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От Сильченко О.К.

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PGC 38025: A STAR-FORMING LENTICULAR GALAXY WITH AN OFF-NUCLEAR STAR-FORMING CORE

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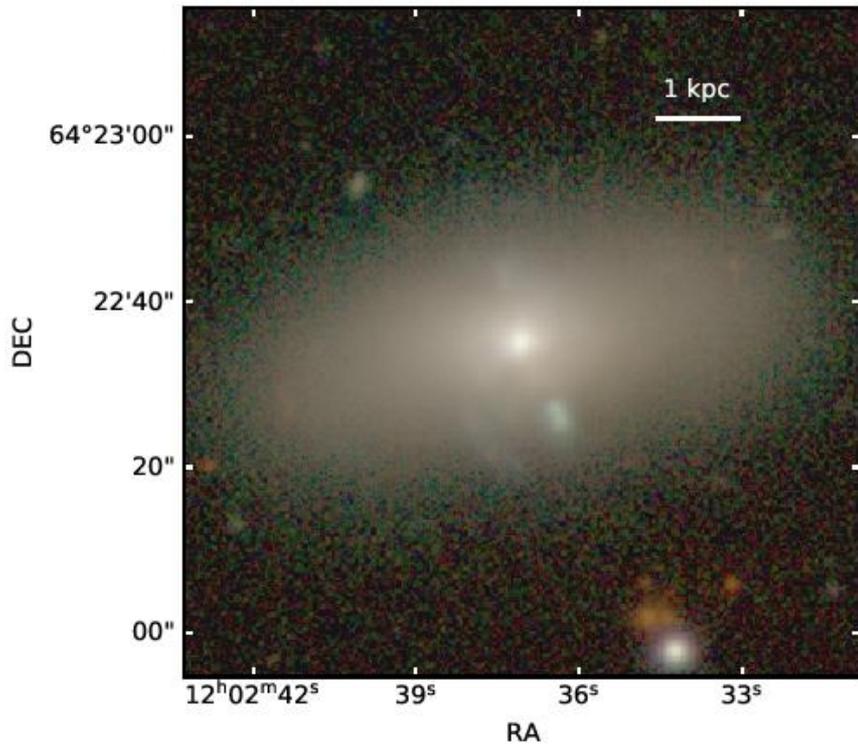
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## ABSTRACT

Lenticular galaxies (S0s) were considered mainly as passive evolved spirals due to environmental effects for a long time; however, most S0s in the field cannot fit into this common scenario. In this work, we study one special case, SDSS J120237.07+642235.3 (PGC 38025), a star-forming field S0 galaxy with an off-nuclear blue core. We present optical integral field spectroscopic (IFS) observation with the 3.5 meter telescope at Calar Alto (CAHA) Observatory, and high-resolution millimeter observation with the NOthern Extended Millimeter Array (NOEMA). We estimated the star formation rate (SFR =  $0.446 M_{\odot} yr^{-1}$ ) and gaseous metallicity ( $12 + \log(O/H) = 8.42$ ) for PGC 38025, which follows the star formation main sequence and stellar mass - metallicity relation. We found that the ionized gas and cold molecular gas in PGC 38025 show the same spatial distribution and kinematics, whilst rotating misaligned with stellar component. The off-nuclear blue core is locating at the same redshift as PGC 38025 and its optical spectrum suggest it is H II region. We suggest that the star formation

# Линзовидная галактика PGC 38025



**Figure 1.** Optical grz composite image from DESI Legacy Imaging Surveys (Dey et al. 2019)

**Table 1.** Description of NOEMA observations

PGC 38025	
RA	12: 02: 37.195
Dec	64: 22: 29.070
Redshift	0.00505
Obs. date	2019 July 2, 4, 8 September 9, 14
Configuration	D
$N_{ant}$	9
Obs. freq (GHz)	114.692
Time on source (hr)	6.8
FoV (arcsec)	43.9×43.9
Synth. beam (arcsec)	3.86×2.96
Synth. beam (kpc)	0.40×0.31

and  $H_0 = 70 \text{ km}^{-1} \text{ s}^{-1} \text{ Mpc}^{-1}$  in this paper (Hinshaw et al. 2013).

