Обзор ArXiv/astro-ph, 10-15 июня 2019 года

От Сильченко О.К.

ArXiv: 1906.03230

The M101 Satellite Luminosity Function and the Halo to Halo Scatter Among Milky Way Analogues

P. Bennet,[1] D. J. Sand,[2] D. Crnojević,[3,1] K. Spekkens,[4,5] A. Karunakaran,[5] D. Zaritsky,[2] and B. Mutlu-Pakdil[2]

[1]*Physics & Astronomy Department, Texas Tech University, Box 41051, Lubbock, TX 79409-1051, USA*
[2]*Steward Observatory, University of Arizona, 933 North Cherry Avenue, Rm. N204, Tucson, AZ 85721-0065, USA*
[3]*University of Tampa, 401 West Kennedy Boulevard, Tampa, FL 33606, USA*
[4]*Department of Physics and Space Science, Royal Military College of Canada P.O. Box 17000, Station Forces Kingston, ON K7K 7B4, Canada*
[5]*Department of Physics, Engineering Physics and Astronomy, Queens University, Kingston, ON K7L 3N6, Canada*

(Received X, 2019; Revised X, 2019; Accepted June 10, 2019)

Submitted to ApJ

ABSTRACT

We have obtained deep Hubble Space Telescope (HST) imaging of 19 dwarf galaxy candidates in the vicinity of M101. Advanced Camera for Surveys (ACS) HST photometry for 2 of these objects showed resolved stellar populations and Tip of the Red Giant Branch (TRGB) derived distances (D$\sim$7 Mpc) consistent with M101 group membership. The remaining 17 were found to have no resolved stellar populations, meaning they are either part of the background NGC 5485 group or are distant low surface brightness (LSB) galaxies. It is noteworthy that many LSB objects which had previously been assumed to be M101 group members based on projection have been shown to be background objects, indicating the need for future diffuse dwarf surveys to be very careful in drawing conclusions

SAGA – проект по подсчету спутников у галактик – аналогов MW

- CFHT – несколько десятков кандидатов
- Группа M101 (D=7 Мпк)
- Проверка 19 кандидатов путем получения изображений на HST: нужно, чтобы разрешились на звезды
- Разрешились на звезды только 2 из 19; у остальных по пределу вершины ветви гигантов D>15 Мпк

Почувствуйте разницу

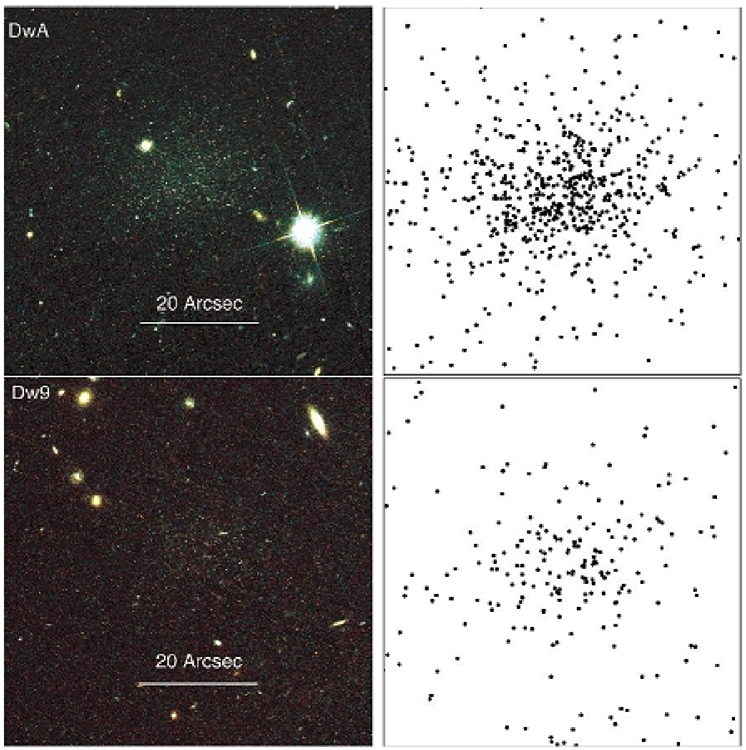


Figure 2. Left: Colorized image cutouts of the resolved dwarf candidates from *HST/ACS*, DwA and Dw9. Right: Plots of all the point sources identified by DOLPHOT after quality cuts. Images are 1.0'x1.0', north is up, east is left. DwA and Dw9 contrast with the other dwarfs in our sample which have no overdensity of stellar objects at their position; see Figure 3.

