UNIVERSITÀ DEGLI STUDI DI PADOVA

Inquiring into the nature of the Abell 2667 Brightest Cluster Galaxy

Speaker: Edoardo Iani

Co-authors: G. Rodighiero (Padova supervisor), J. Fritz, G. Cresci, C. Mancini, G.B. Caminha, P. Tozzi, P. Rosati, L. Rodríguez-Muñoz, B.M. Poggianti, D. Fadda, S. Berta, P. Pérez-González, A. Enia, A. Zanella (ESO supervisor), L. Ang, P. Popesso, L. Morselli, A. Concas, A. Sabatini, J. Vernet (ESO supervisor), R. van Weeren

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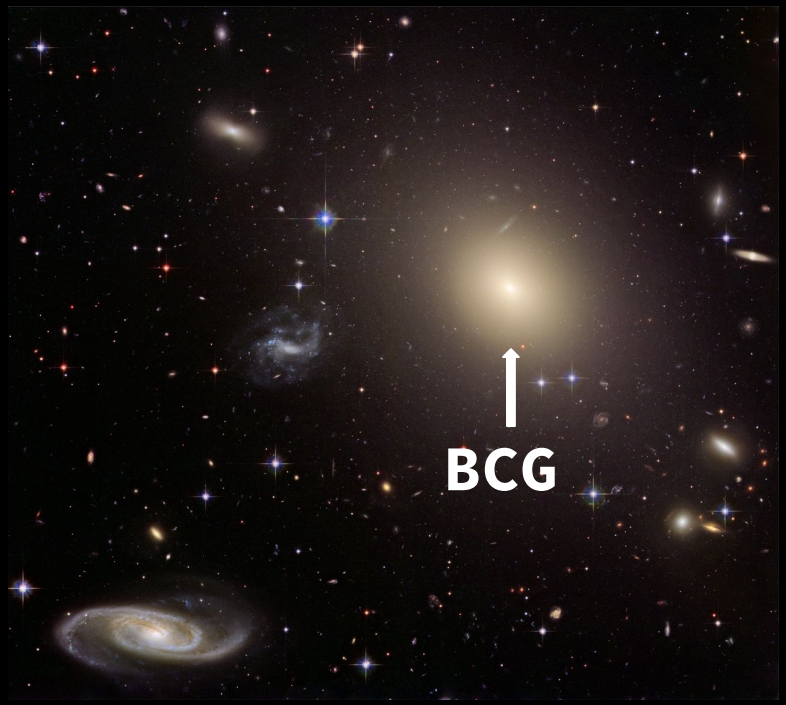
Κέρκυρα, 20th June 2018

A (very) general overview



HST RGB image of Abell S740 and its BCG.

Brightest Cluster Galaxies (**BCG**s) are:

- **the largest, most massive, and luminous galaxies in the Universe**;

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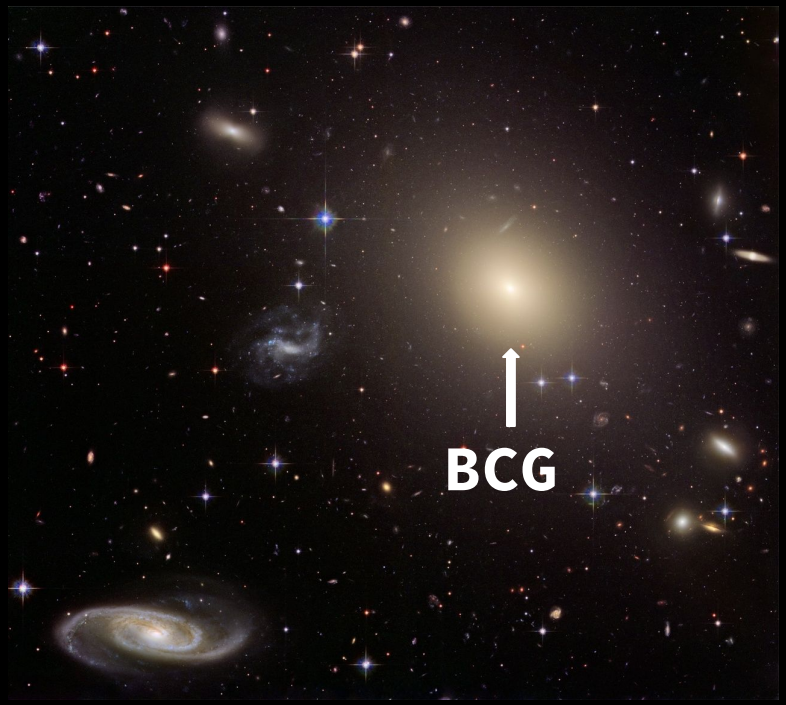

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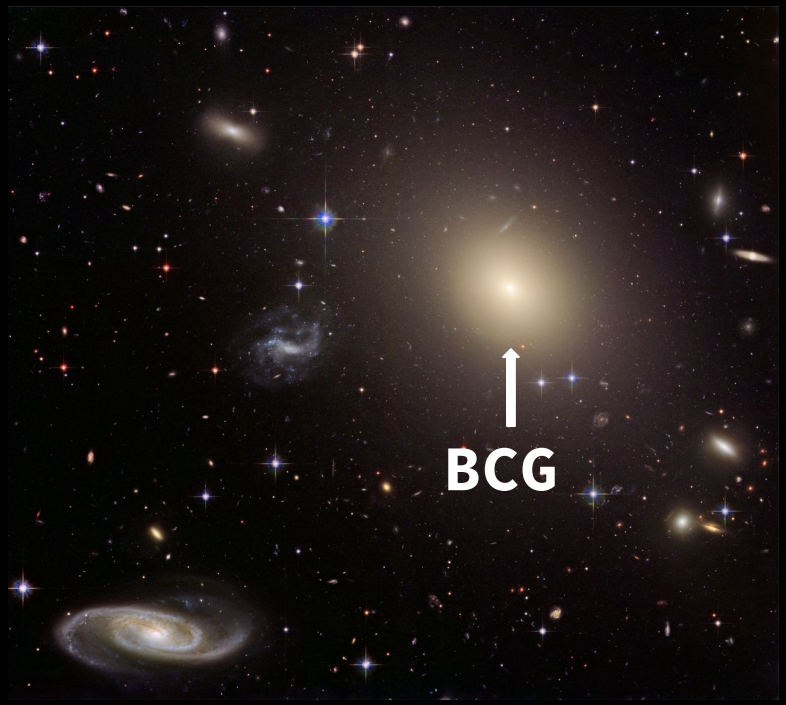

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MUSE stellar continuum of the A2667 BCG.

