

# Mid-IR counterpart of radio-loud AGN-hosting-BCG

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# Overview of quick presentation

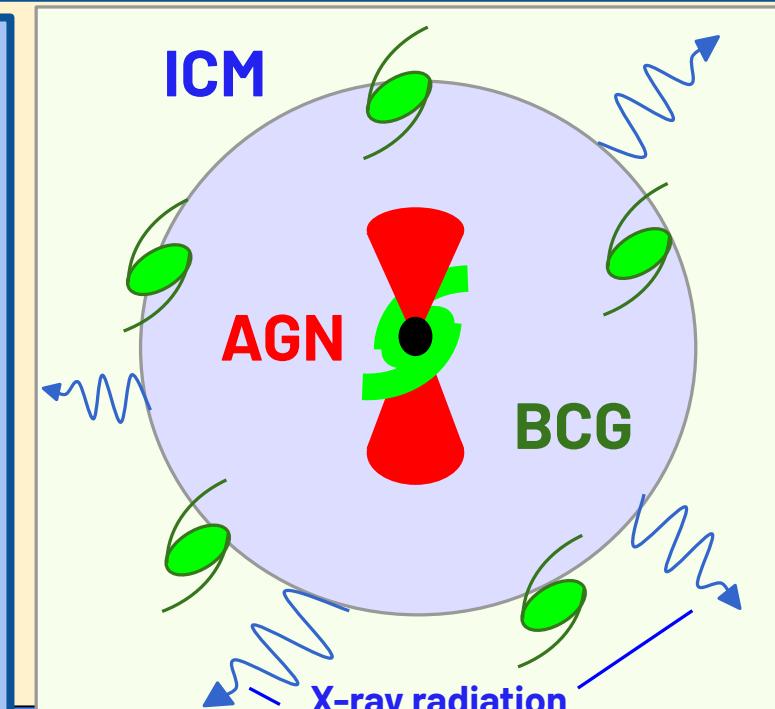
- **Background**
  - A brief explanation on my project
- **Motivation from JWST**
  - A scientific goal to JWST data with my project
- **What (had) I done.**
  - Results

# Background: a brief review

Brightest cluster galaxy (**BCG**)  
is:

- A central member of galaxy cluster
- Unlike typical galaxies, a BCG is inside **intracluster medium (ICM)**.
- An hot gas ICM can interact with BCG in various ways, including an active galactic nuclei (**AGN**)

(“AGN-hosting-BCG”)

