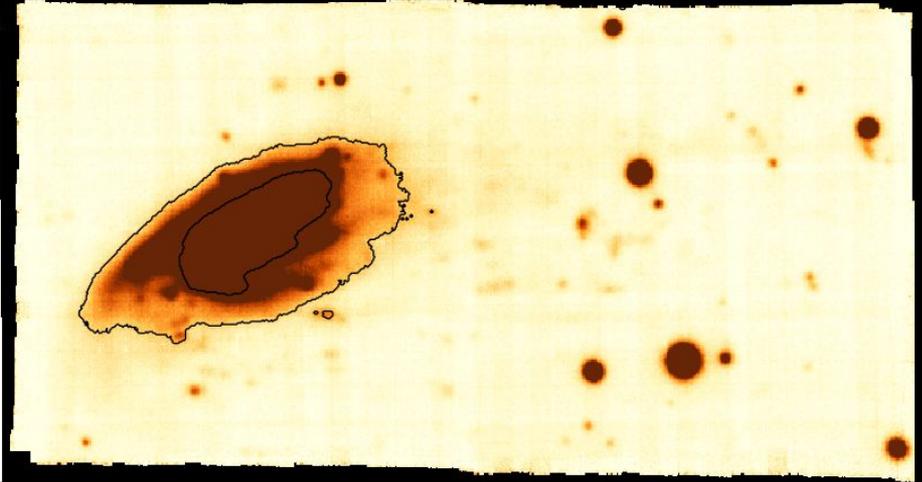
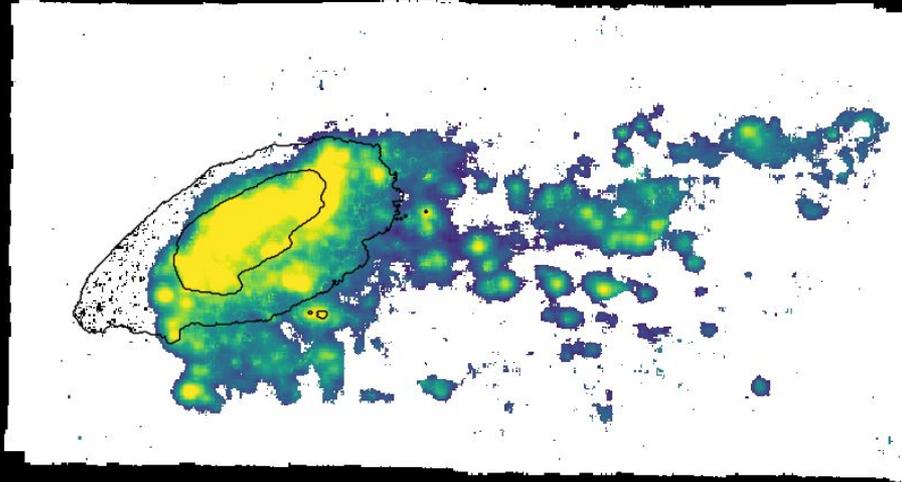


# The discovery of a ram-pressure stripping / AGN connection Ram pressure feeding super-massive black holes?



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日本語要約

# Ram-pressure feeding of supermassive black holes

Bianca M. Poggianti, Yara L. Jaffé, Alessia Moretti, Marco Gullieuszik, Mario Radovich, Stephanie Tonnesen, Jacopo Fritz, Daniela Bettoni, Benedetta Vulcani, Giovanni Fasano, Callum Bellhouse, George Hau & Alessandro Omizzolo

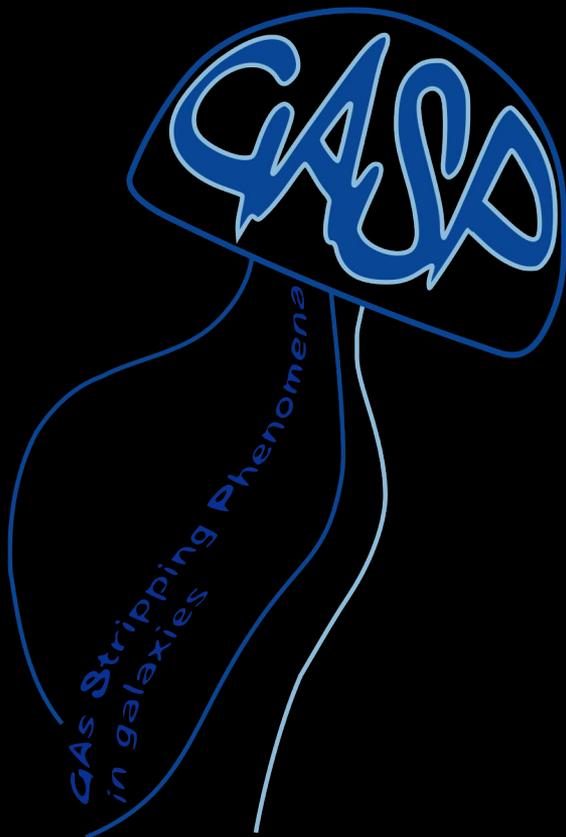
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## Gas Stripping Phenomena in galaxies