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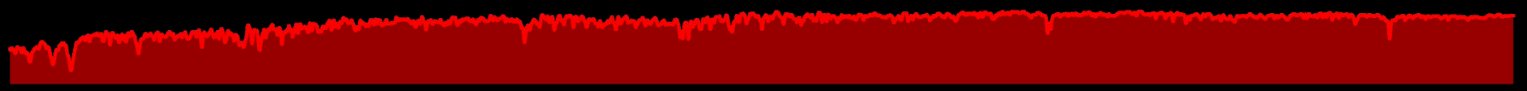
- the largest, most massive, and luminous galaxies in the Universe;
- ~ at rest at the centre of the clusters gravitational potential well and close to the peak of the ICM X-ray emission;
- **cD/D galaxies with, generally, red spectra (passive galaxies) but,**



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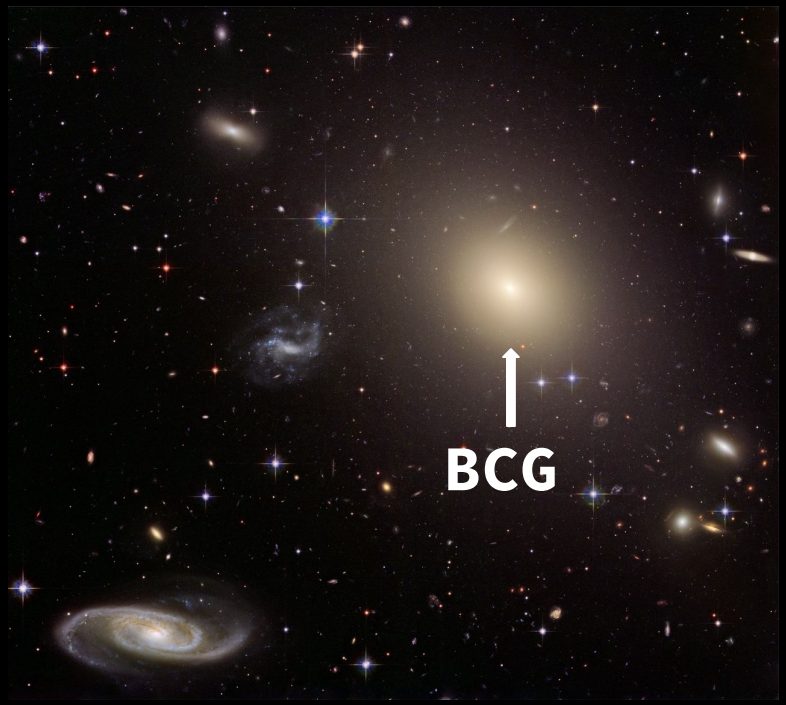

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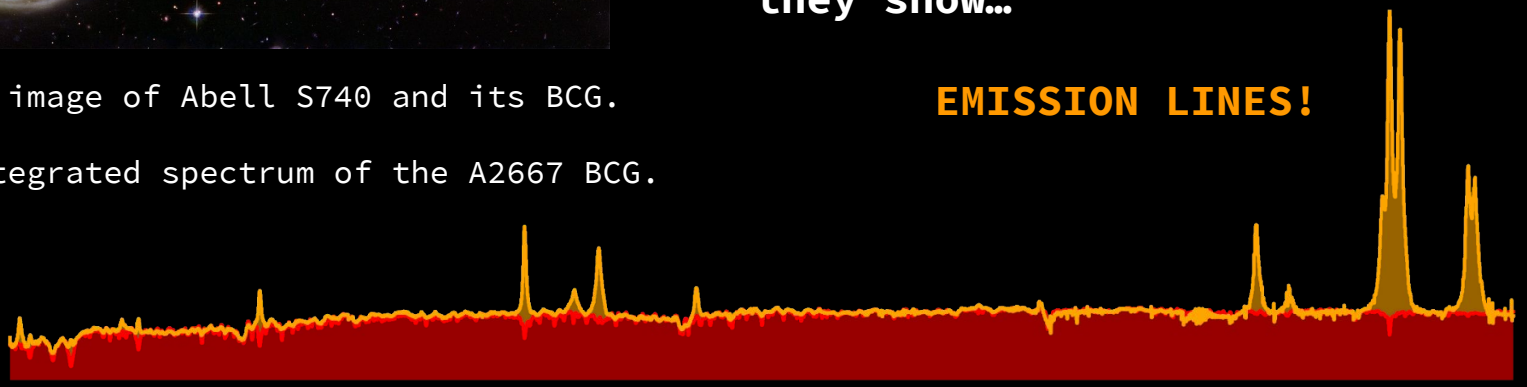
- **cD/D galaxies with, generally, red spectra (passive galaxies) but, if residing in Cool Core clusters, they show…**

EMISSION LINES!

MUSE integrated spectrum of the A2667 BCG.



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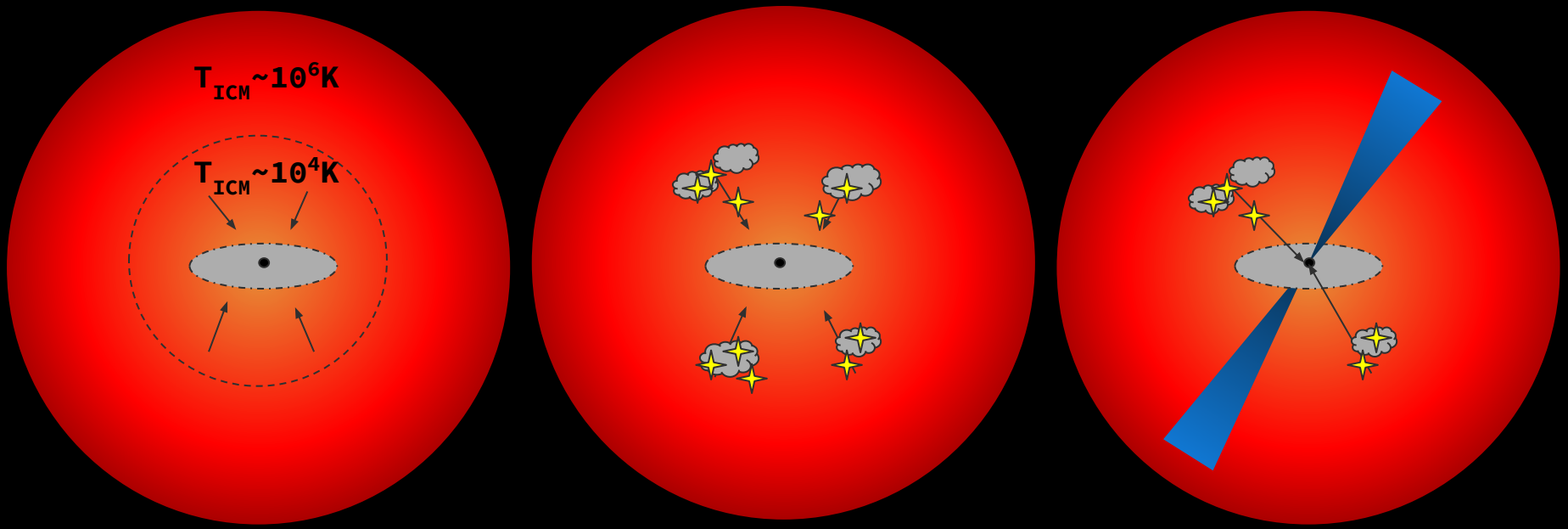
What is a **cool core clusters**?

dynamically relaxed cluster with $t_{cool} << t_{Hubble}$ in the innermost ~10-100 kpc

Why line-emitting BCGs generally found in **cool core clusters**?