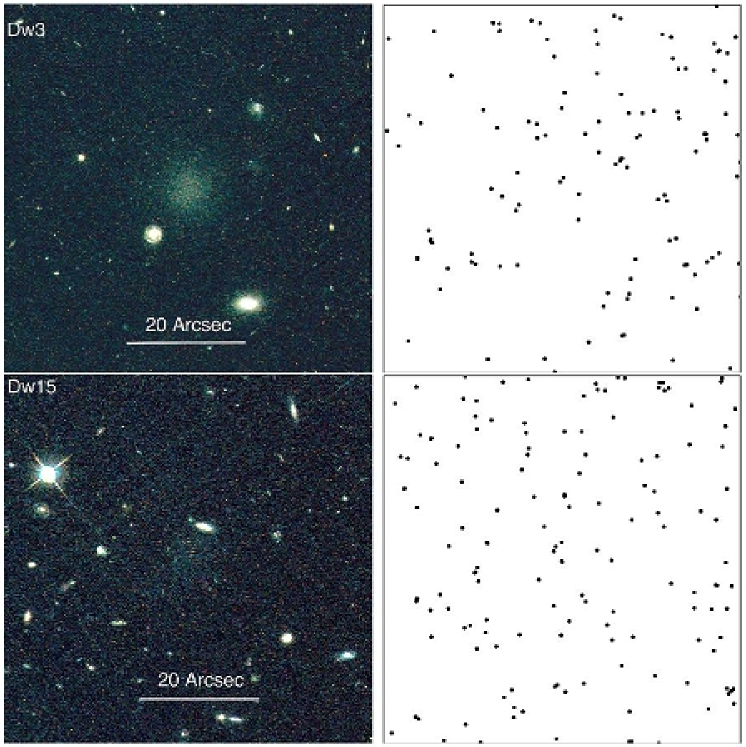


Figure 3. Left: Colorized image cutouts of two unresolved, background dwarfs from *HST/ACS*, Dw3 and Dw15. Right: Plots of all the point sources found by DOLPHOT after quality cuts. Images are 1.0'x1.0', north is up, east is left. There is no apparent overdensity of stars at the position of each dwarf; only DwA and Dw9 show such an overdensity (see Figure 2). These dwarfs also show no overdensity when only considering sources consistent with being RGB stars. The images of Dw3 and Dw15 are representative of the 17 total dwarf candidates that only show diffuse emission in *HST* imaging.