### ESO Large Programme - PI Poggianti

120h with MUSE@VLT

End of observations: ~2018

94 Gas stripping candidates (clusters/groups/field)

20 galaxies as control sample

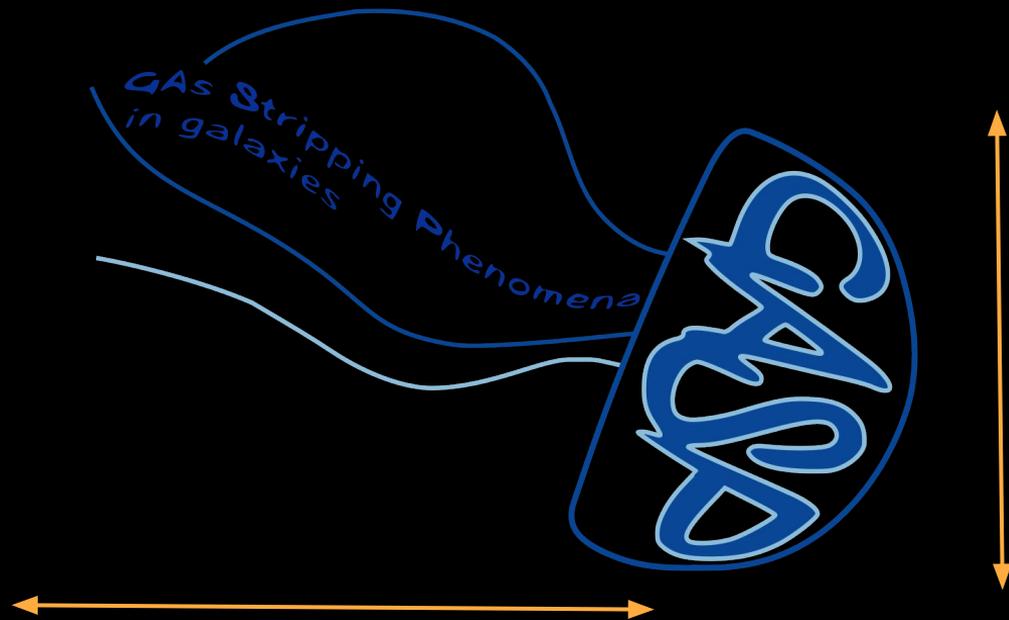
where, how, why is gas removed from galaxies?

Poggianti et al. (2017) ApJ, 844, 49

Talk by Moretti, this conf.

<http://web.oapd.inaf.it/gasp>

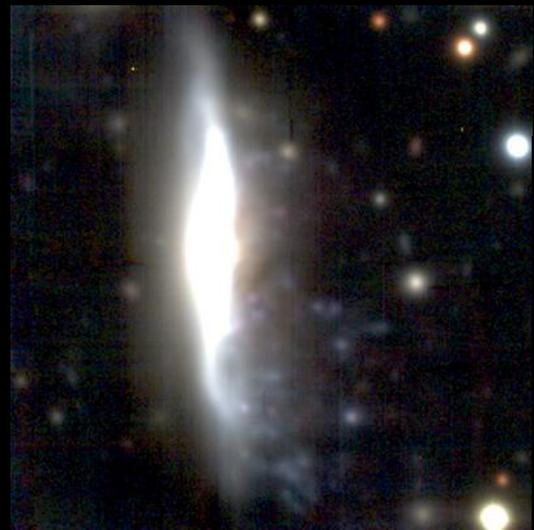
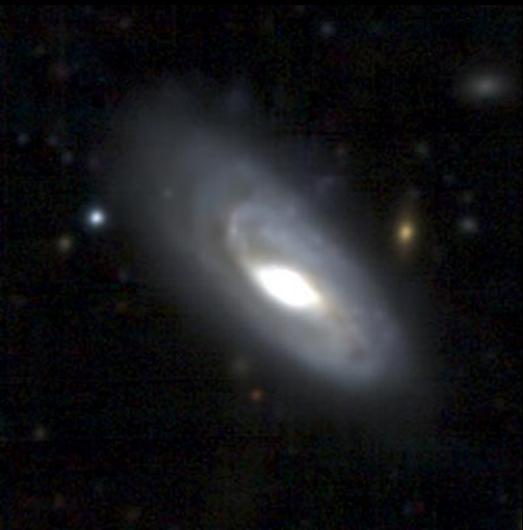
We selected extreme cases of gas stripping

