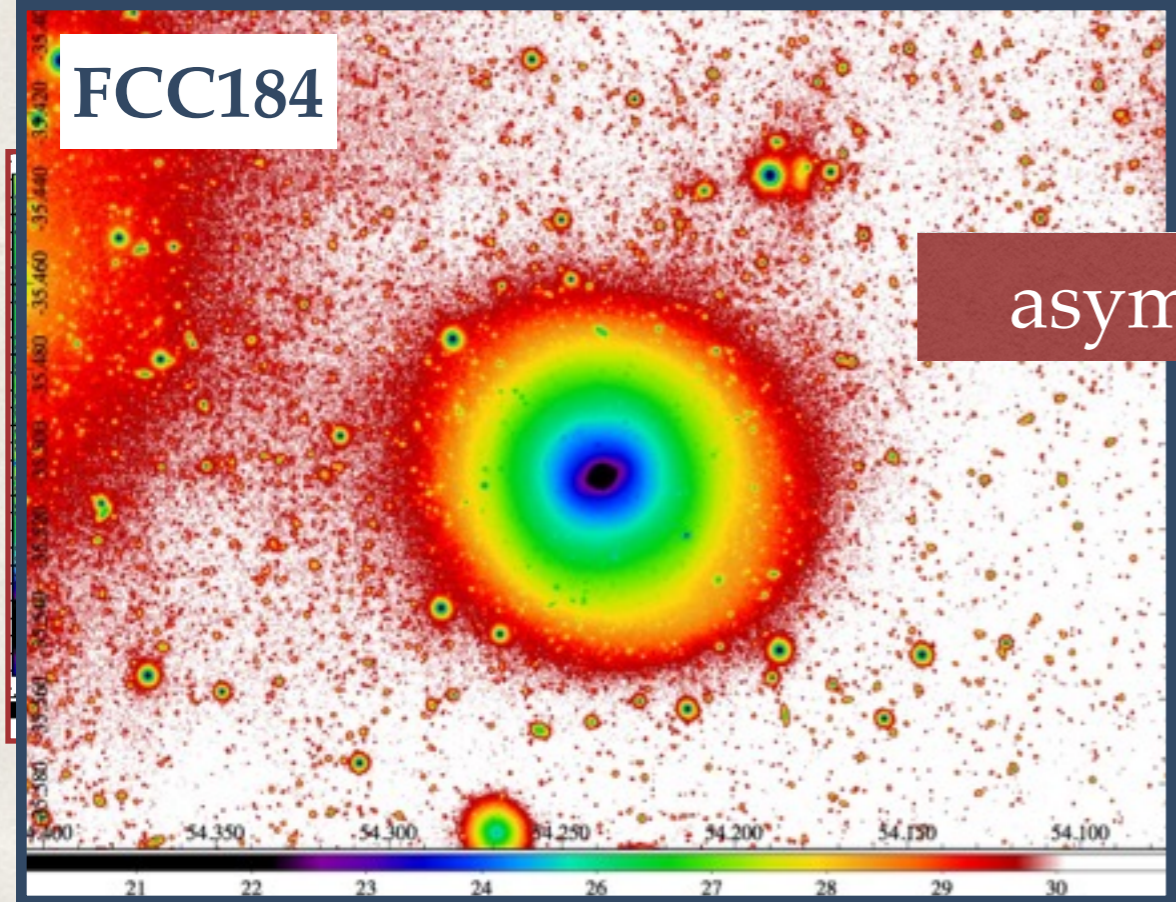
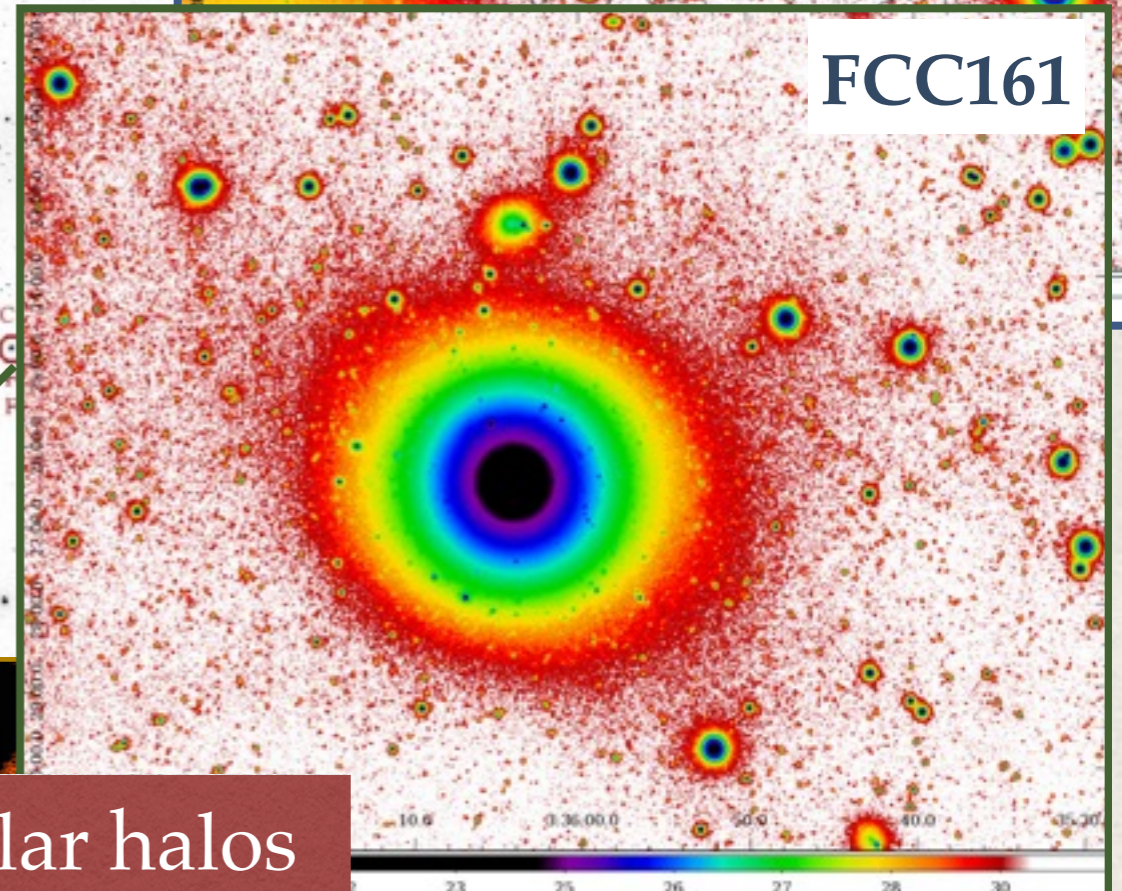
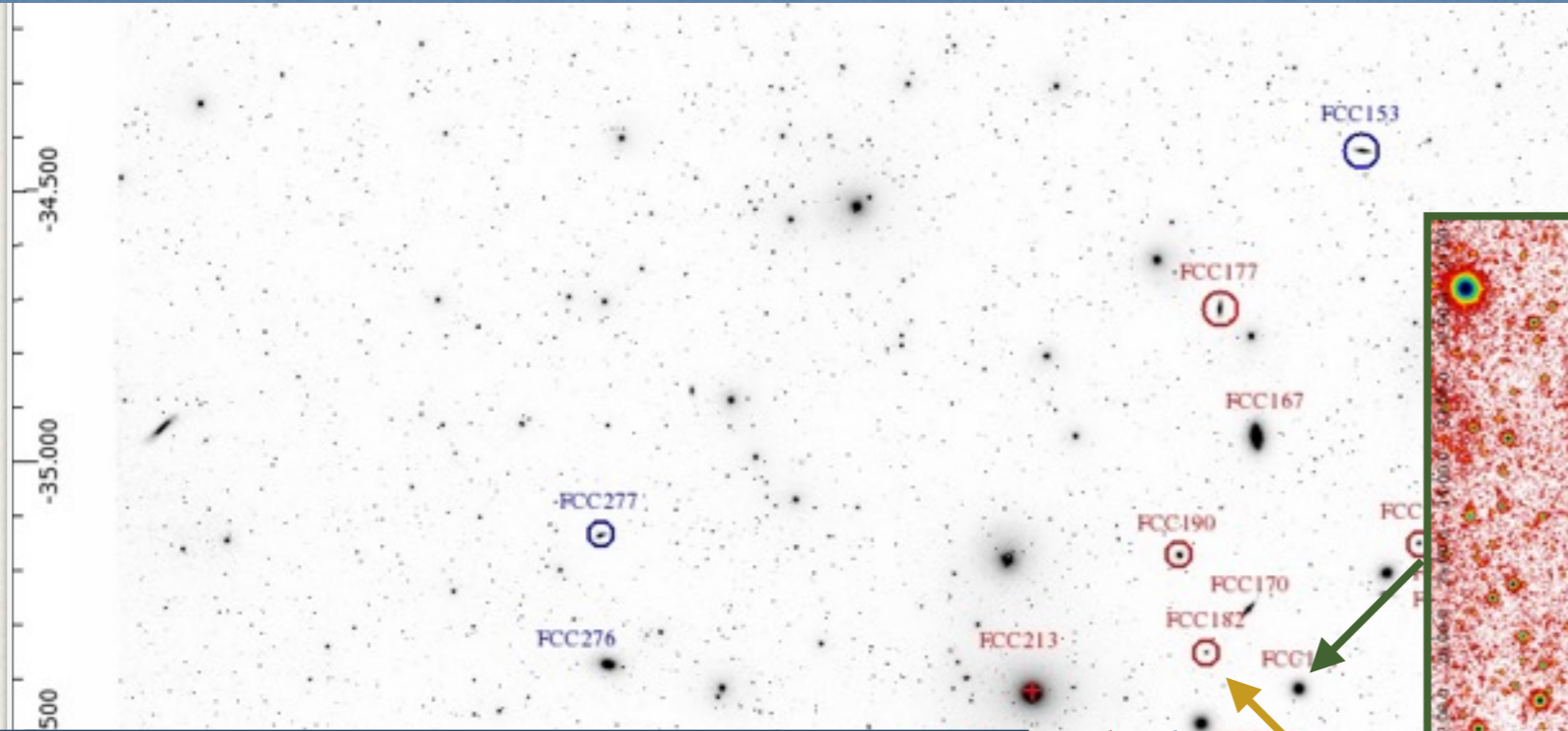
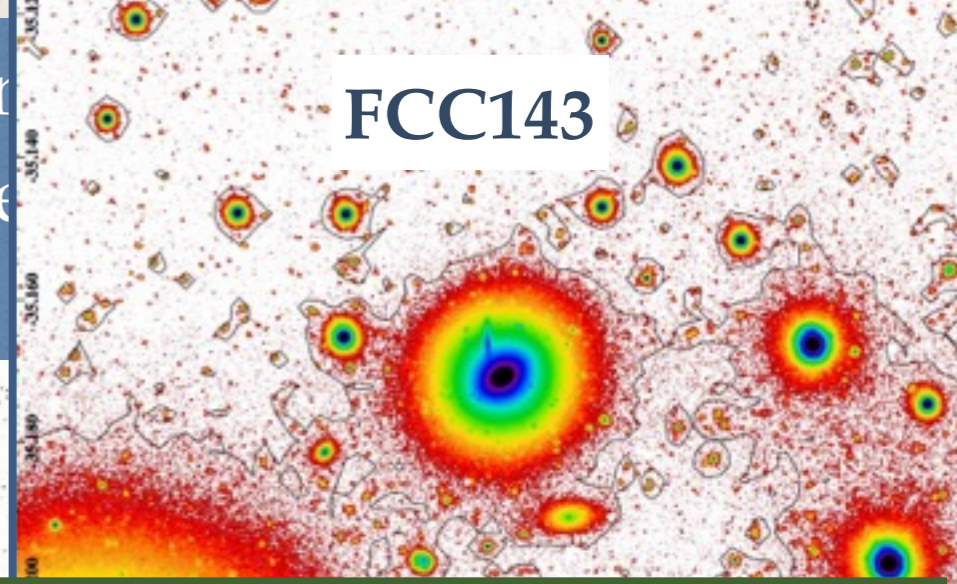
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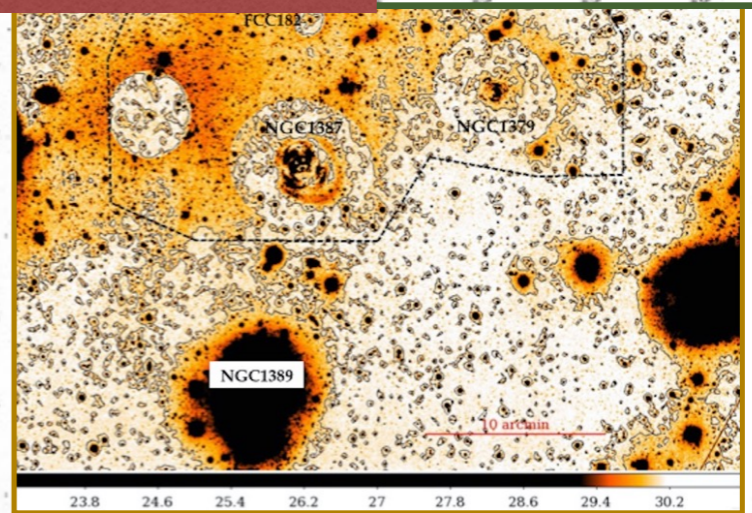
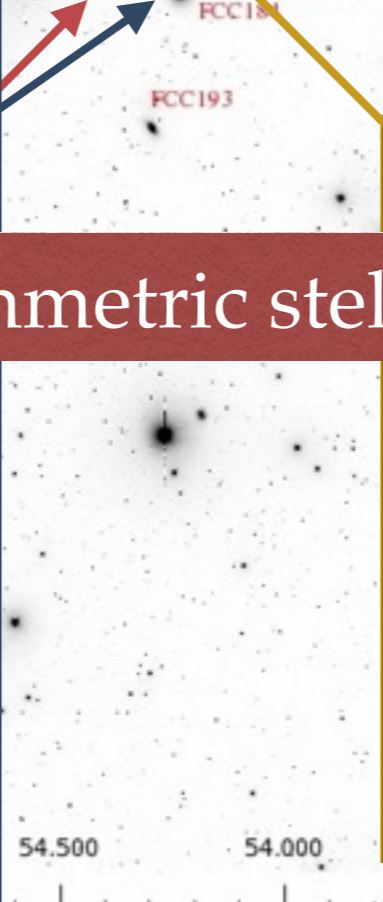
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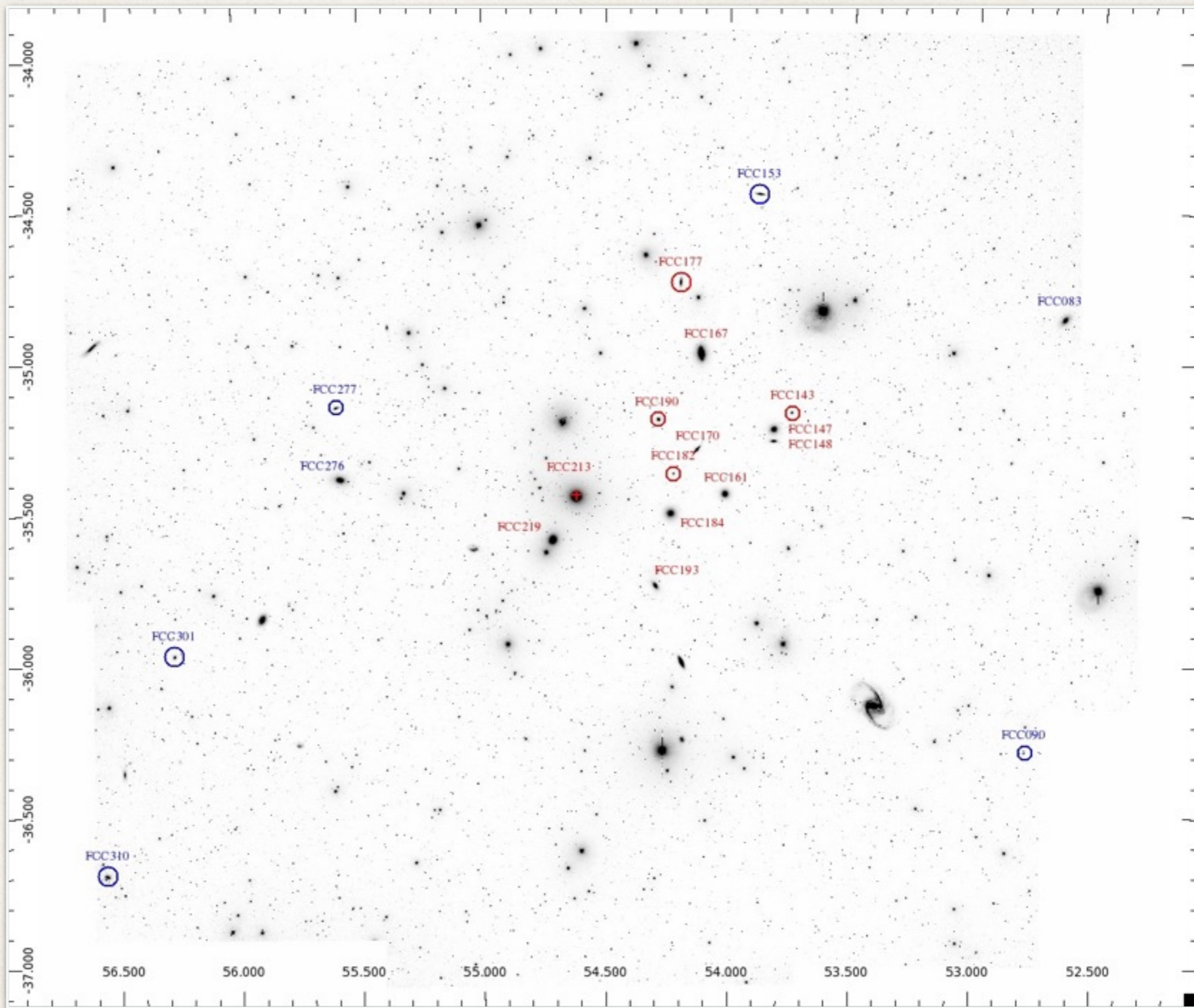
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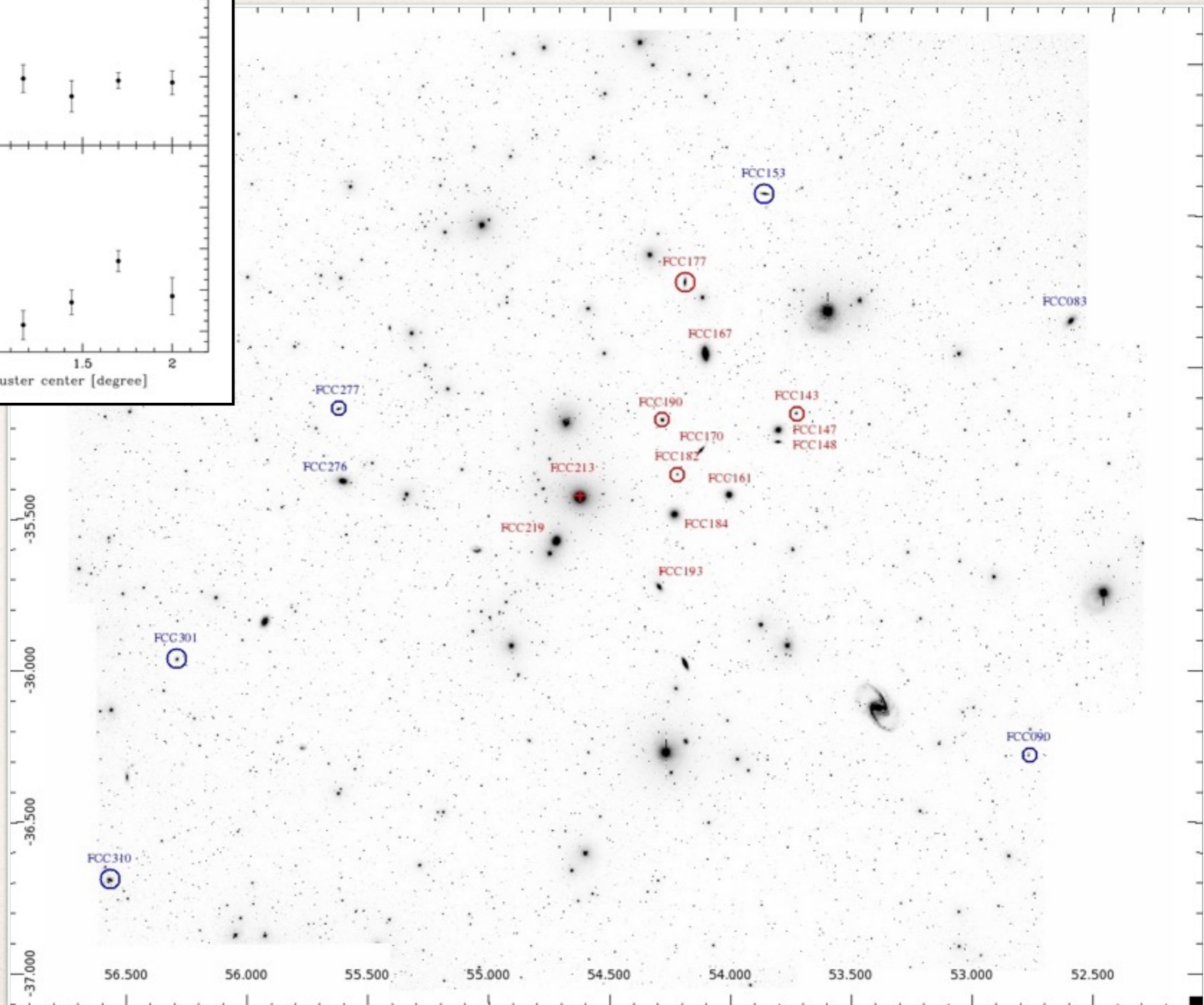
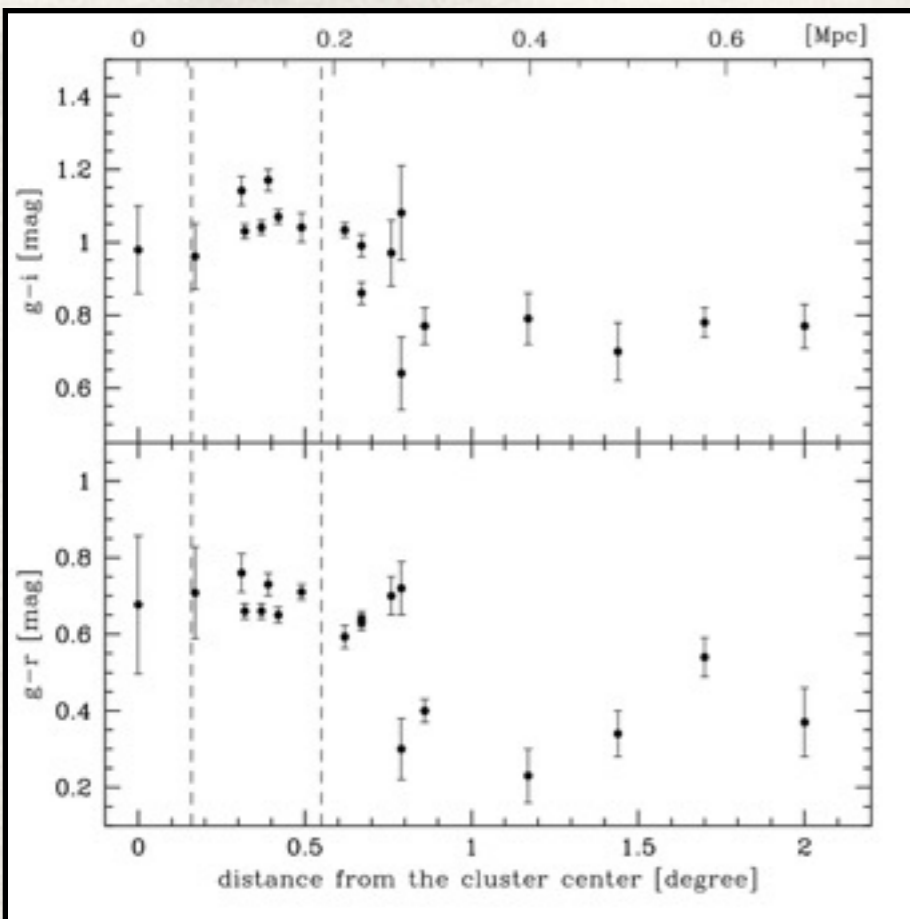
asymmetric stellar halos



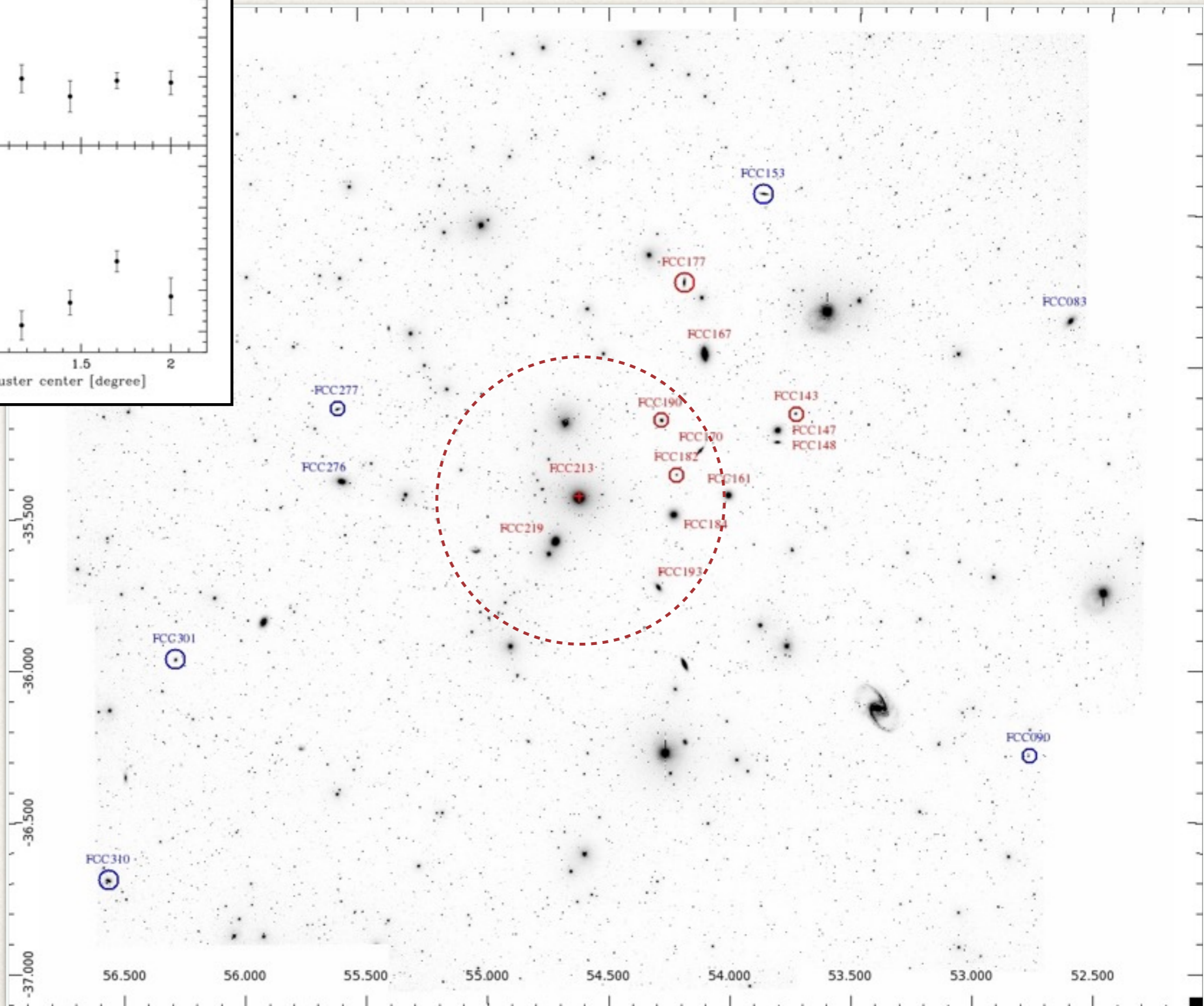
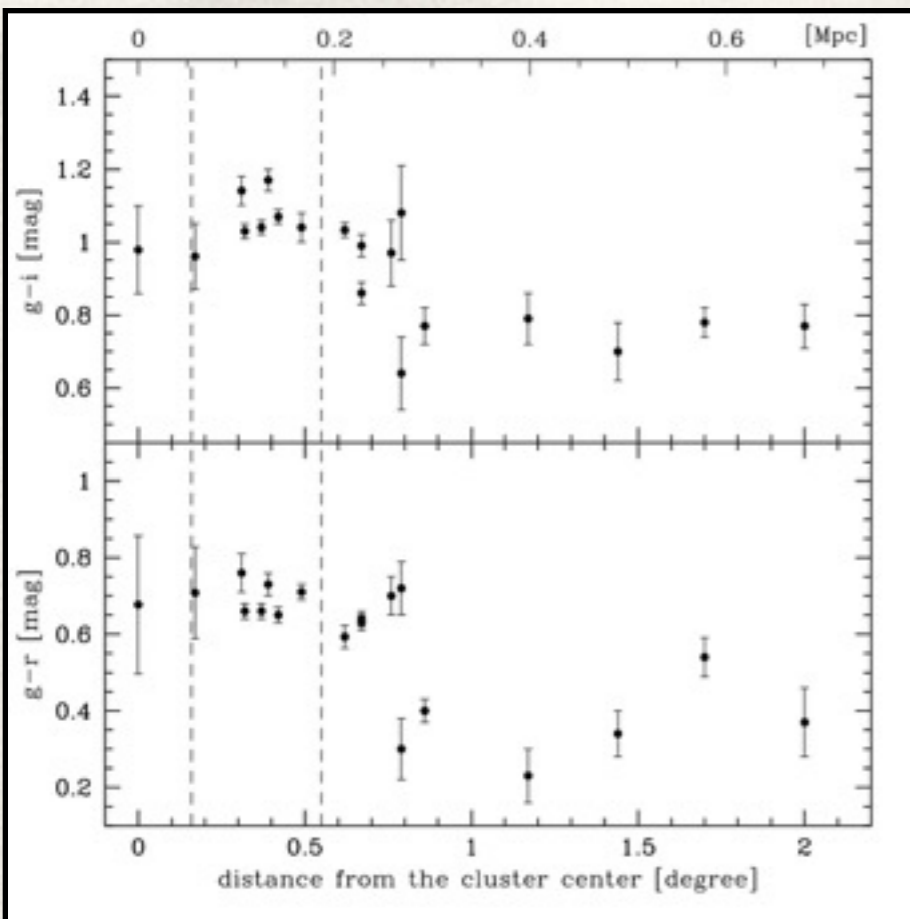
The bright ETGs in the R_{vir} of the cluster: RESULTS