Разрешилось

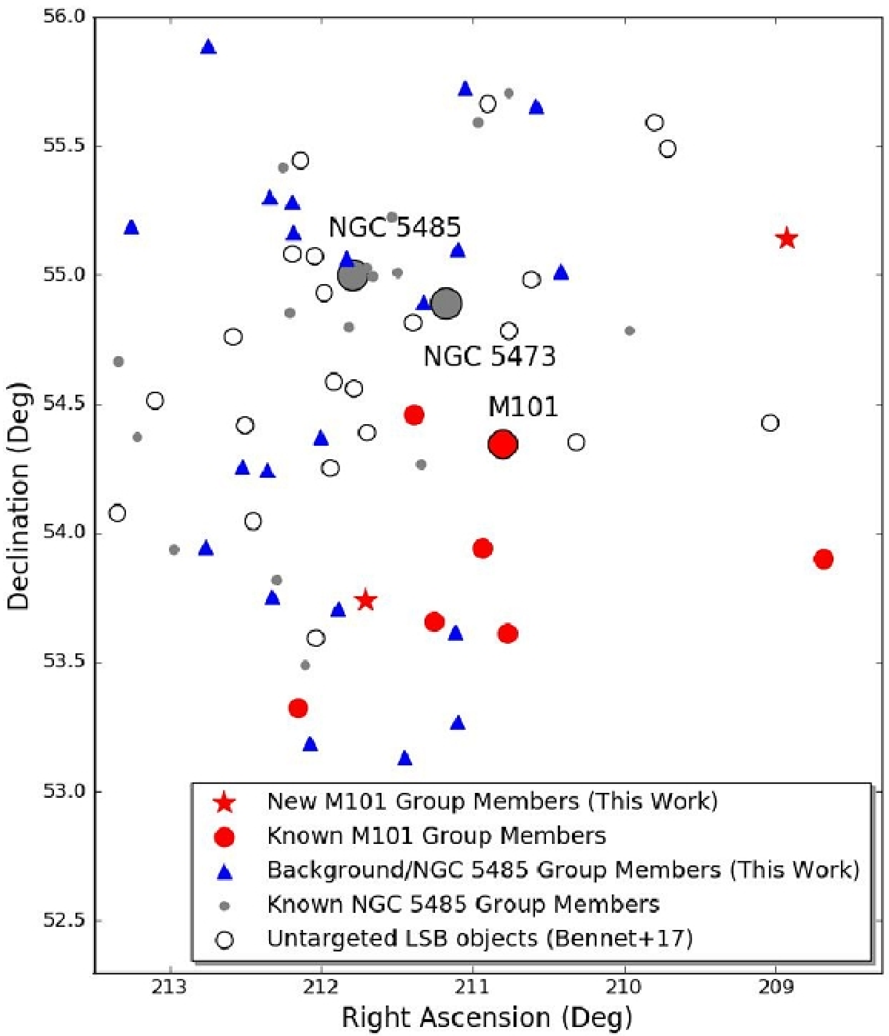
Не разрешилось

Характеристики новых спутников

Table 1. Confirmed M101 Dwarfs

Name	DwA	Dw9
RA (J2000)	14:06:49.9±1.0"	13:55:44.8±3.0"
Dec (J2000)	+53:44:29.8±0.8"	+55:08:45.6±2.1"
m_V (CFHTLS) (mag)	19.2±0.1	20.8±0.1
m_V (HST) (mag)	19.6±0.2	21.0±0.2
M_V (HST) (mag)	−9.5±0.2	−8.2±0.2
r_h (CFHTLS) (arcsec)	10.92±0.23	7.66±0.64
r_h (HST) (arcsec)	12.6±1.2	10.8±2.4
r_h (HST) (pc)	417±40	384±85
μ(V,0) (mag arcsec^{-2})	26.0±0.3	27.2±0.5
Mass ($M_\odot$)	$7.0\pm0.4\times10^5$	$2.0\pm0.1\times10^5$
Ellipticity	0.33±0.06	≤0.37
Distance (Mpc)	$6.83^{+0.27}_{-0.26}$	$7.34^{+0.39}_{-0.37}$
Projected Distance from M101 (kpc)	100	160