# CALIFA+STARLIGHT (Cid Fernandez)

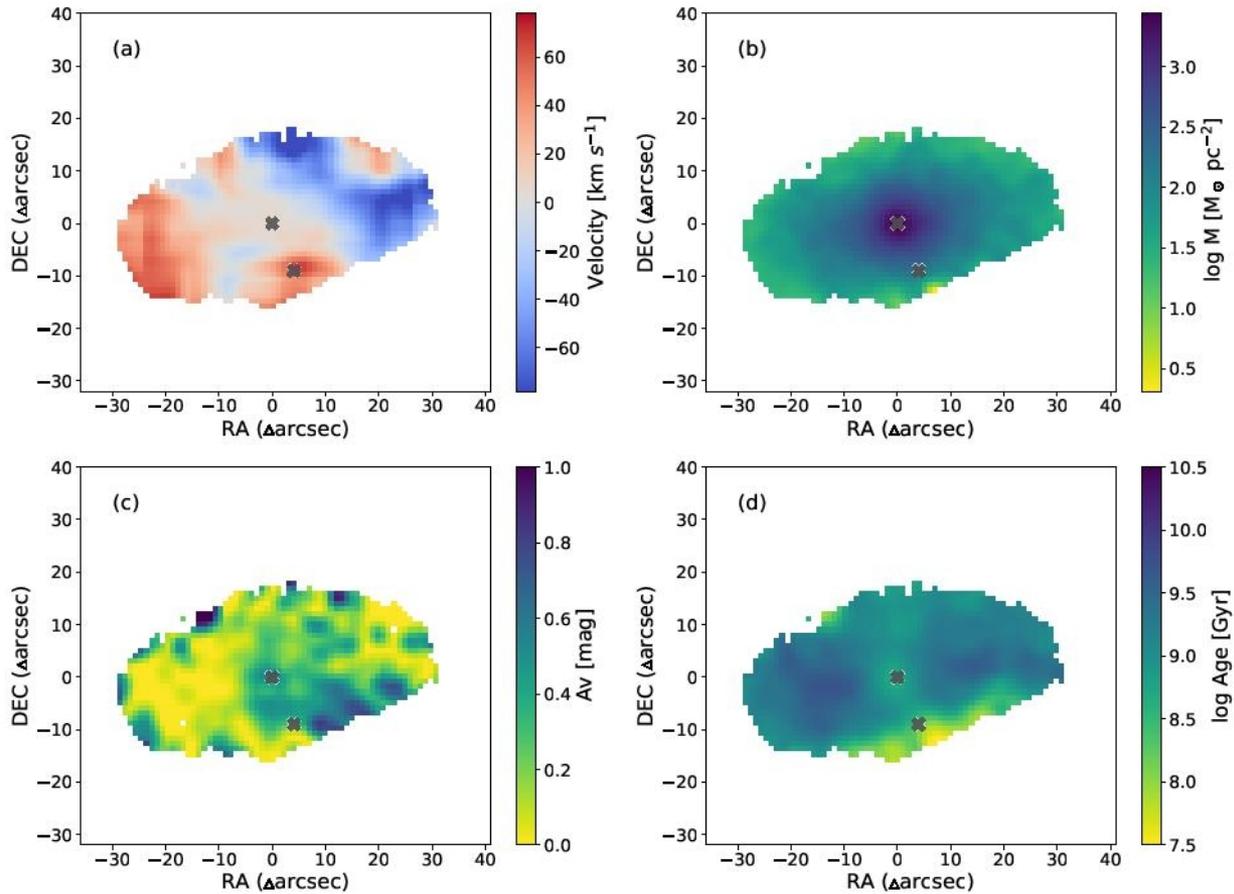


Fig. 4. Spaxel-by-spaxel stellar properties distribution of PGC 38025 derived from our stellar population anal-