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The Abell 2667 Cluster

RGB image of A2667
(*HST* F814W+F606W+F450W)

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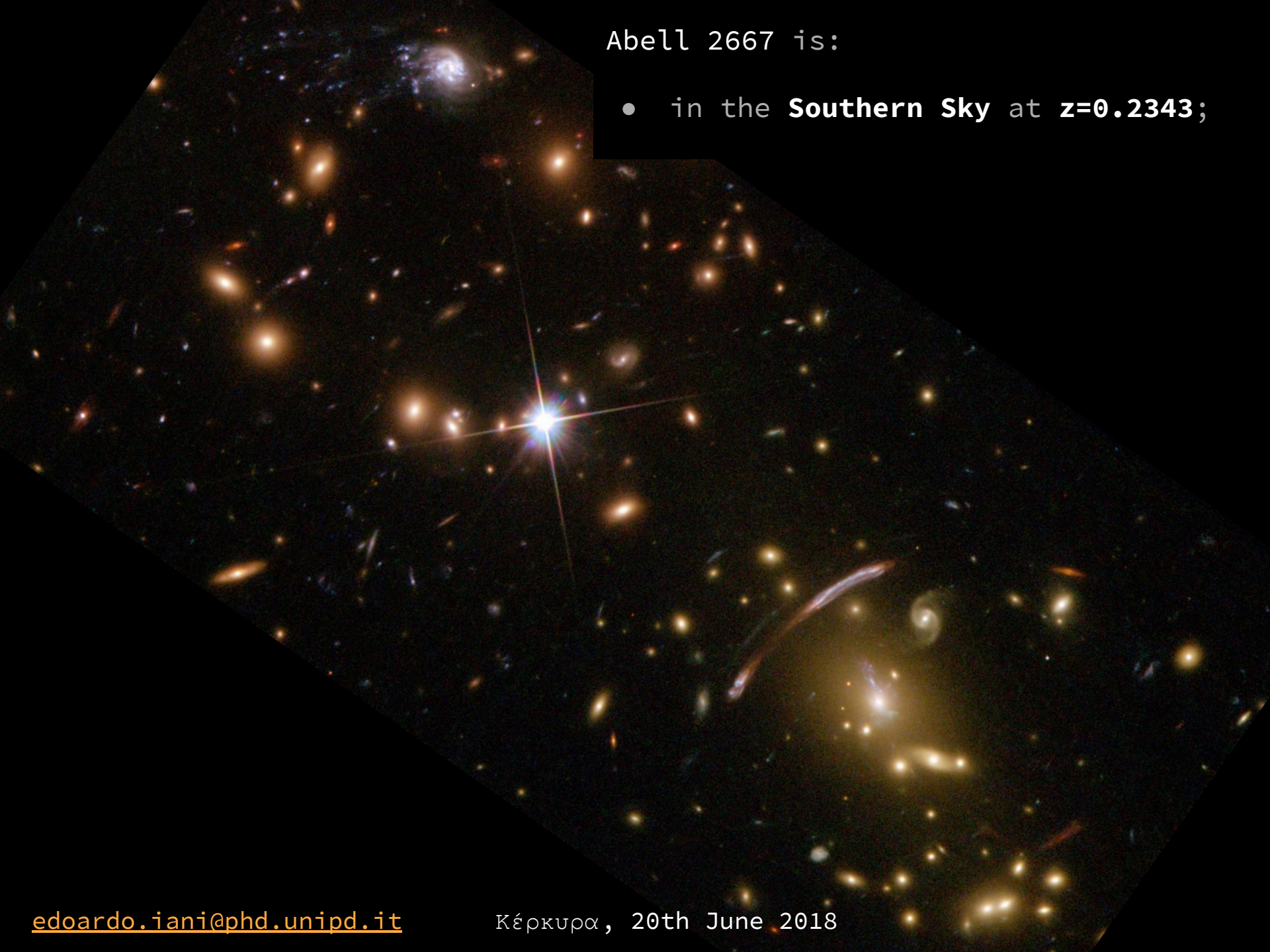

Abell 2667 is:

- in the **Southern Sky** at **z=0.2343**;