Так выглядит поле



Единая зависимость масса-радиус

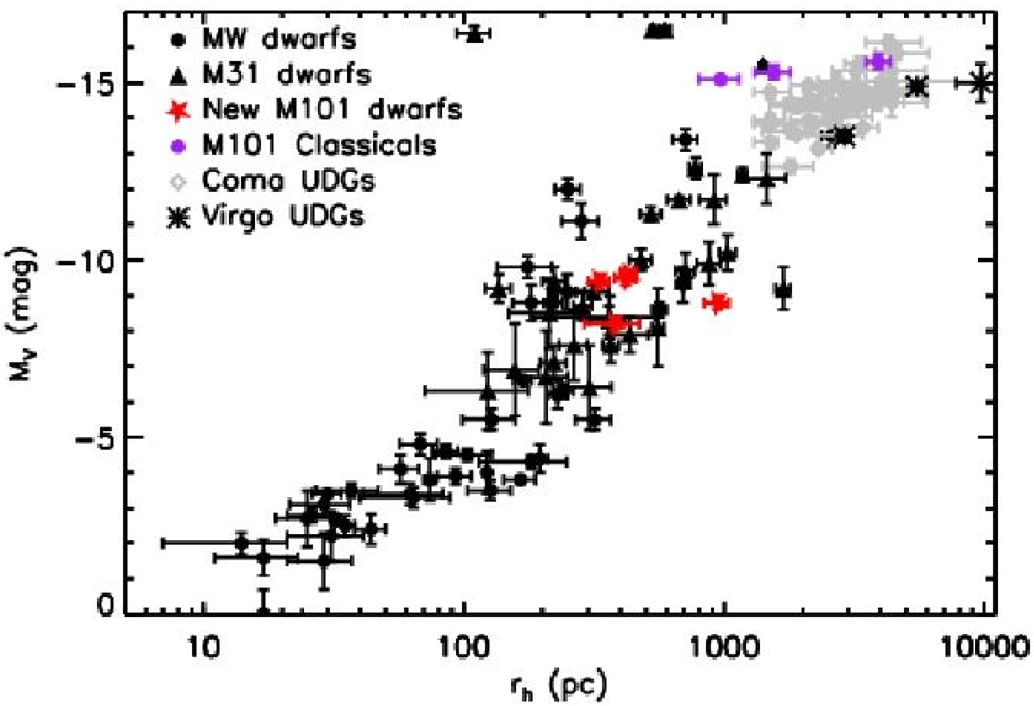


Figure 5. Absolute *V*-band magnitude as a function of half-light radius for M101 dwarf galaxy members as compared to the Local Group and ultra-diffuse galaxies in the Coma and Virgo clusters. The previously known classical M101 group members (Tikhonov et al. 2015) are shown in purple circles and the updated properties for the new M101 dwarf satellites from this work and from Danieli et al. (2017) are shown as red stars. The new population of faint M101 dwarfs is consistent with the size-luminosity relation found in Local Group dwarfs. The data for the MW and M31 dwarf galaxies (black points and triangles,

Функции светимости и число спутников – очень разные

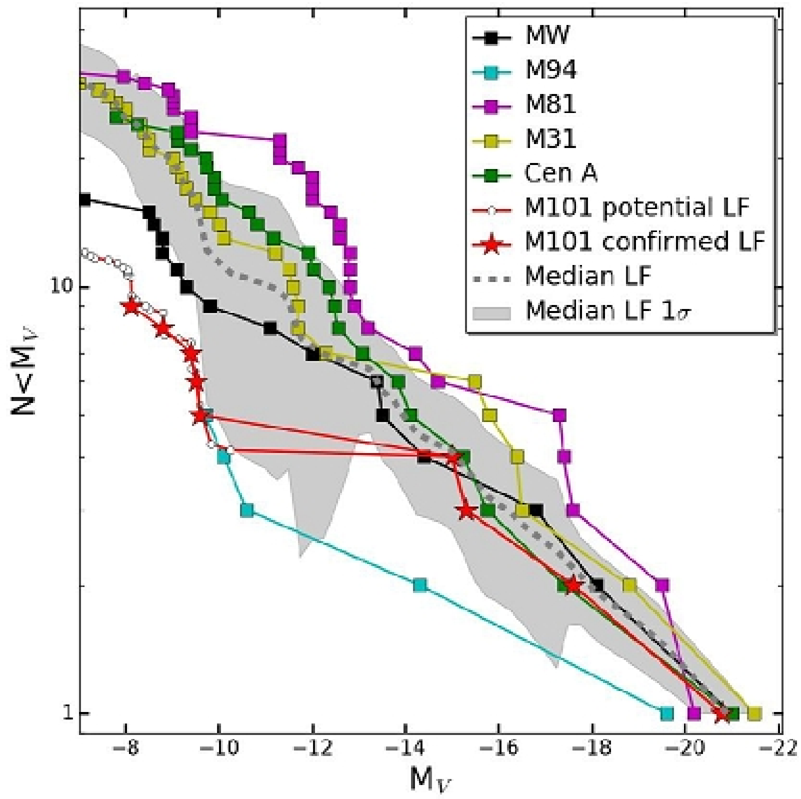


Figure 7. The cumulative satellite LF for several Milky Way-like systems out to a projected radius of 250 kpc, and the constructed median from the set. The M101 LF is displayed with star symbols, while the small circles indicate the LF for M101 after we include the statistical weighting of targets not followed-up with *HST* (see discussion in 4.3). The grey dashed line is the median of the individual galaxy measurements while the shaded region represents the 1σ scatter of the median. No attempt was made to correct any LF for incompleteness; we consider the M101 LF complete down to $M_V \approx -{-8.2}$ mag for confirmed M101 dwarfs and $M_V \approx -{-7.5}$ mag for potential M101 dwarfs. The data for the group LFs come from Smercina et al. (2018) for M94 represented by the cyan squares, Crnojević et al. (2019) for Cen A represented by the green squares, Chiboucas et al. (2013) and Smercina et al. (2017) for M81 represented by the magenta squares, Martin et al. (2016) & McConnachie et al. (2018) for M31 represented by the yellow squares and McConnachie (2012) for the MW represented by the black squares. Note that this is a lower limit for the MW due to incomplete spatial coverage.