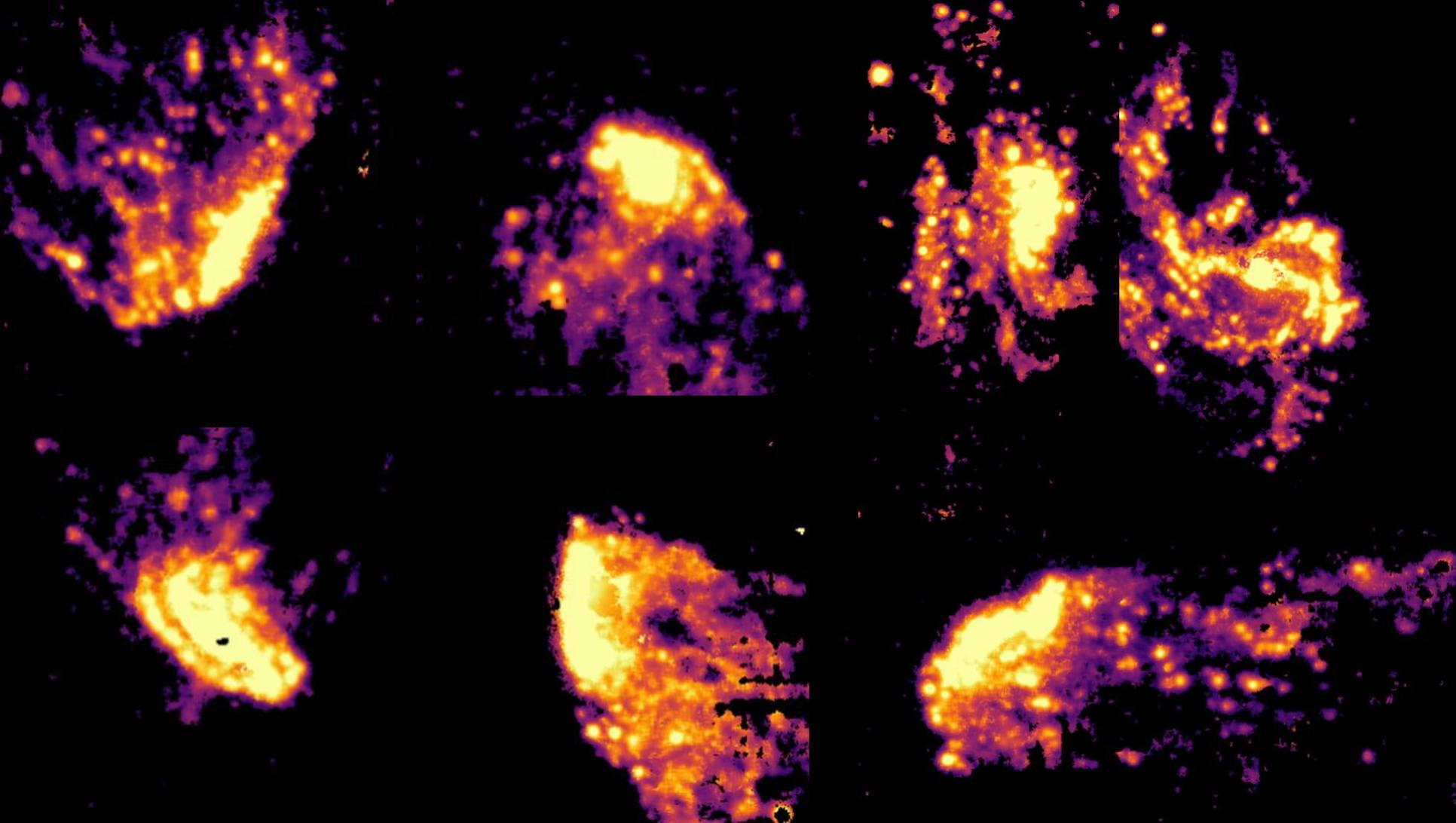


selection criterion: H $\alpha$  tentacles longer than the diameter of the stellar disk

>> 7 galaxies

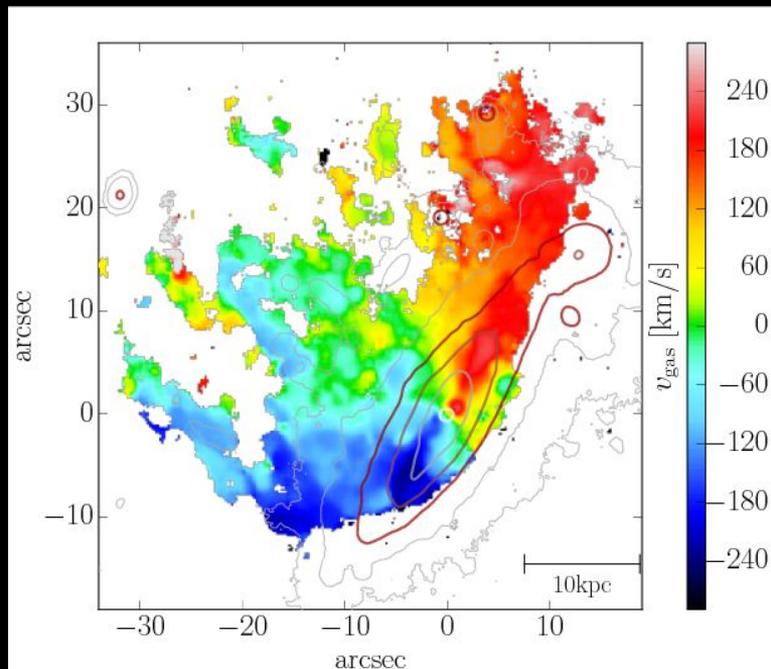
>> all massive:  $4 * 10^{10} - 3 * 10^{11}$  Msun