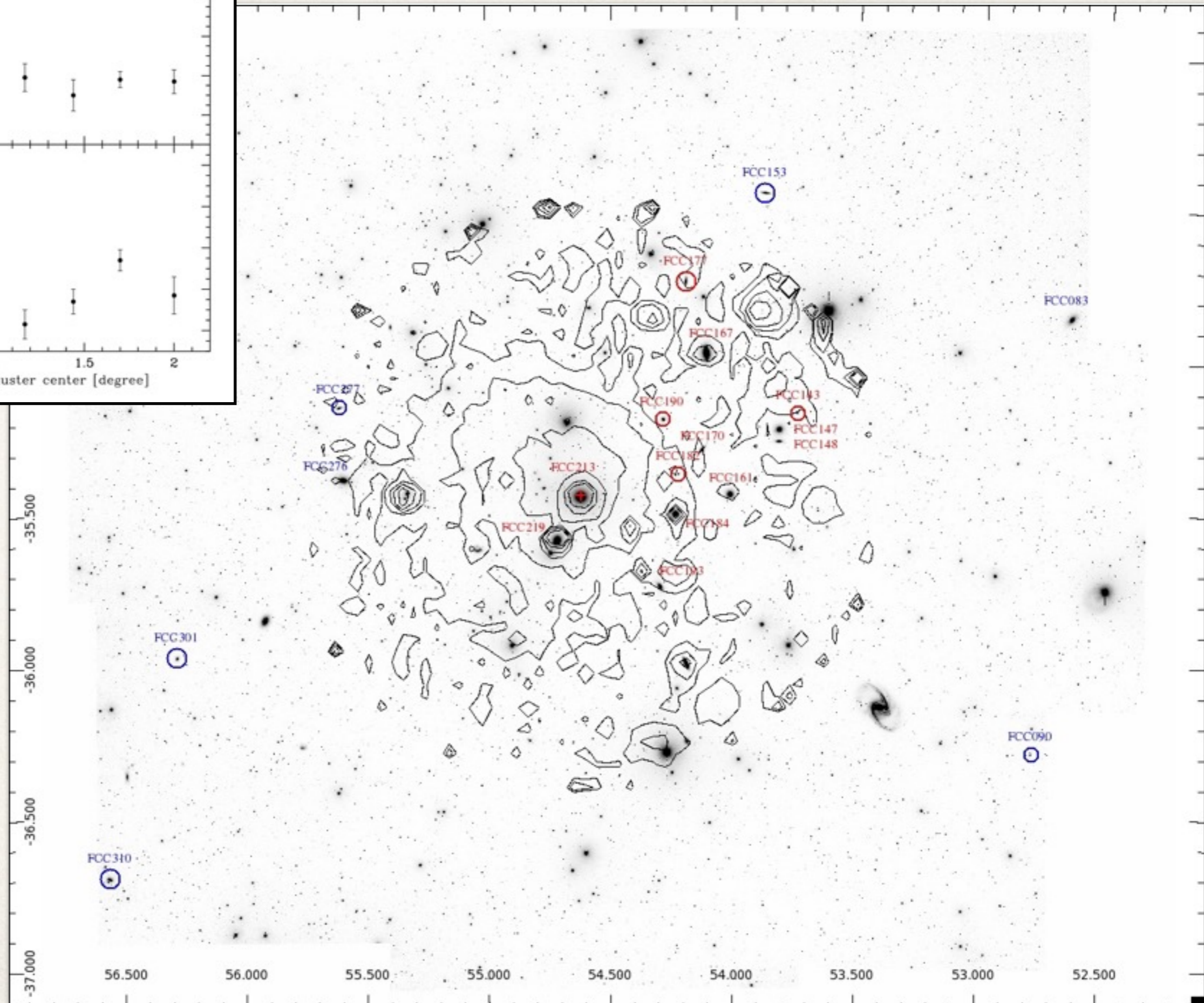
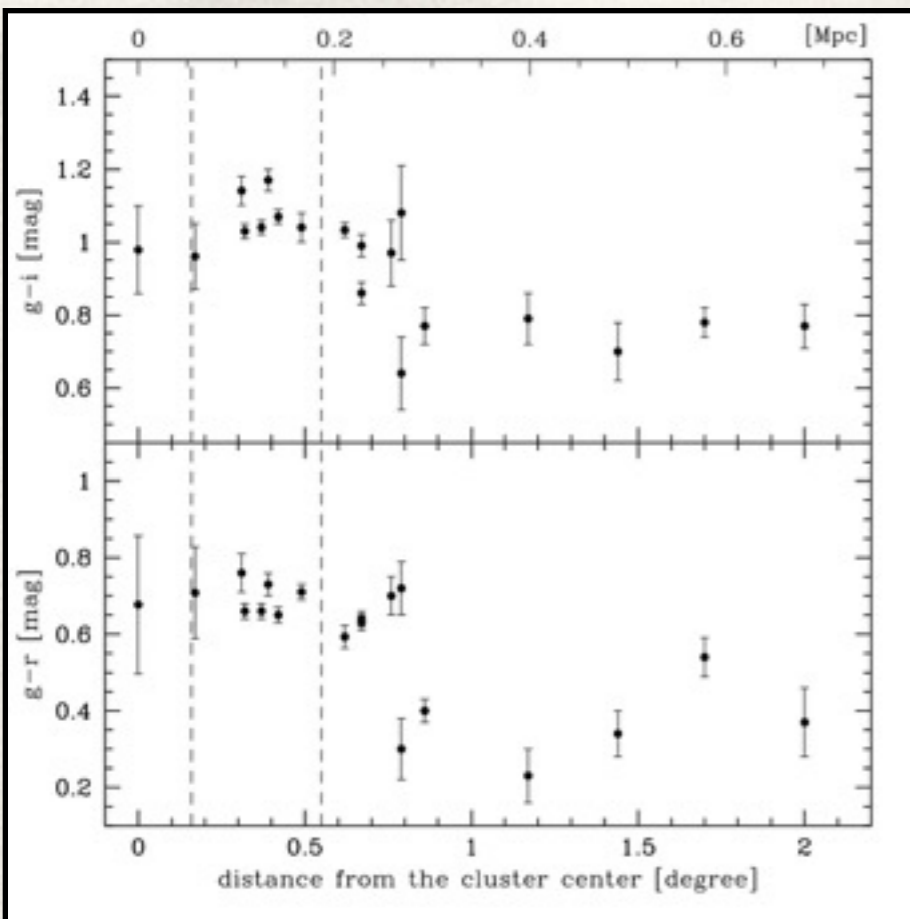
in the R_{vir} of the cluster: RESULTS



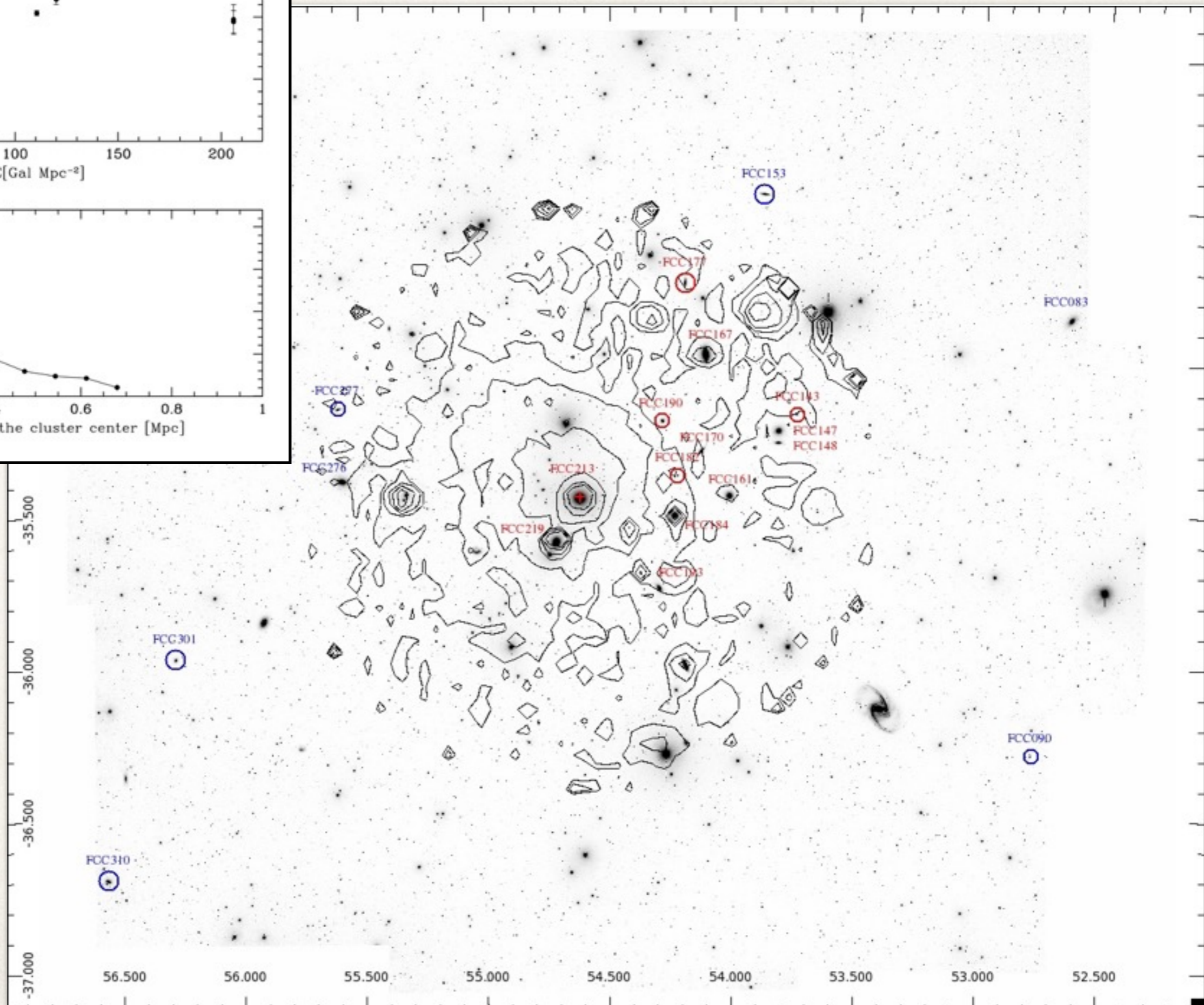
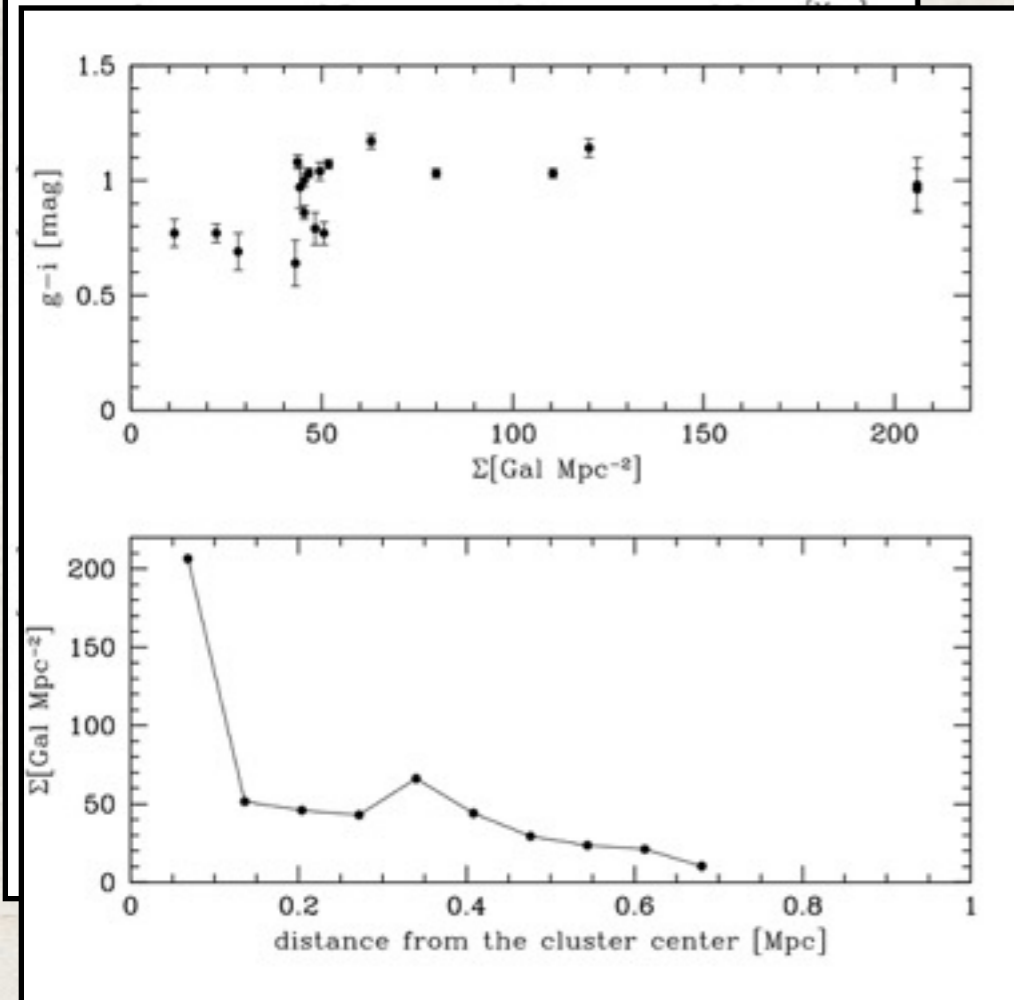
in the R_{vir} of the cluster: RESULTS



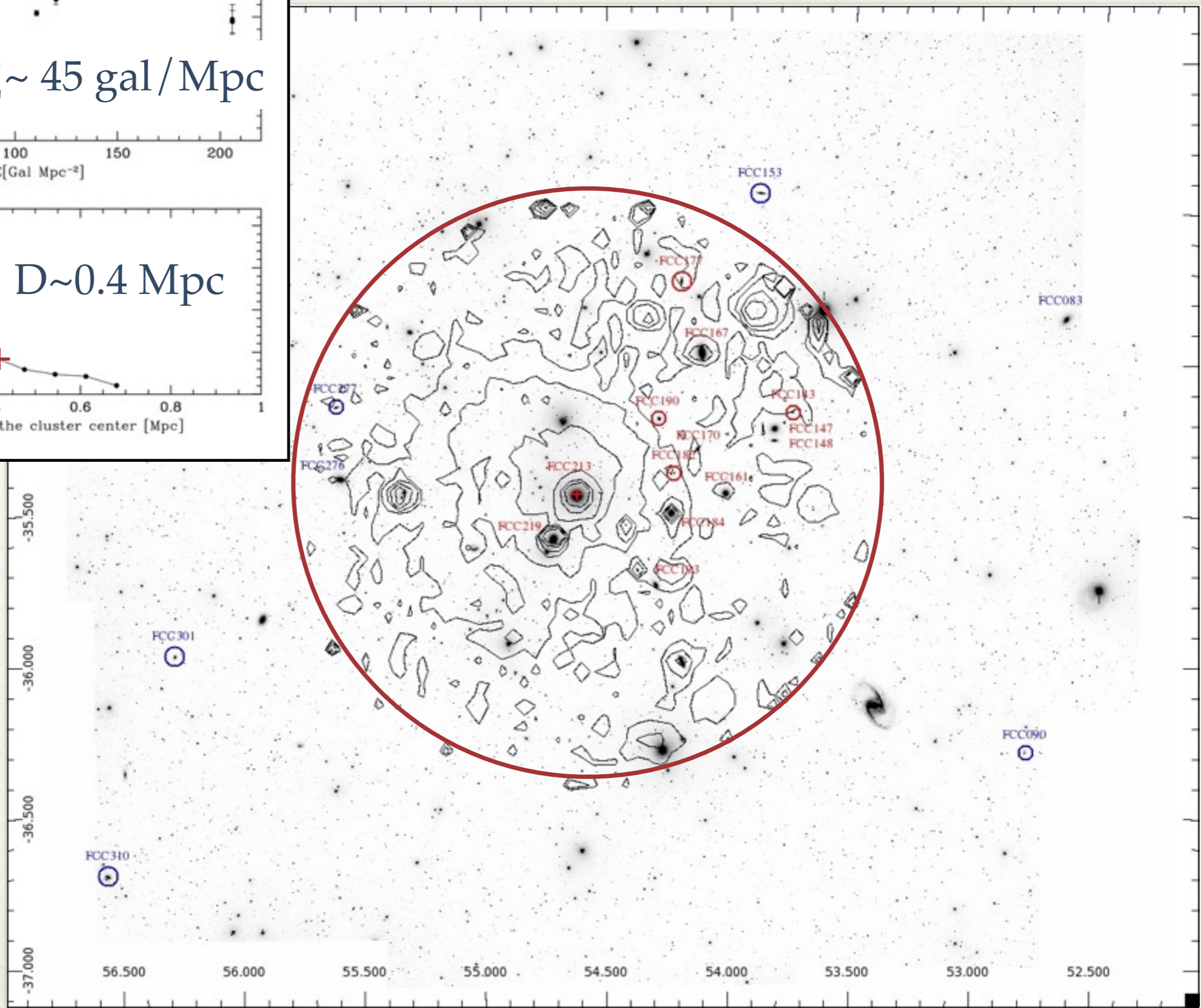
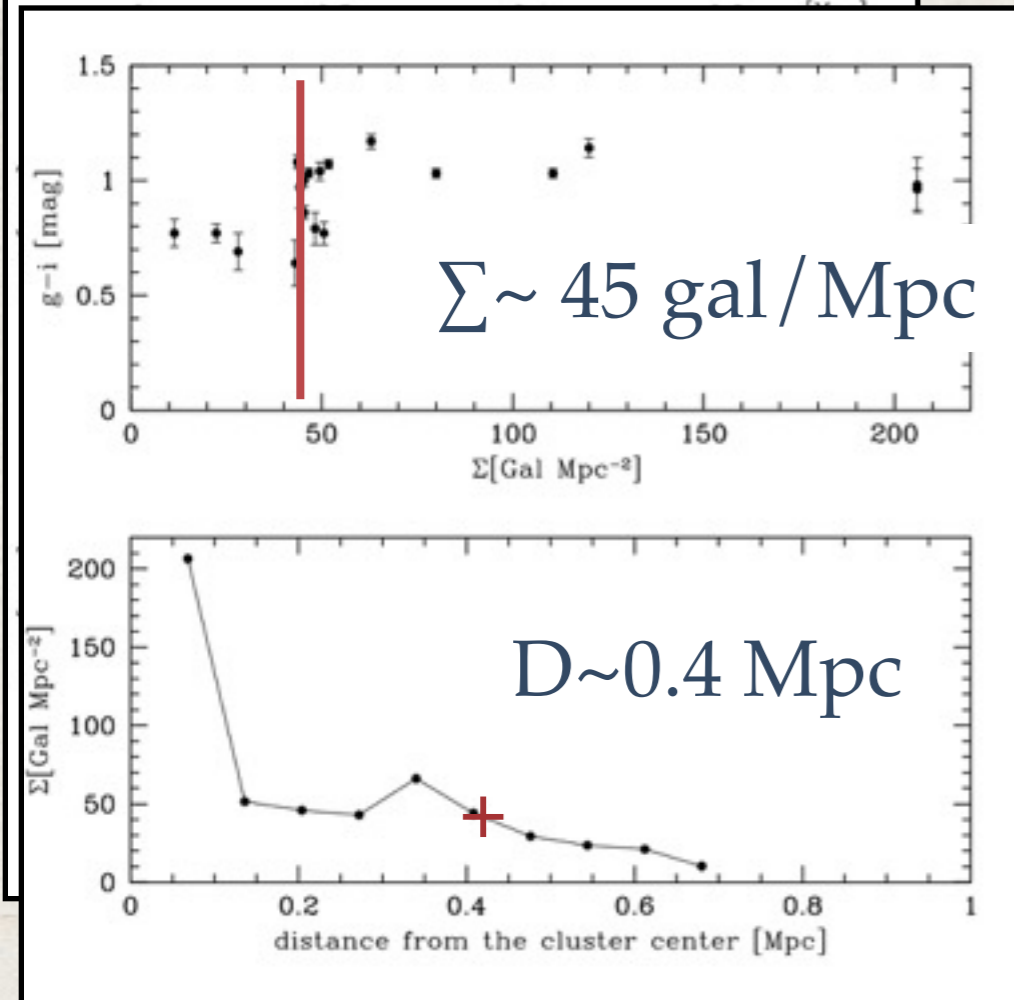
in the R_{vir} of the cluster: RESULTS



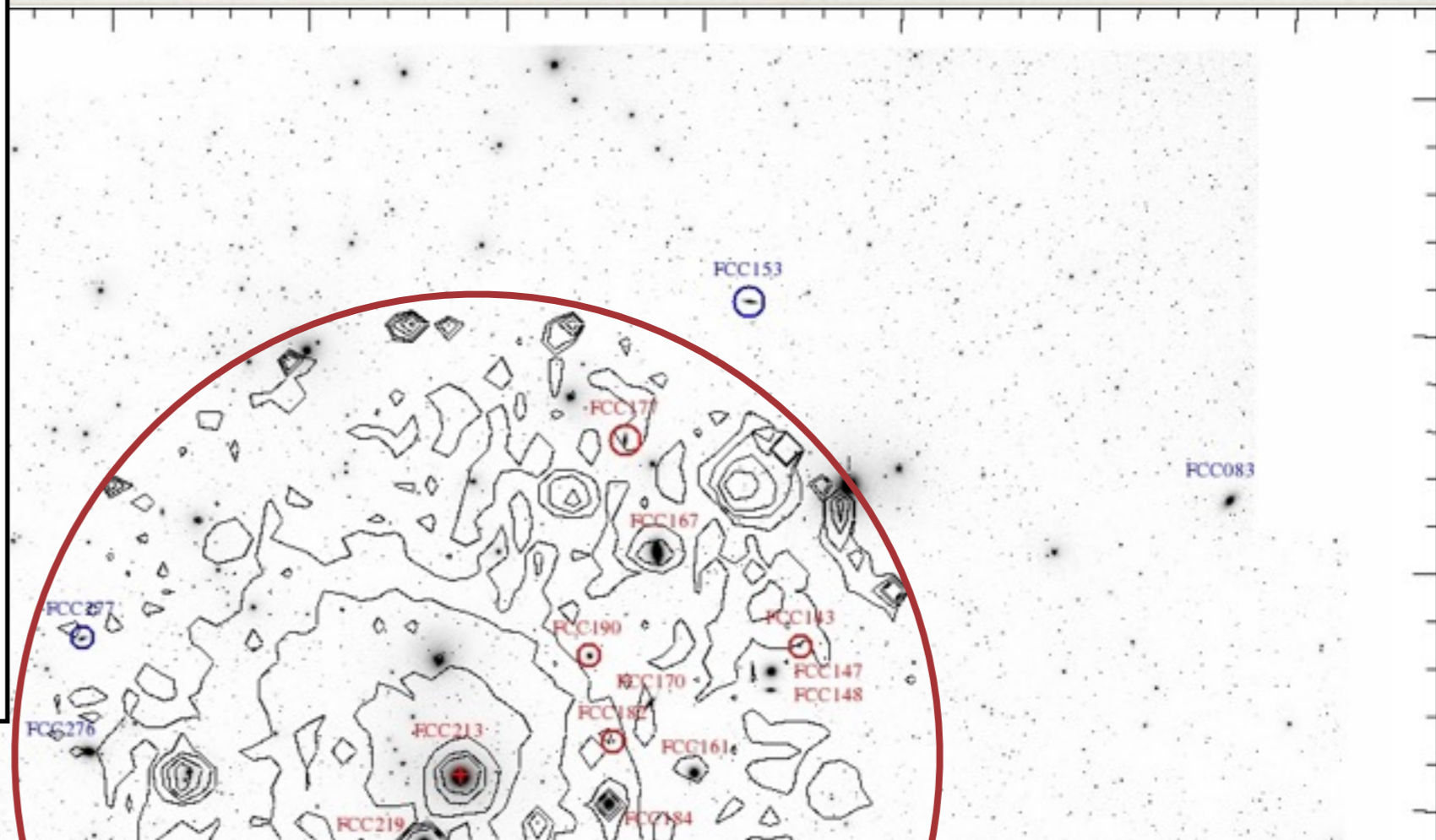
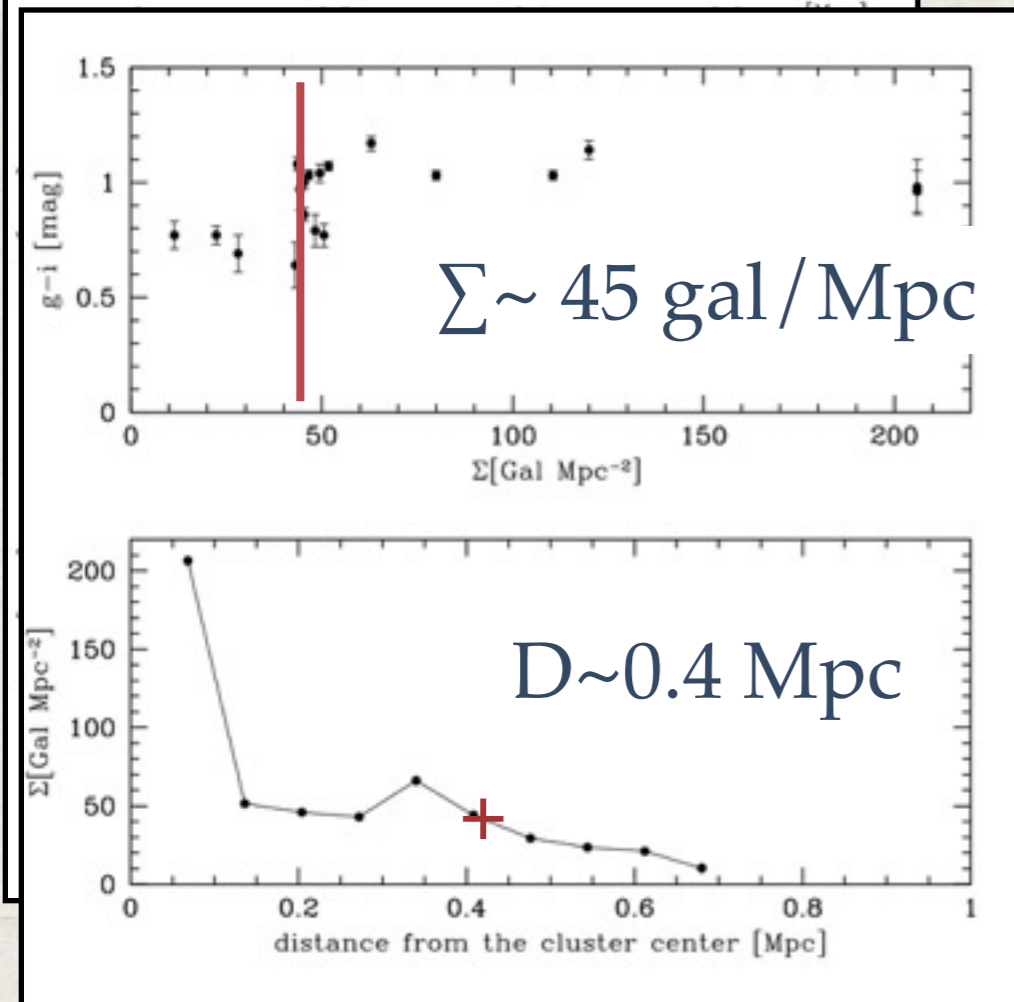
the R_{vir} of the cluster: RESULTS