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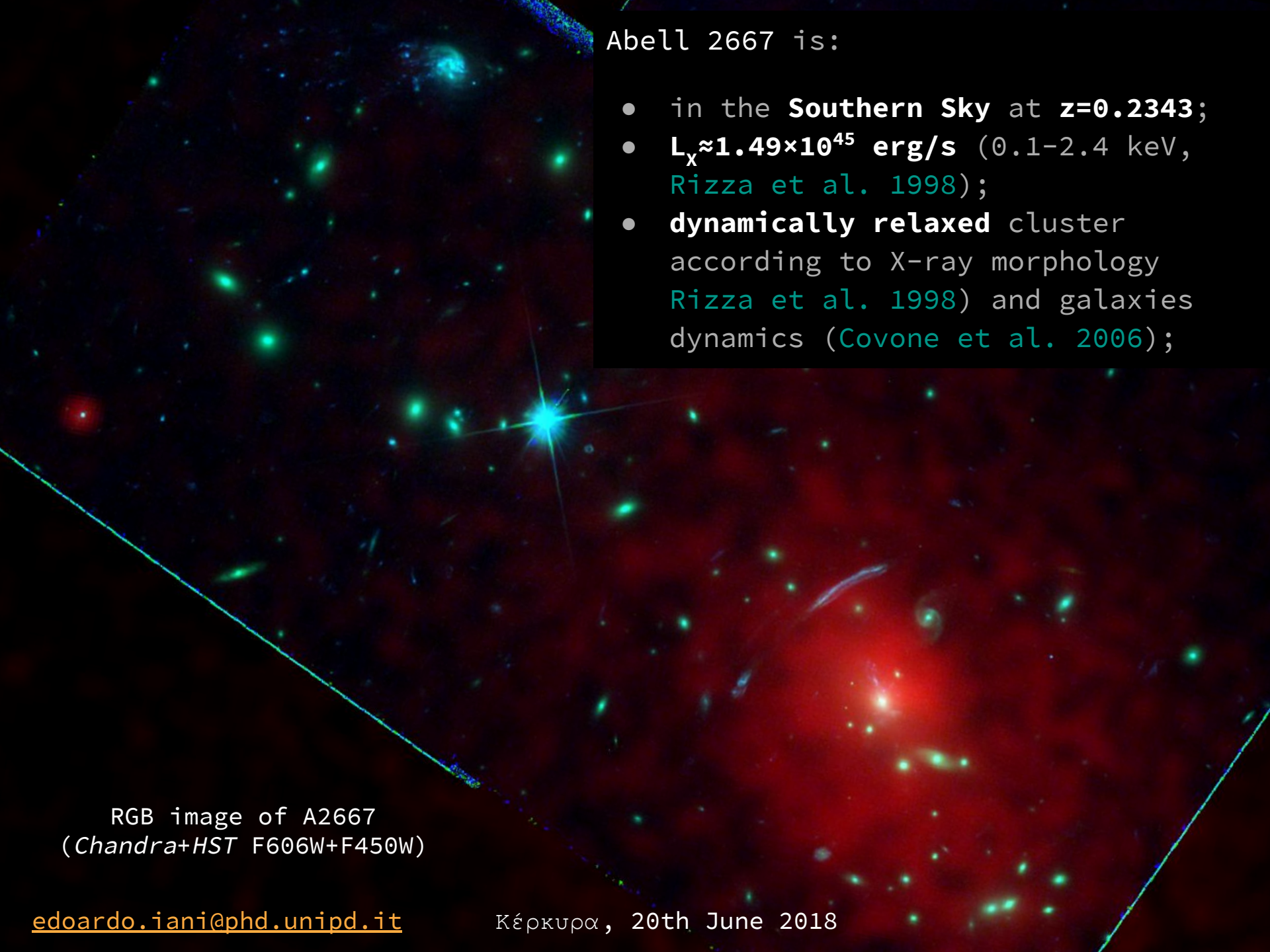

Abell 2667 is:

- in the **Southern Sky** at **z=0.2343**;
- **$L_X \approx 1.49 \times 10^{45}$ erg/s** (0.1-2.4 keV, Rizza et al. 1998);
- **dynamically relaxed** cluster according to X-ray morphology Rizza et al. 1998) and galaxies dynamics (Covone et al. 2006);

RGB image of A2667
(*Chandra*+*HST* F606W+F450W)

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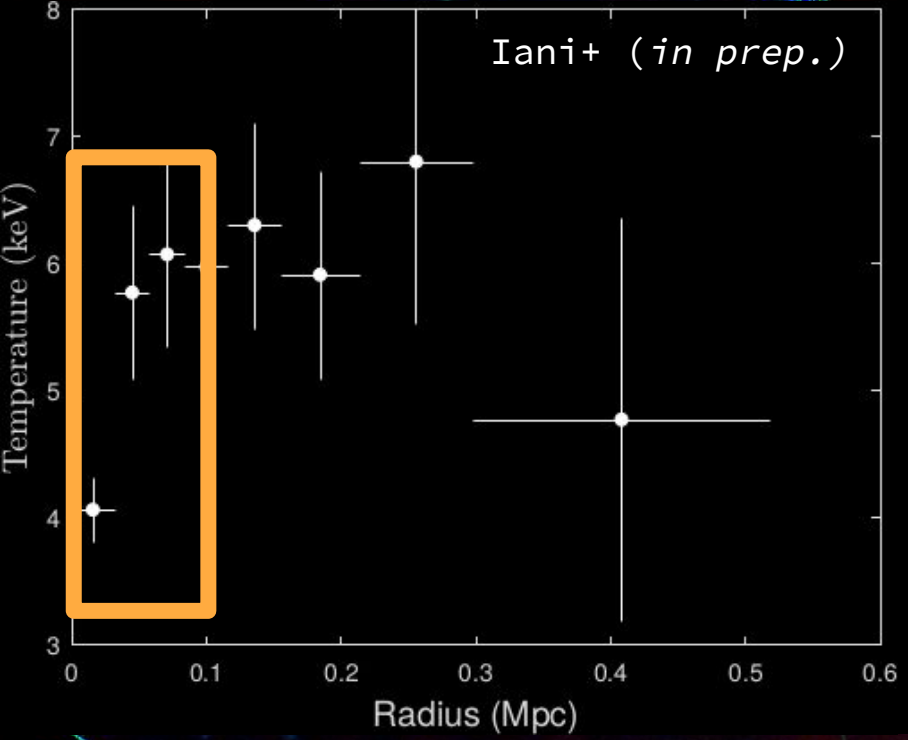

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- **dynamically relaxed** cluster according to X-ray morphology (Rizza et al. 1998) and galaxies dynamics (Covone et al. 2006);
- **cool core cluster** according to X-ray data, with t_{cool}=0.5 Gyr (Cavagnolo et al. 2009).

RGB image of A2667
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The Abell 2667 BCG

radio (NVSS): radio-loud source ($P_{1.4GHz}=10^{24.5}$ W/Hz, Kale et al. 2015) → AGN (Rusell et al. 2013)

Chandra: Type 2 AGN with $L_X \approx 2.82\times10^{43}$ erg/s (2-10 keV) and $N_H=1.56\times10^{23}$ cm-2 (Yang et al. 2018);

IR: SFR=8.7 $M_\odot$/yr from FIR (Rawle et al. 2012).

Why and where is star-formation taking place?

Is there any consequence of the AGN activity (e.g. feedback)?