К вопросу о звездообразовании

Table 3. Confirmed M101 group members within 250 kpc

Name	RA	Dec	M_V	Projected M101 Distance (kpc)	Distance (Mpc)	Ongoing Star Formation
(1)	(2)	(3)	(4)	(5)	(6)	(7)
M101	14:03:12.5	+54:20:56	-20.8	0	6.79 ± 0.41^{a}	Y
NGC 5474	14:05:01.6	+53:39:44	-17.6	89	6.82 ± 0.41^{a}	Y
NGC 5477	14:05:33.3	+54:27:40	-15.3	44	6.77 ± 0.40^{a}	Y
Holm IV	13:54:45.7	+53:54:03	-15.0	160	6.93 ± 0.48^{a}	Y
M101 DF1	14:03:45.0	+53:56:40	-9.6	50	6.37 ± 0.35^{b}	N
M101 DF2	14:08:37.5	+54:19:31	-9.4	97	$6.87^{+0.21\,b}_{-0.30}$	N
M101 DF3	14:03:05.7	+53:36:56	-8.8	89	$6.52^{+0.25\,b}_{-0.27}$	N
M101 DwA	14:06:49.9	+53:44:30	-9.5	100	$6.83^{+0.27\,c}_{-0.26}$	N
M101 Dw9	13:55:44.8	+55:08:46	-8.2	160	$7.34^{+0.39\,c}_{-0.37}$	N

[a] From Tikhonov et al. (2015)

[b] From Danieli et al. (2017)

[c] From this work.

Эффект окружения?

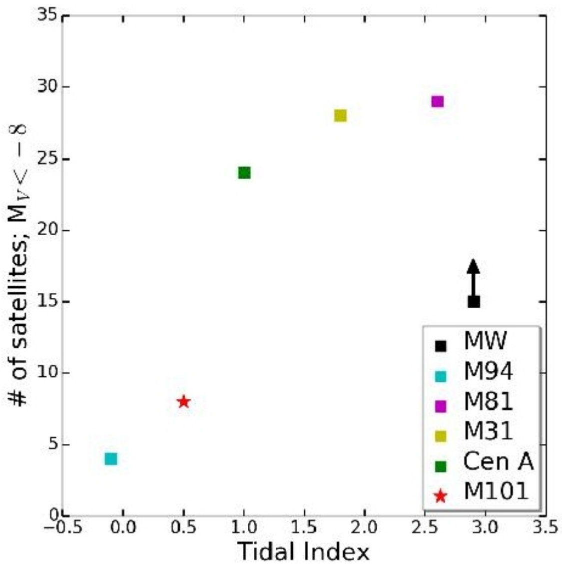
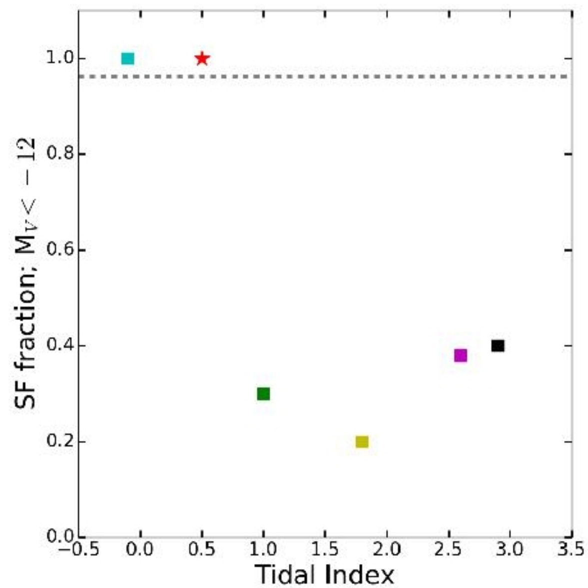
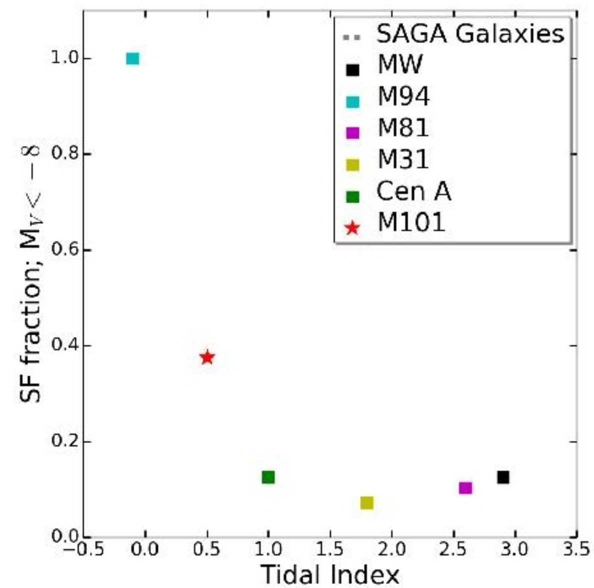