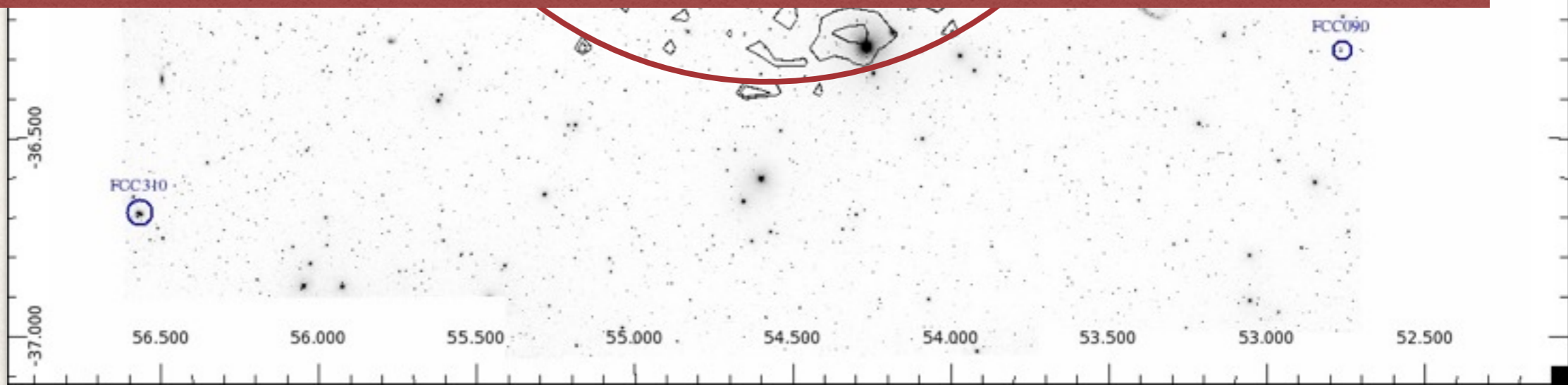
the R_{vir} of the cluster: RESULTS



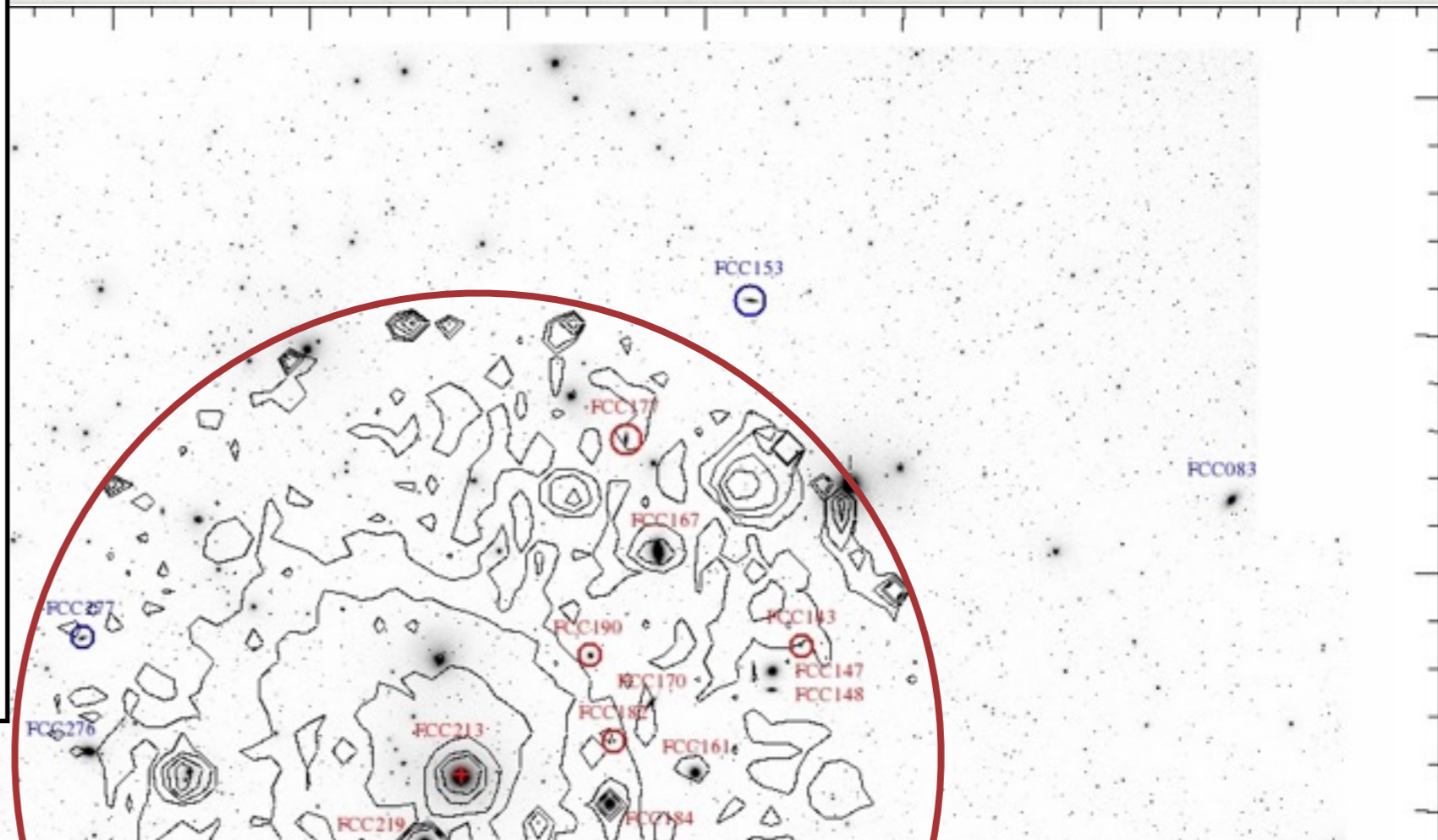
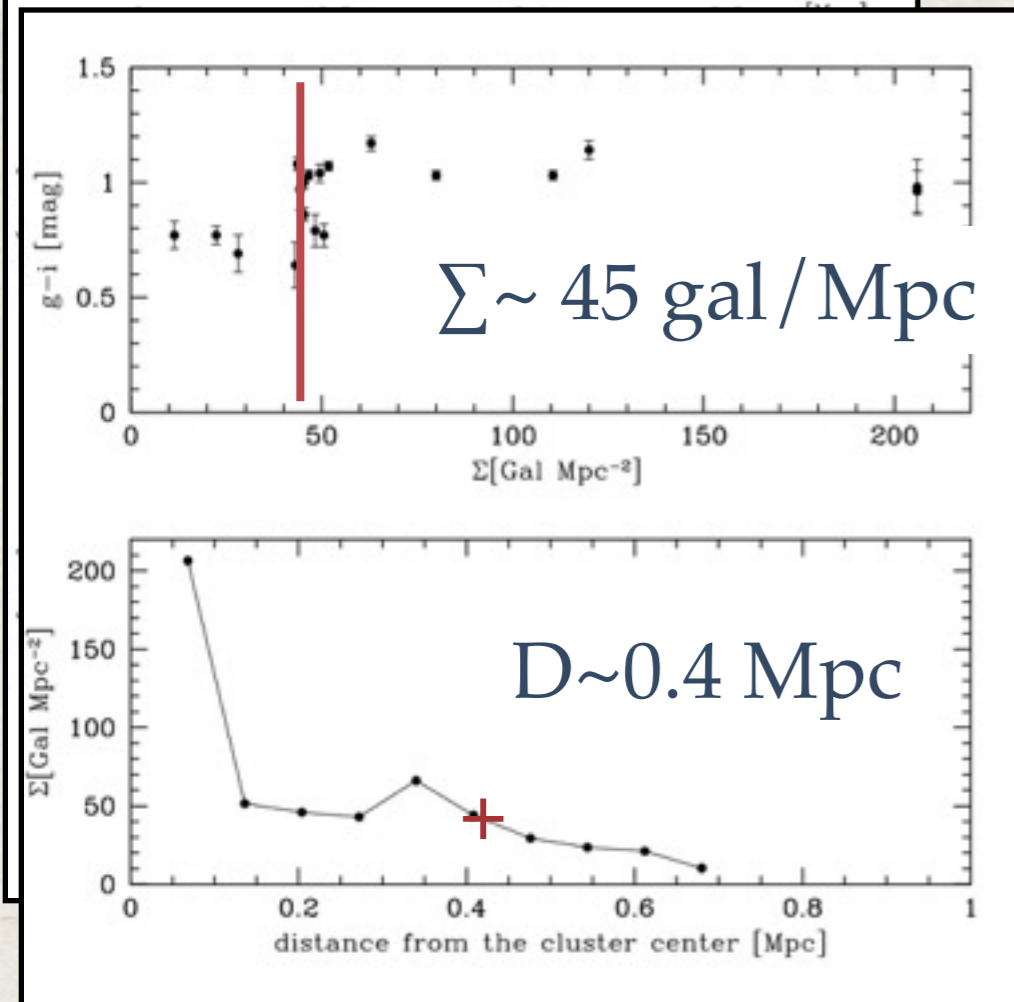
the R_{vir} of the cluster: RESULTS



strong indication of a different *galaxy evolution & star formation history* as function of the cluster-centric radius

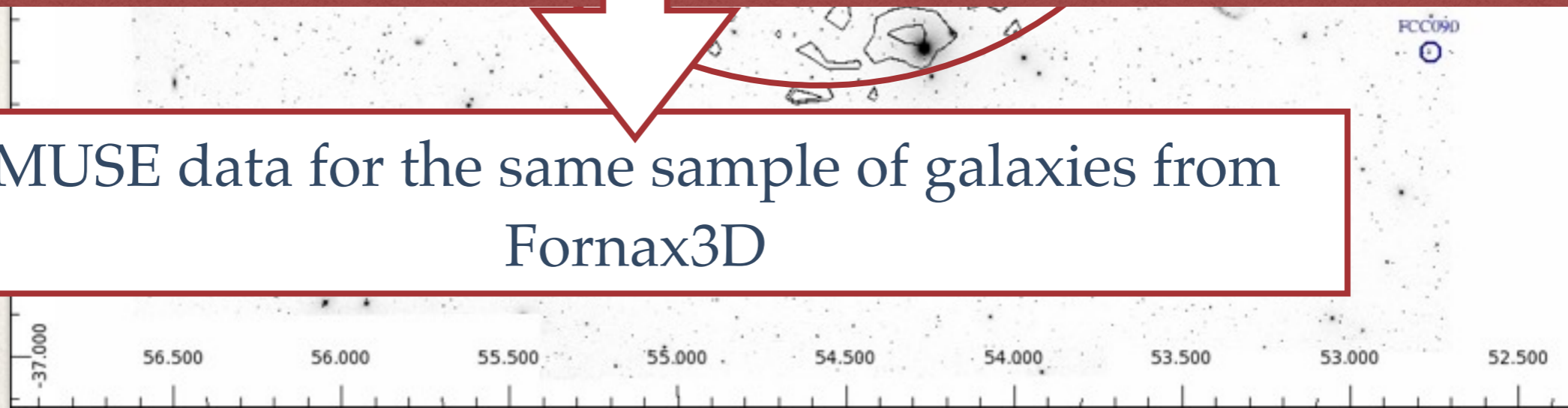


the R_{vir} of the cluster: RESULTS



strong indication of a different *galaxy evolution & star formation history* as function of the cluster-centric radius

MUSE data for the same sample of galaxies from Fornax3D



Fornax3D: A magnitude-limited survey of galaxies within the virial radius of the Fornax Cluster with MUSE

Sarzi et al. 2018, A&A in press

Team

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Tim de Zeeuw (Leiden, Netherland)

Fornax3D: A magnitude-limited survey of galaxies within the virial radius of the Fornax Cluster with MUSE

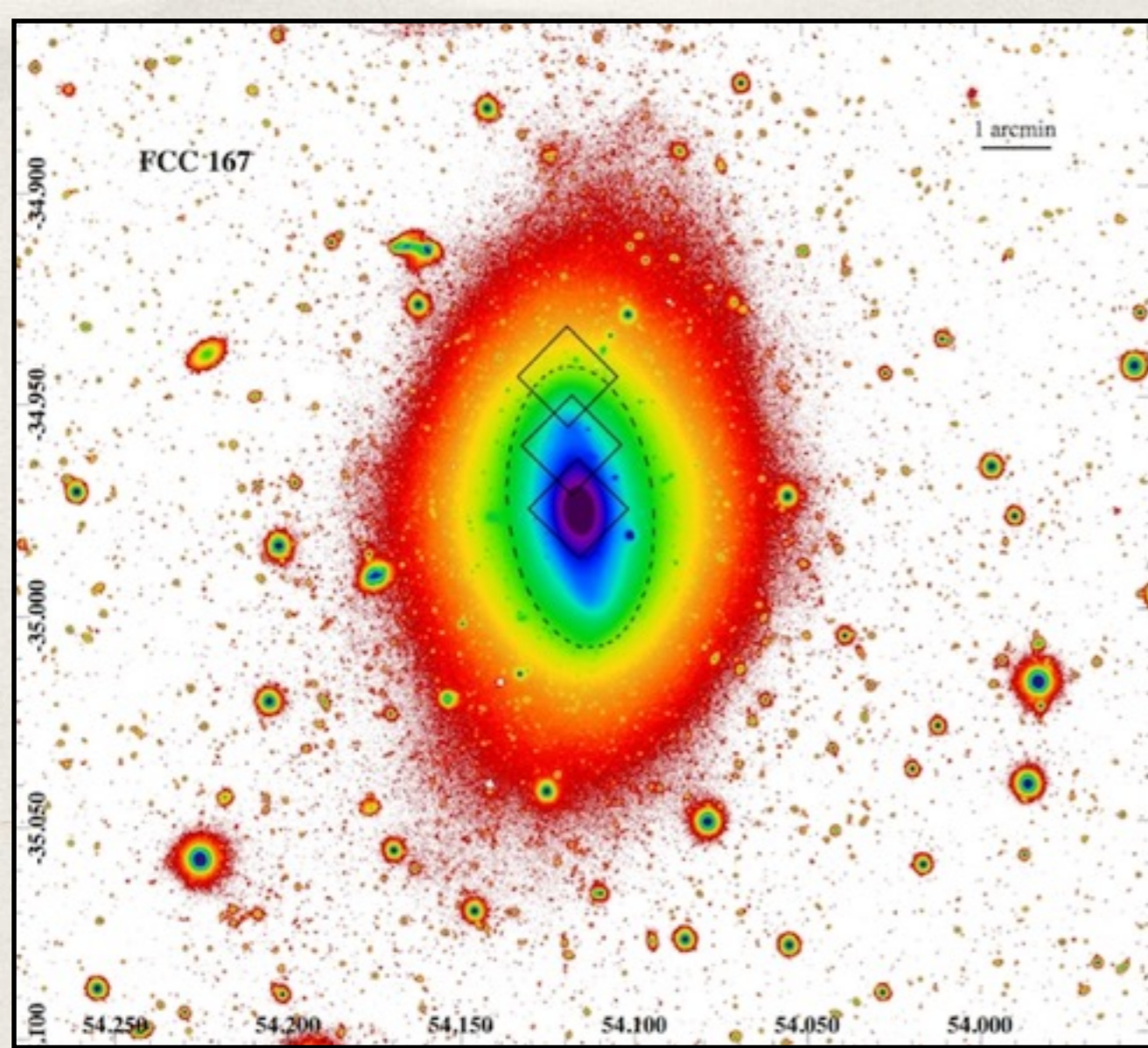
Sarzi et al. 2018, A&A in press

— Survey —

- * 2D map of 32 galaxies in the core of the Fornax Cluster
- * brighter than $M_B = -16$
- * within the R_{vir} (0.7 Mpc)
- * ETGs (23) & LTGs (9)

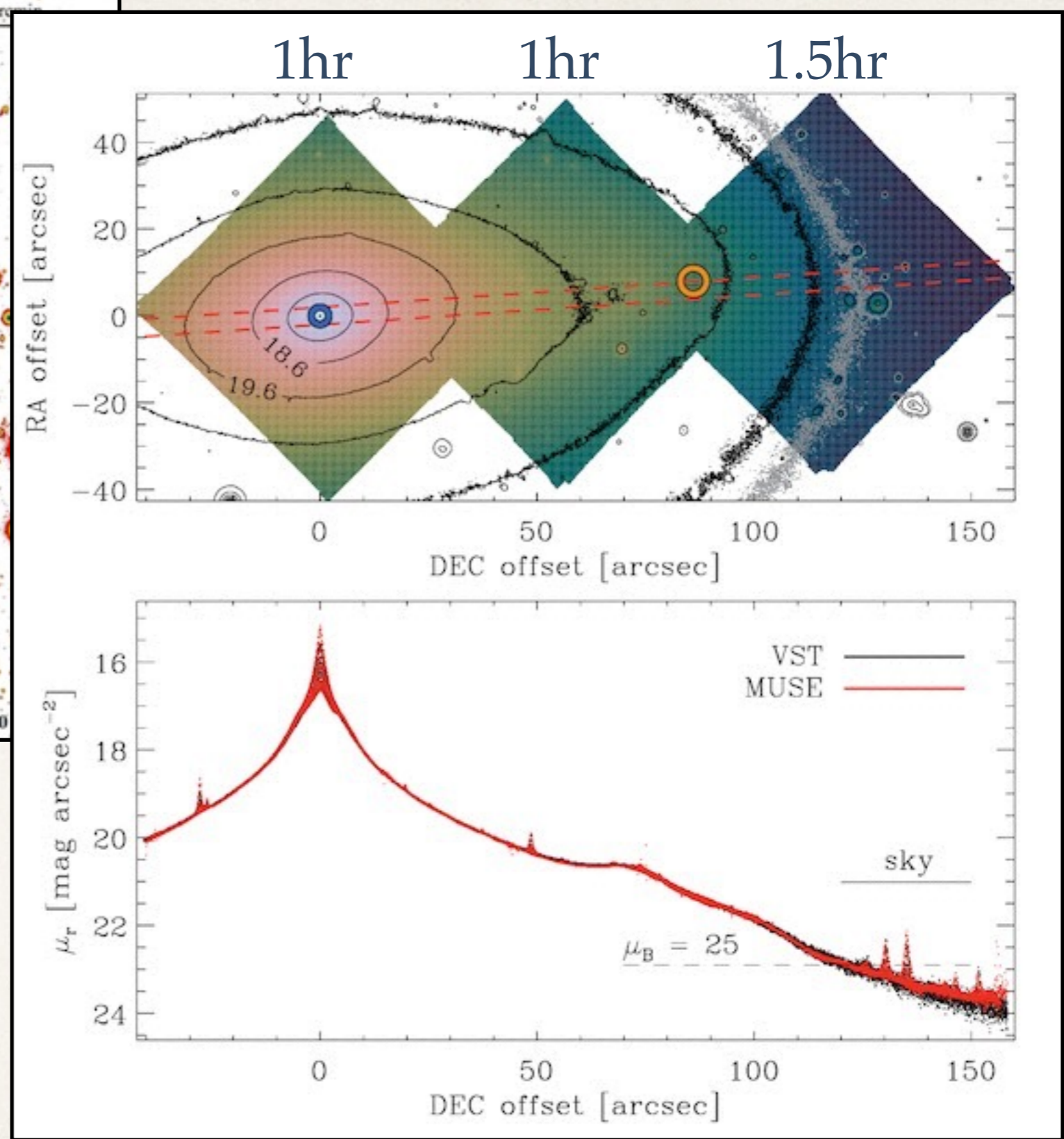
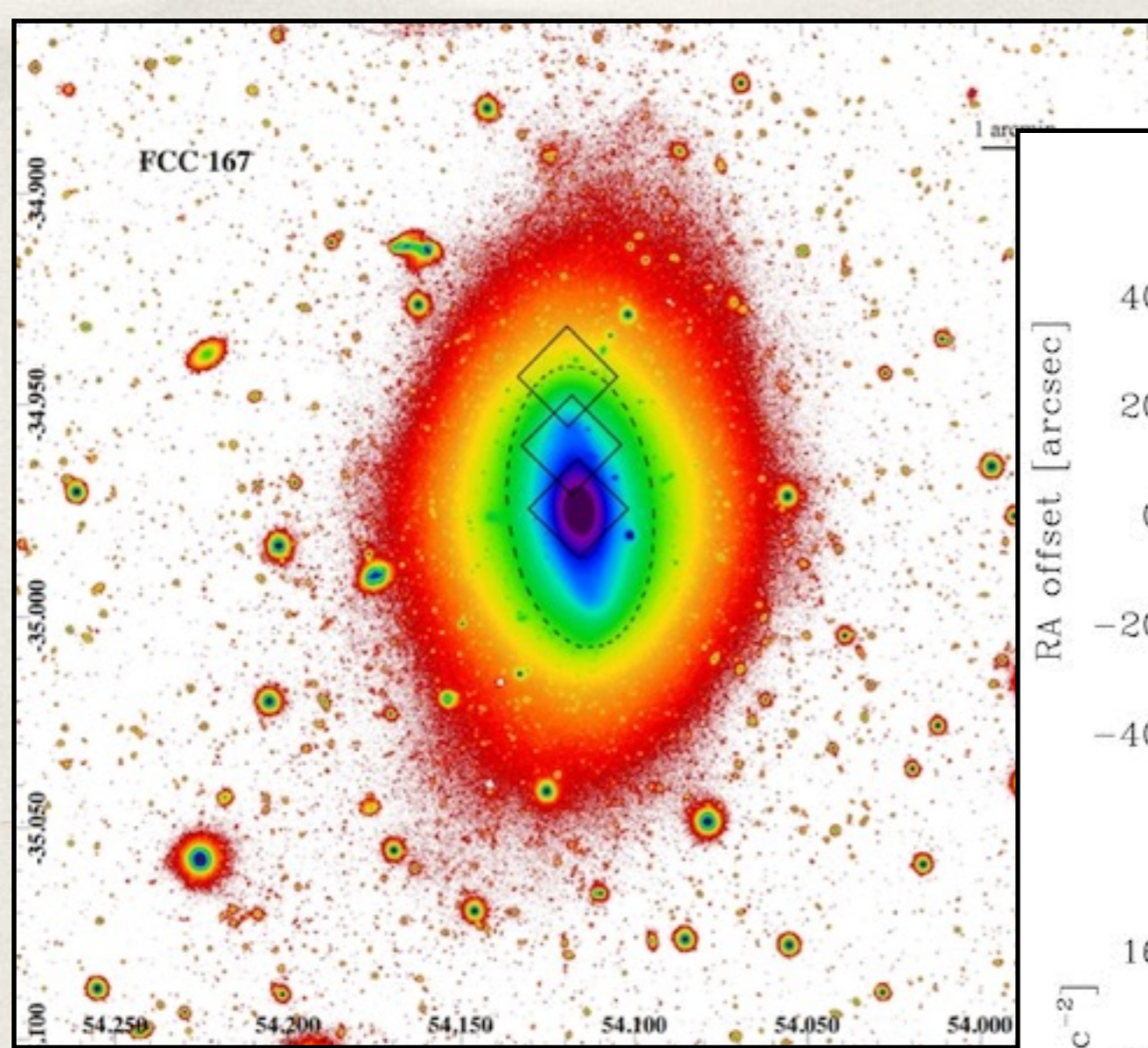
— science goals —

- * structural stellar components (bulges, disks, bars, kinematically decoupled structures) via spectral and dynamical modelling decomposition
- * IMF and stellar population in halos (\sim outside $2R_e$)
- * Stellar population: origin of the chemically distinct structures (Mg, Fe, Na disks) and galaxy structural components
- * Census of PNe & GCs
- * Study and evolution of nuclear stellar disks/clusters

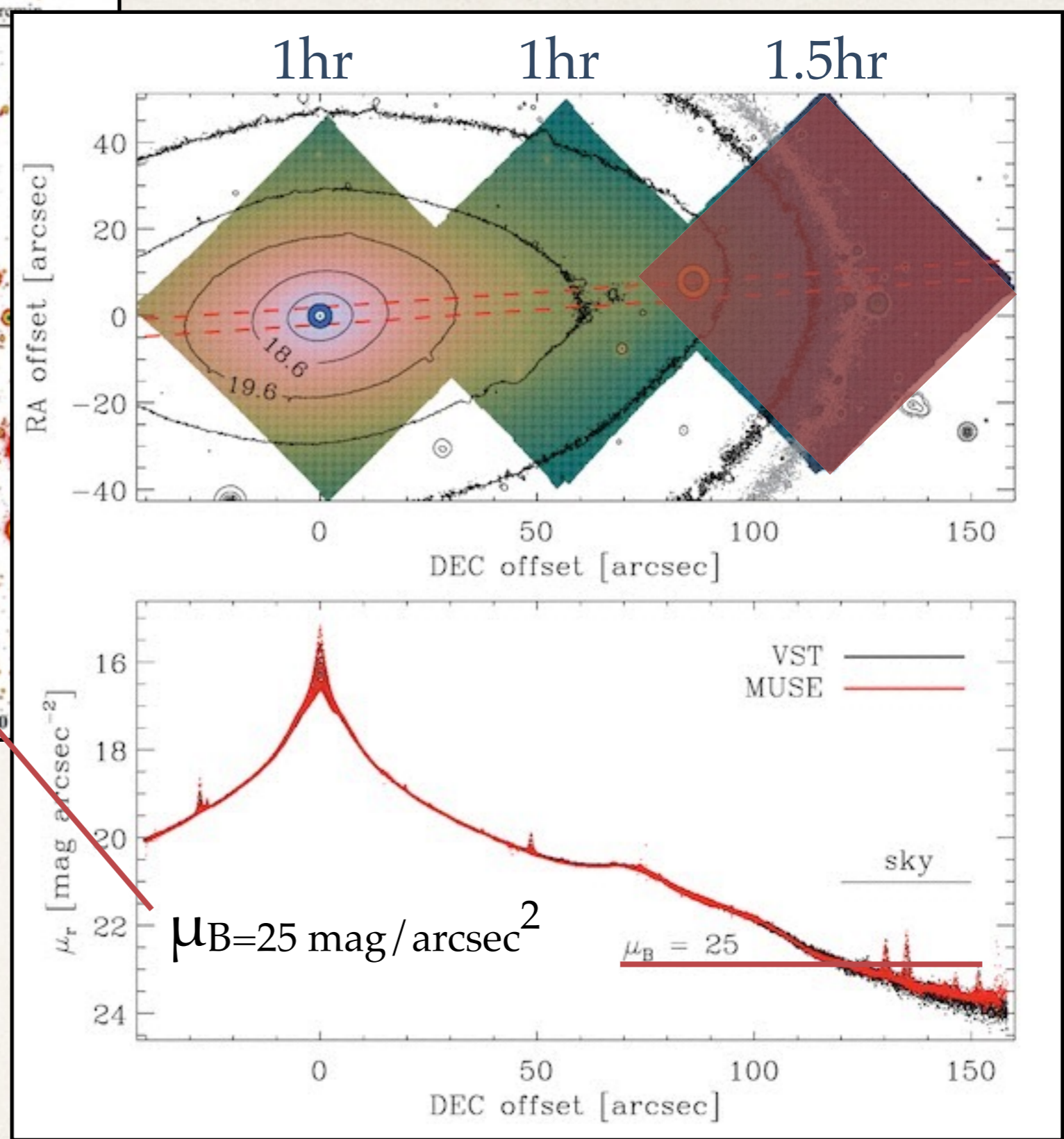
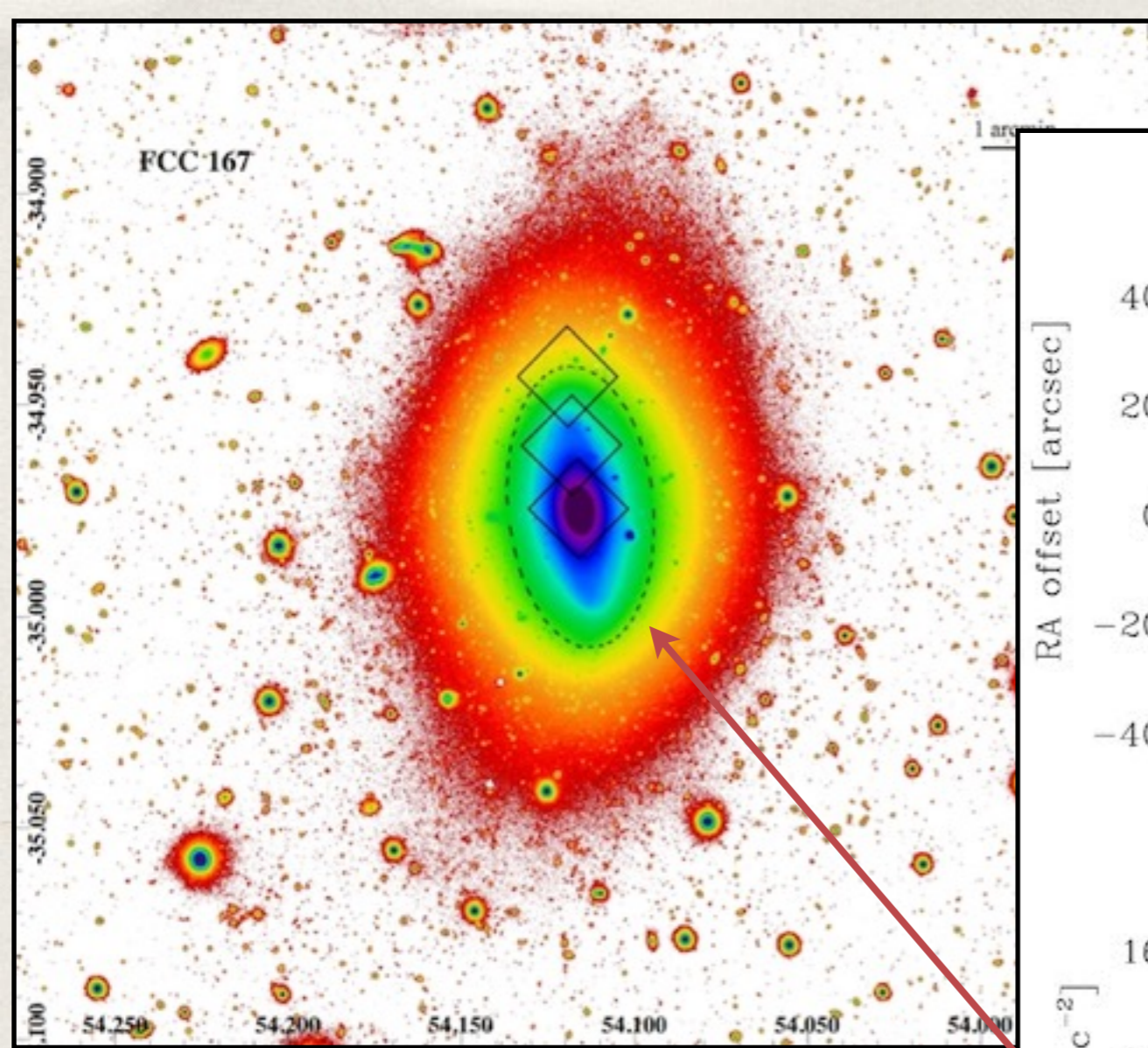


