HST view of star-forming clumps in jellyfish galaxies

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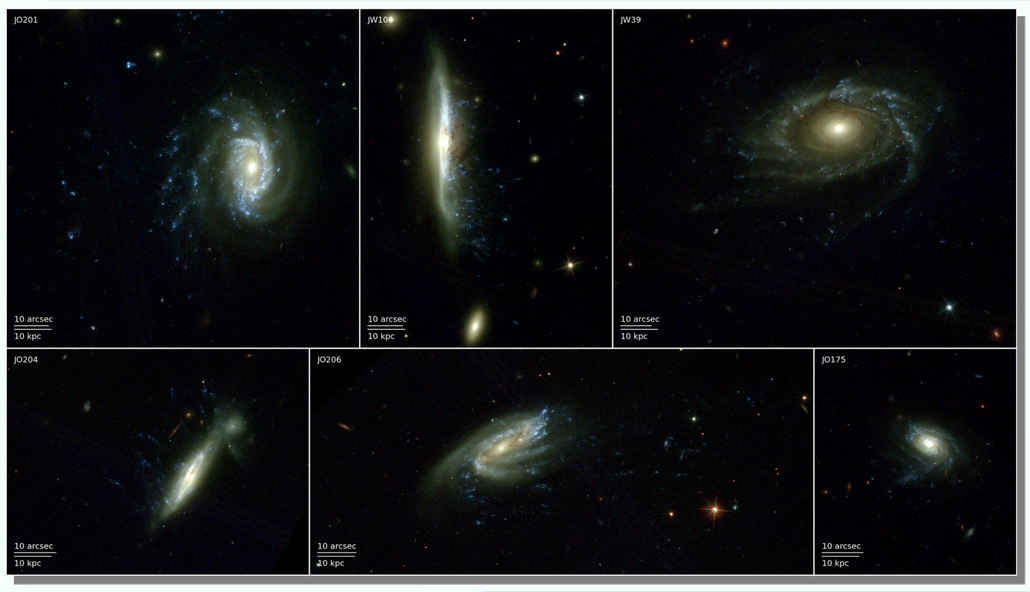
INTRODUCTION

Young stellar clumps with **ongoing star formation** are found in the tails of galaxies undergoing intense **ram-pressure stripping** (**RPS**) in galaxy clusters (so-called **jellyfish galaxies**). These clumps offer a unique opportunity to study the star formation process in the absence of an underlying disk and embedded within the **hot intracluster medium**. Such extreme environment is similar to the one occurring at redshift z>2. Unveiling if and how the **star-formation process** is ***influenced by the surrounding environment*** is fundamental to understand which are its **driving mechanisms**.



DATA

- **HST** images of **6 jellyfish galaxies** at z≈0.05, in four broad-band filters (**UV to I**) and one narrow-band **Hα** filter.
- Detection of **star-forming clumps *inside*** and ***outside*** the galactic disks.

High number of detected clumps
+
High spatial resolution of HST (≈70 pc)

→

- **statistical study** of the sample (luminosity and size distribution function, luminosity-size relation)
- analysis of their **morphological properties** in relation to the environment.