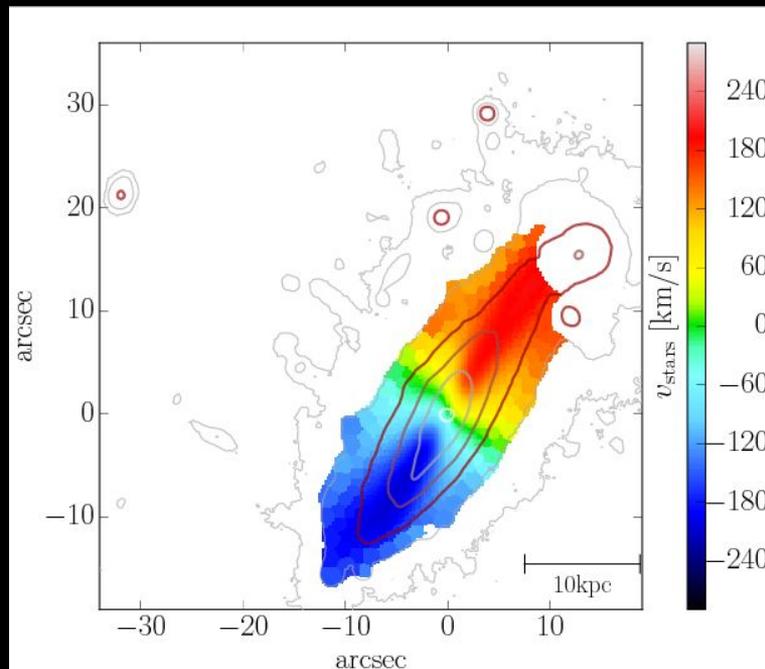


# They are ram-pressure stripped

GAS



STARS

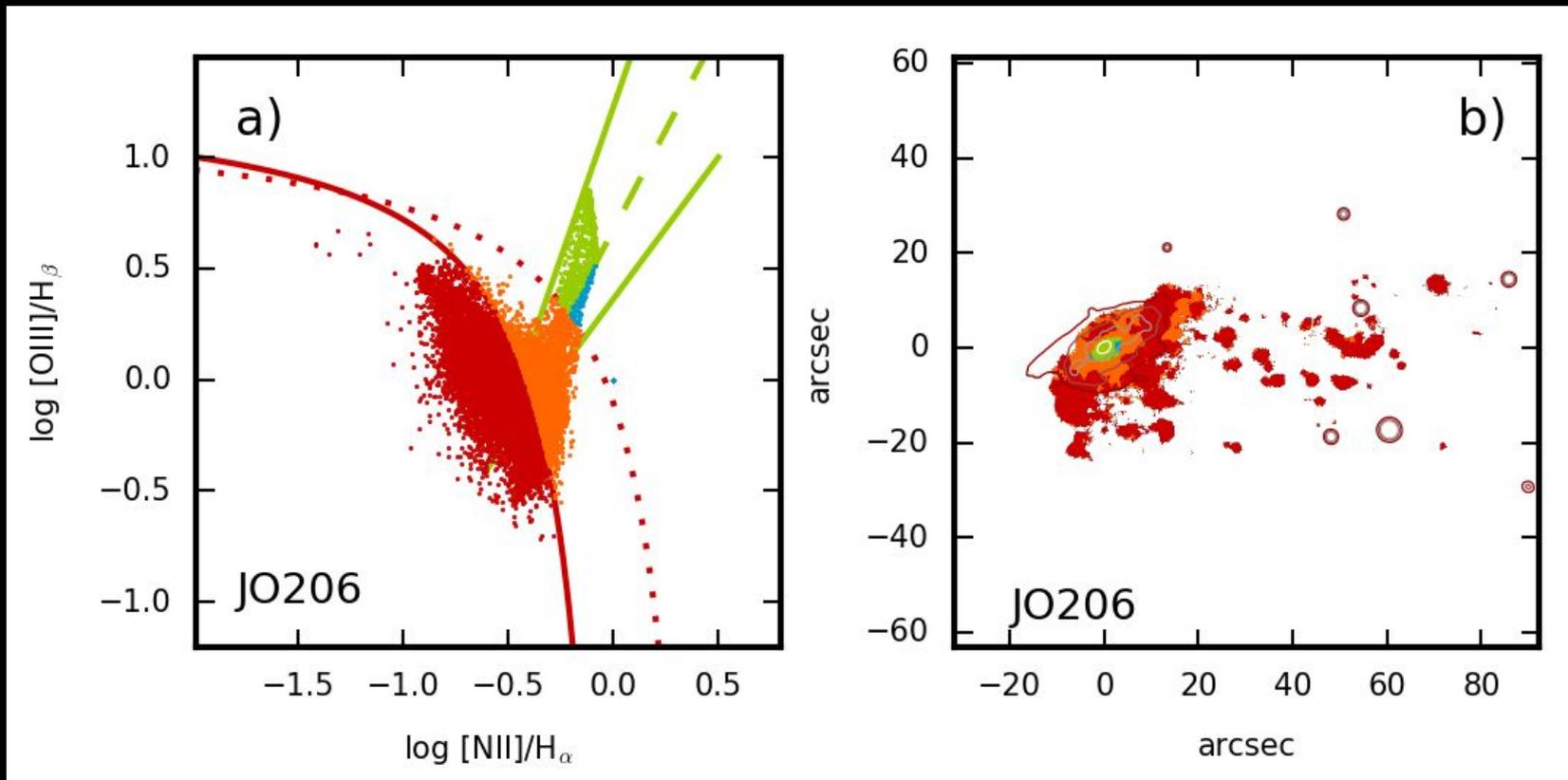


Gullieuszik et al. (2017)

The stellar component is not disturbed  
Gas-only stripping > ram-pressure

Detailed analysis for:  
JO206 Poggianti et al. (2017)  
JO201 Bellhouse et al. (2017)  
JO204 Gullieuszik et al. (2017)

BPT diagram with line ratios for each spaxel.