Fornax3D

Sarzi et al. 2018



Fornax3D



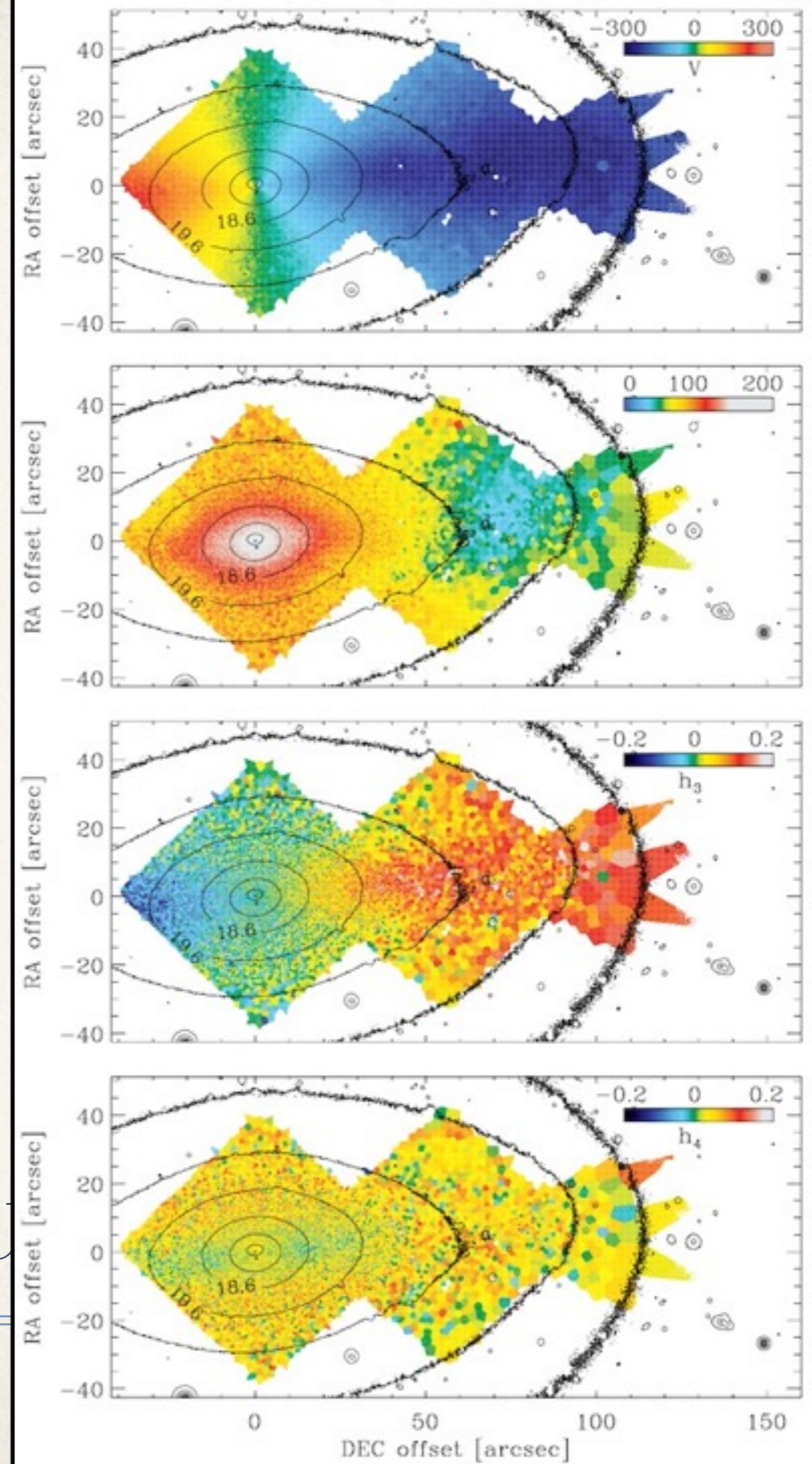
Fornax3D

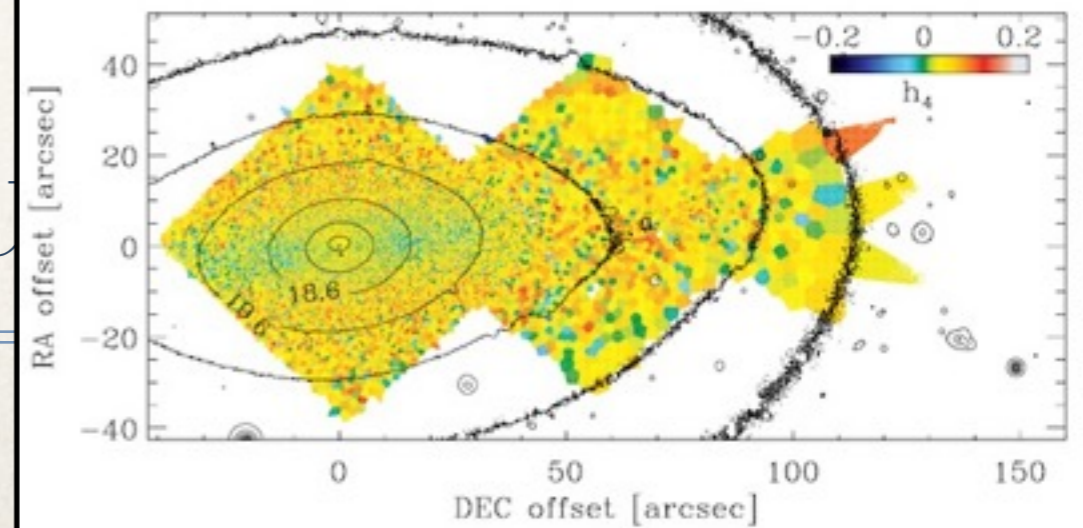
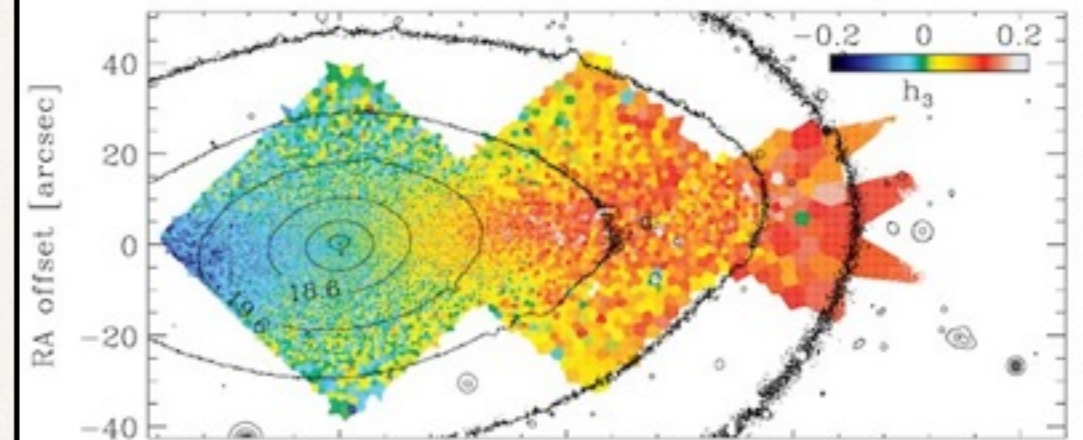
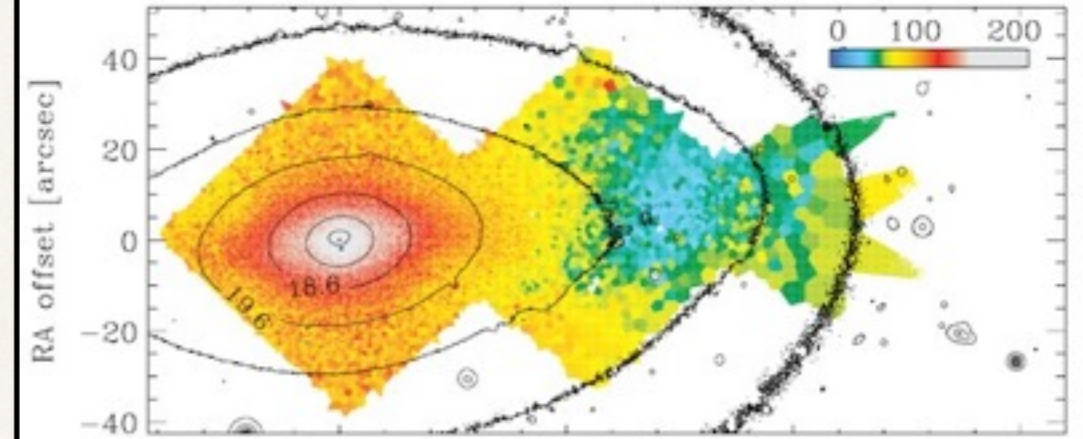
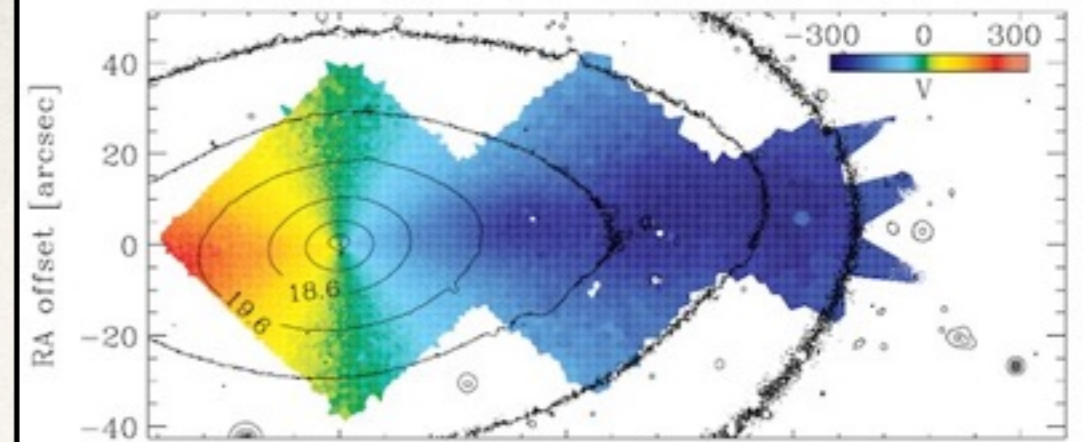
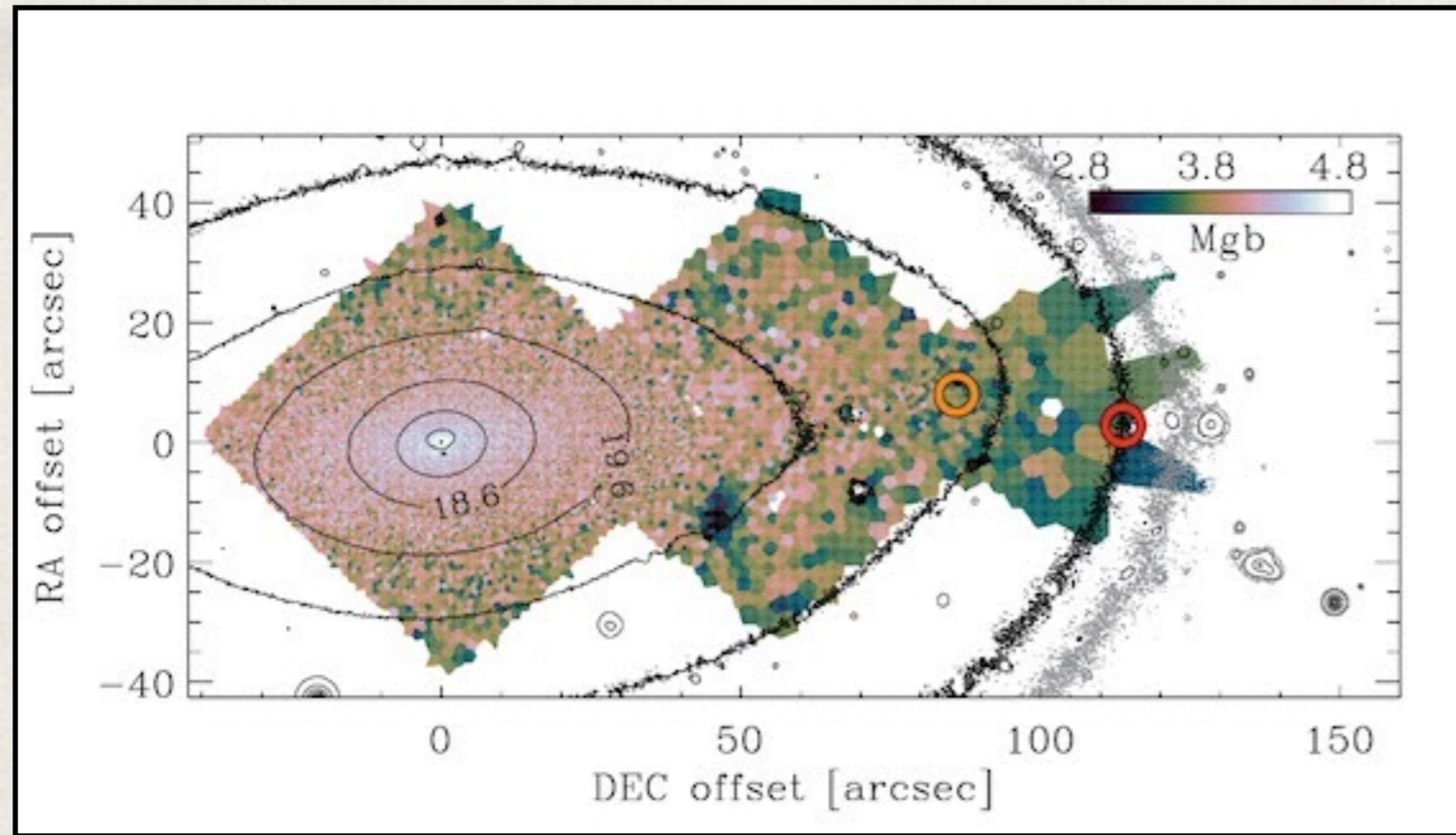
Fornax3D: some results

Sarzi et al. 2018

Fornax3D: some results

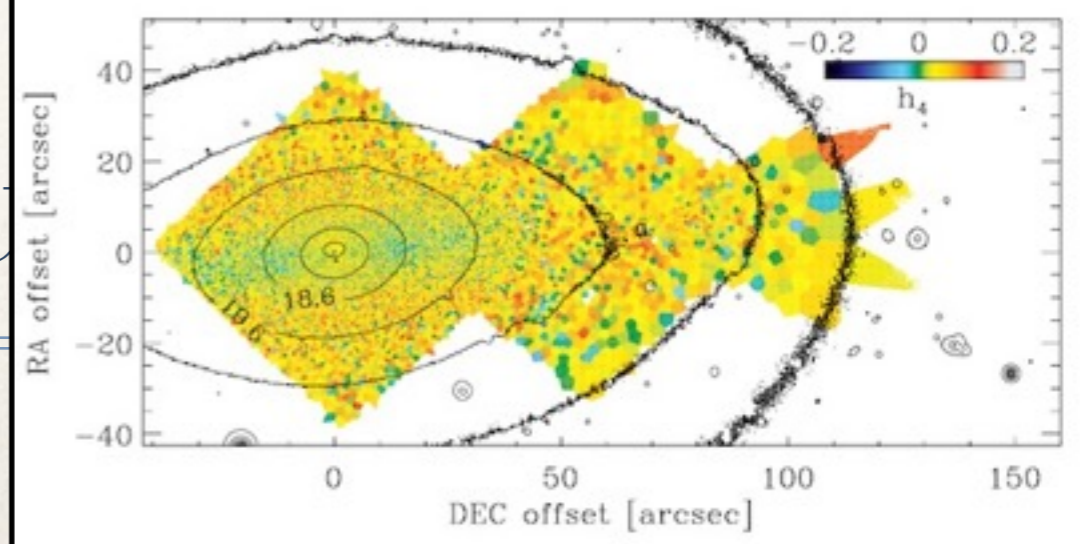
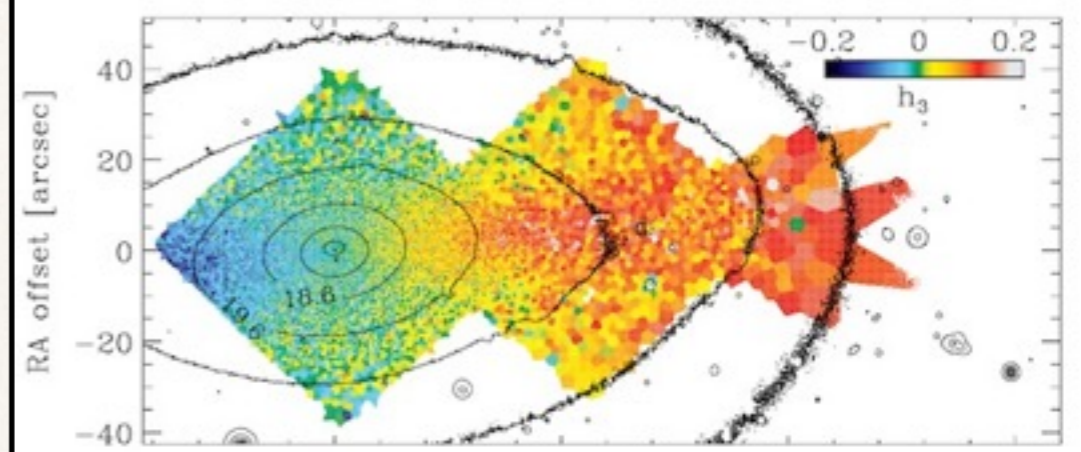
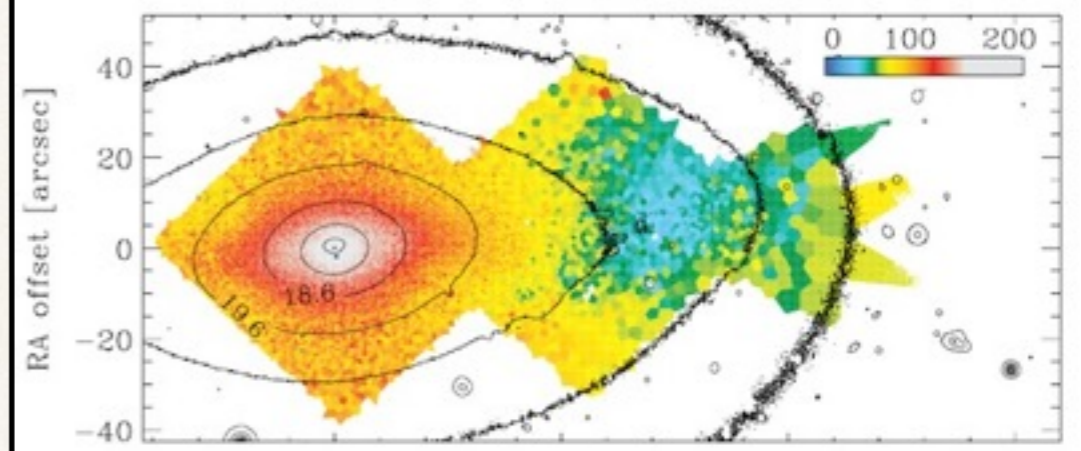
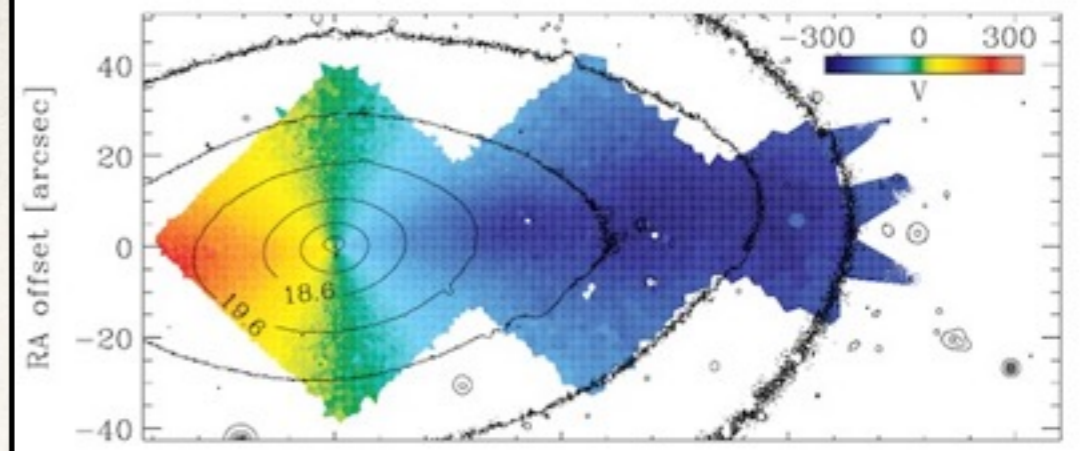
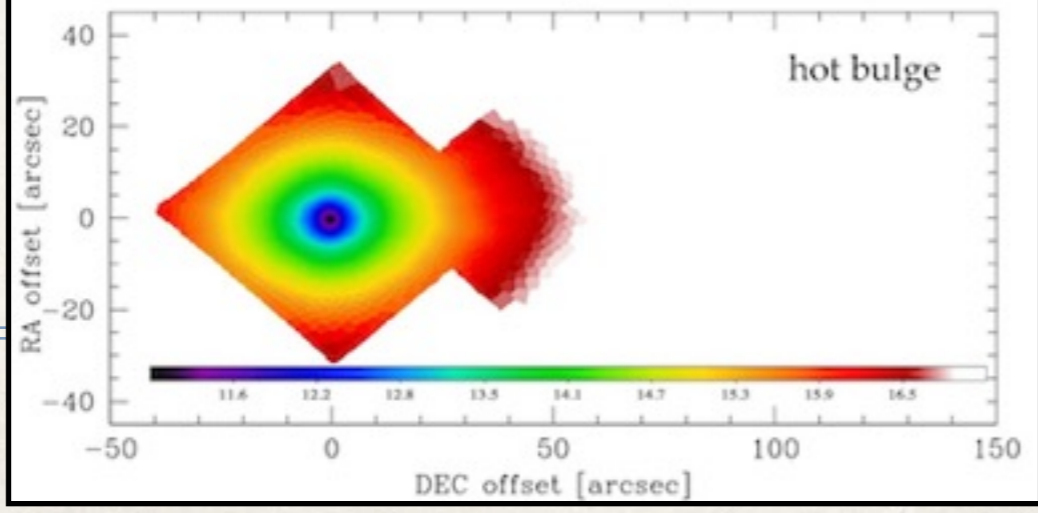
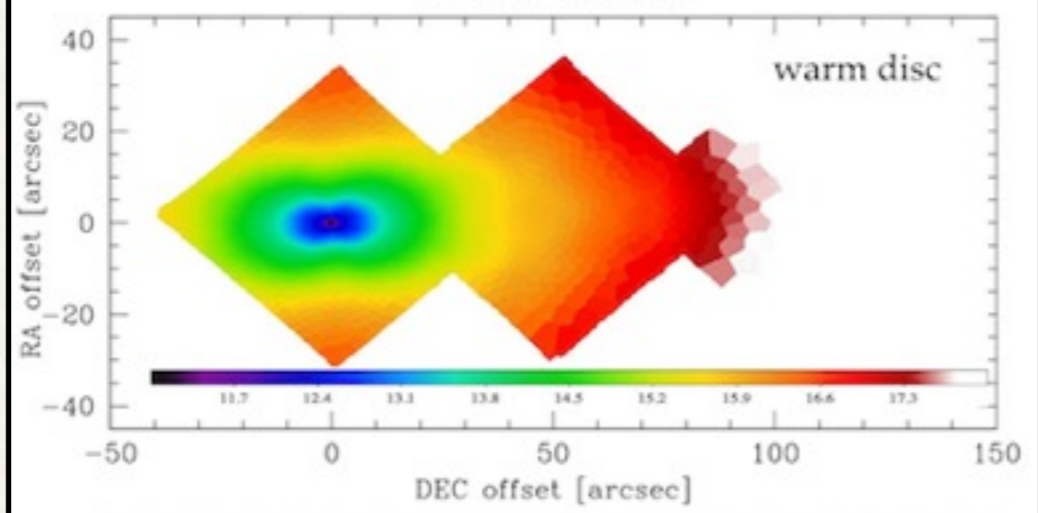
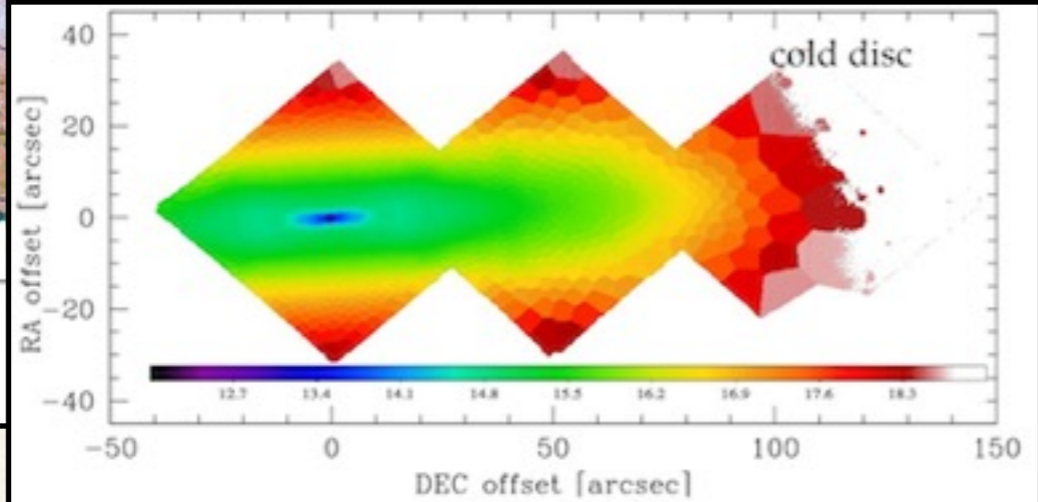
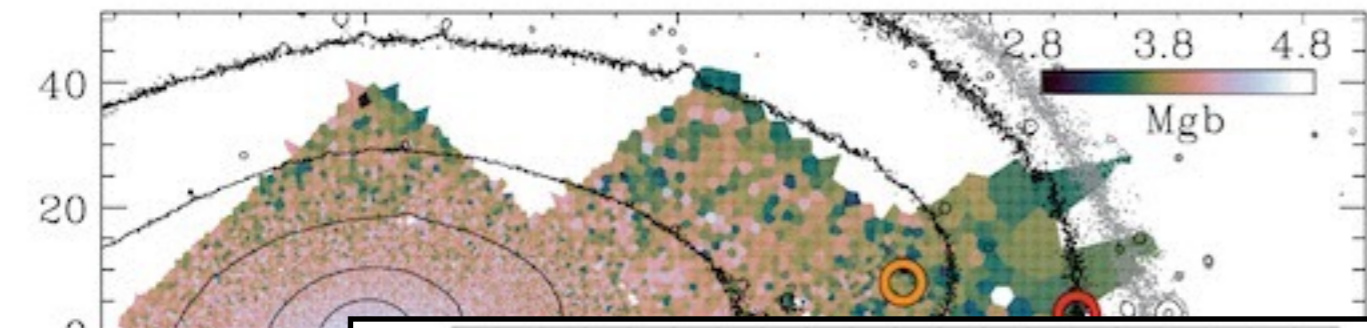
Sarzi et al. 2018





Fornax3D: some results

RA offset [arcsec]