# После вычитания модельного континуума – спектры ядра и сгустка

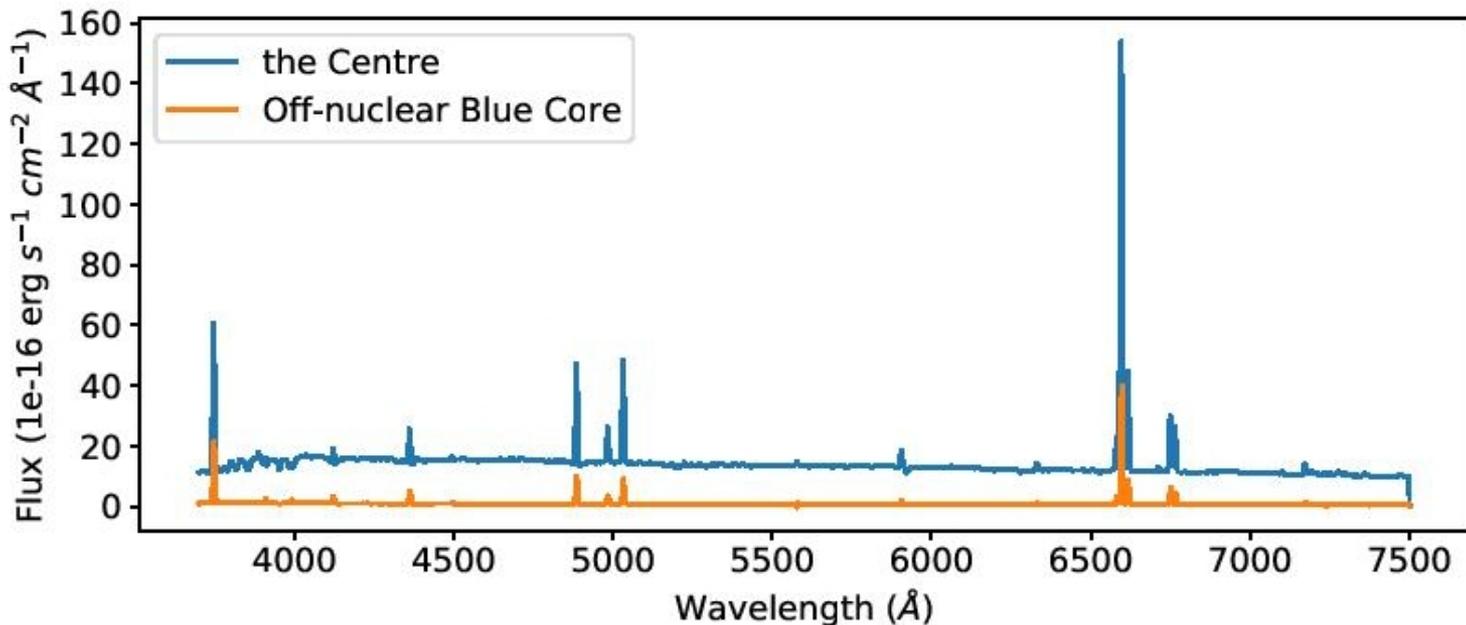