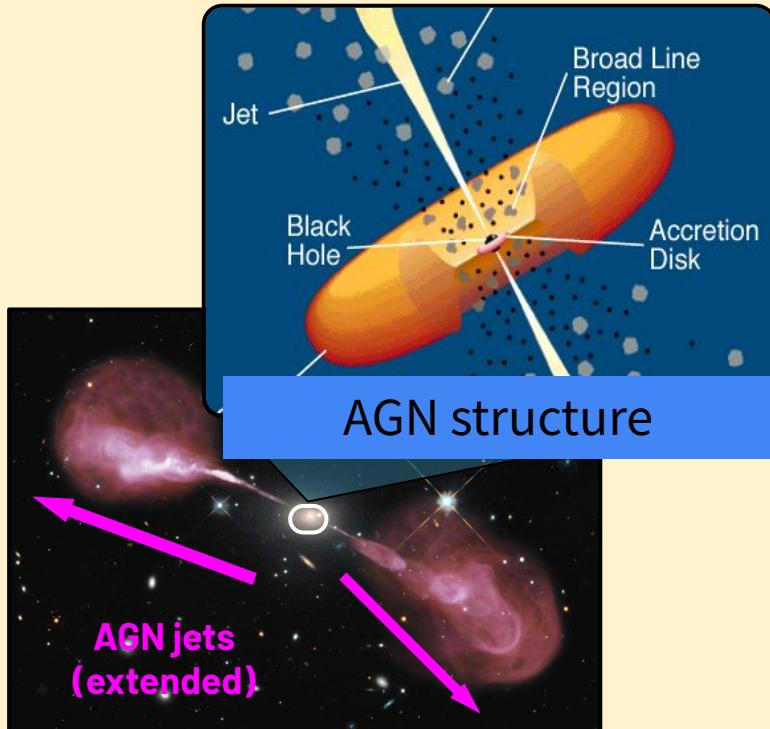


Simplify diagram for AGN-hosting-BCG

# Background: a brief review(2)

## Radio-loud active galactic nuclei (AGN) is:

- A supermassive blackhole at centre of BCG that become “active” / shooting out relativistic jet
- Synchrotron radiation makes the jet radio-brighted (“loud”).



Kinematic mode/  
Radio-loud- AGN

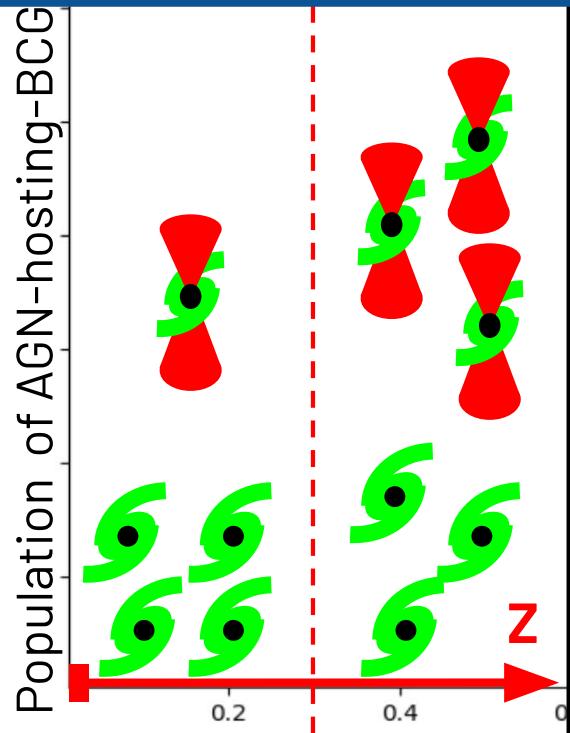
# AGN-hosting-BCG study

The study begin with a question:

**“How does the population of radio-loud AGN-hosting-BCG evolve with time”**

To achieve this:

- We use BCG catalog<sup>1</sup> (ra, dec, redshift<sup>2</sup>) to find radio brighted source in 1.3675 GHz mid-RACS<sup>3</sup> (radio wavelength survey)



AGN-hosting-BCG diagram

cite : <sup>1</sup>Bleem et al. (2015), <sup>2</sup>Bocquet et al. (2019),

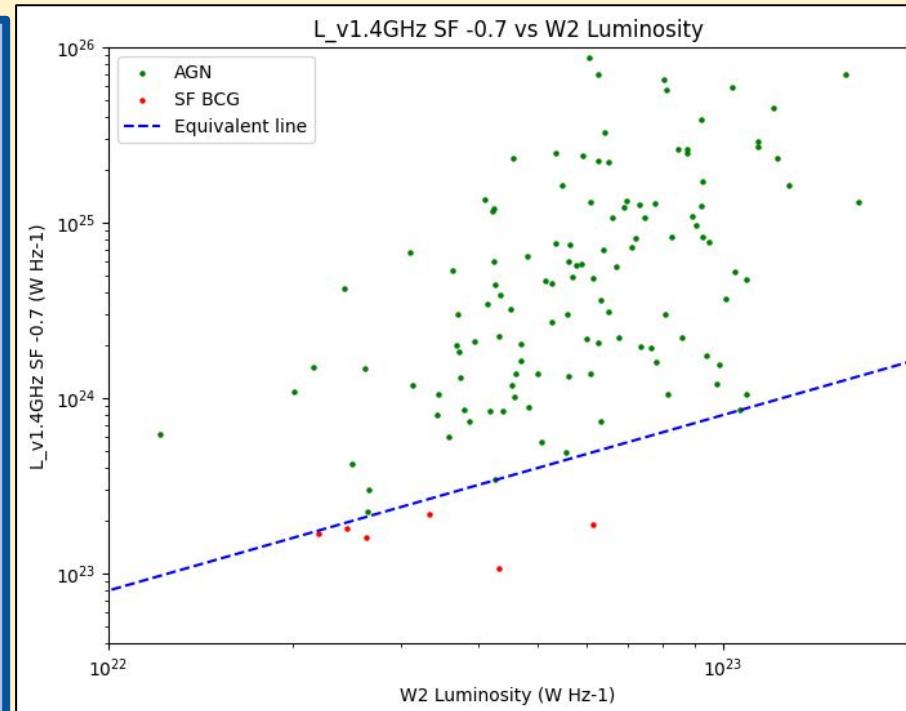
<sup>3</sup>Duchesne et al. (2023)