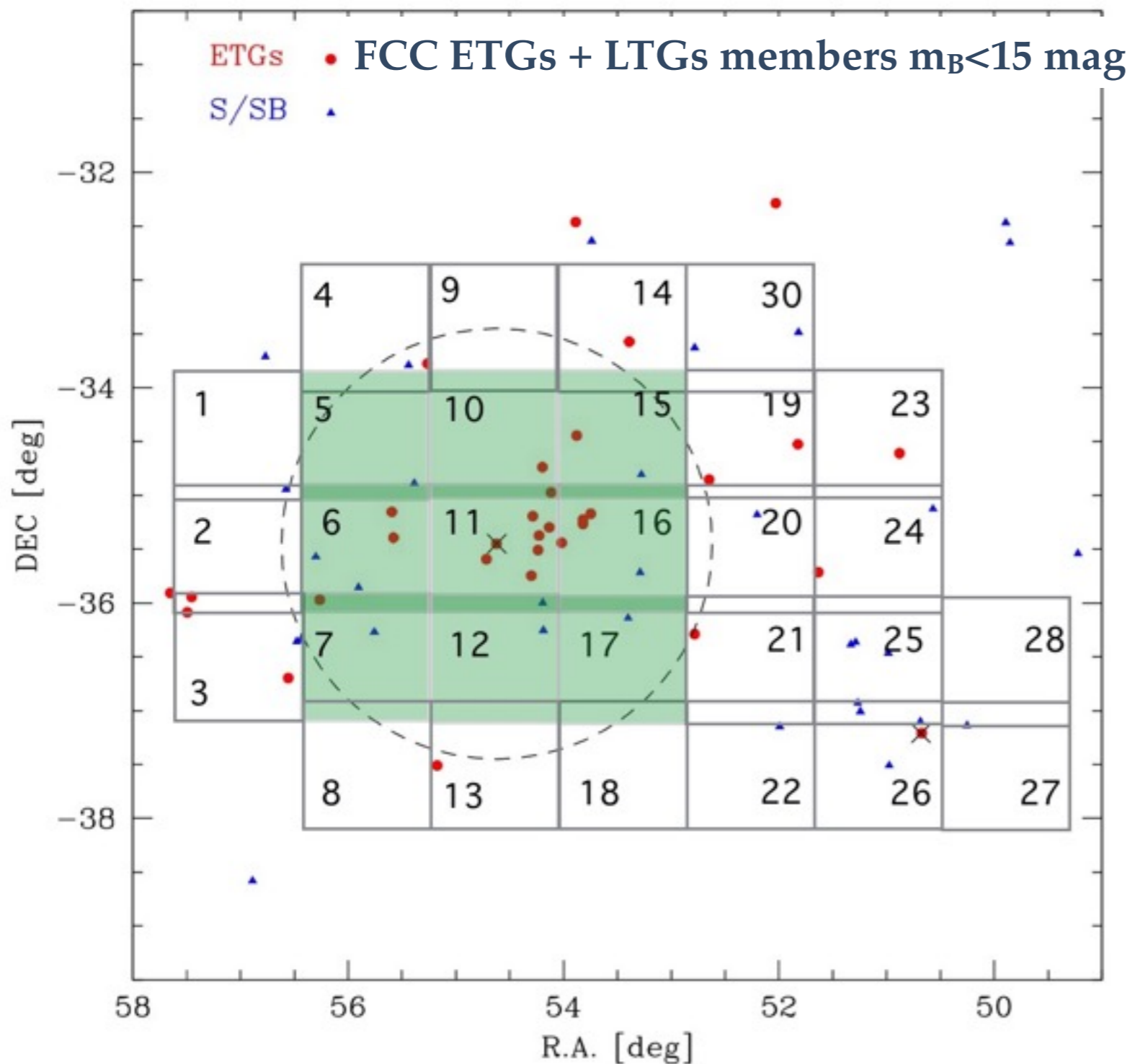


Forn

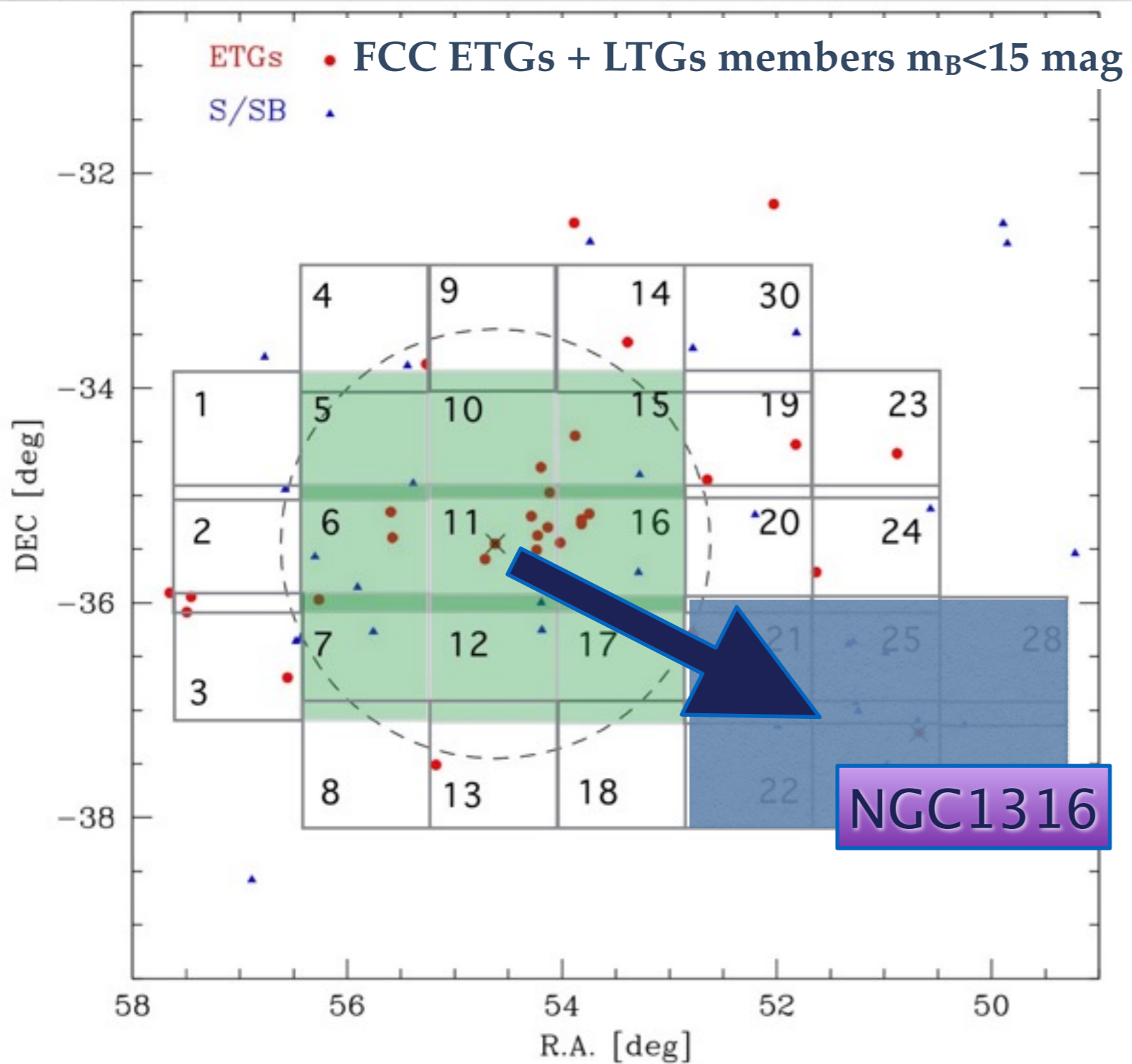
SU

Sarzi et al. 2018

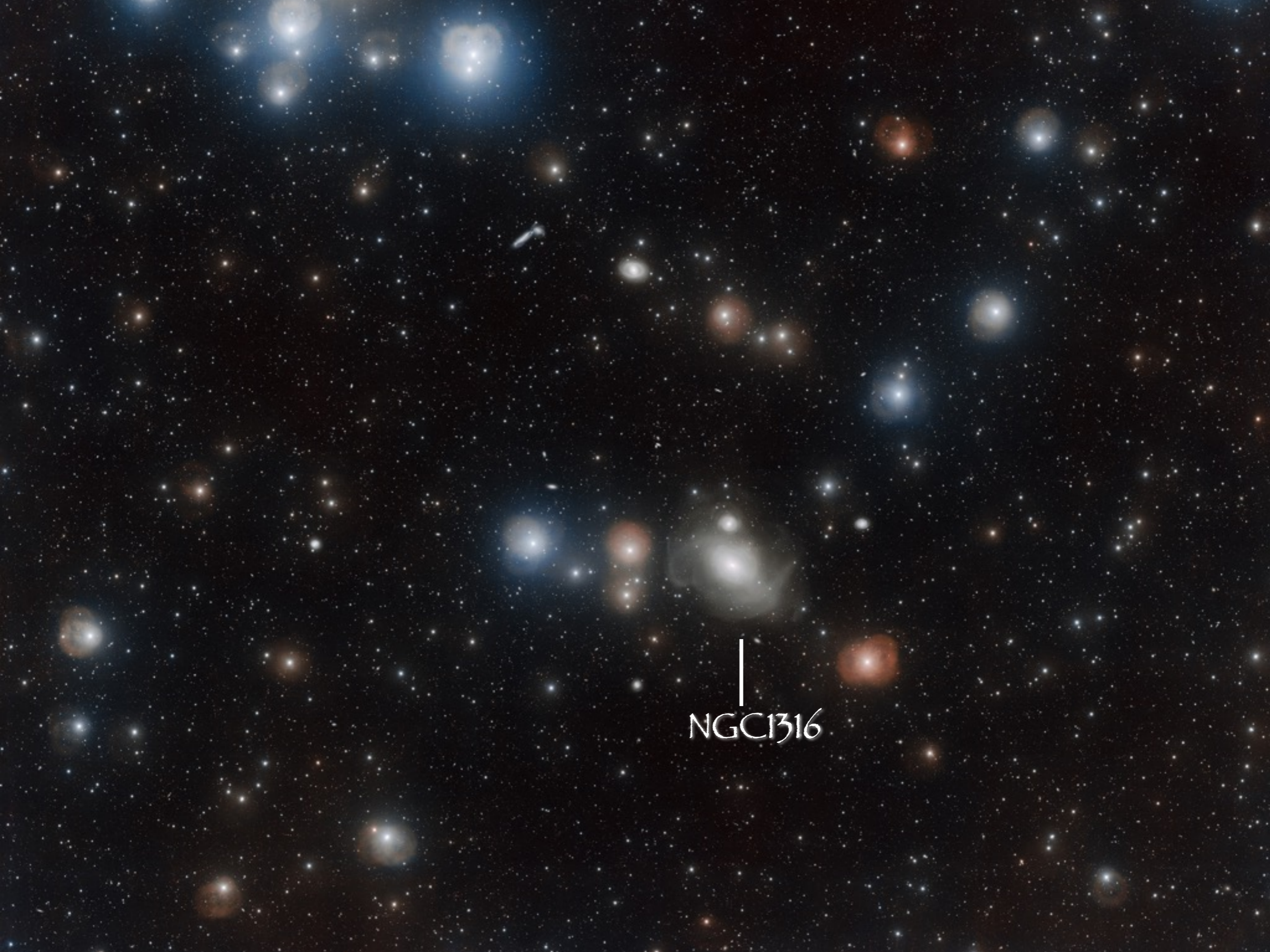
FDS: the SW group



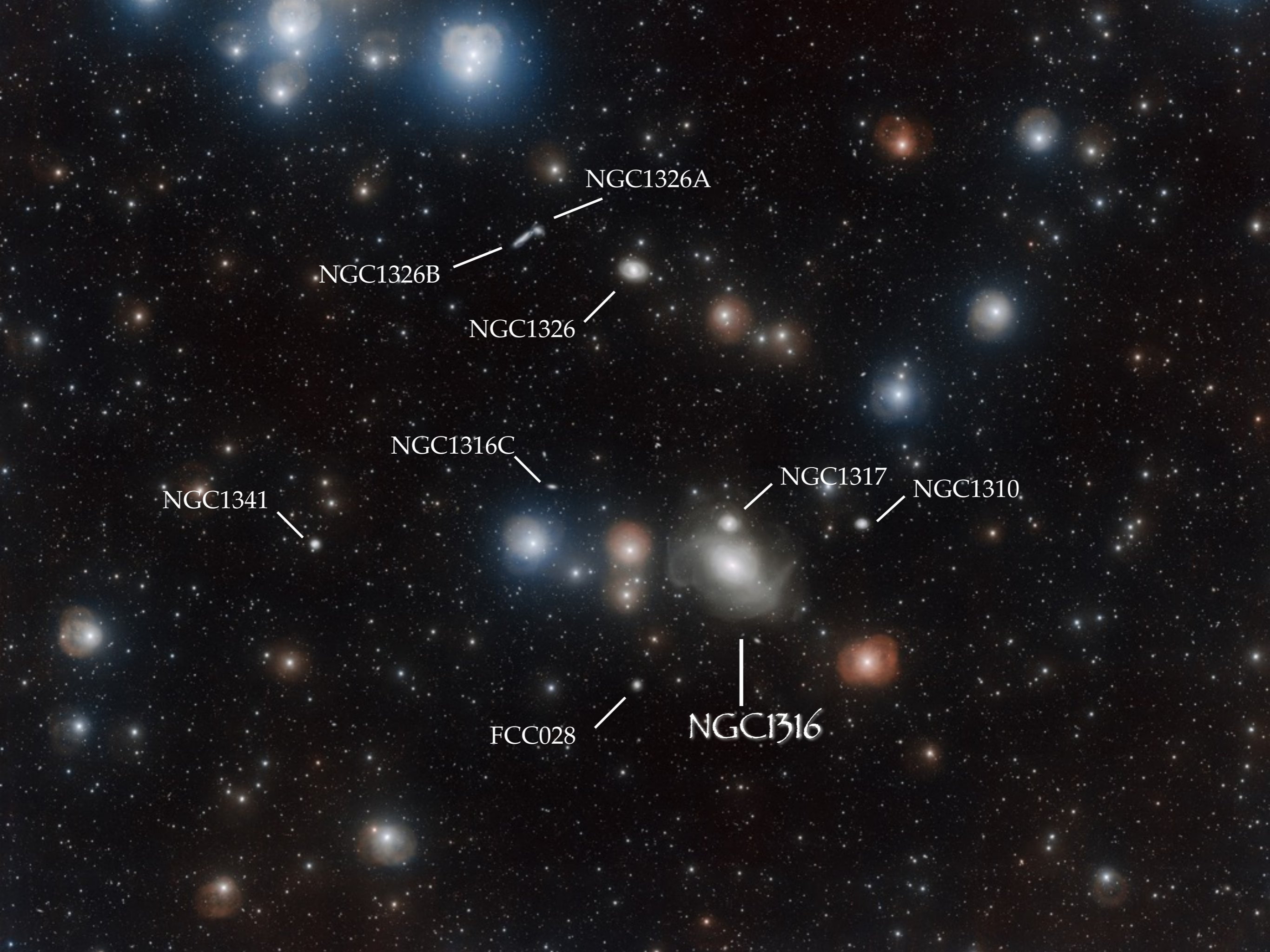
FDS: the SW group







|
NGC 1316



NGC1326A

NGC1326B

NGC1326

NGC1316C

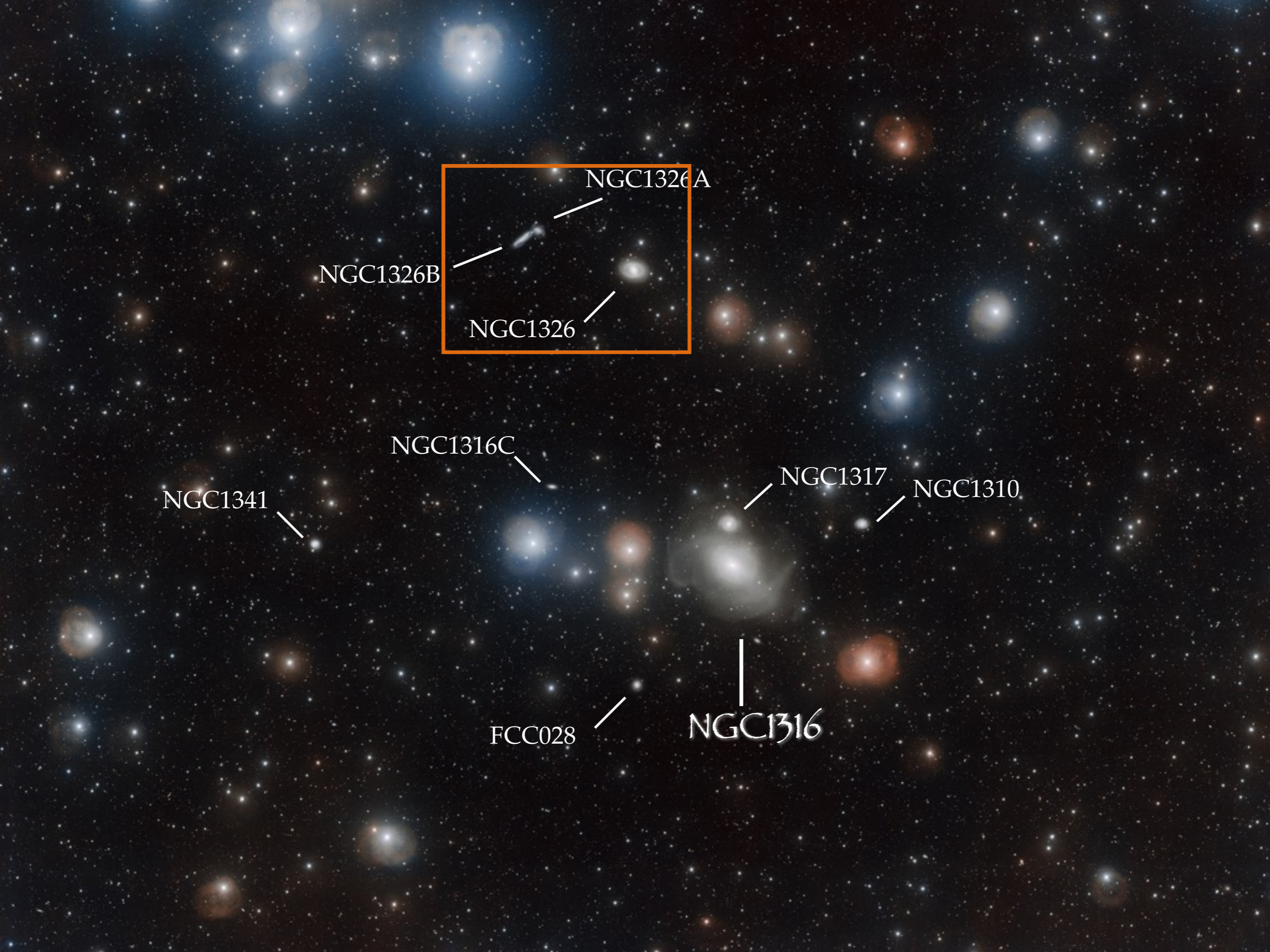
NGC1341

FCC028

NGC1317

NGC1310

NGC1316



NGC1326A

NGC1326B

NGC1326

NGC1316C

NGC1341

FCC028

NGC1317

NGC1310

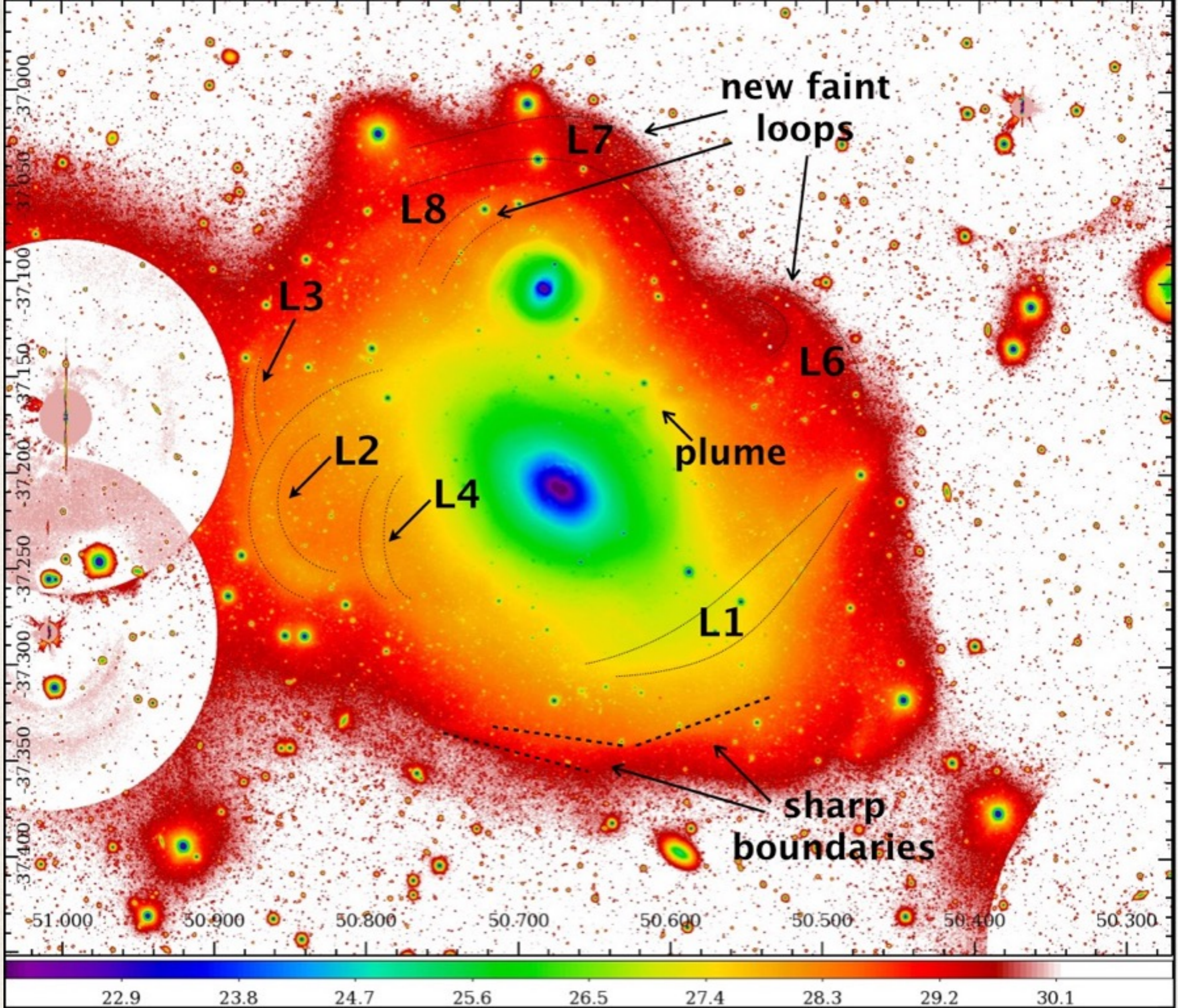
NGC1316



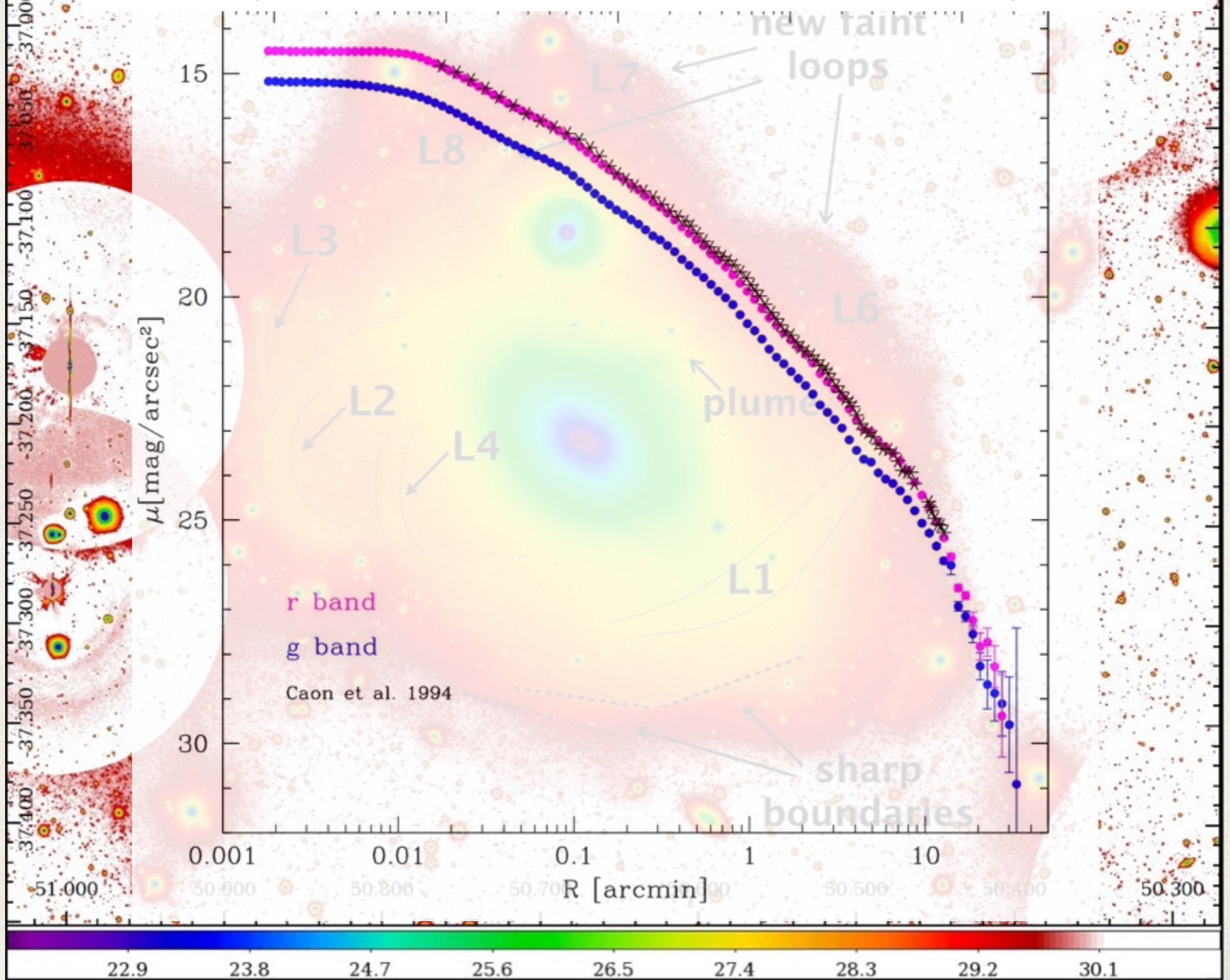


Fornax A: a two-phase assembly caught in act

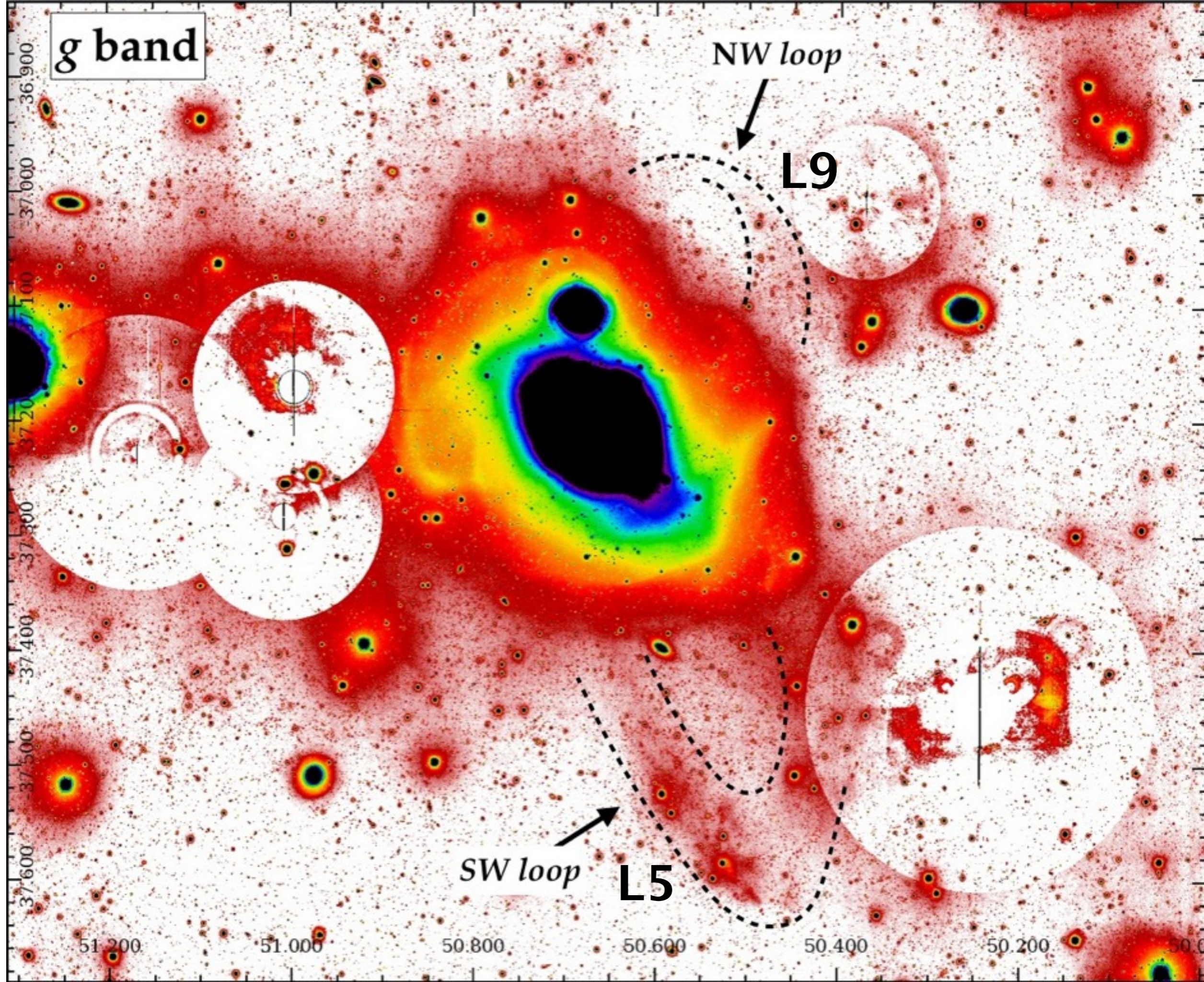
Iodice et al. 2017, ApJ, 839, 21



surface photometry out to 33 arcmin (~ 200 kpc $\sim 15R_e$)