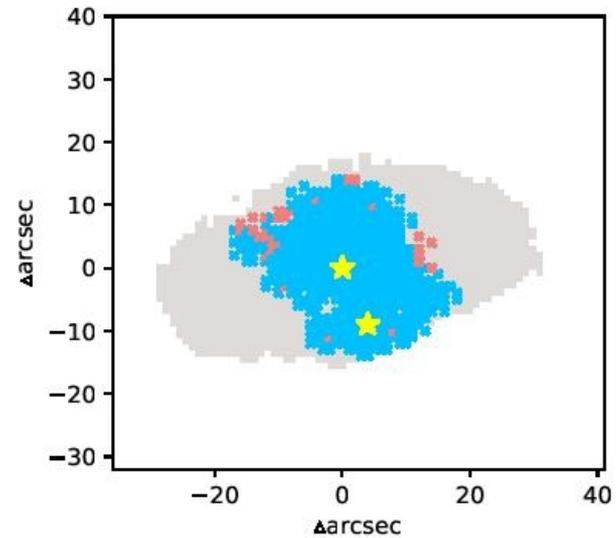
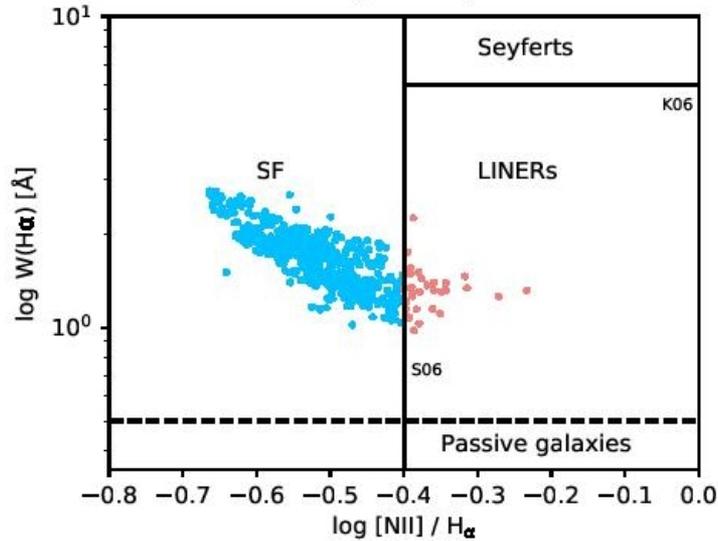