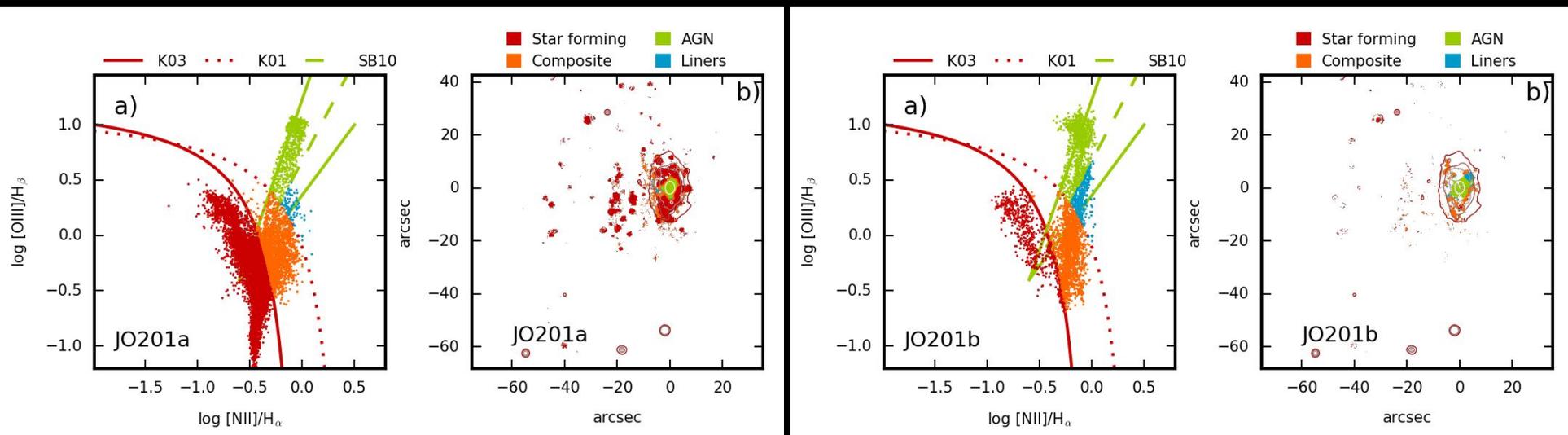


# Ionization mechanism

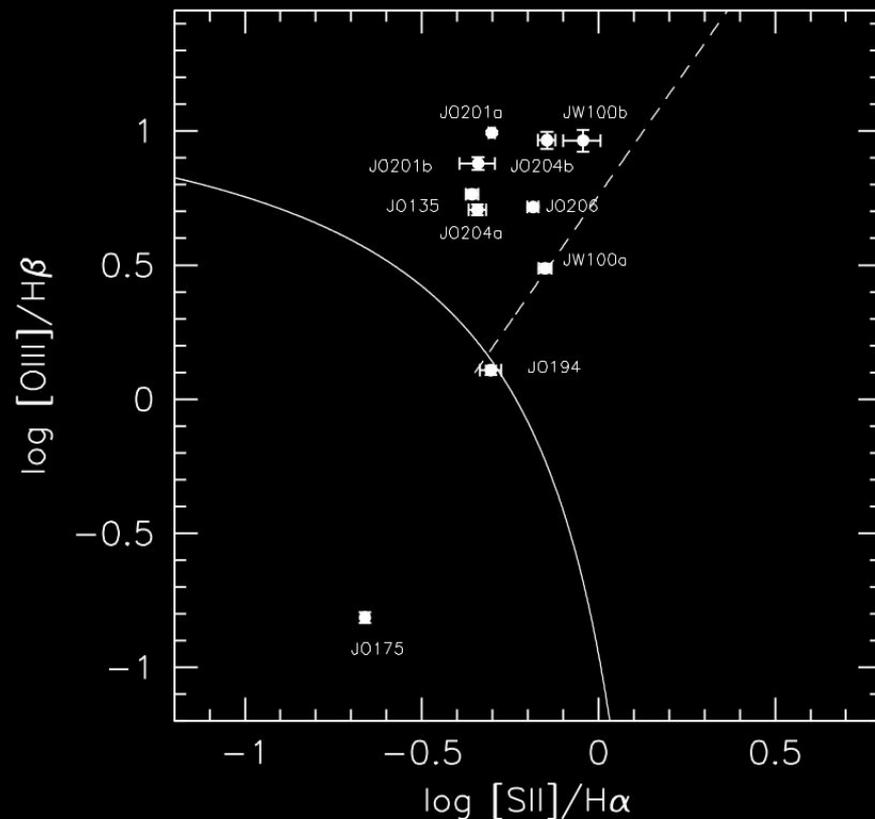
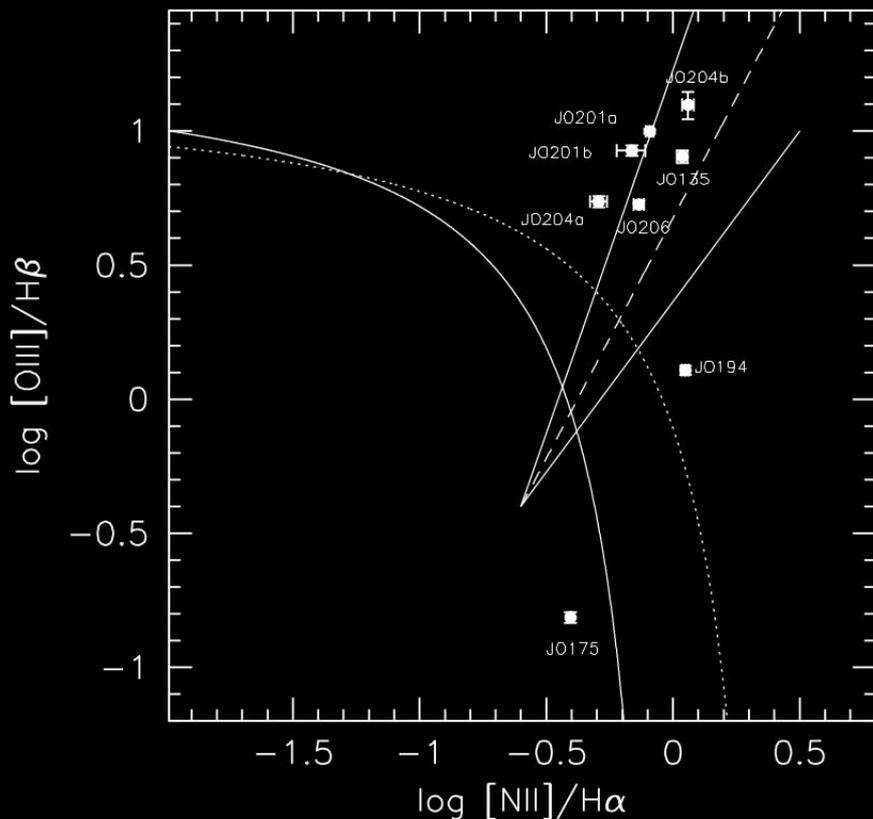
BPT diagram with line ratios for each spaxel.