g band

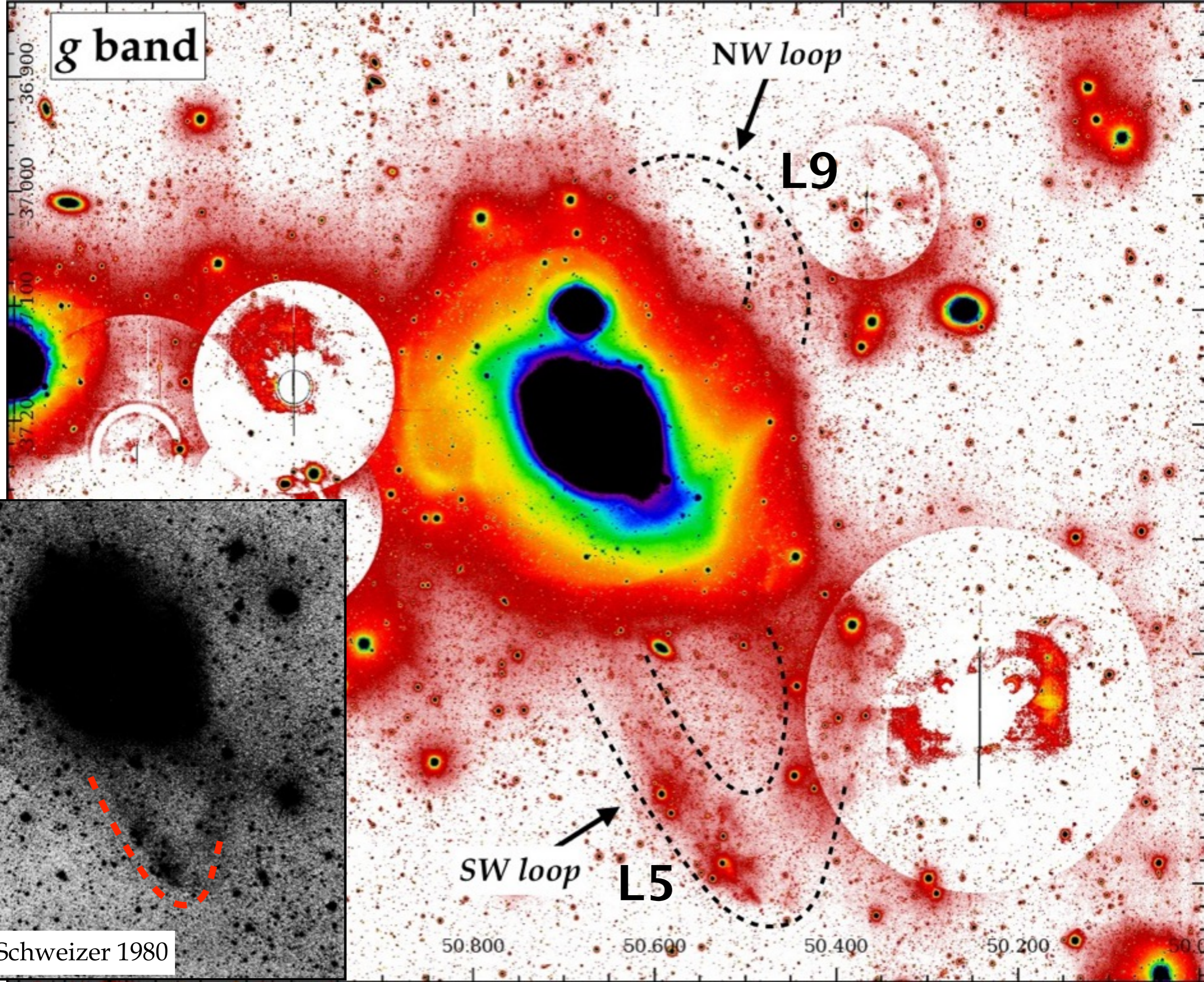


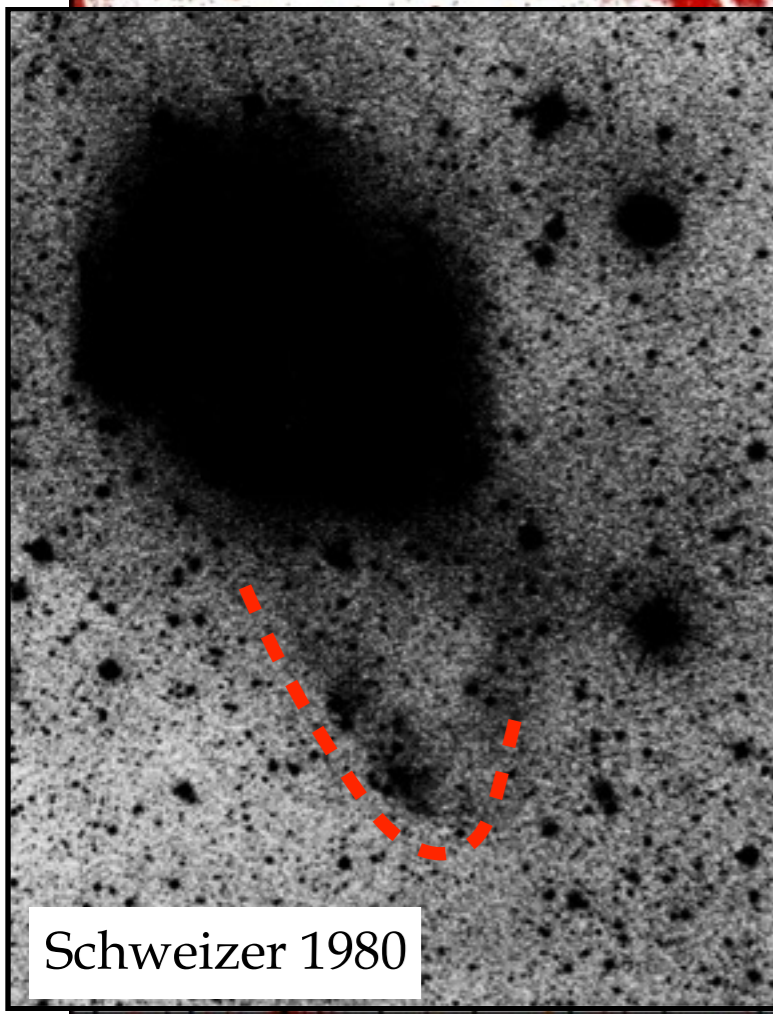
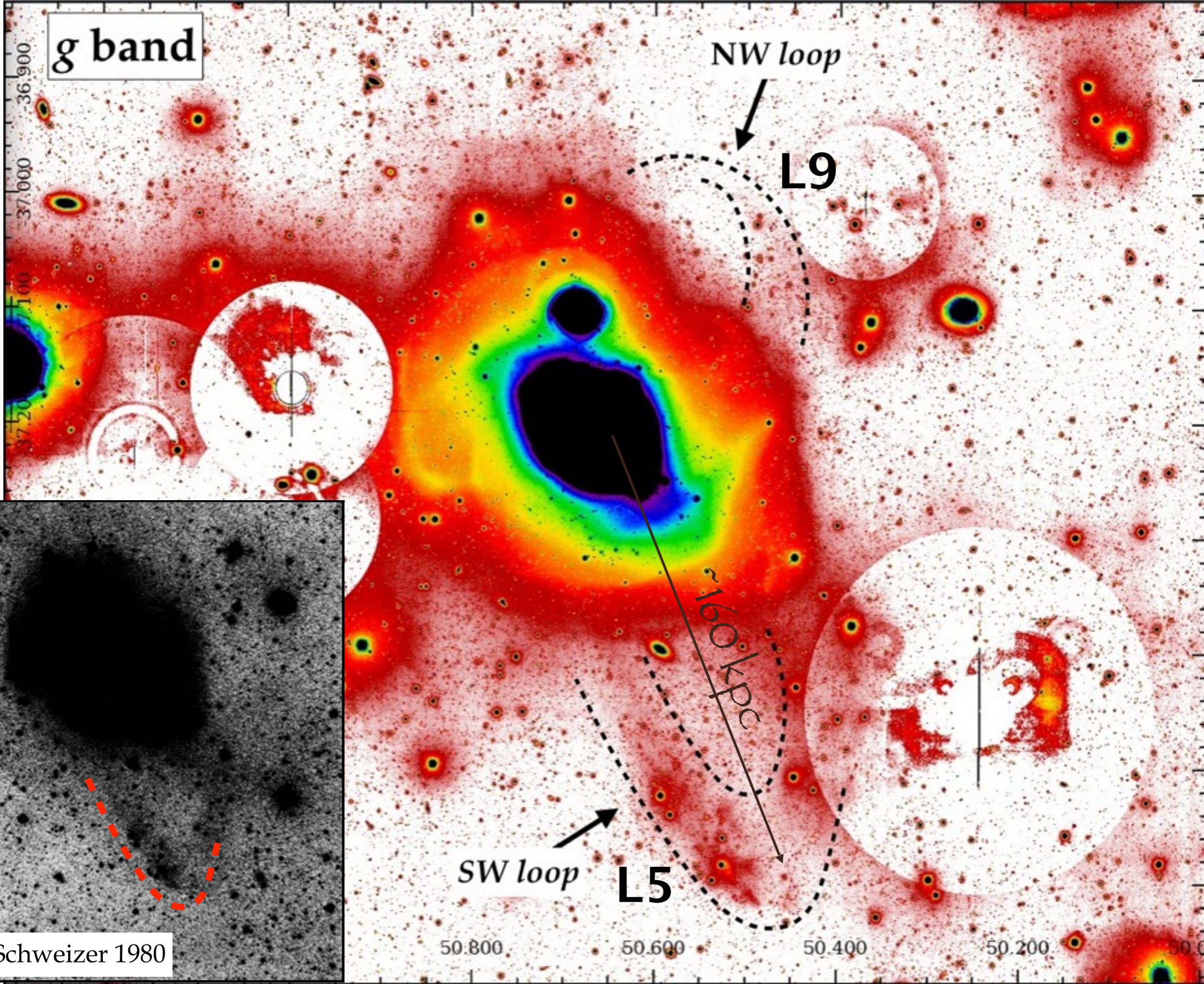
NW loop

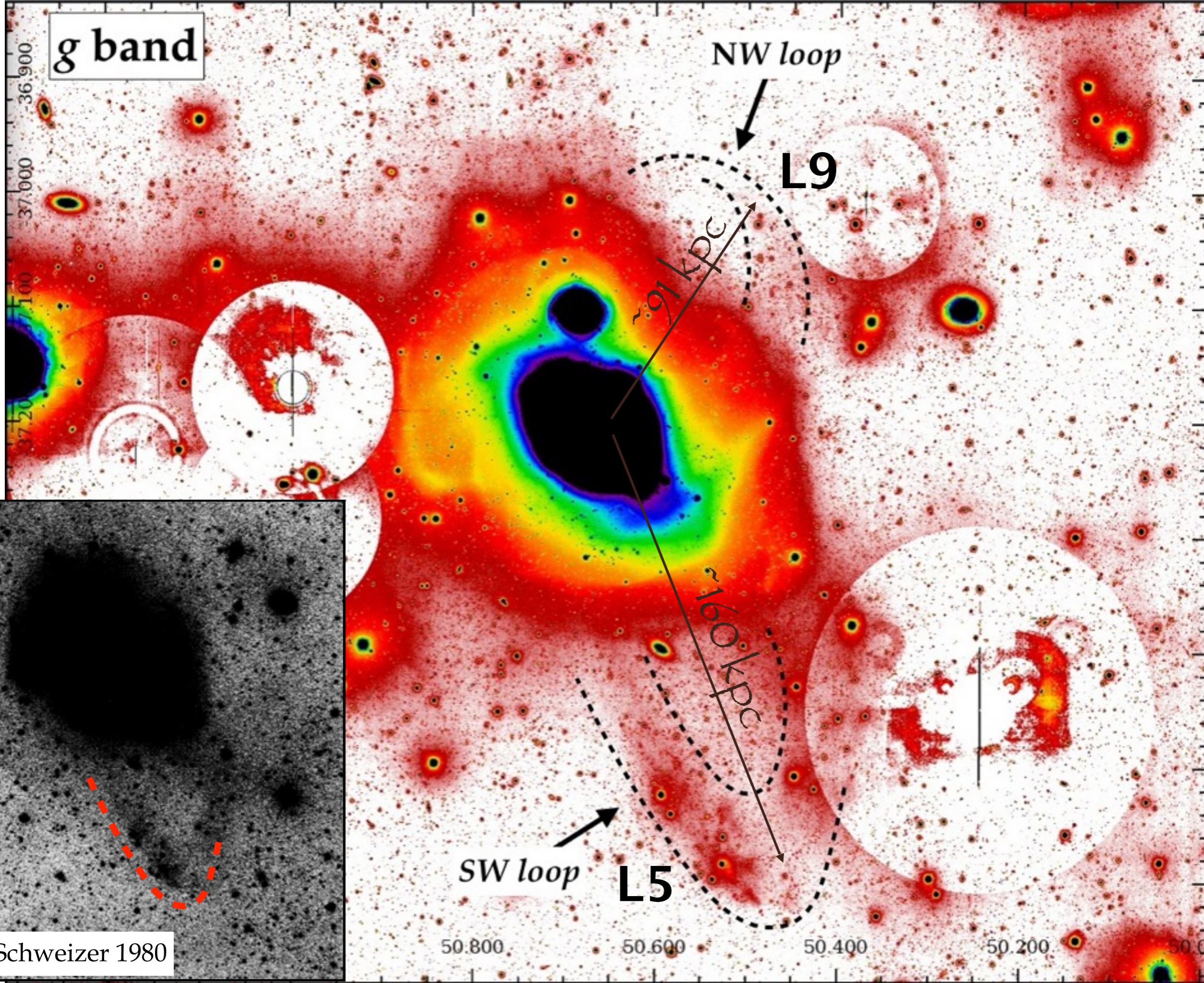
L9

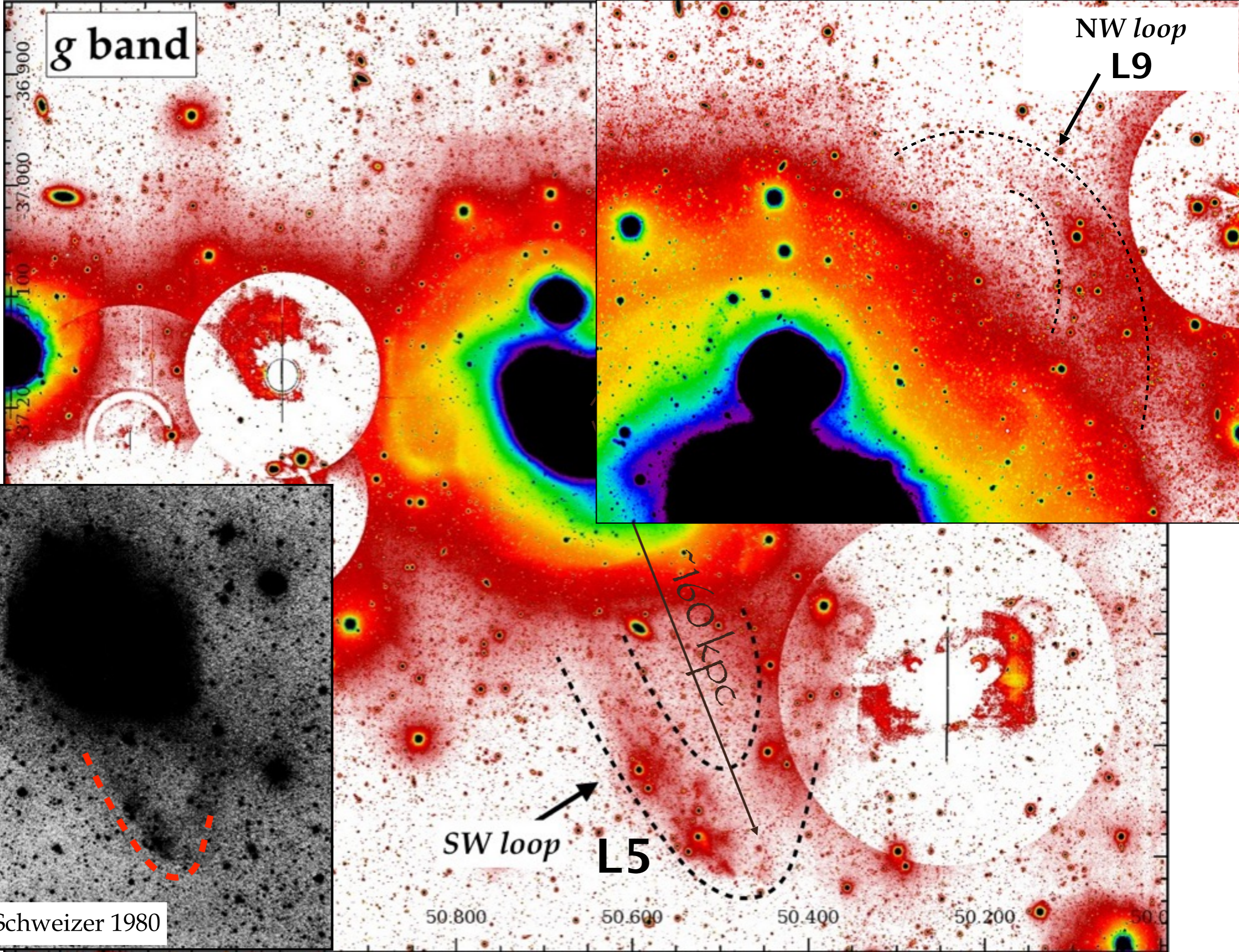
SW loop

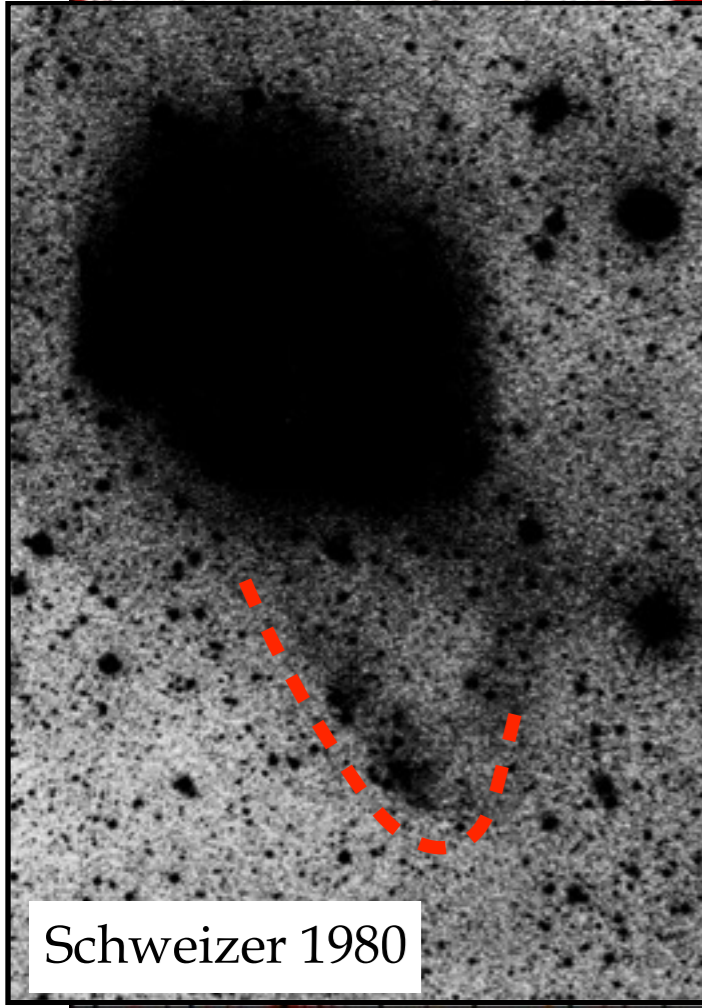
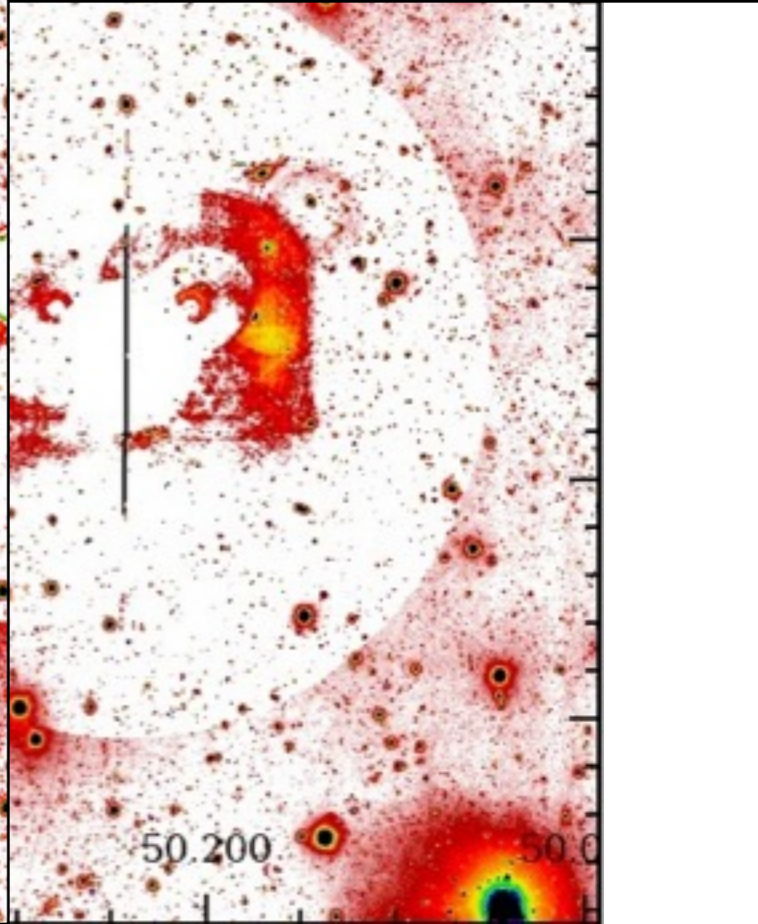
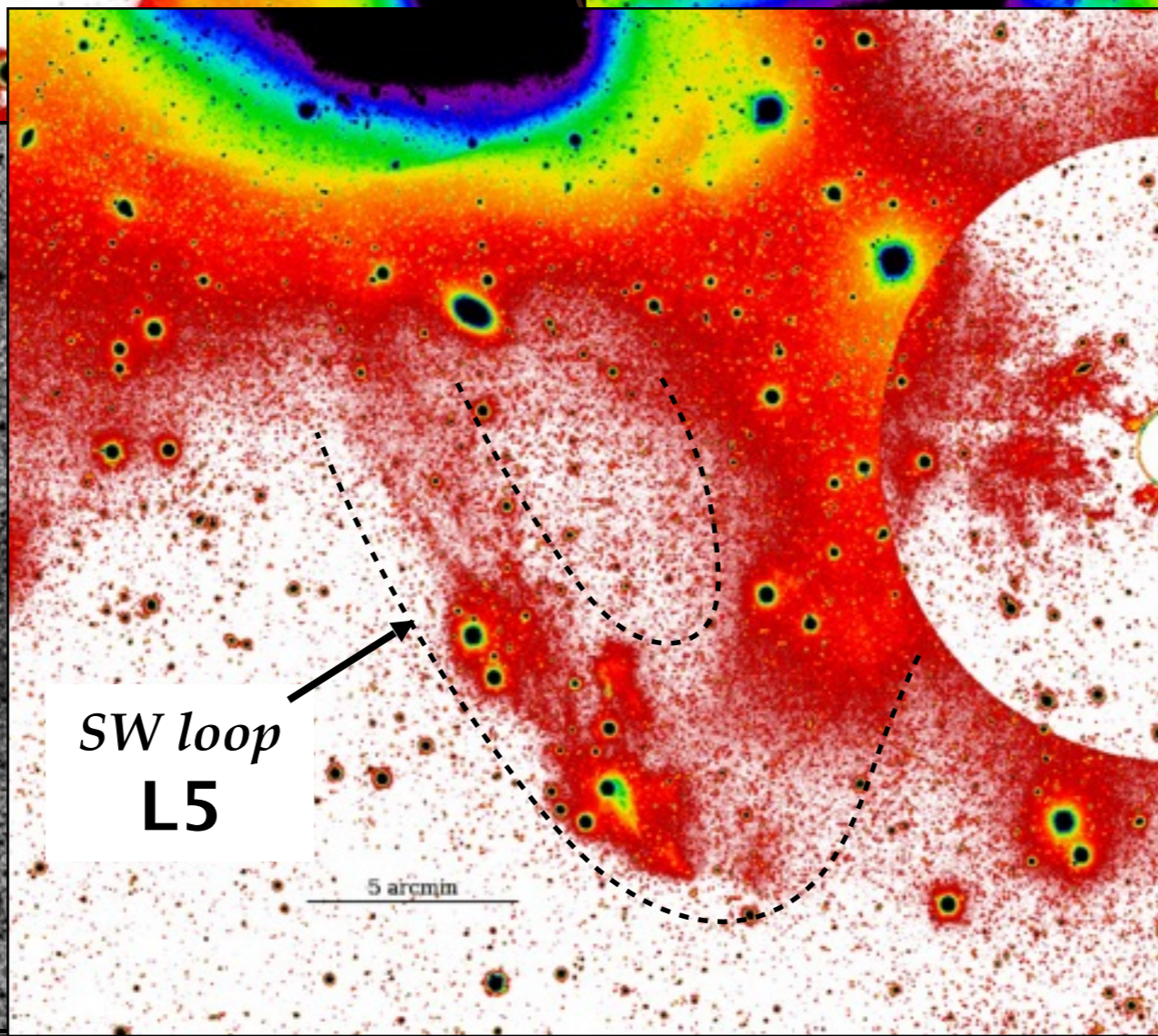
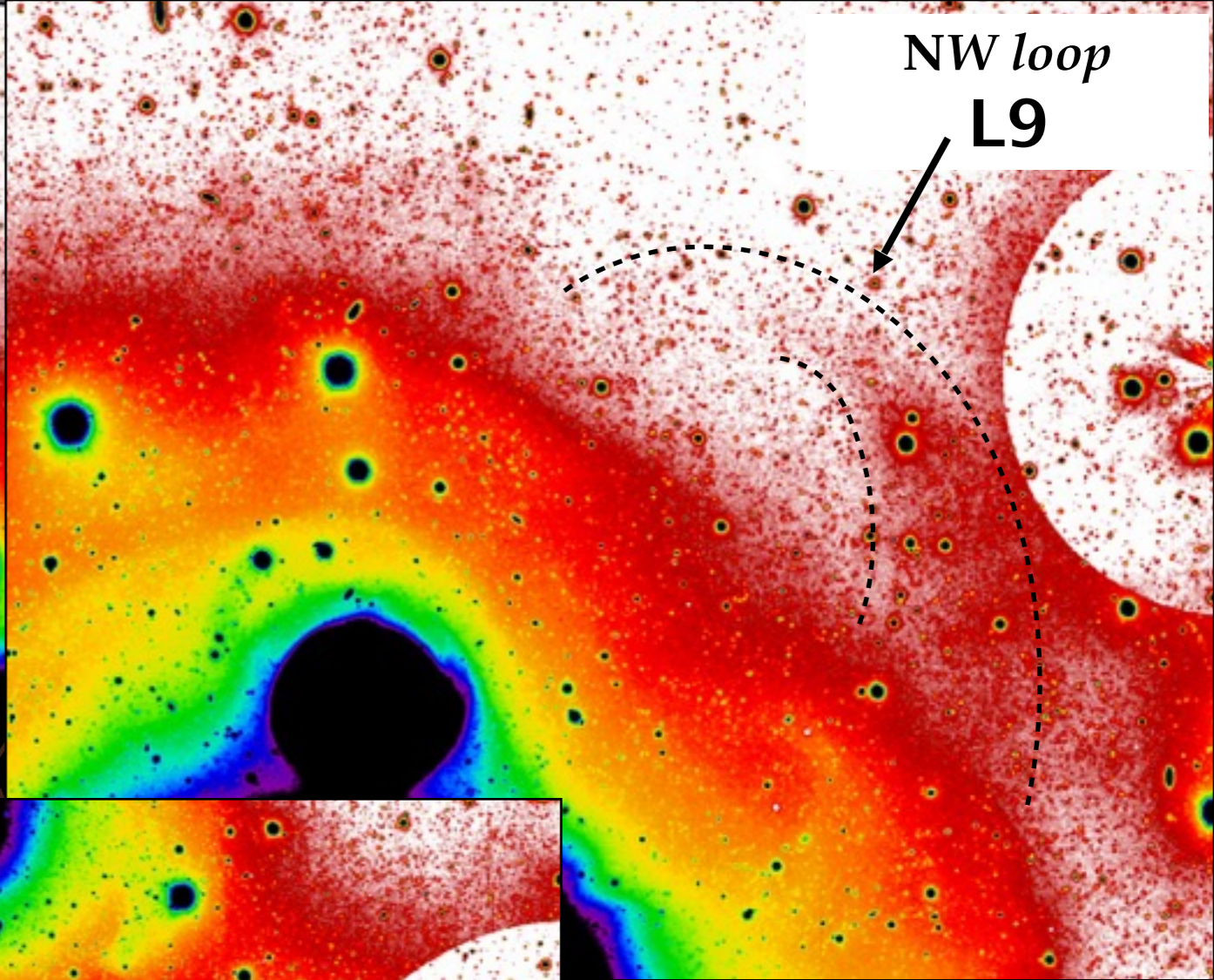
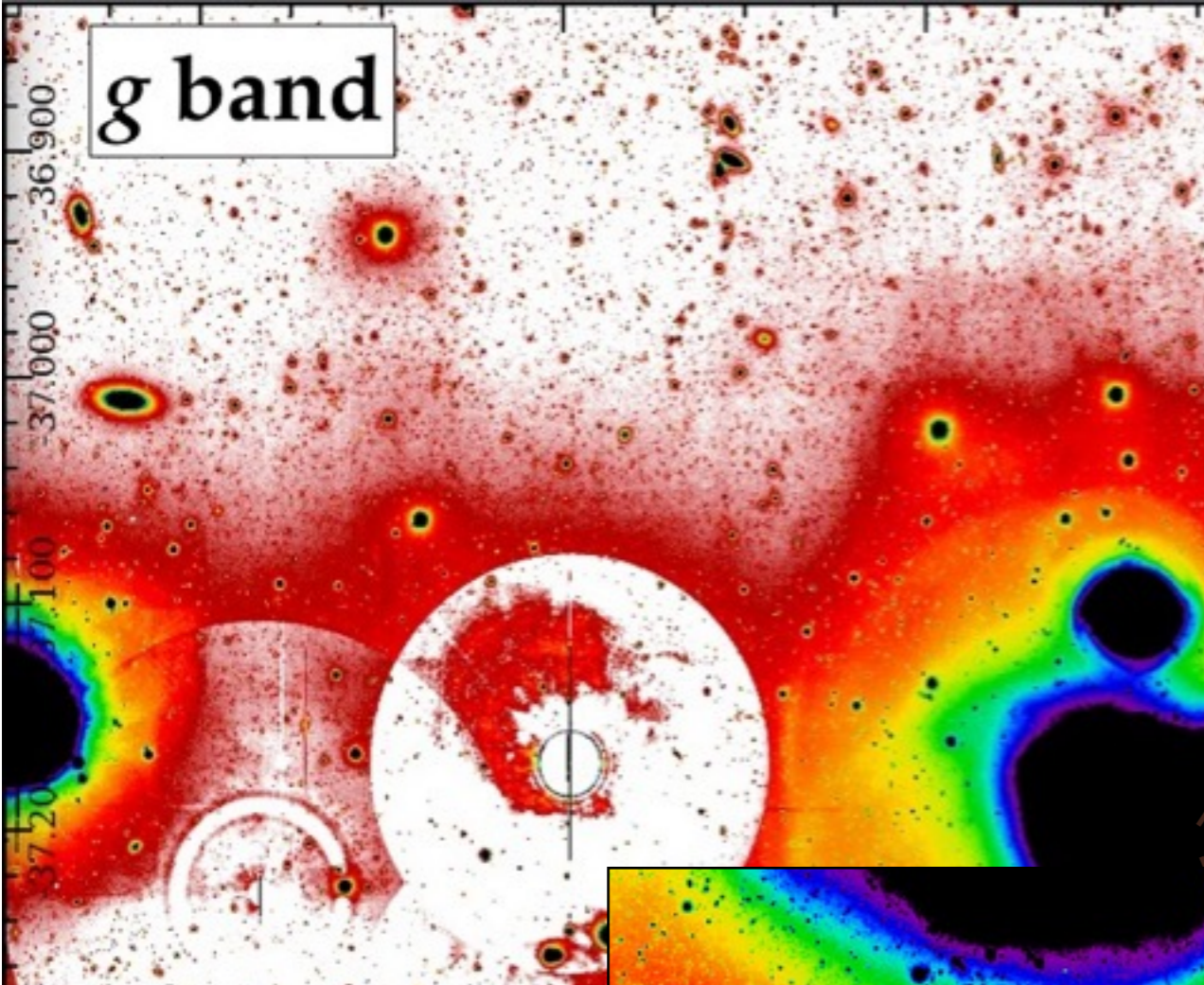
L5