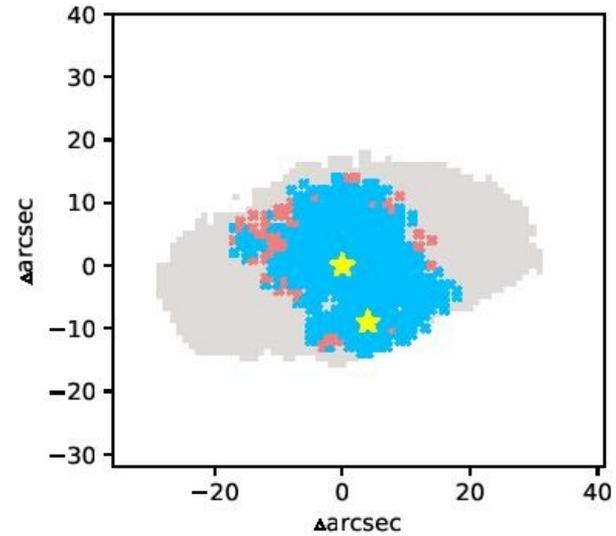
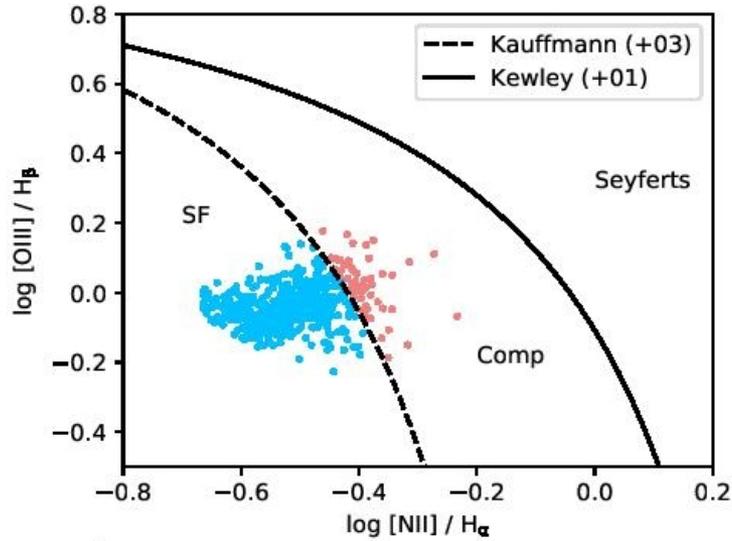
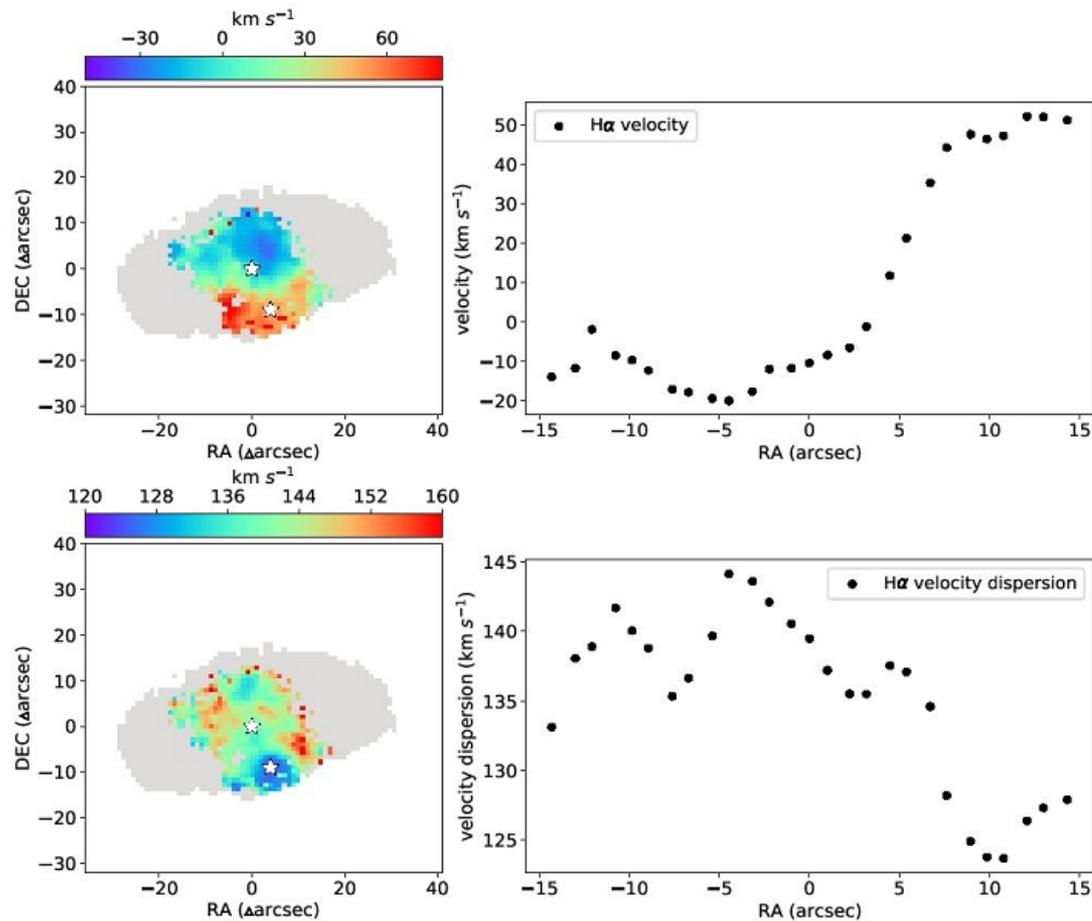