JO201, JO204, JW100: gas emission lines have double peaks -> multi-component fit

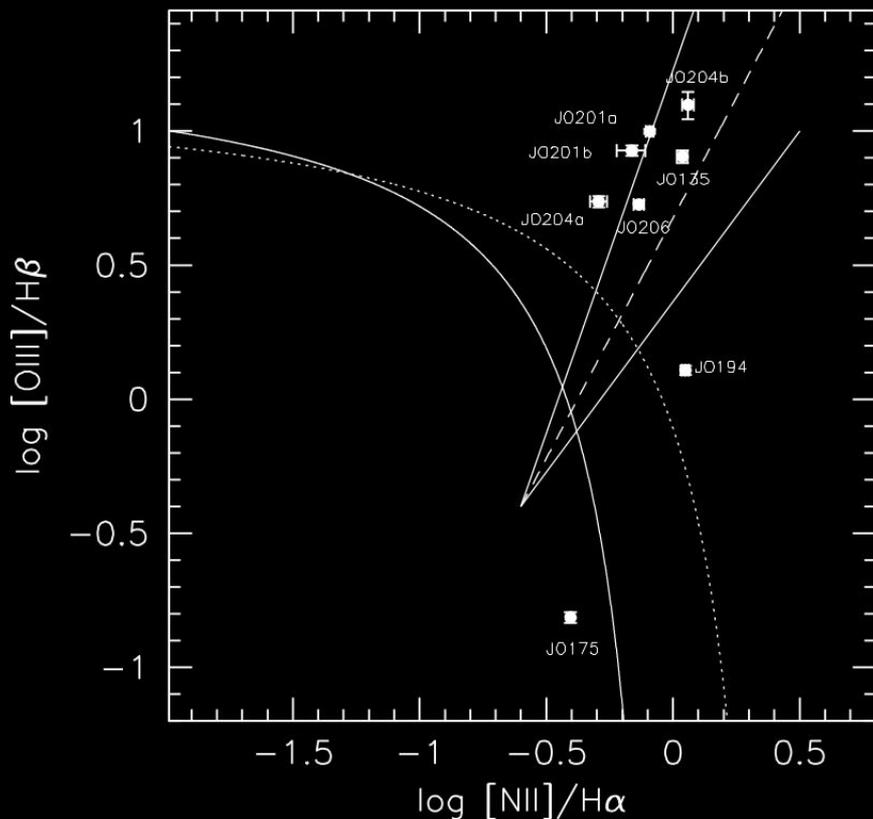
> BPT diagrams for each component



# They host an AGN



# They host an AGN



$ID_{P16}$	$M_*$ ( $M_\odot$ )	$L_X$ ( $\text{ergs}^{-1}$ , 0.3-8keV)
JO206	$1.1 \times 10^{11}$	$7.7 \times 10^{42}$
JO201	$6.7 \times 10^{10}$	$7.3 \times 10^{41}$
JO204	$4.4 \times 10^{10}$	No data
JW100	$3.2 \times 10^{11}$	$2.0 \times 10^{41}$
JO135	$1.0 \times 10^{11}$	$3.2 \times 10^{41}$
JO194	$1.6 \times 10^{11}$	$1.4 \times 10^{41}$
JO175	$3.9 \times 10^{10}$	No data

data from Wang+2016 CHANDRA ACIS survey

AGN are rare:

3% in WINGS cluster galaxies (Marziani et al. 2017)

8% in field galaxies (Brinchmann et al. 2004)

We found 6 AGN in our sample of 7 jellyfish galaxies

There must be a link between ram-pressure stripping and AGN activity.

other works are finding jellyfish galaxies with no AGN

e.g. Fossati, Gavazzi, Merluzzi

- Mass effect? Our galaxies have  $M_{\text{star}} > 10^{10} M_{\text{sun}}$

- RPS phase?

# Which came first? ram-pressure stripping or AGN?

**THE OLD CHICKEN AND EGG PROBLEM ...**



**AGN >> RPS**

AGN inject energy in the ISM  
Decrease binding energy  
Increase efficiency of RPS