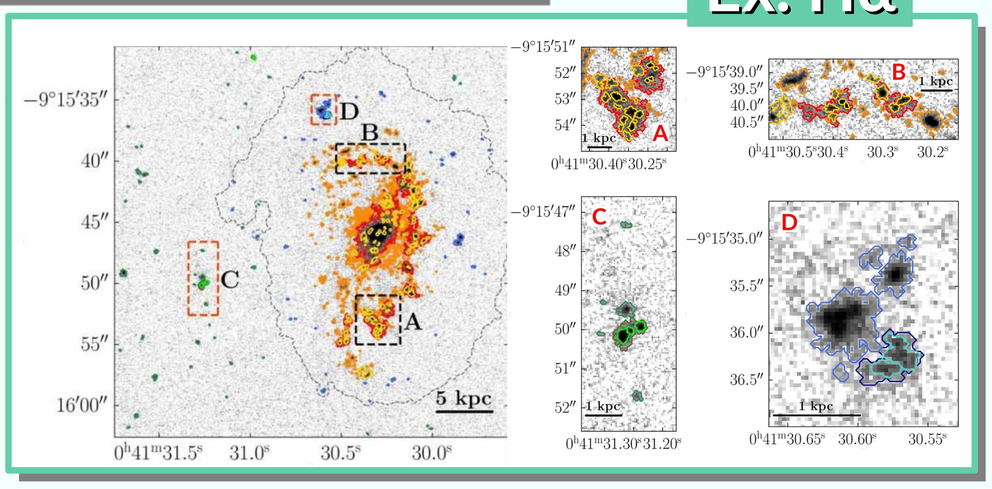
DETECTION

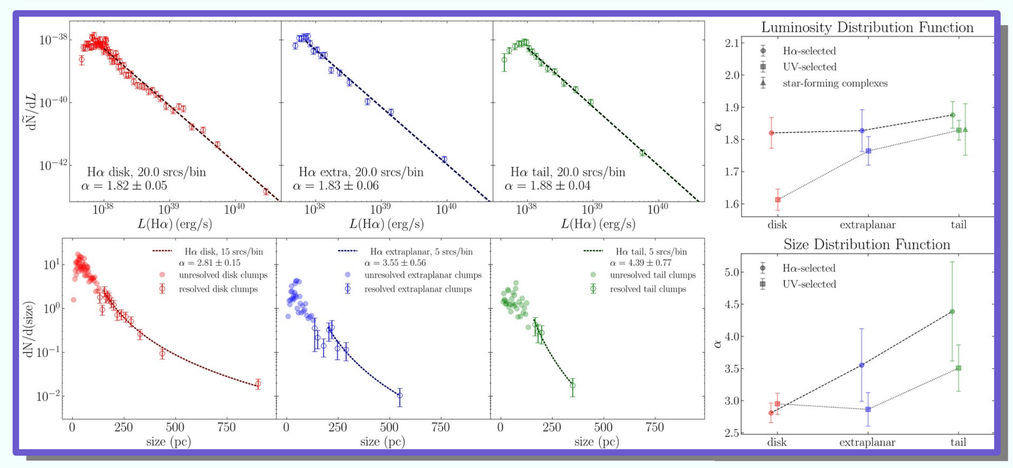
Clumps detected independently in **Hα** and **UV** (F275W), and divided in ***spatial categories*** (**disk**, **extraplanar** and **tail**) to study the effects of RPS and environment.

We detect **optical complexes** (F606W), in **tails**, to trace the **stellar component** formed from the stripped gas.

2406 Hα
3750 UV
424 OPT

Ex. Hα





LUM. AND SIZE DEFINITION

1) LUMINOSITY: total luminosity within the clump.
2) SIZE: twice the geometric mean of the major and minor sigma defined by the **second moments** of the **surface brightness distribution**, corrected for the point-spread function (PSF).
If **size > FWHM(PSF)**, then the clump is assumed ***resolved***.

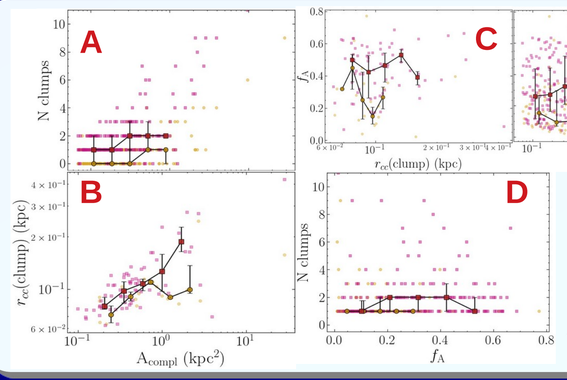
DISTRIBUTION FUNCTIONS

LUMINOSITY (LDF)

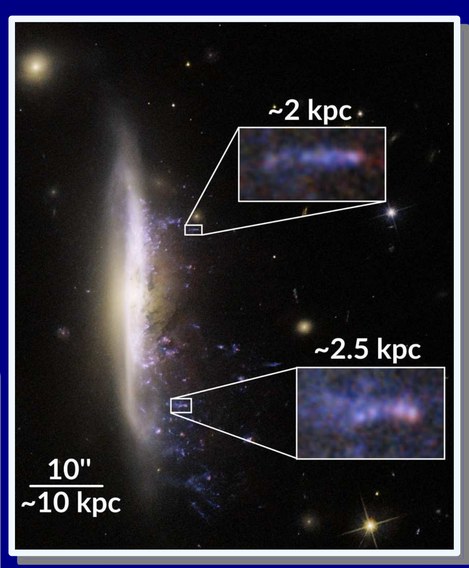
- Fitted by a **single power-law**. Hint of a plateau in the disk LDF.
- **Slope** usually within **1.8-1.9**, consistent with previous observations and theoretical results (slope ≈2) for a ***scale-free regime driven by turbulence***.
- **Hα** slopes slightly **larger** than **UV** and **optical** slopes.