Figure 3. Optical spectra extracted from the galaxy centre (blue) and off-nuclear blue core (orange).

# VRT → Звздообразование

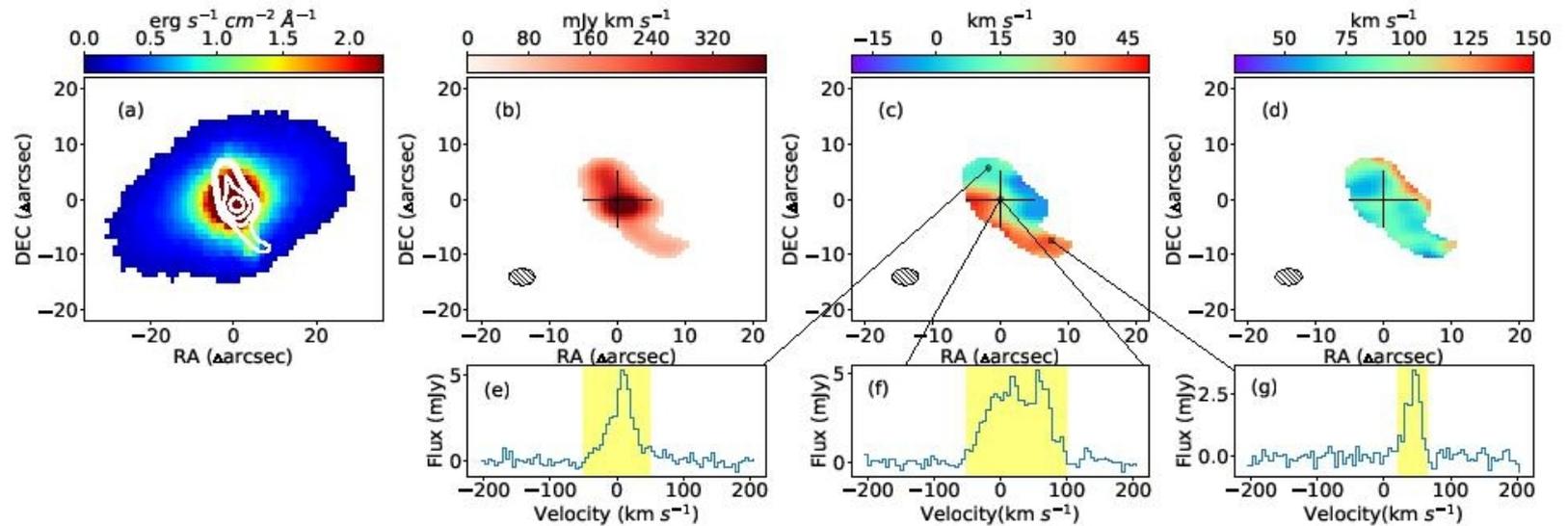


# Вращение ионизованного газа



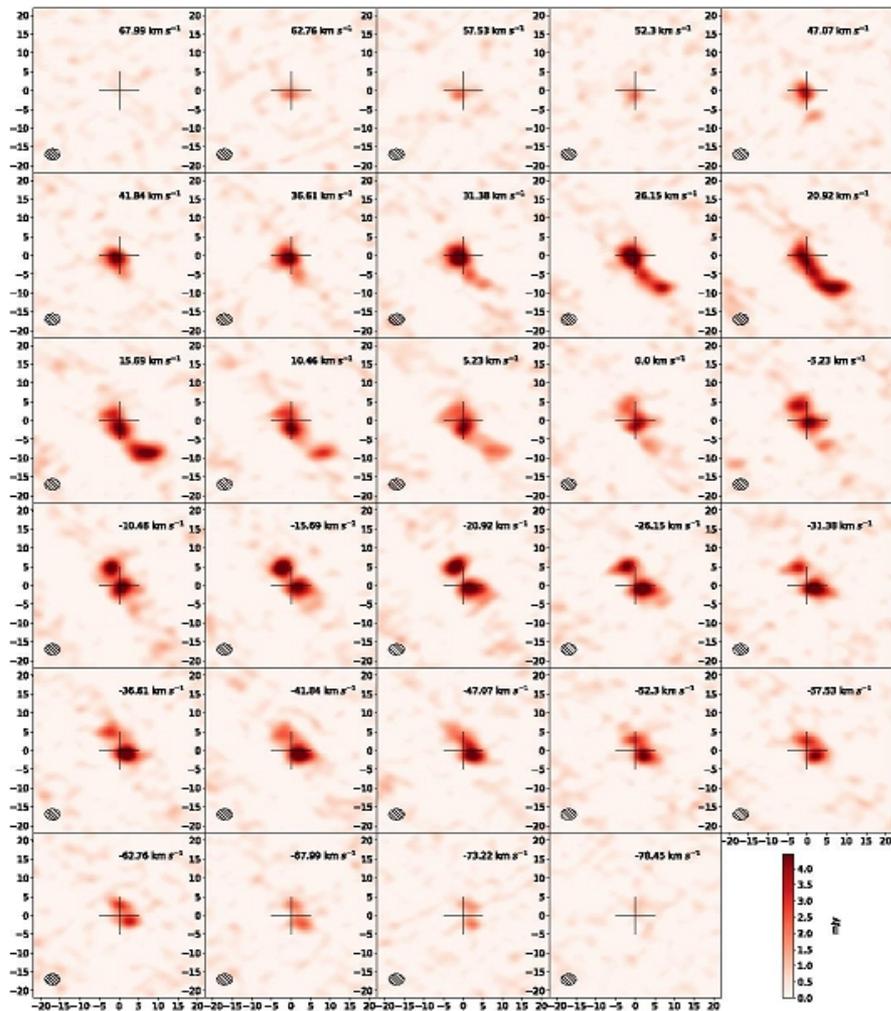
**Figure 7.** Velocity and velocity dispersion maps of ionized gas in PGC 38025. The white stars indicate the centres of PGC 38025 and off-nuclear blue core, and the red lines show pseudo-slit located at the center of PGC 38025 and tilted across the centre of off-nuclear blue core. Velocity and velocity dispersion along the red line are shown on right two panels.

# Вращение молекулярного газа



**Figure 10.** (a) The background is synthesis r-band image of CAHA observation, contour represents the distribution of CO (1-0) emission; (b) flux map (moment 0) of CO (1-0); (c) velocity map (moment 1) of CO (1-0); (d) velocity dispersion map (moment 2) of CO (1-0); (e) spectrum of point symmetric to off-nuclear blue core; (f) spectrum of centre of PGC 38025; (g) spectrum of off-nuclear blue core.