Figure 8. The environmental density of our target MW-mass galaxies, based on tidal index (i.e. density contrast, where smaller numbers indicate a more isolated galaxy; see Karachentsev et al. 2013), against number of confirmed satellites with $M_V \leq -8$. M101 is represented by a red star, the other MW-mass galaxies are represented by squares. The





ArXiv: 1906.05298

Signatures of stellar accretion in MaNGA early-type galaxies

Grecco A. Oyarzún,[1] Kevin Bundy,[2] Kyle B. Westfall,[2] Francesco Belfiore,[2,3] Daniel Thomas,[4]
Claudia Maraston,[4] Jianhui Lian,[4] Alfonso Aragón-Salamanca,[5] Zheng Zheng,[6,7] Violeta Gonzalez-Perez,[4,8]
David R. Law,[9] Niv Drory,[10] and Brett H. Andrews[11]

[1] *Astronomy Department, University of California, Santa Cruz, CA 95064, USA*
[2] *University of California Observatories - Lick Observatory, University of California, Santa Cruz, CA 95064, USA*
[3] *European Southern Observatory, Karl-Schwarzschild-Str. 2, Garching bei München, 85748, Germany*
[4] *Institute of Cosmology and Gravitation, University of Portsmouth, Burnaby Road, Portsmouth, PO1 3FX, UK*
[5] *School of Physics and Astronomy, University of Nottingham, University Park, Nottingham, NG7 2RD, UK*
[6] *National Astronomical Observatories, Chinese Academy of Sciences, A20 Datun Road, Beijing, China*
[7] *CAS Key Laboratory of FAST, NAOC, Chinese Academy of Sciences*
[8] *Energy Lancaster, Lancaster University, Lancaster LA14YB, UK*
[9] *Space Telescope Science Institute, 3700 San Martin Drive, Baltimore, MD 21218, USA*
[10] *McDonald Observatory, The University of Texas at Austin, 1 University Station, Austin, TX 78712, USA*
[11] *PITT PACC, Department of Physics and Astronomy, University of Pittsburgh, Pittsburgh, PA 15260, USA*

(Accepted June 14, 2019)