# AGN-hosting-BCG study result

- To distinguish between star forming galaxy and radio-loud AGN >>
  - We use WISE band 2 luminosity<sup>1</sup> as a part of finding AGN.

>> We now know which one is AGN or star-forming BCG.

>> **Have a quick look in NIRCam!**



cite : <sup>1</sup>Paper in prep.

AGN-hosting-BCG diagram

# Motivation from JWST

Target name:

- SPT-CL0404-4418

Redshift:

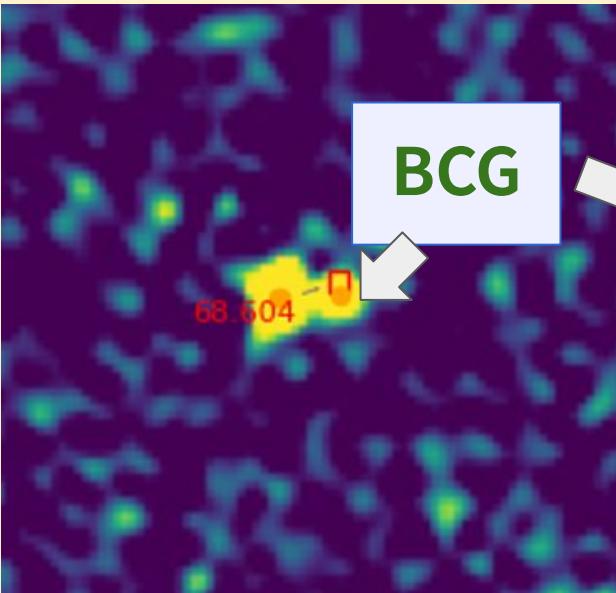
- 0.8

Data from proposal:

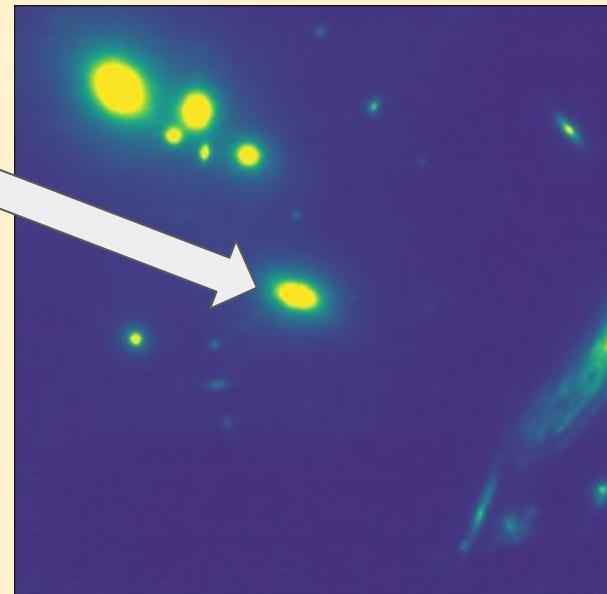
- 5594

Science goal:

- **Find basic properties of this BCG!**

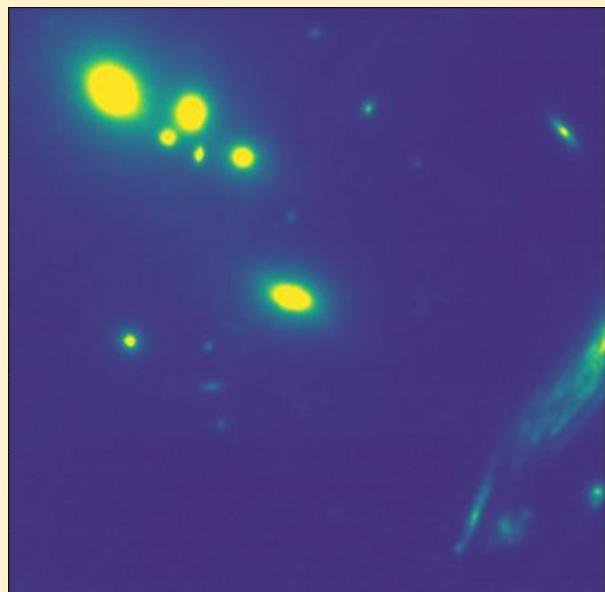


RACS-mid (1.4 GHz radio)



NIRCam Fw150W2  
(long wavelength IR)

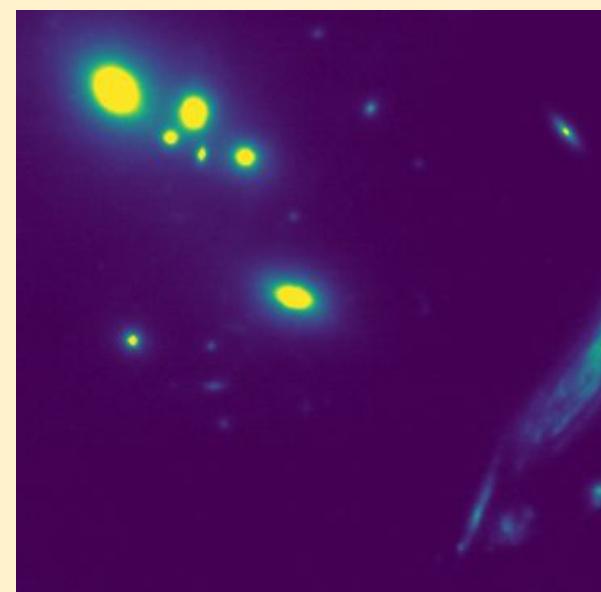
# What (had) I done: result



Stage 3 (sci product)



Background



Background-subtraction

- Package use: photutils -> Background2D, MedianBackground

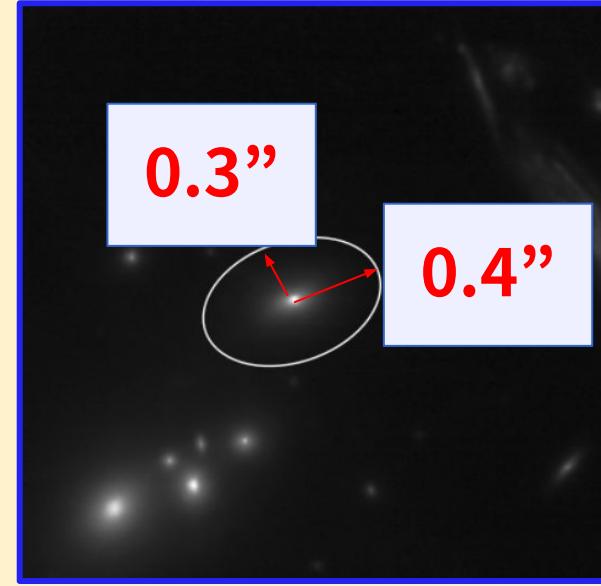
# What (had) I done: result (2)

BCG parameters:

- Semimajor = 0.412 arcsec
- Semiminor = 0.273 arcsec
- Eccentricity = 0.75



Segmentation



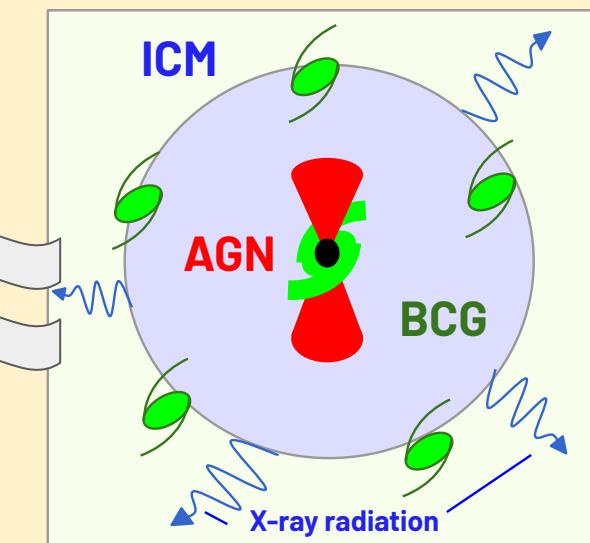
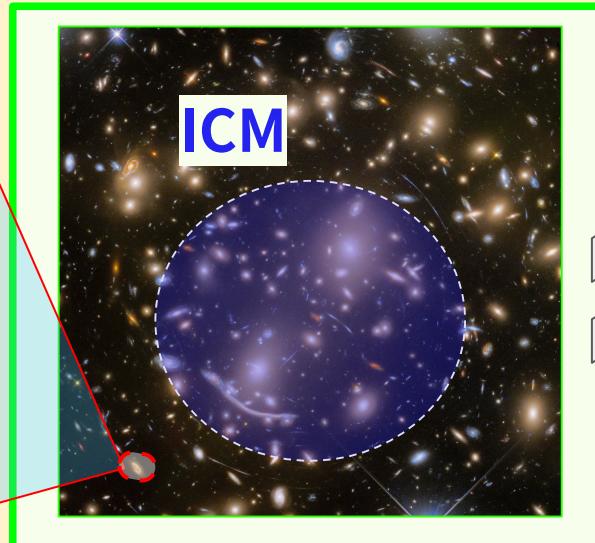
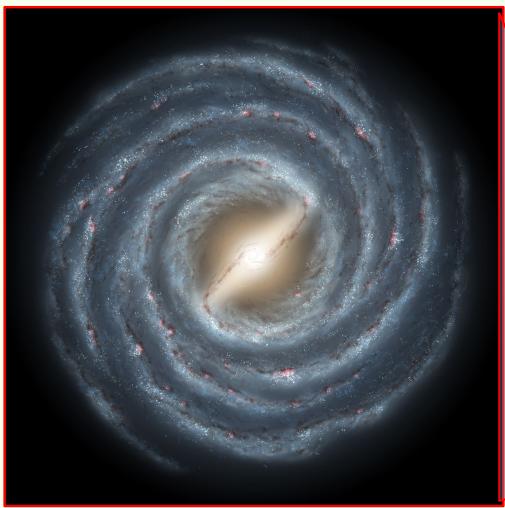
Kron radius