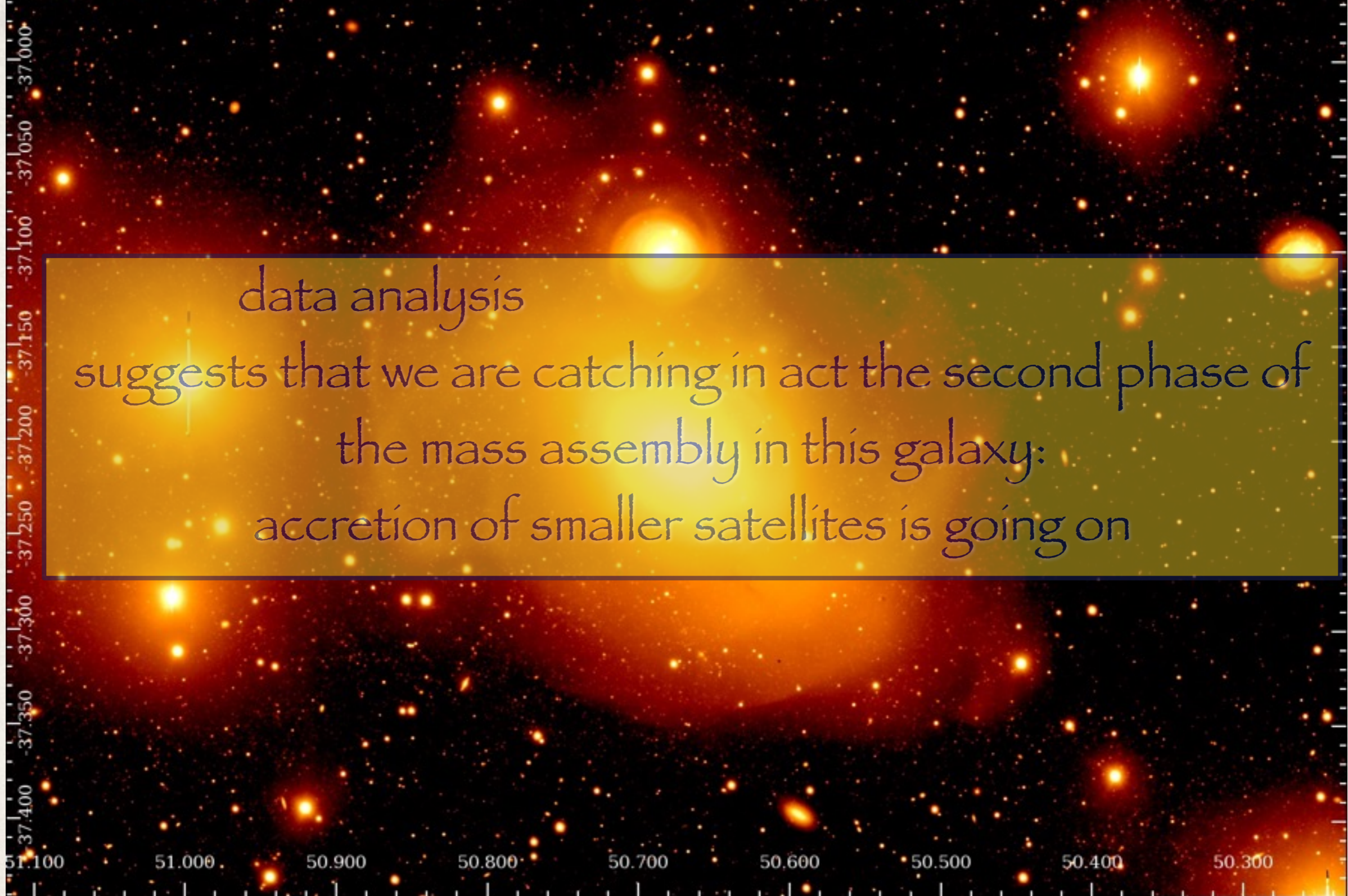






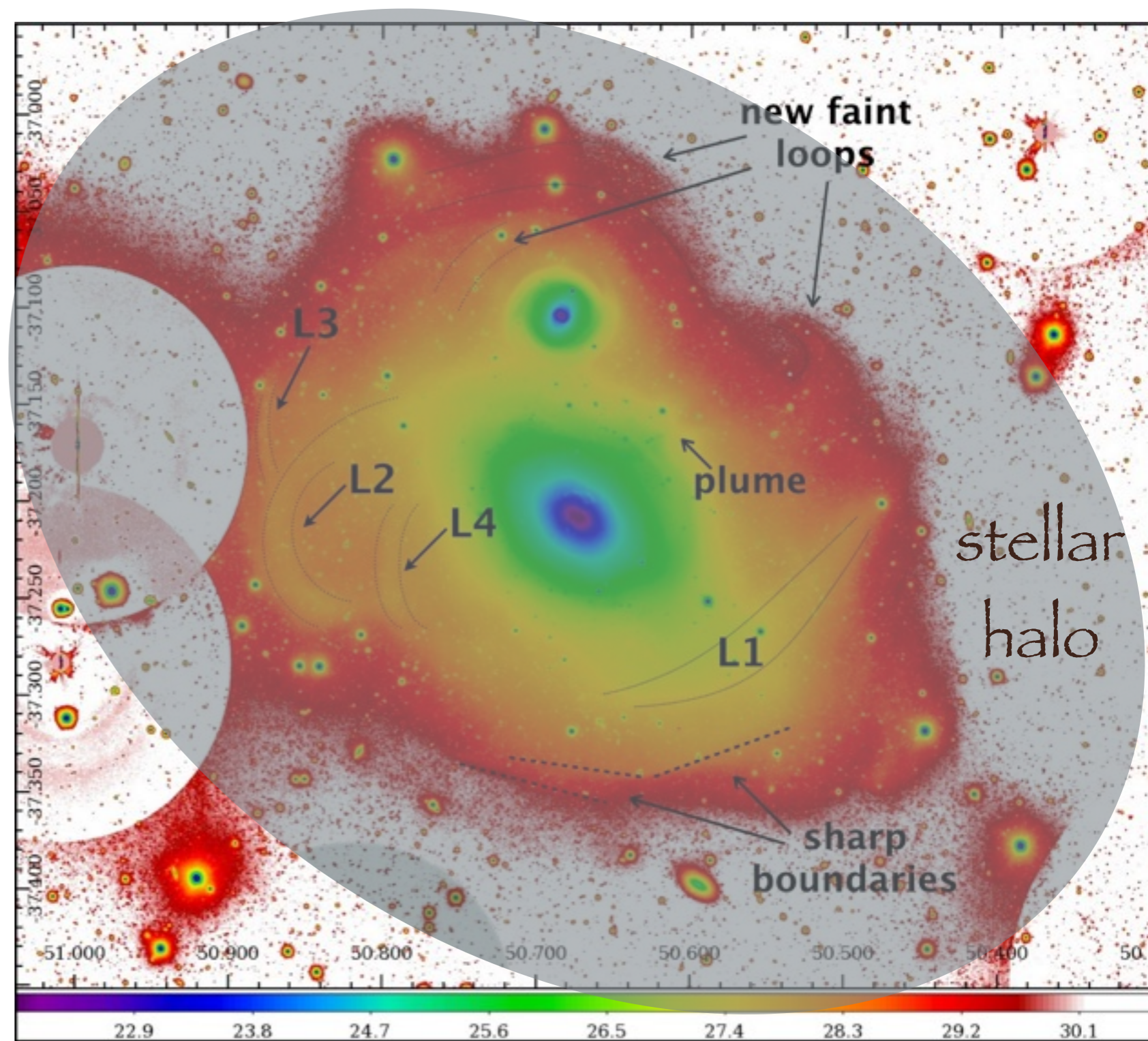
Fornax A: a two-phase assembly caught in act

Iodice et al. 2017, ApJ, 839, 21



Fornax A: a two-phase assembly caught in act

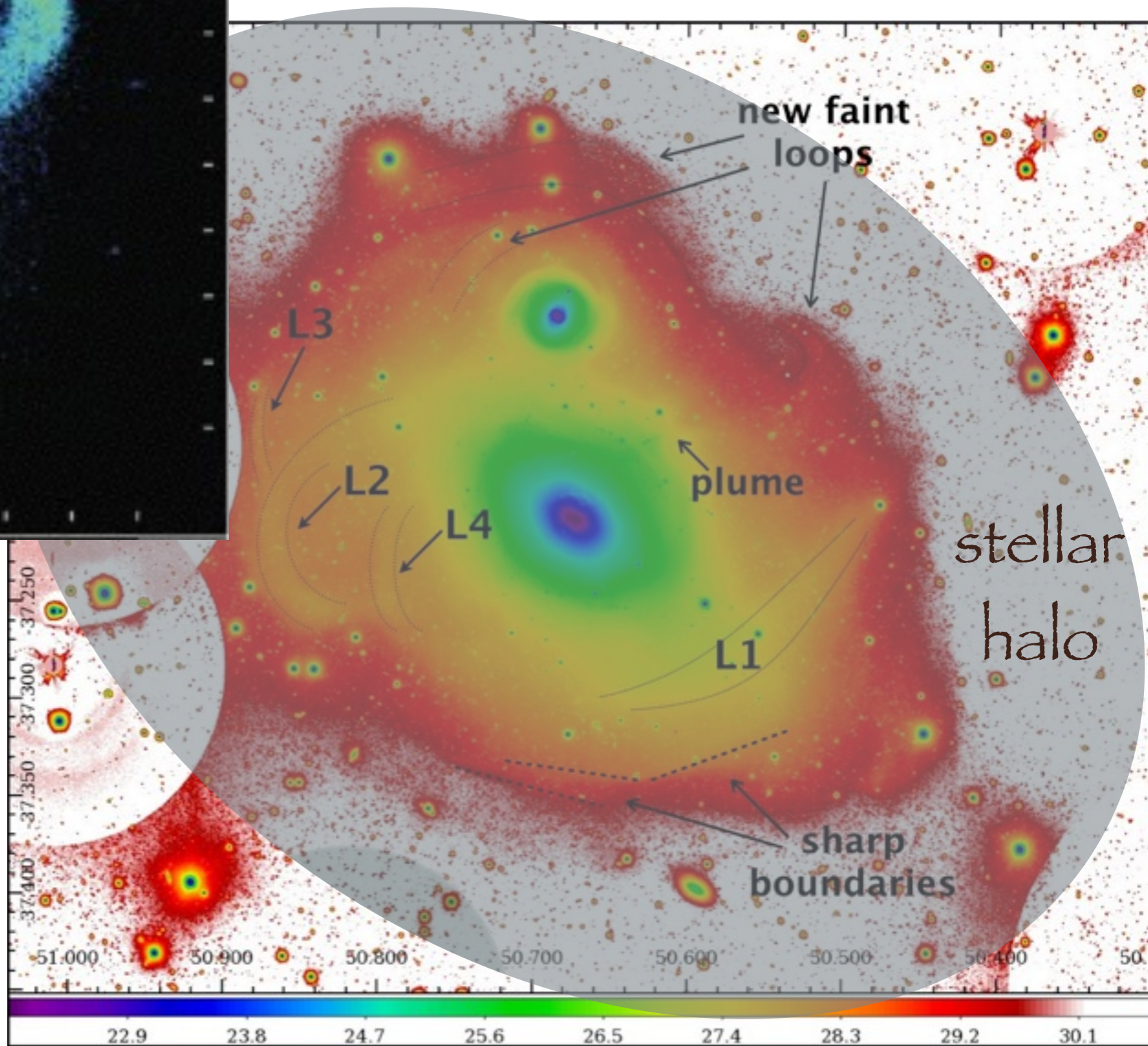
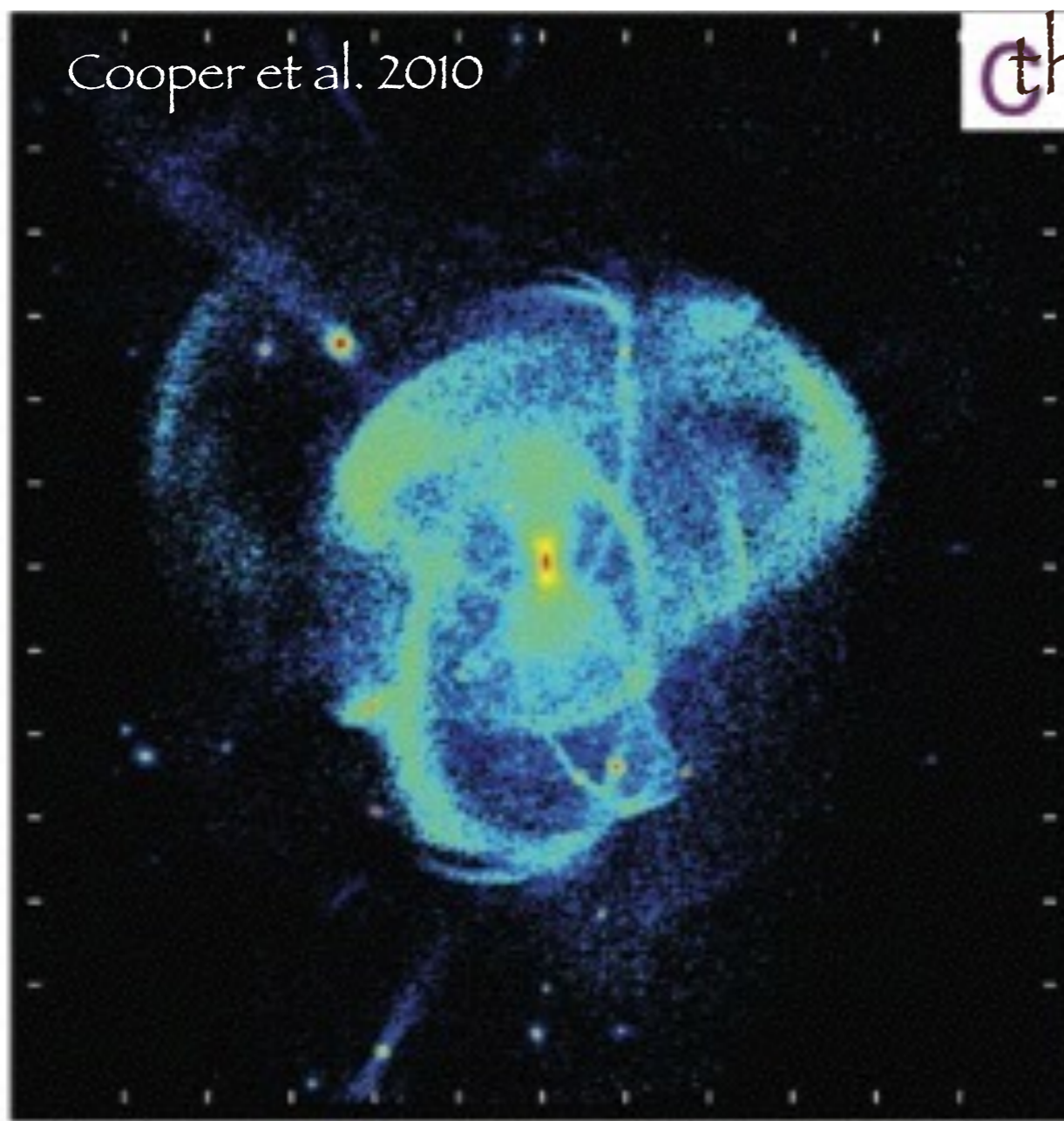
the build up of the stellar halo:



Cooper et al. 2010

the build up of the stellar halo:

125
100
75
50
25
0
-25
-50
-75
-100
-125

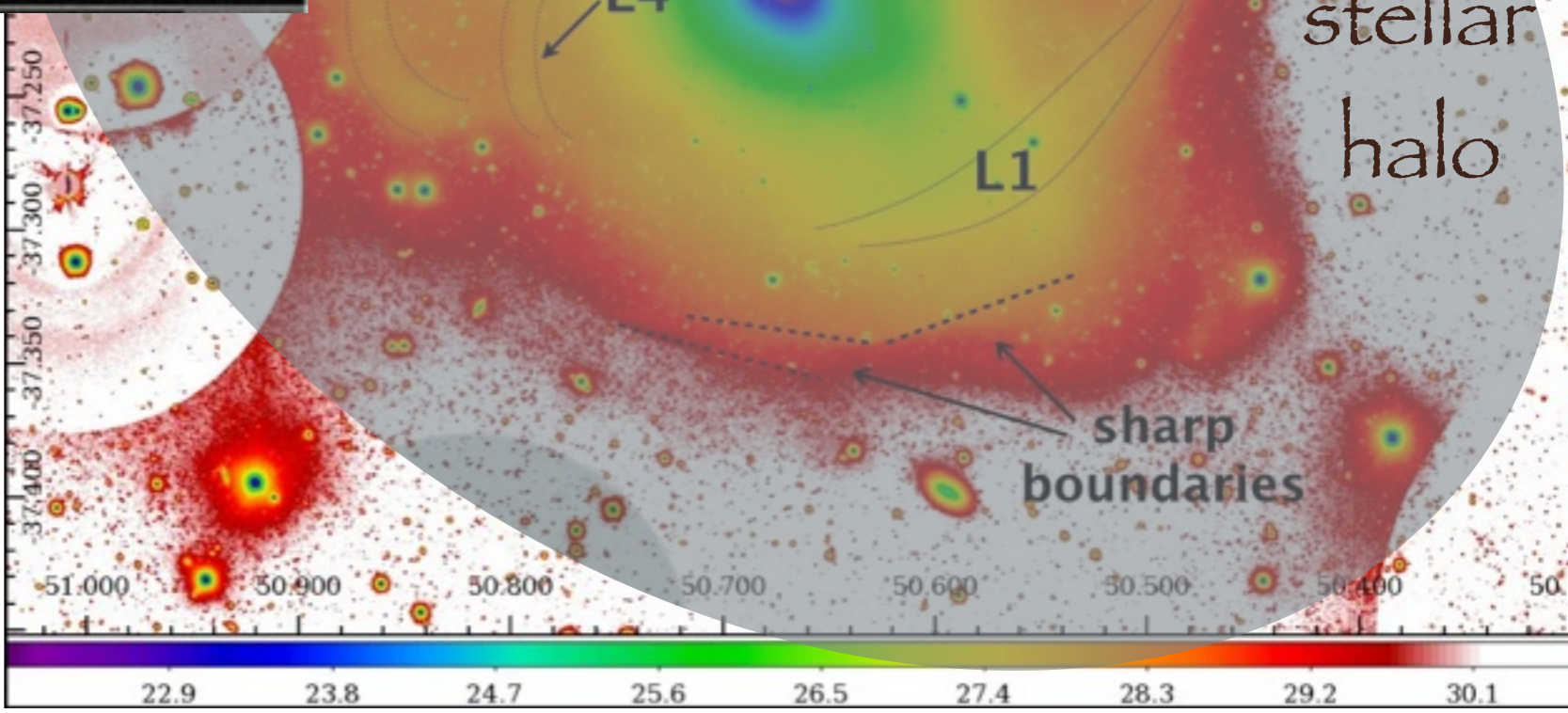
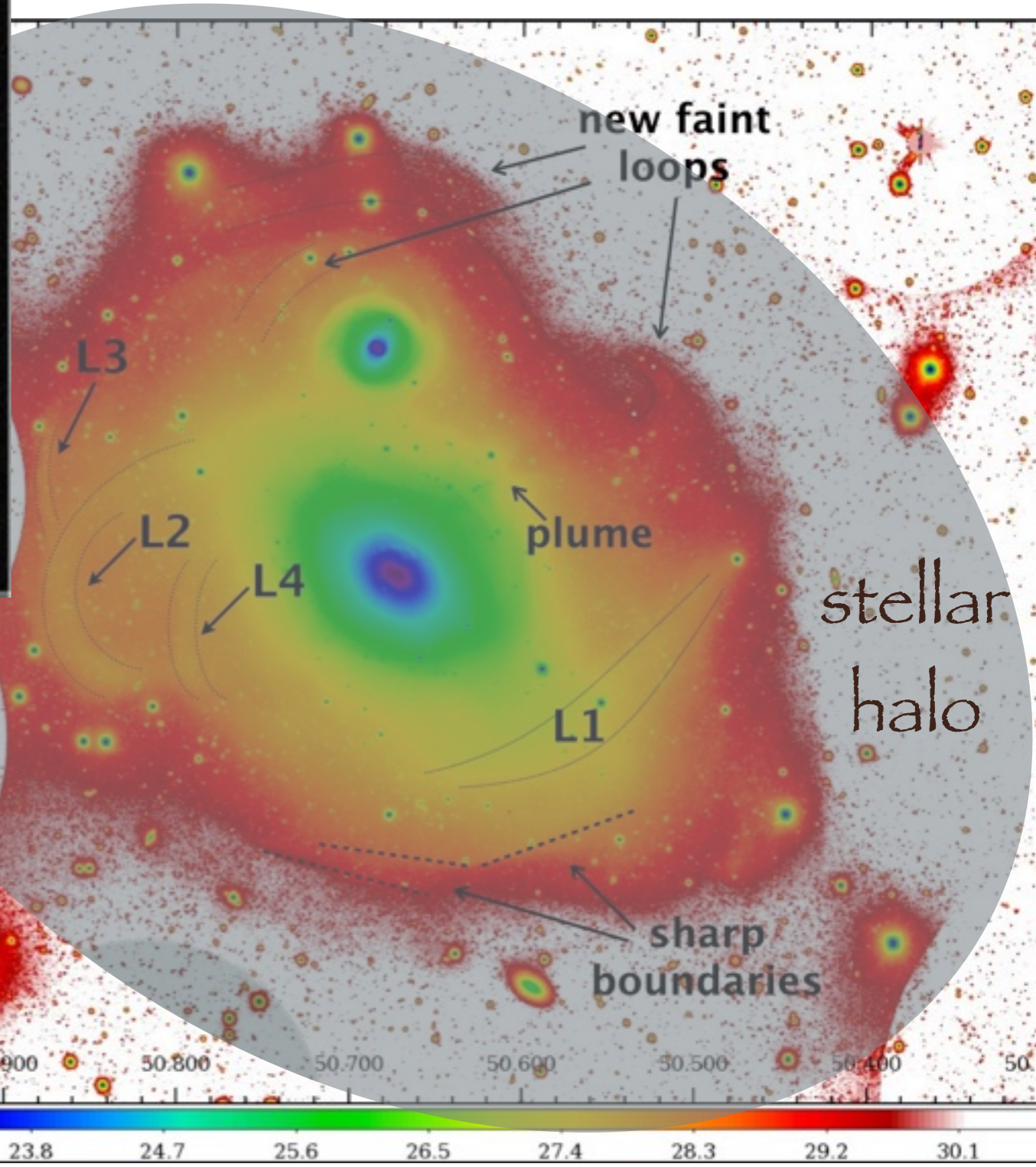


Cooper et al. 2010

the build up of the stellar halo:

stellar halo in NGC1316 formed by gradual accretion of several progenitors:
similar morphology + total extension

125
100
75
50
25
0
-25
-50
-75
-100
-125

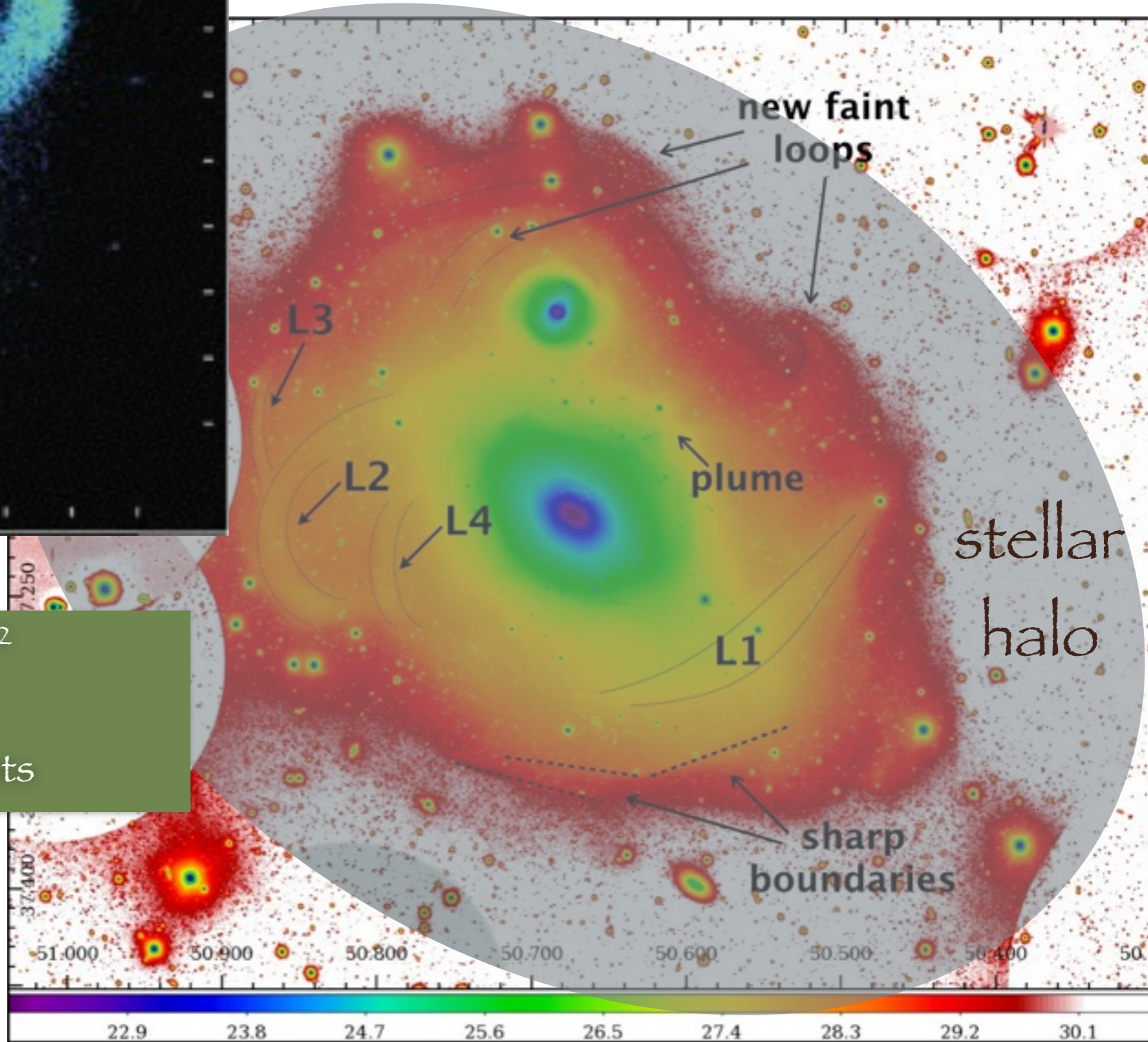
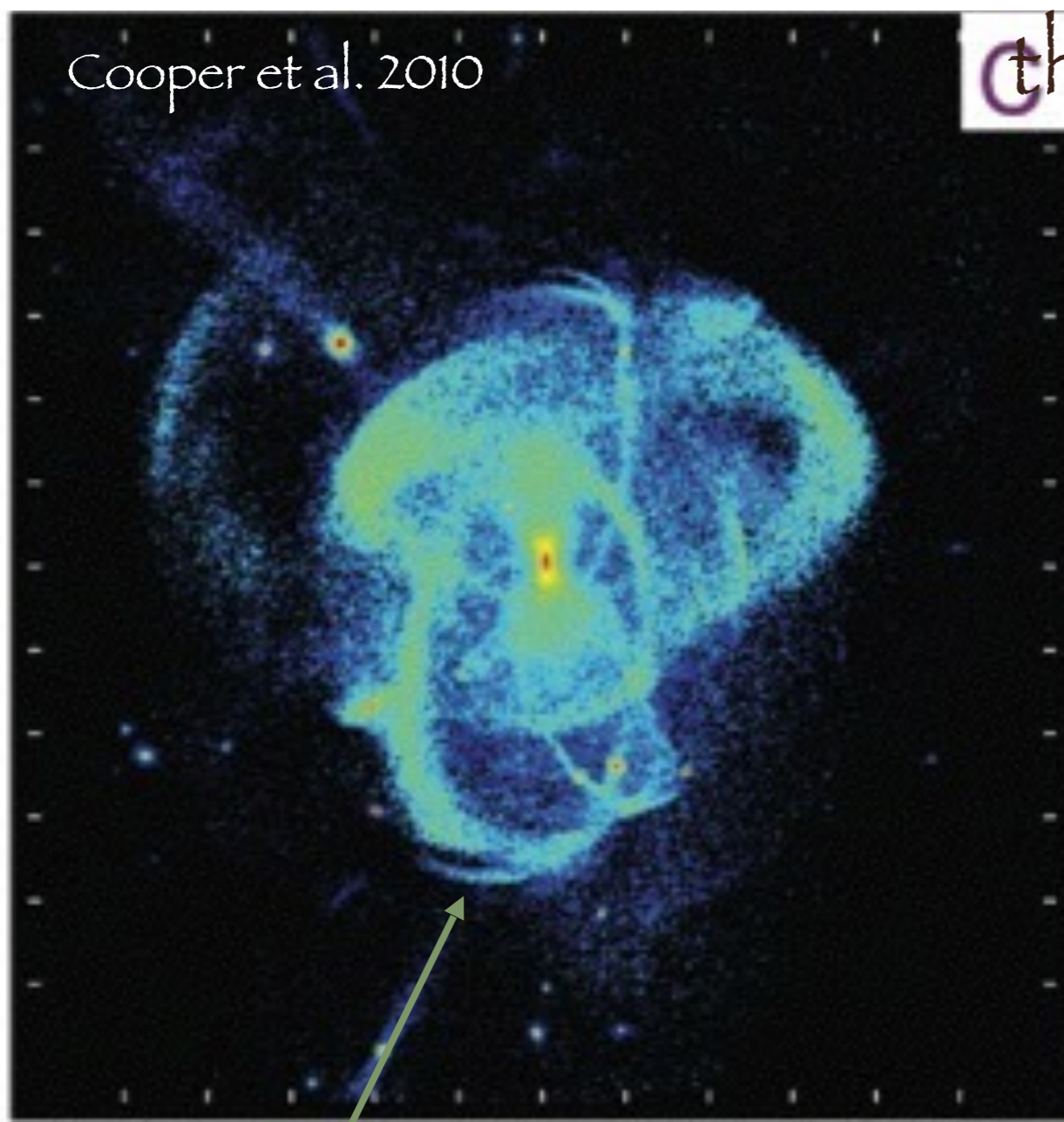