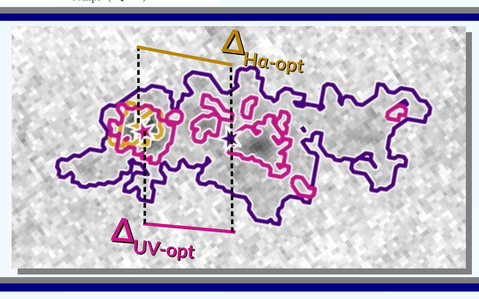
SIZE (SDF)

- Fitted by a **single power-law**.
- **Slopes** span a range **from 2.9 to 4.4**;
- Disk slope > tail slope. According to literature, that suggests the **disk clumps** to be ***more clustered*** than those in the tails;
- **Hα** slopes **larger** than **UV** slopes.



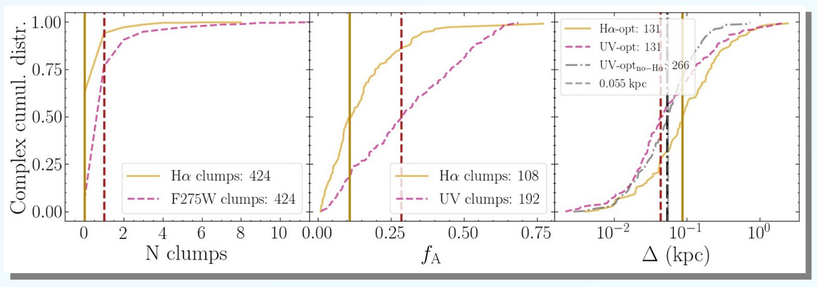
Clumps in large complexes are **more numerous** (**A**) and **larger** (**B**) than those in small complexes, in such a way that the complex **filling factor** (f_A) is **independent** on these parameters (**C** and **D**) and therefore the area of the complex A_{compl} (**E**).





FIREBALLS

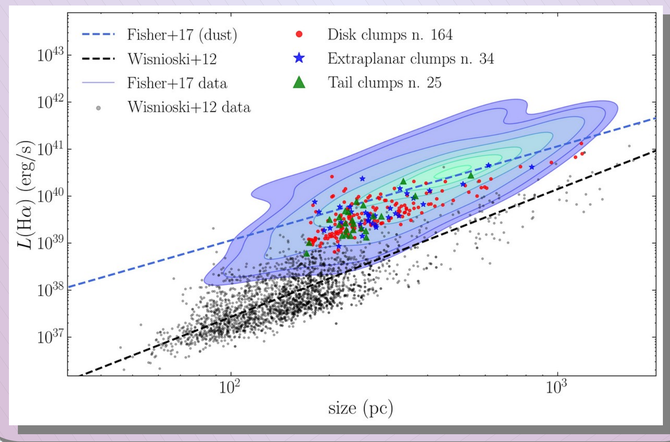
As also previously observed, tail **Hα** and **UV** clumps tend to be displaced on one side of the host **complex**, with younger stars (**Hα**) **farther** from the disk (particularly evident in **RGB images**).



- *Number of clumps* N_{clumps}: most complexes contain no or **at most one Hα** clump and **one or two UV** clumps.
- *Filling factor* f_A: **UV** clumps **better fill** the host complex than **Hα** clumps.
- *Center displacement* **Δ**: **Hα** clumps are **more displaced** than **UV** clumps with respect to the center of the host complex.

LUM.-SIZE RELATION

- **Slope ≈2** for **disk** and **extraplanar** clumps. According to previous observations, such slope is found in clumps with **high *surface density SFR***.
- We find **no remarkable difference** among clumps of different ***spatial categories***.
- Our clumps **compatible** with those observed in **Starburst galaxies** (DYNAMO), suggesting an **enhanced Hα luminosity** at a given size with respect to clumps in Main-Sequence galaxies.



MORPHOLOGY

CONCLUSIONS

- Evidence of clumpy **ongoing star formation** in the **tails** of stripped gas in **jellyfish galaxies**.
- The *star-formation driving mechanism* is likely to be **turbulence**, regardless of the environment.
- The clump **Hα luminosities** are **enhanced** with respect to Main-Squence galaxies.
- In the **tails**, the number and size of clumps increase with the size of the host optical complex. In general, UV clumps are more numerous and larger than Hα clumps.
- Evidence of the ***fireballs***: the *different generations* of stars are **spatially displaced** from one to the others, with young stars located farther from the disk the old ones.

ONGOING WORK

Using the results by *Werle+23*, we got **masses** and **ages** of the clumps, that we will use to study the ***mass function*** of the clumps by means of a Bayesian fit.

Using mock observations, we are ***validating*** the inferred values for the clump masses and the mass ***completeness*** of the sample.

The results will confirm if these clumps form according to a ***turbulent cascade***, just like clumps in main sequence galaxies.