- Package use: photutils ->source finding

# **End of presentation**

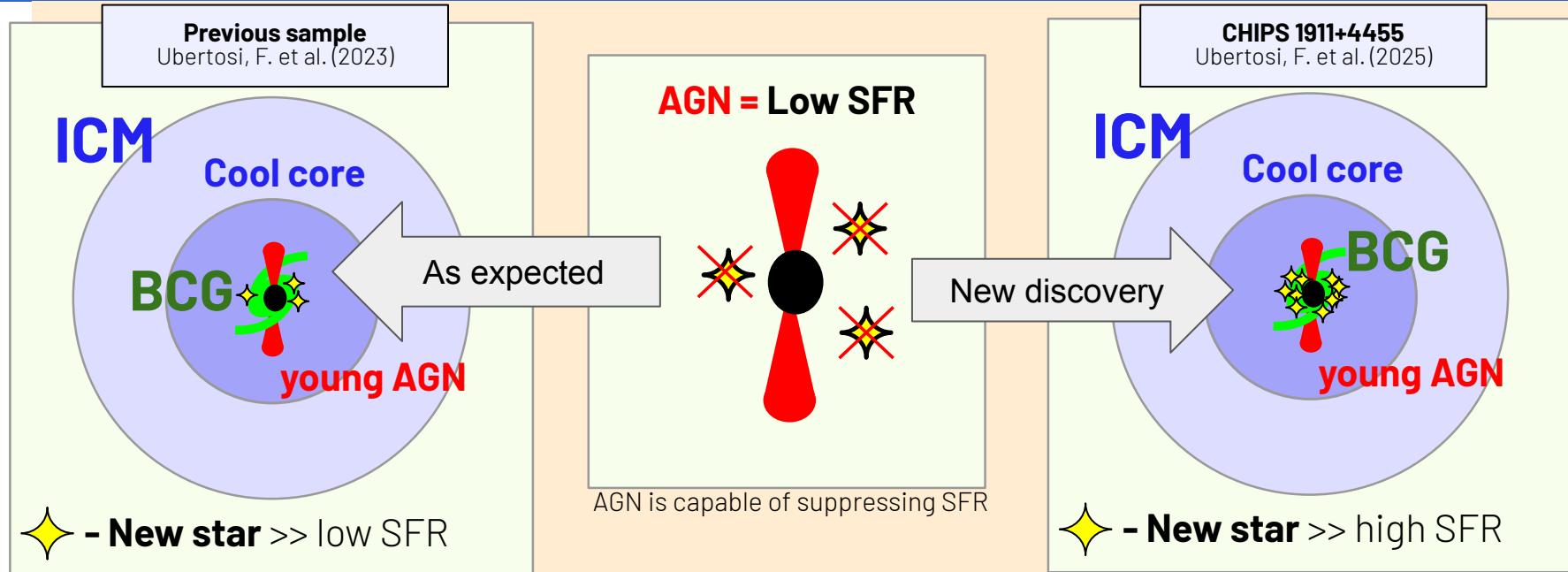
## **Thank you**

# Background: a brief review



Definition of a galaxy cluster: 2 or more galaxies bound together

# Summary: The cooling timescale of the cool core system



A illustration represent  
his boundary cool core system

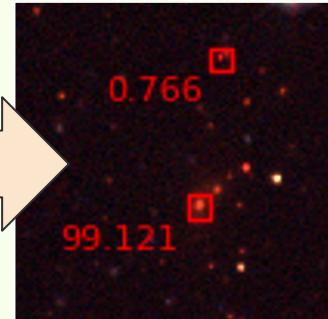
A illustration represent  
CHIPS 1911+4455 cool core system

- But this system has a high SFR → A new type of boundary cool core system.
- Additional informations: Queuing of hot gas and star-forming gas have a different timescale?

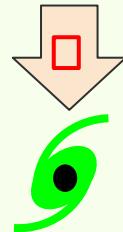
# Our project's procedure



South pole telescope (left)  
and Blanco 4m telescope (right)



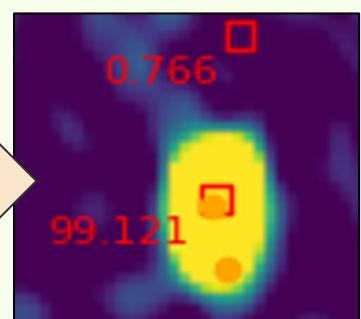
BCG positions from DeCALS  
(Optical bands)



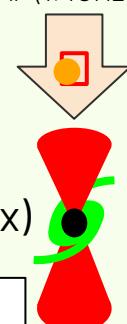
BCG data (position)



ASKAP radio  
telescope



Radio luminosity data from  
ASKAP(1.4GHz)



Radio-loud AGN candidates (flux)

- We use the South Pole Telescope with Sunyaev-Zeldovich effect (SPT-SZ) to provide the BCGs position data.
- ASKAP telescope data for finding the radio-loud AGN candidates