# Долго мучались с картами каналов и RV-диаграммами...



# ...пока кто-то не подсказал про Barolo

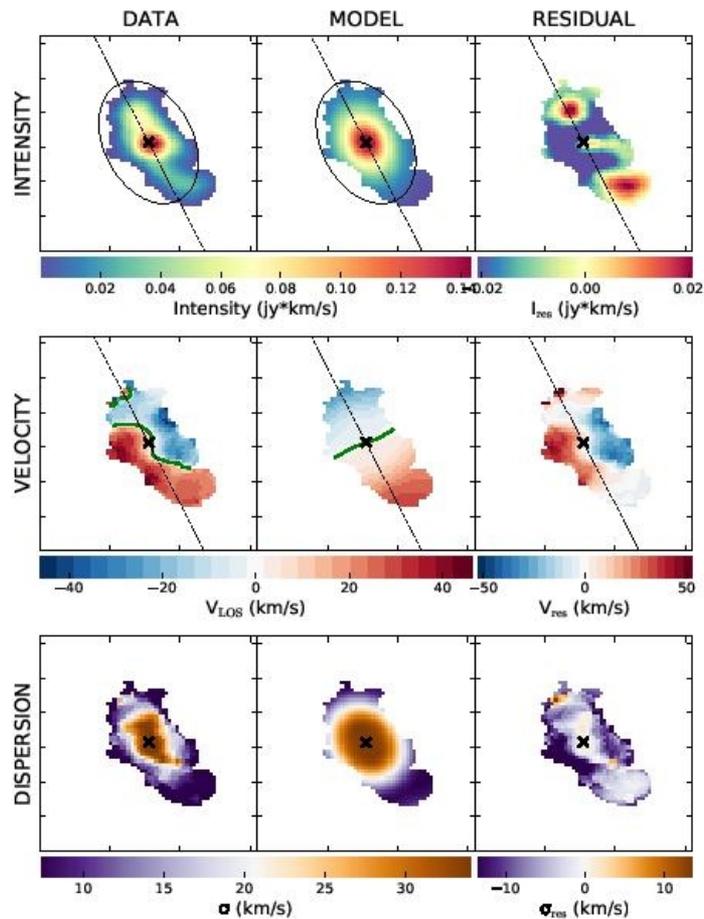


Figure 12. Moments maps of  $3^{\text{D}}$ Barolo modelling. From the upper to bottom are intensity, velocity, and velocity dispersion maps. Each row from left to right are origin, model, and residual maps.

- Главный газовый диск – полярный, с радиусом более 1 кпк.
- Совсем внутри (у них не разрешился толком) – компактный молекулярный диск в плоскости галактики, радиус меньше 300 пк

# Газа много, по SF – на главной последовательности

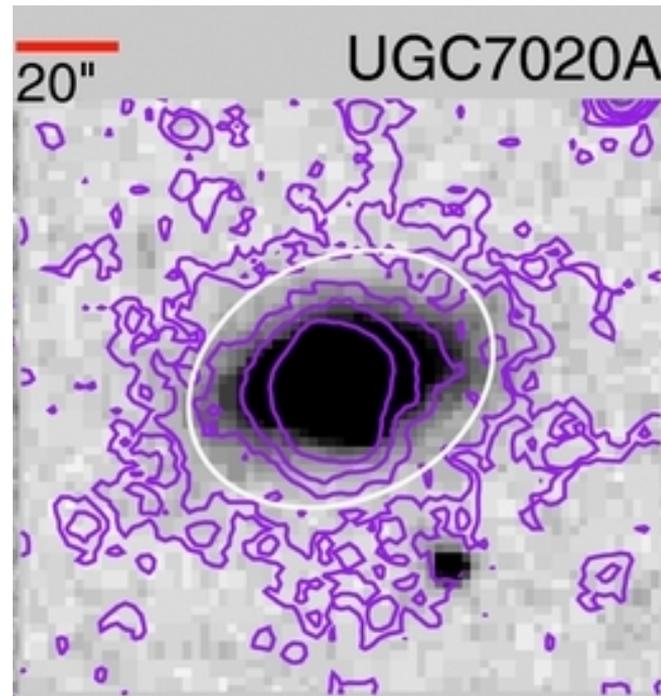
Table 4. Properties of PGC 38025

Quantity	Value	Unit	Ref.
Hubble Type	S0	–	(1, 2)
RA	12 : 02 : 37.195	–	(1)
Dec	64 : 22 : 29.070	–	(1)
Redshift	0.00505	–	(1)
Distance	21.71	Mpc	(2)
$M_{\text{stellar}}$	$1.23 \times 10^9$	$M_{\odot}$	(3)
$M_{\text{H}_2}$	$1.17 \times 10^8$	$M_{\odot}$	(2)
molecular gas fraction	9.47%	–	(2)
SFR	0.46	$M_{\odot} \text{yr}^{-1}$	(2)
$12 + \log(\text{O}/\text{H})$	8.42	–	(2)

NOTE—Reference: (1) NED, (2) this paper, (3) MPA-JHU

- По металличности газа сделали вывод, что источник аккреции – падение спутника.
- По поводу сгустка – шизофрения до конца: то это тот самый спутник, то – III-область в полярном кольце.

# От меня лично: GALEX, XUV-диск



Moffett et al. (2012)