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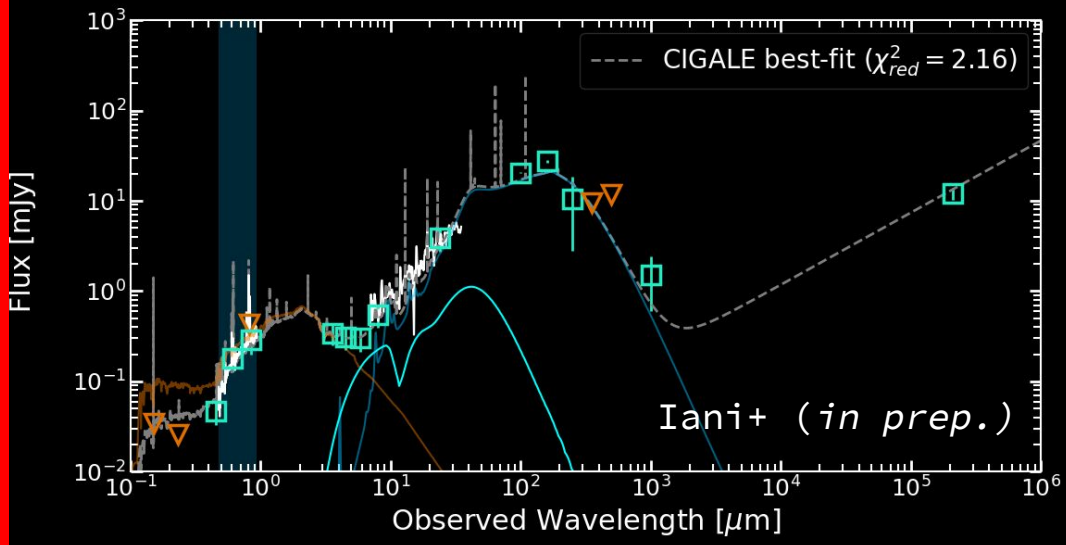

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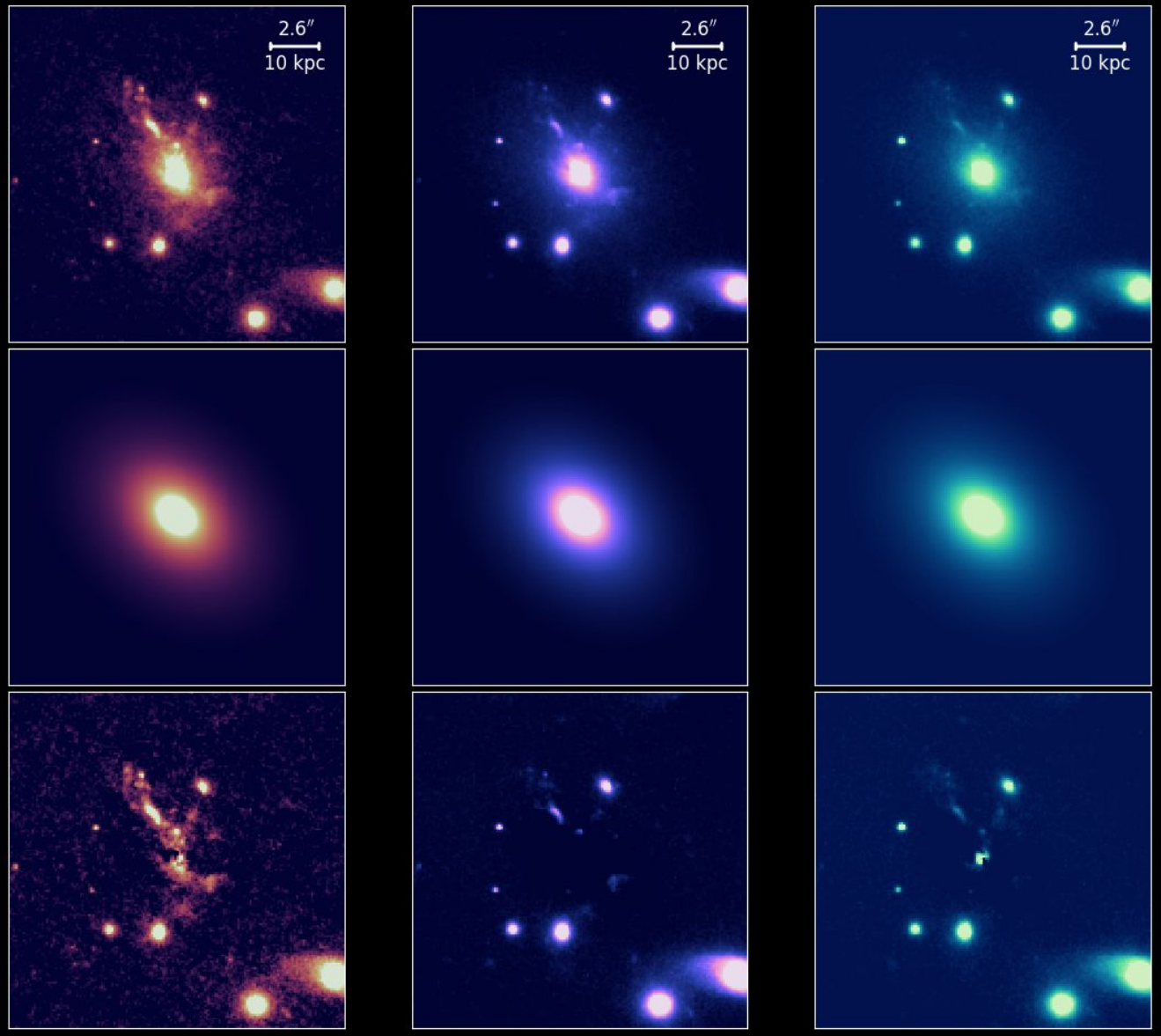
MONTHLY NOTICES of the Royal Astronomical Society



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Iani+ (*in press*)