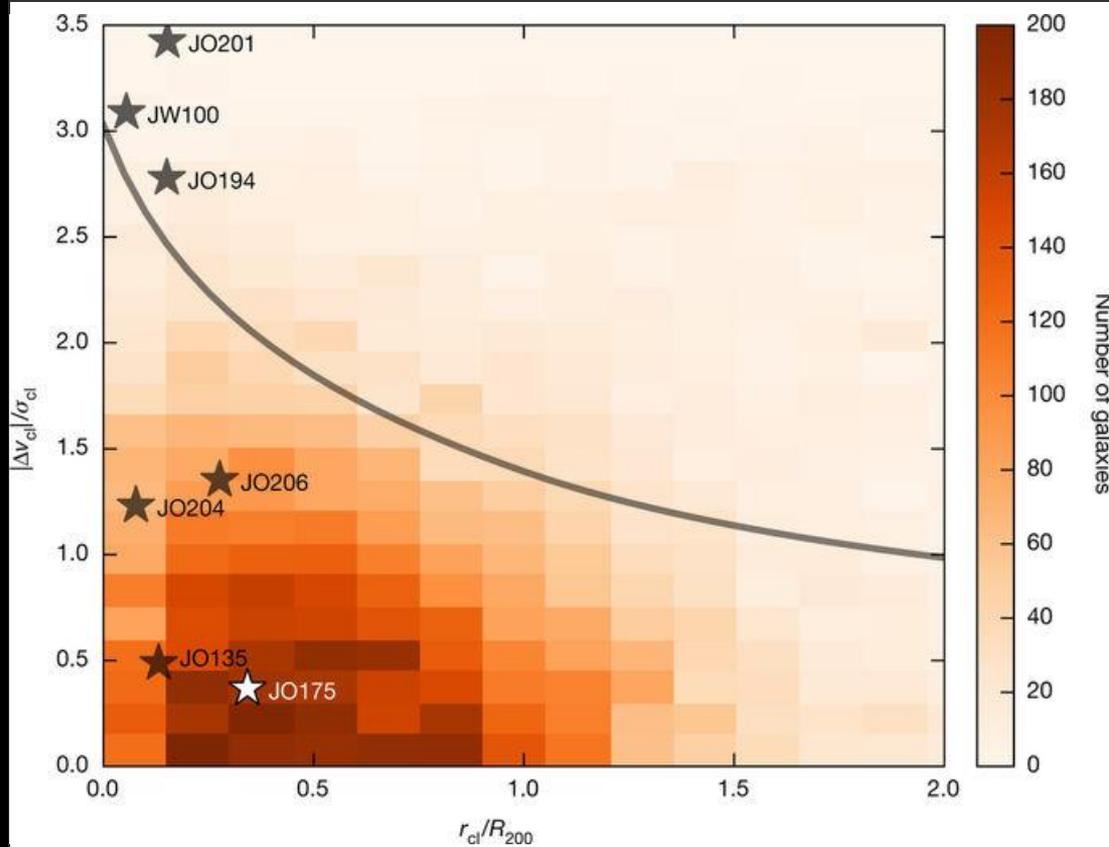
*or*

**RPS >> AGN**

RPS can bring gas toward the  
center feeding the central BH and  
triggering the AGN.

# (projected) Phase space diagram

The 7 jellyfish galaxies + all OmegaWINGS



The 7 galaxies are in the inner regions of the cluster and they move at high speed in the ICM (we measure LOS velocity!)

>> conditions are favourable for RPS

If RPS were triggered by the AGN we should have observed galaxies across the whole phase-space diagram.

# Supporting evidences for RPS/AGN connection

## Haines+2012

*“Nuclear activity may be triggered by interaction with the cluster itself, either as they pass through virial shocks, via compression of gas onto the nucleus in the early stages of ram pressure stripping, or tidal shocks as they pass through cluster pericenter.”*

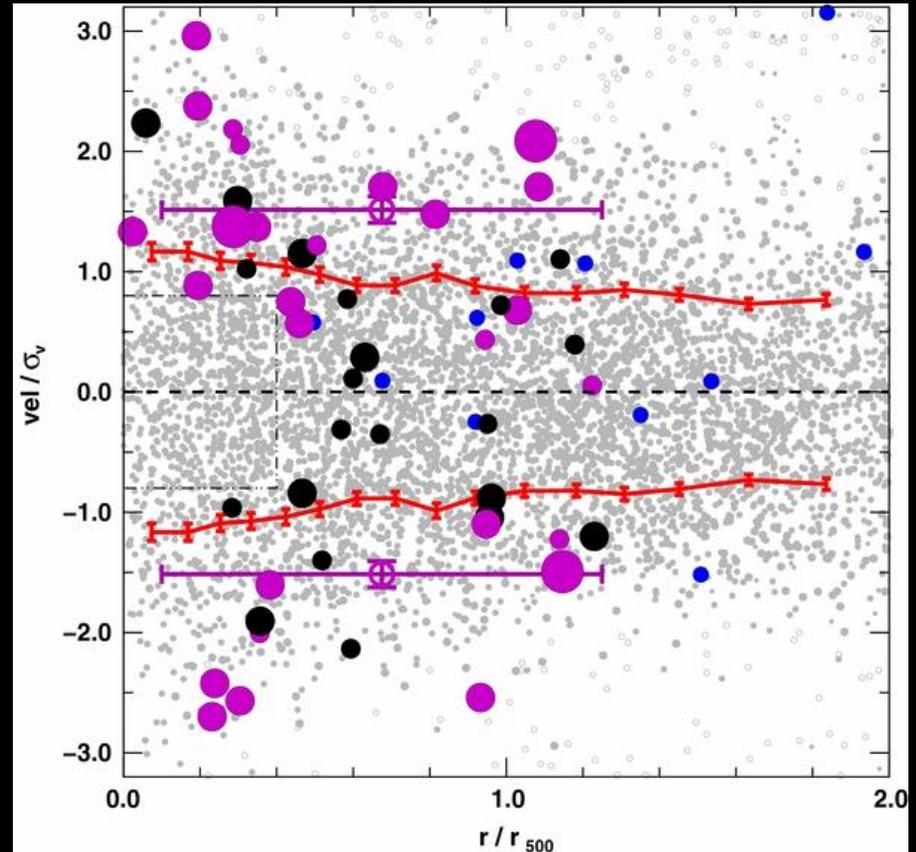
## Pimblet+2013

*“the most powerful optical AGN may reside on the cluster infall regions”*

## Ramos-Martinez+2017

MHD models show inflows induced by RPS

(see also [Marshall+2017](#))



Haines et al (2012)

**We used GASP observations to select extreme jellyfish-galaxies**

**>> the only criterion is “*the tail of stripped gas is at least as long as the diameter of the stellar body of the galaxy*”**

**We found 7 extreme jellyfish galaxies**

**In all of them we found that the stripping is due to ram-pressure**

**6 of them host an AGN ( based on BPT diagram + X-ray emission )**

**We strongly suggest that the high incidence of AGN among jellyfish galaxies may be due to ram-pressure causing gas to flow toward the center and triggering the AGN.**

Background image: Abell 85 ( and JO201).  
BV WFI@ESO2.2m (WINGS survey)  
NUV from UVIT-ASTROSAT (K. George)