Примеры суммарных спектров в кольцах

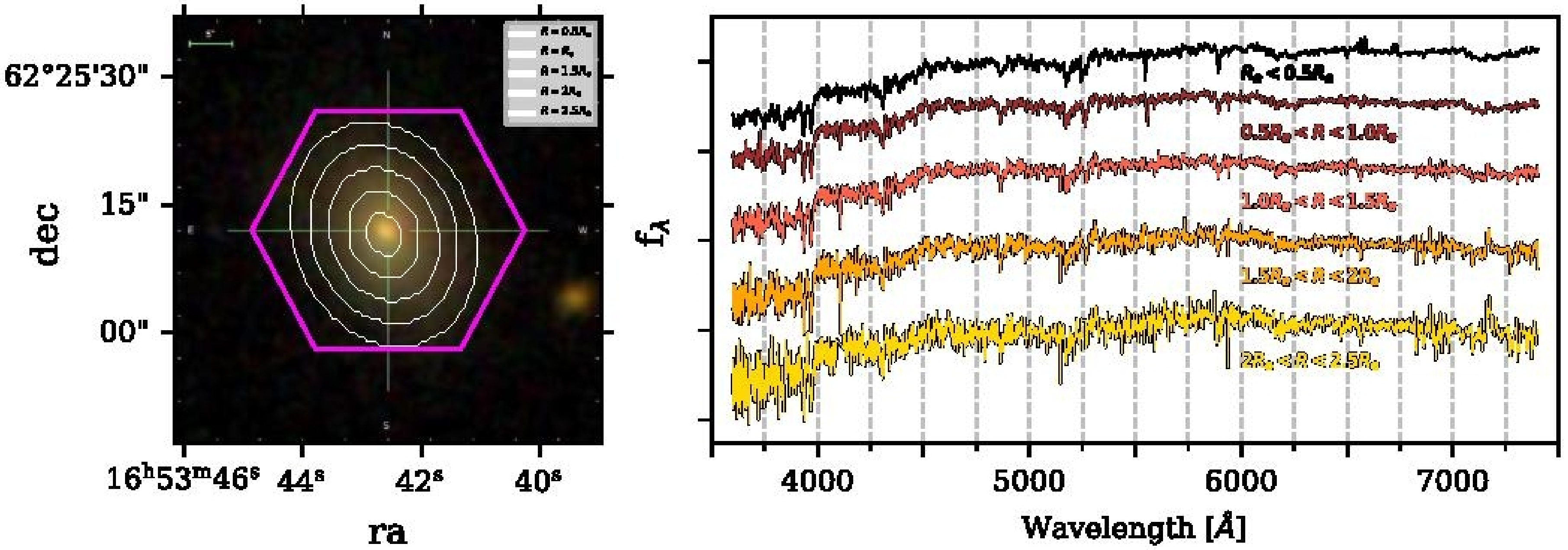


Figure 1. Illustration of our analysis on MaNGA galaxy 1-22298, one of 1010 ETGs in our sample. Left: SDSS r-band image. The MaNGA IFU footprint is overlaid in magenta. We also show in white the five annuli defined for this galaxy. Right: Co-added spectra for every annulus from the center to the outskirts.

Градиенты металличности звезд, посчитанные с 3мя разными моделями

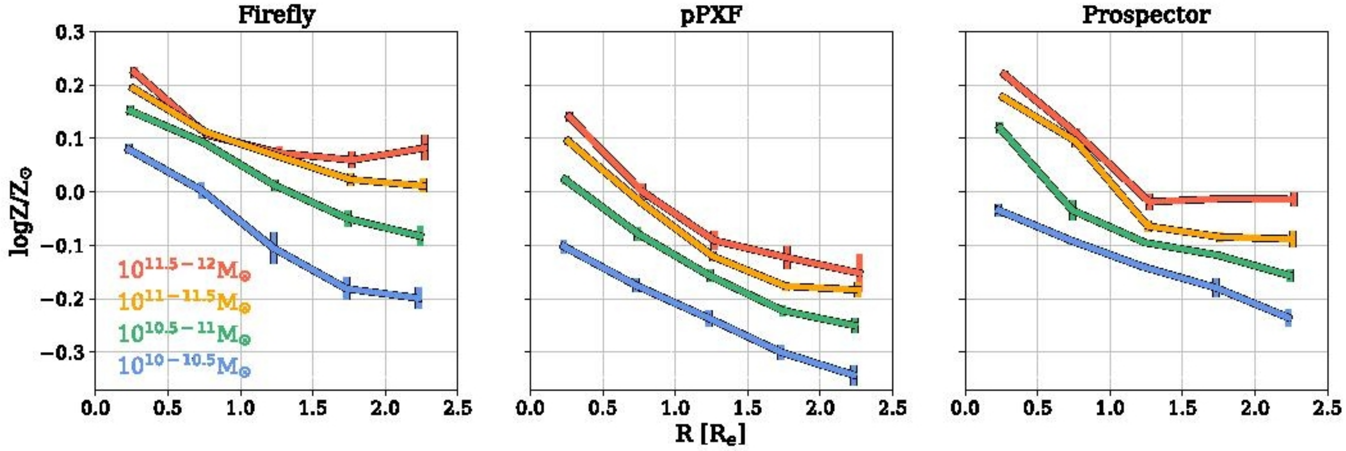


Figure 2. Median radial metallicity profiles of ETGs for different M_* bins. The three panels show the profiles derived by the codes Firefly, pPXF, and Prospector. The profiles of lower mass ETGs fall linearly with galactocentric radius. As galaxy mass increases, the profiles flatten at $R>1.5R_e$.