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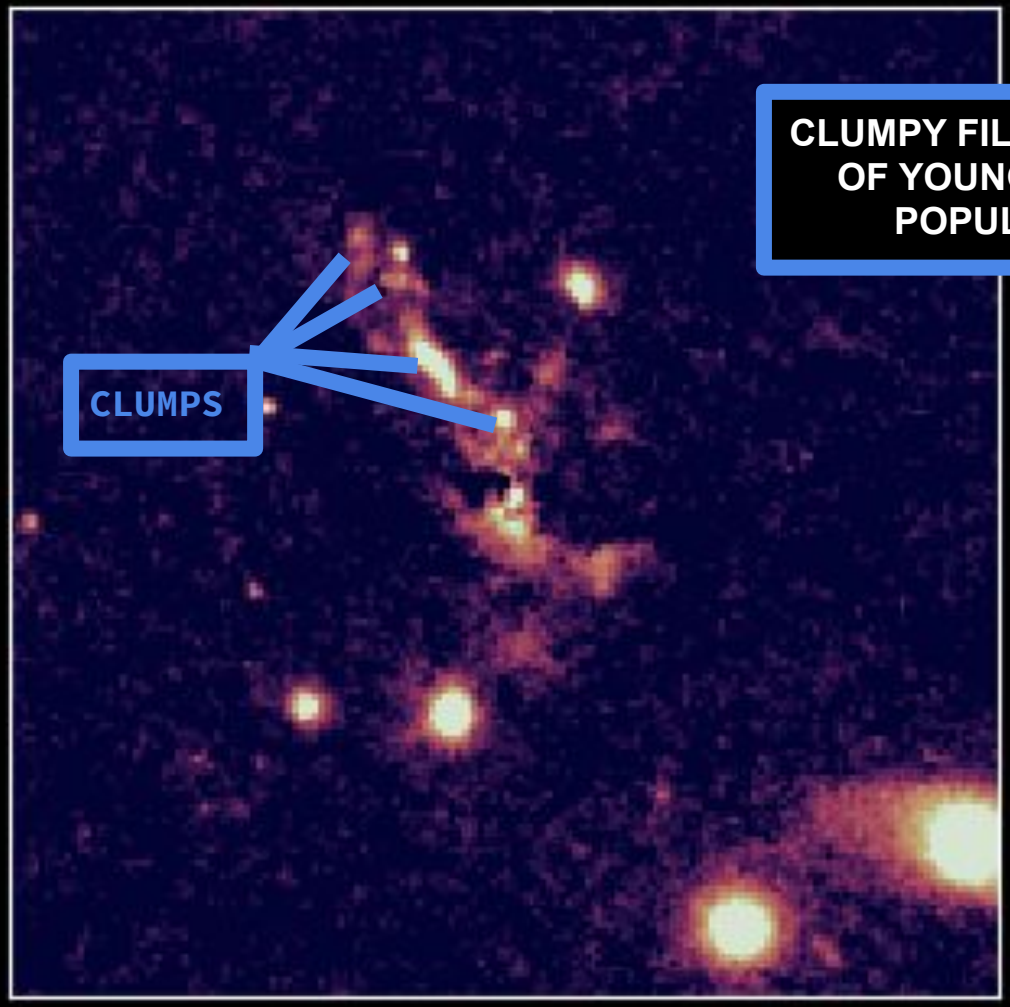

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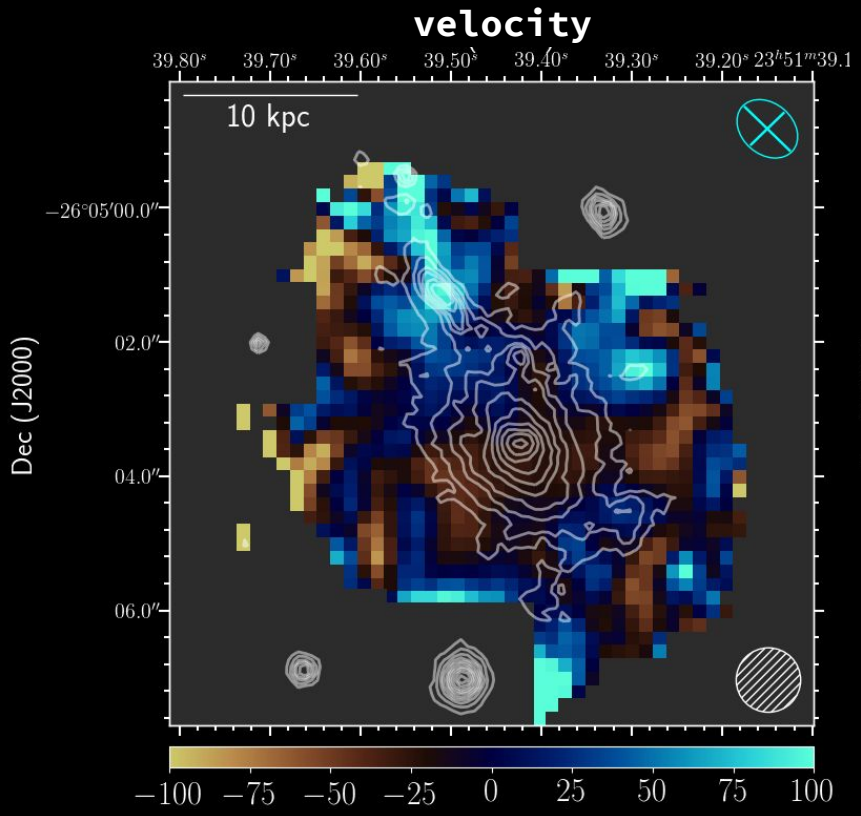
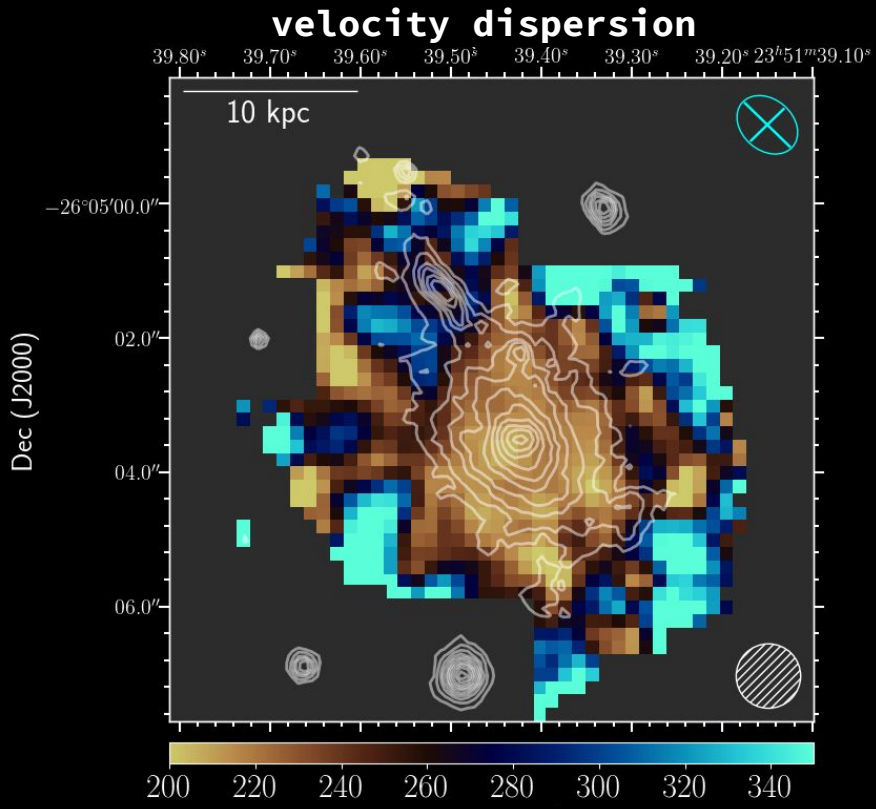
stellar kinematics