Cooper et al. 2010

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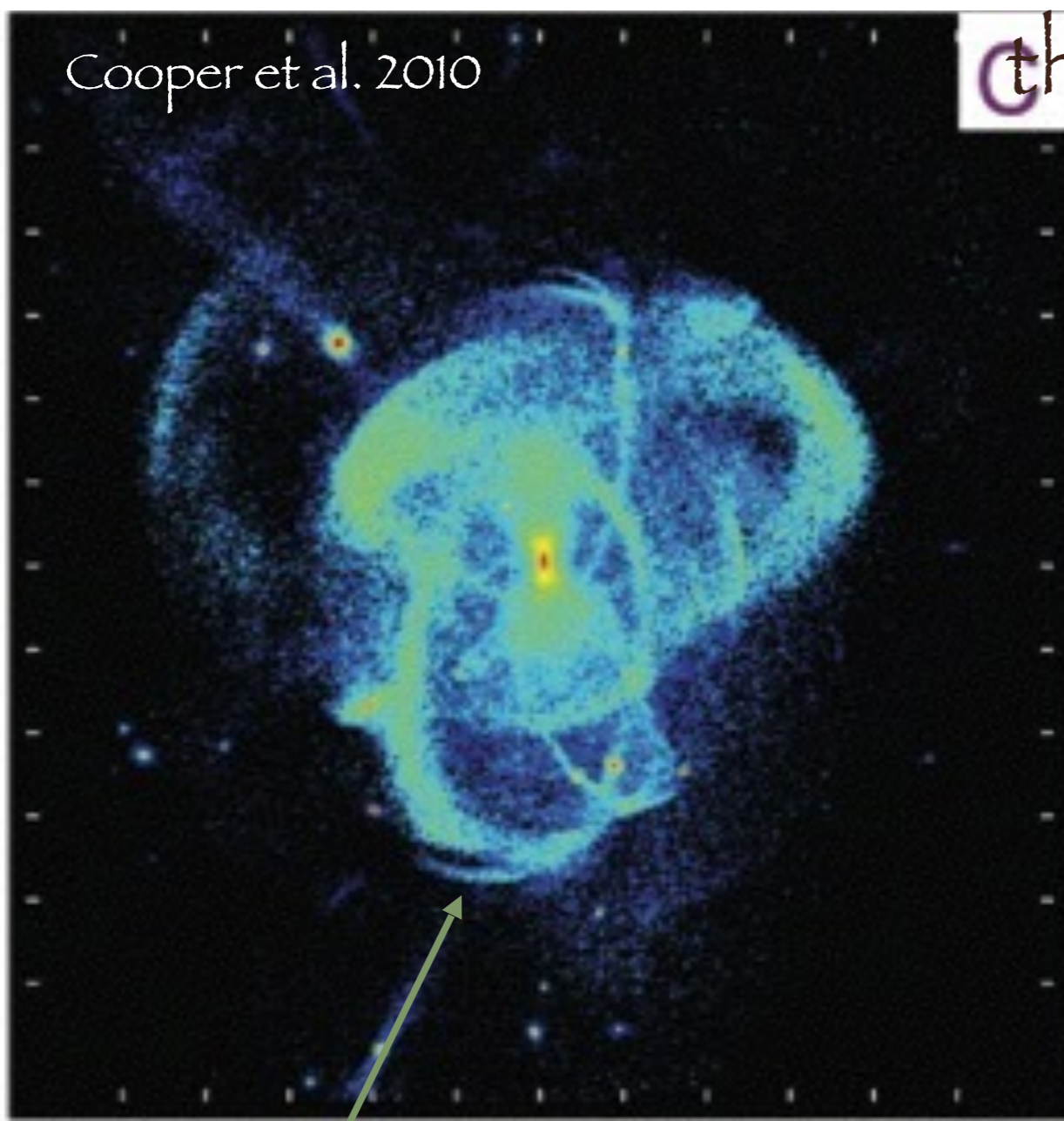
125
100
75
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0
-25
-50
-75
-100
-125



- SB (r band) = 26.6 - 30.6 mag/arcsec²
- exponential profile
- luminous substructures = recent events

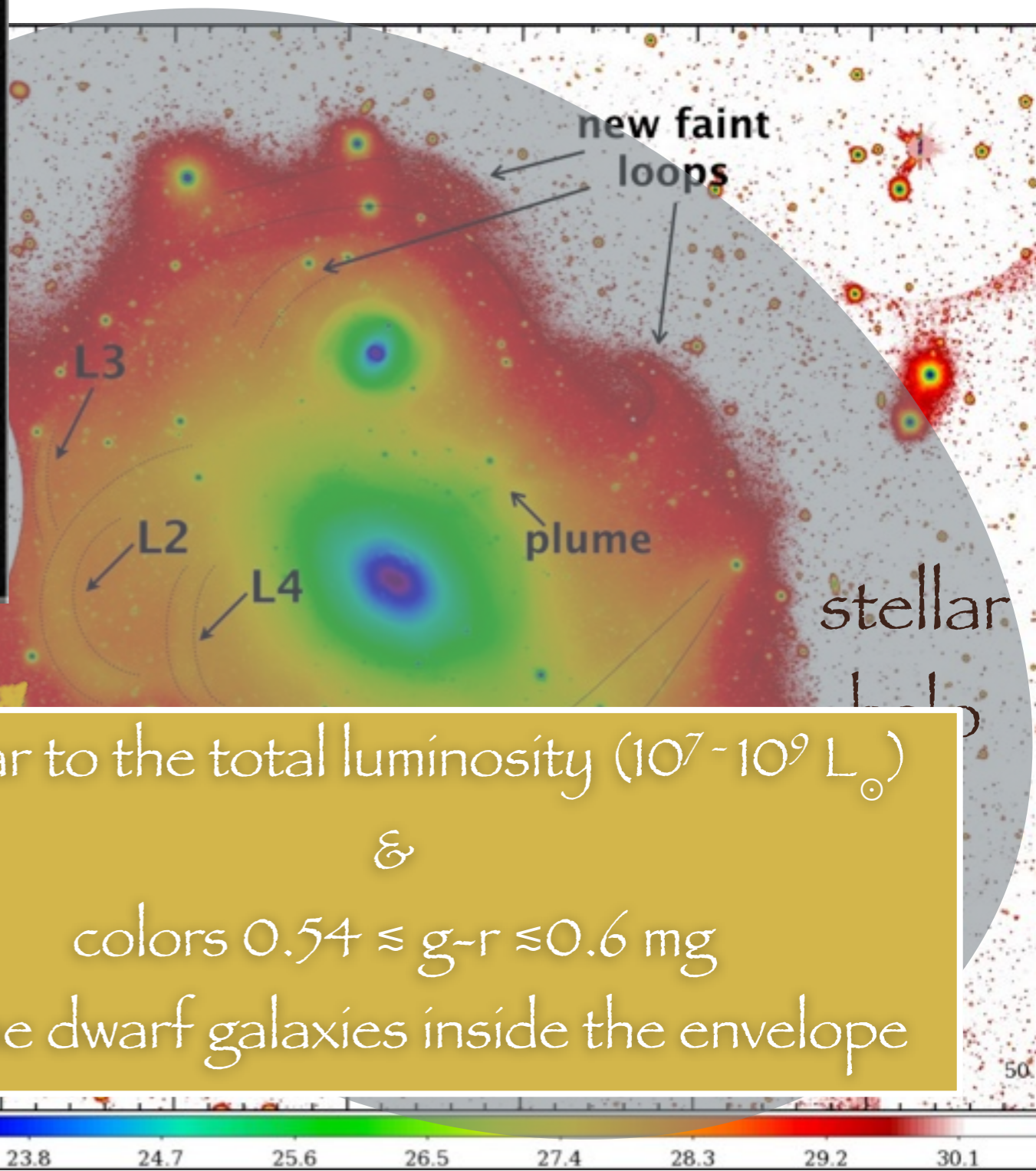
Cooper et al. 2010

125
100
75
50
25
0
-25
-50
-75
-100
-125



the build up of the stellar halo:

stellar halo in NGC1316 formed by gradual accretion of several progenitors:
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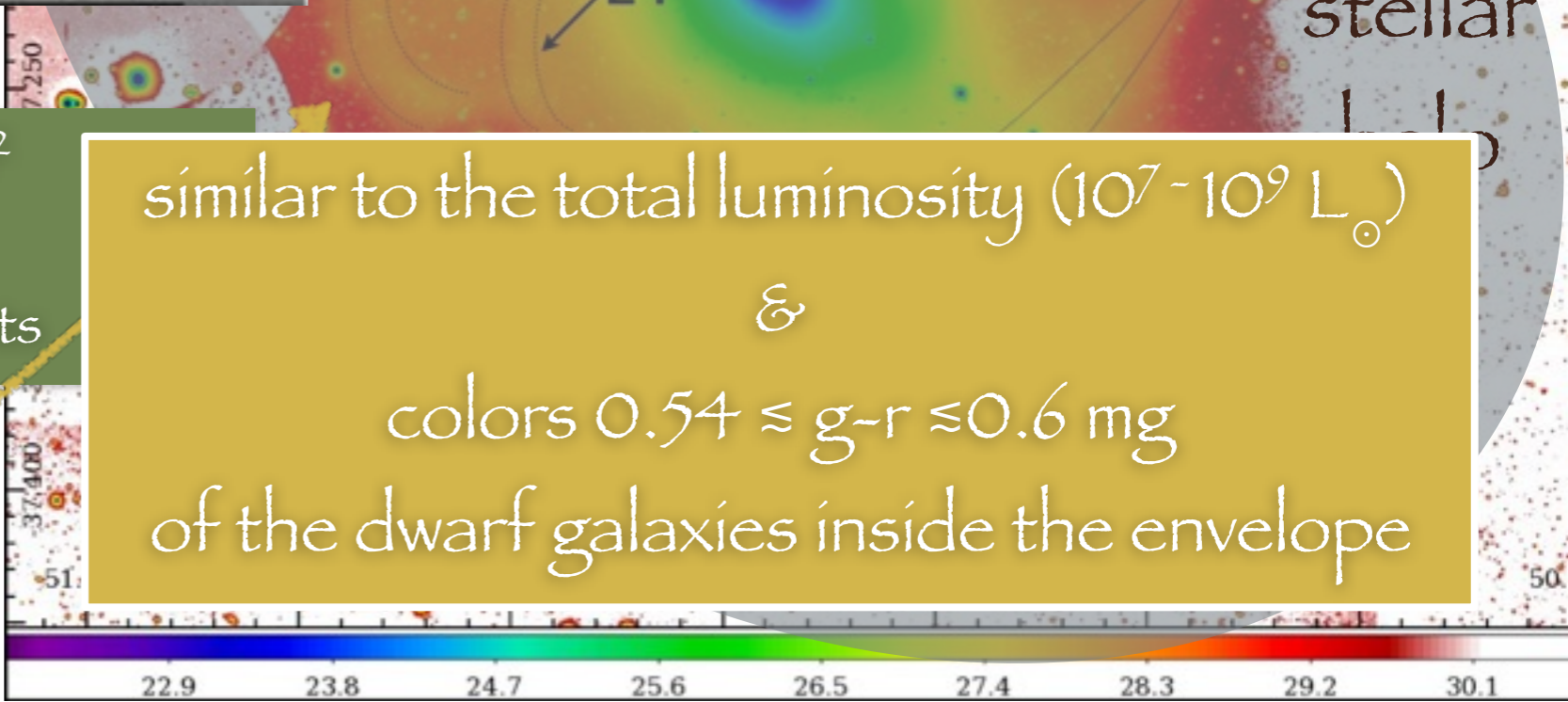


- SB (r band) = 26.6 - 30.6 mag/arcsec²
- exponential profile
- luminous substructures = recent events

$$L_{(L2+L3)} = 7 \cdot 10^9 L_{\odot}$$

$$g-r = 0.54 \text{ mag}$$

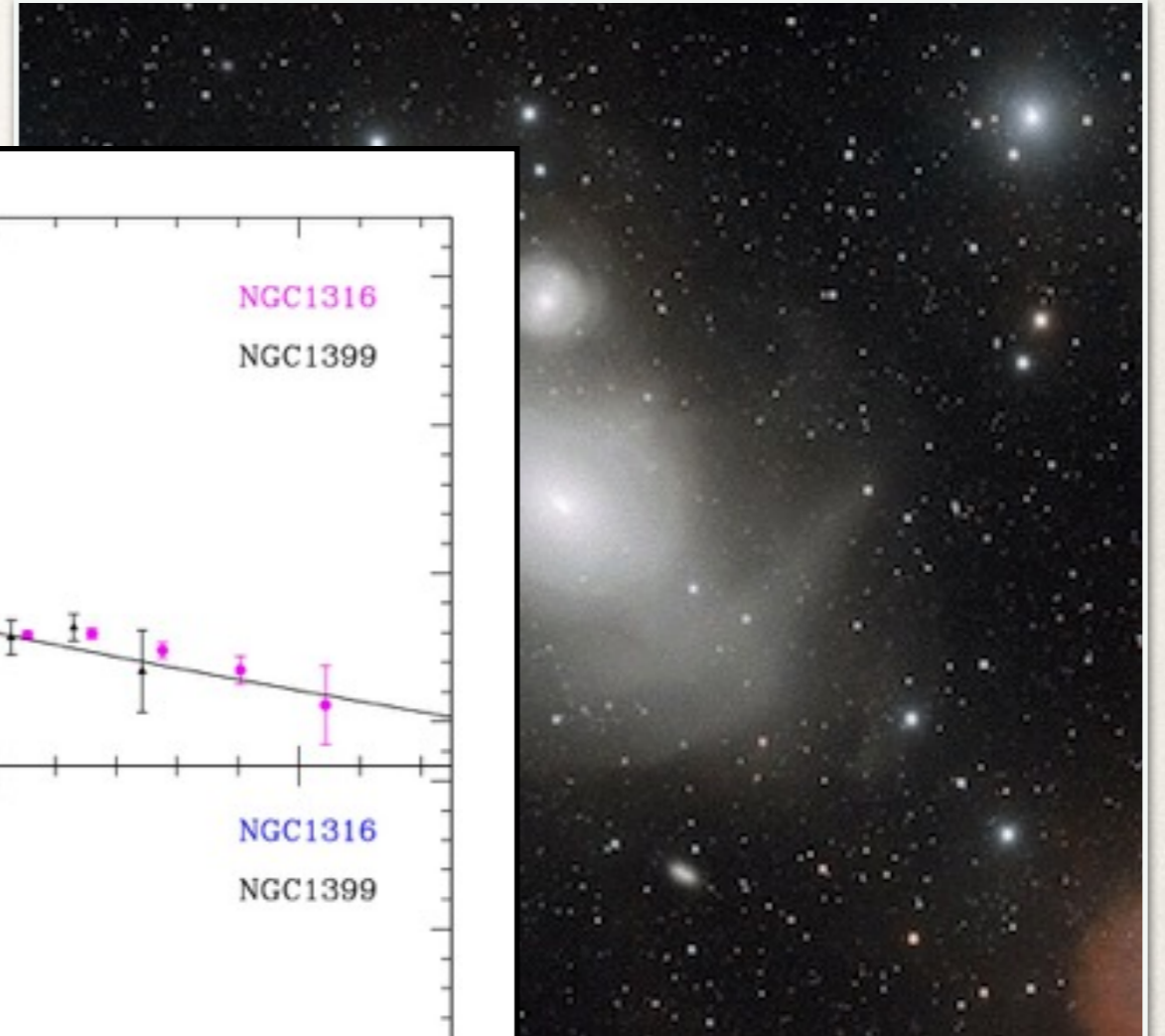
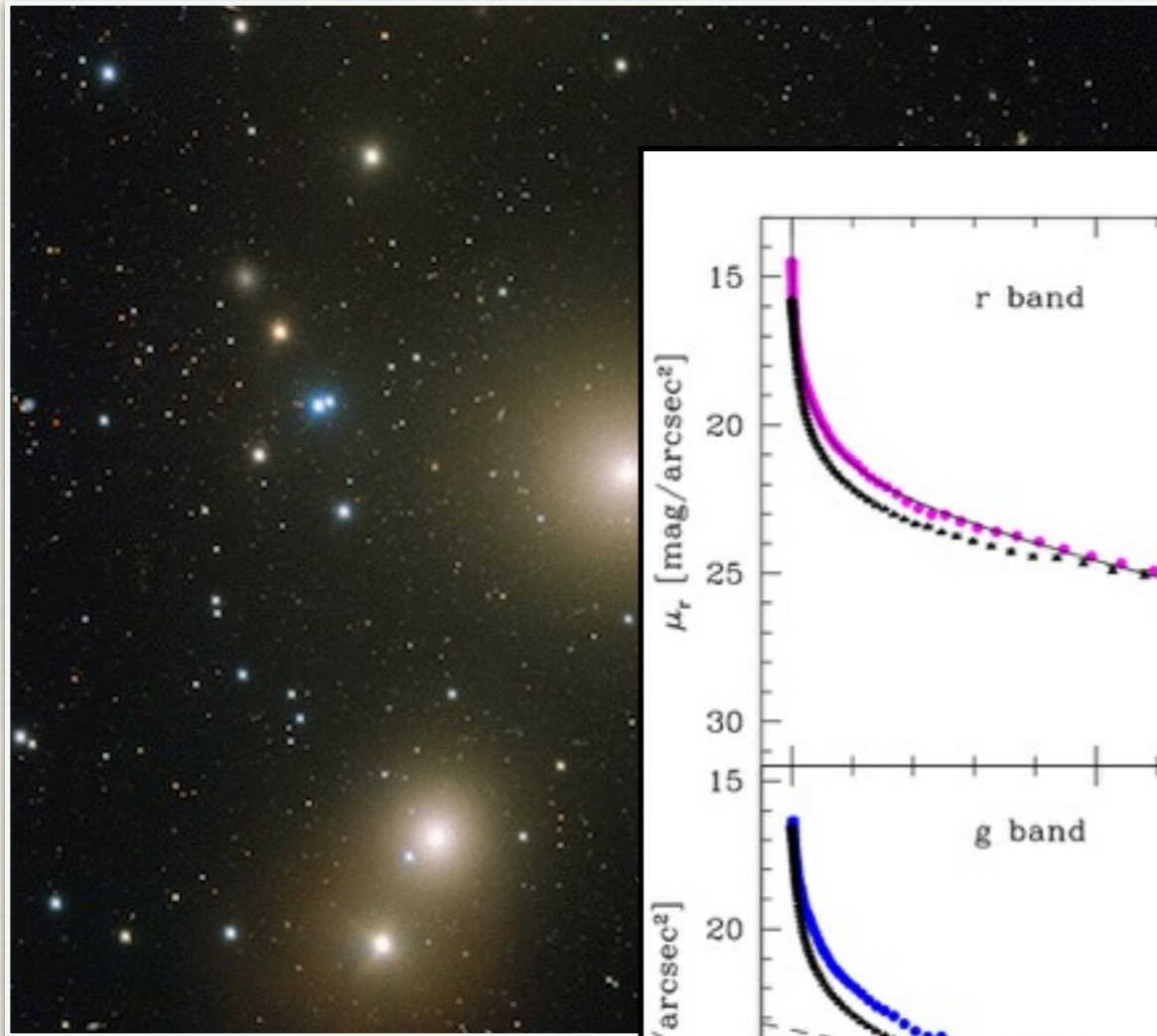
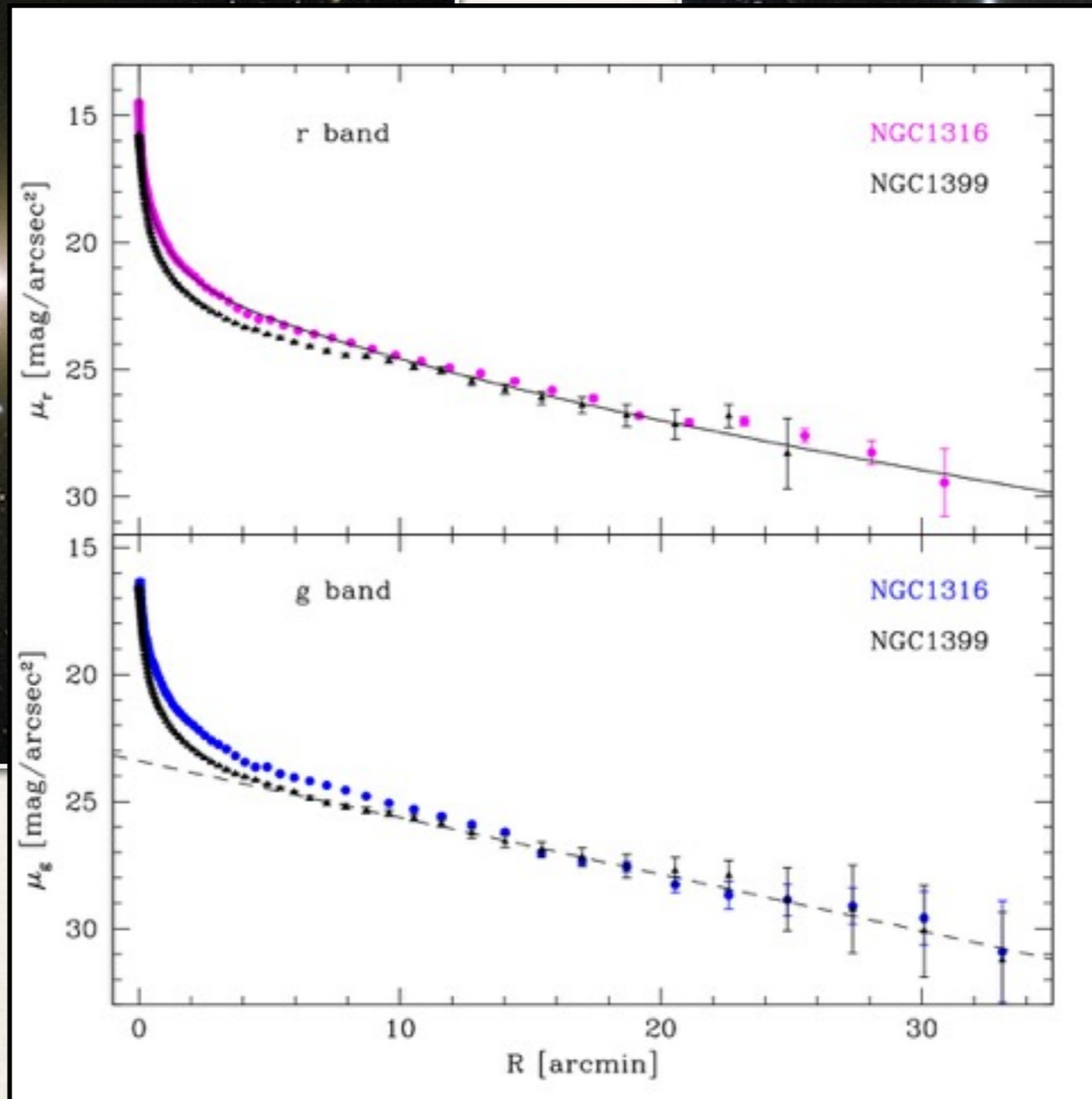
similar to the total luminosity ($10^7 - 10^9 L_{\odot}$)
&
colors $0.54 \approx g-r \approx 0.6 \text{ mag}$
of the dwarf galaxies inside the envelope



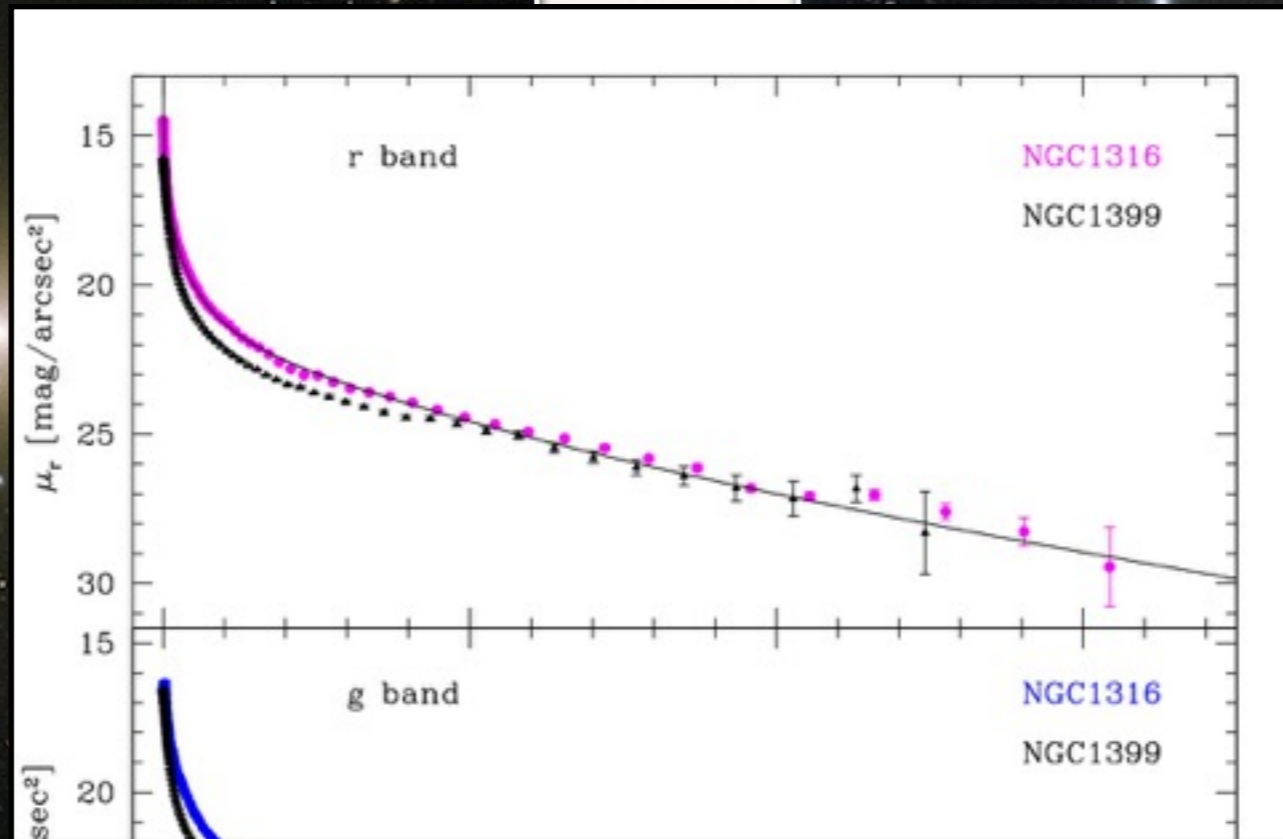
NGC1399 vs NGC1316: two giants in comparison



NGC1399 vs NGC1316: two giants in comparison



NGC1399 vs NGC1316: two giants in comparison



- NGC1399 is an more evolved phase with respect to NGC1316
- both galaxies have an $r^{1/4}$ spheroid
- stellar envelope is still forming in NGC1316 but already settled with an exponential decline

Concluding remarks

- The large mosaic obtained with the 1 deg^2 FoV of OmegaCam@VST

+

- the arcsec-level angular resolution of $0.21 \text{ arcsec/pixel}$

+

- the large integration time

Concluding remarks

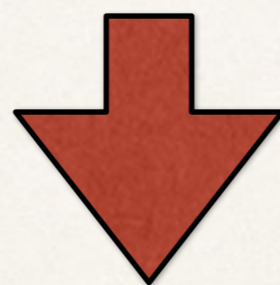
- The large mosaic obtained with the 1 deg^2 FoV of OmegaCam@VST

+

- the arcsec-level angular resolution of $0.21 \text{ arcsec/pixel}$

+

- the large integration time



the galaxy structure from the brightest inner regions to the faint outskirts, out to the intracluster regions

Concluding summary about FDS

- ❖ map the SB in the core of the cluster and around the cD in the SW subgroup out to an unprecedented distance of 192-200 kpc => stellar halo + intracluster
- ❖ Differently from NGC1399, the faint envelope in NGC1316 still hosts the remnants of the accreted satellite galaxies that are forming the stellar halo
- ❖ detect new and faint ($\mu_g \sim 28-30 \text{ mag/arcsec}^2$) features in the intracluster region => map the galaxy interactions
- ❖ trace with a great detail the morphology and structure of each ETG in the Fornax cluster out the largest galactocentric distances ever reached by the previous studies ($\sim 10 - 15R_e$) and beyond $\mu_r = 27 \text{ mag/arcsec}^2$
- ❖ provide a strong indication of a different galaxy evolution & star formation history as function of the cluster-centric radius