Во внешних частях массивных галактик доминируют аккрецированные звезды

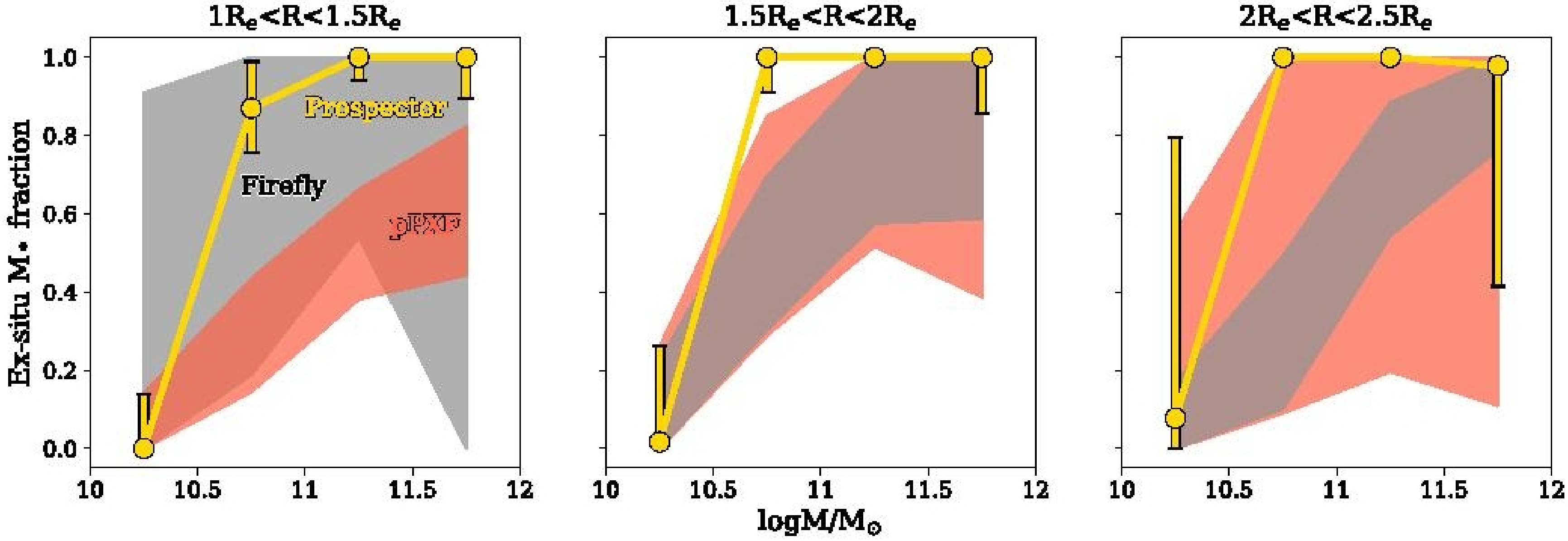
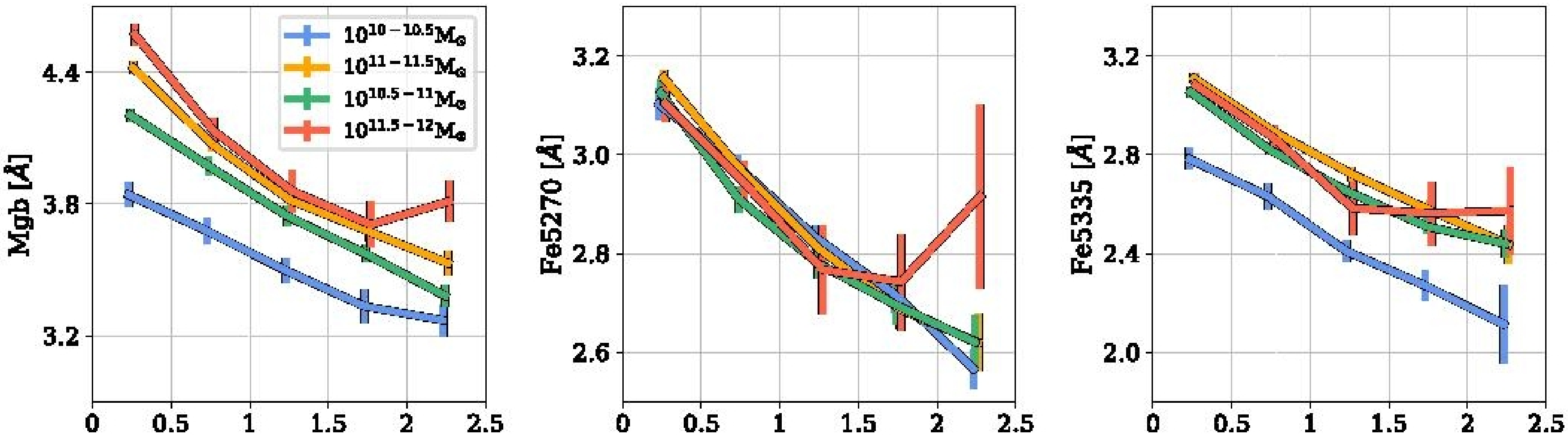


Figure 5. Observational estimate of the *ex-situ* stellar mass fraction in ETGs as a function of M$_*$ for three different radial bins. Shown are the 1σ contours derived with Firefly (grey), pPXF (red), and Prospector (yellow). The estimates come from expressing the metallicity profiles of ETGs as a linear combination of *in-situ* and *ex-situ* profiles (Figure 4). Note how *ex-situ* signatures increase with M$_*$.

Похоже, рецензент не верит в по-пиксельный фиттинг спектров…



Но вывод устоял!