No coherent pattern

Δv_{gas} < 150 km/s

$\sigma 0$ ~ 220 km/s

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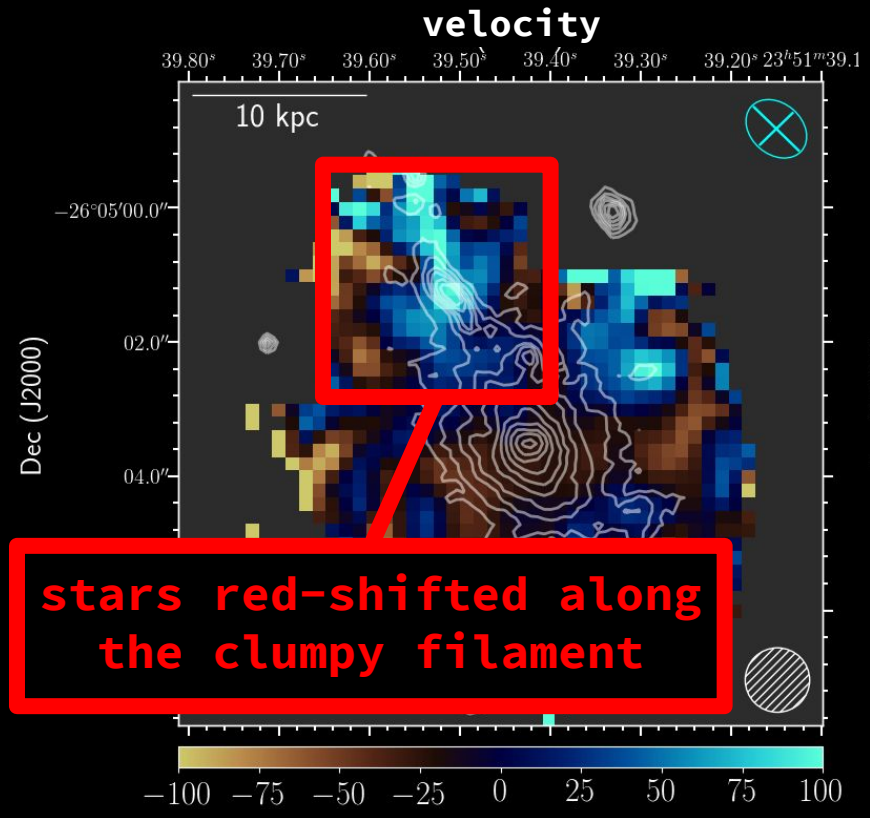

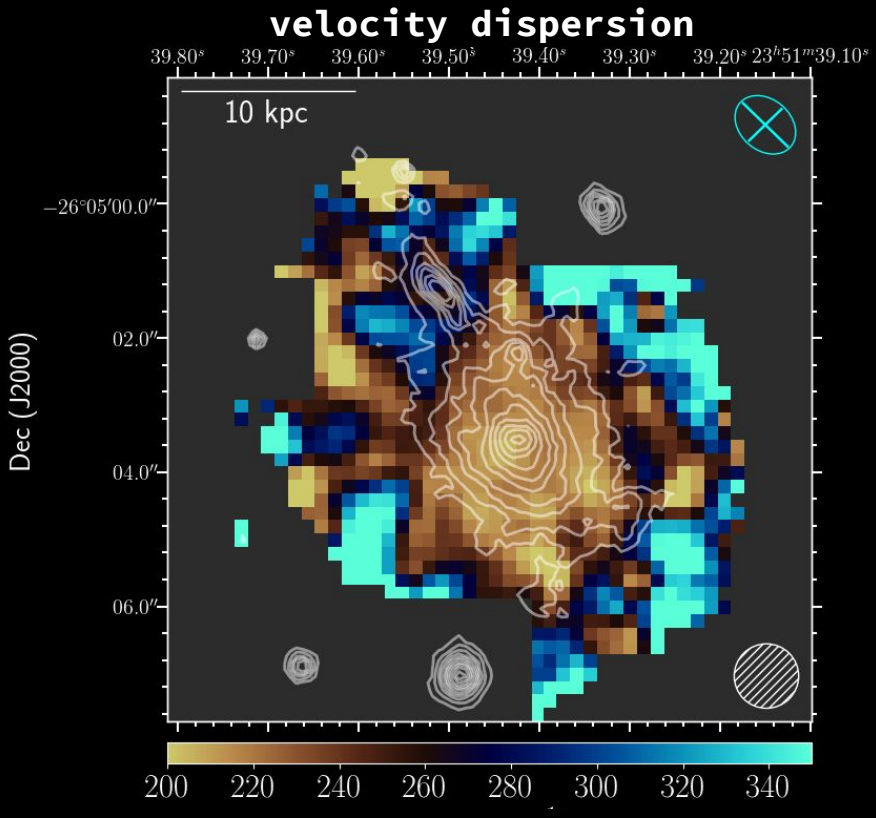

stars red-shifted along the clumpy filament

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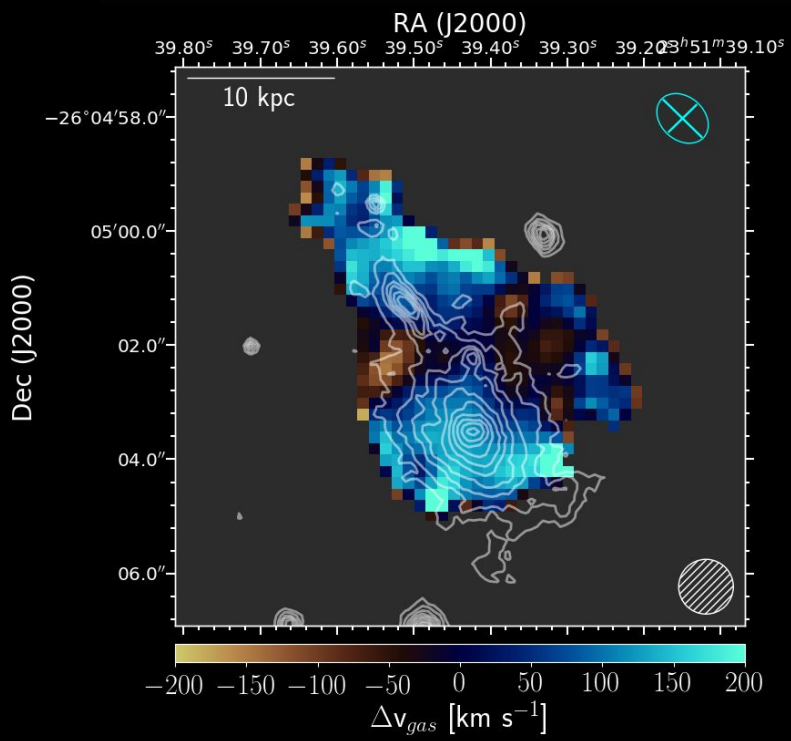
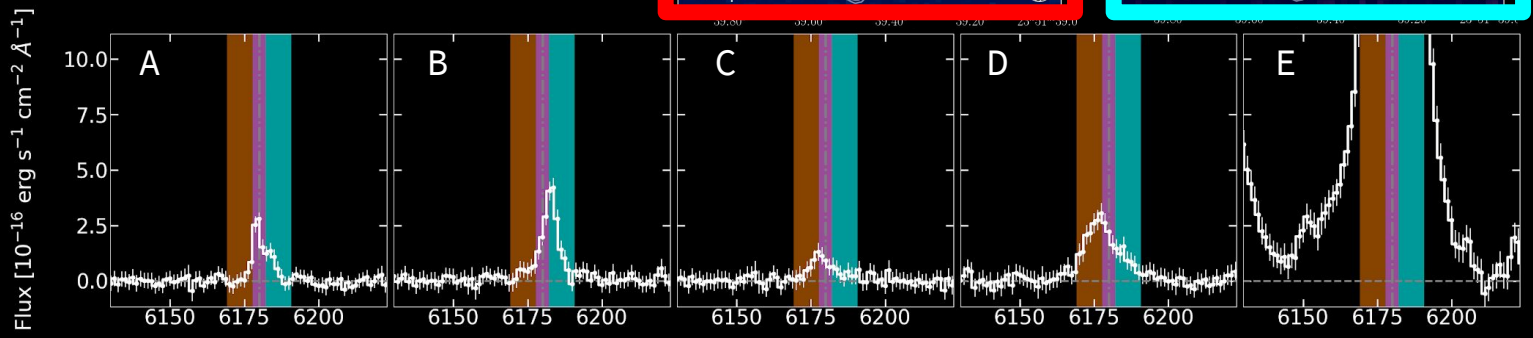


detection of two gas components:

- **red-shifted** (along filament);
- **blue-shifted** (AGN outflow?).



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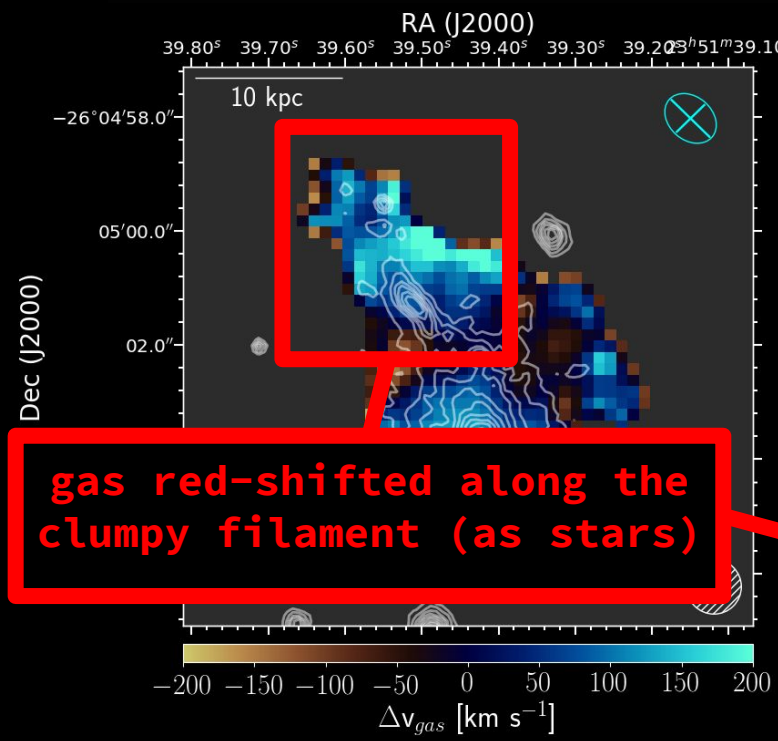

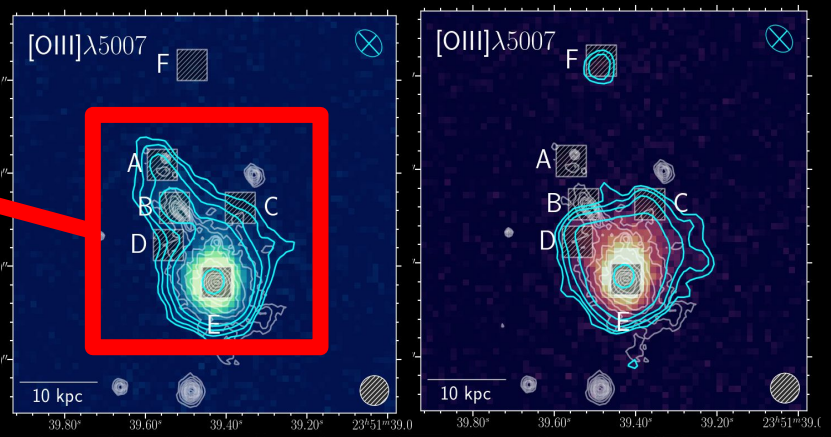

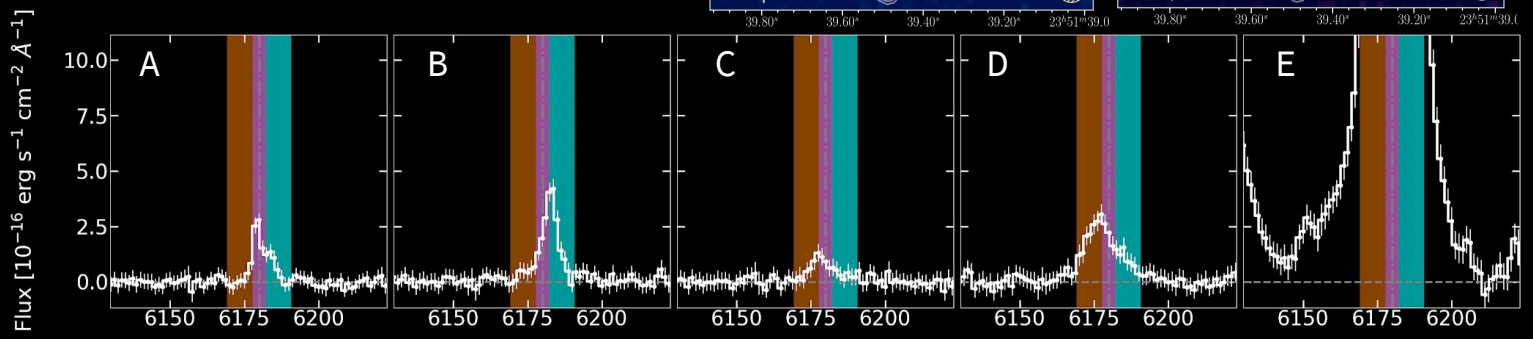

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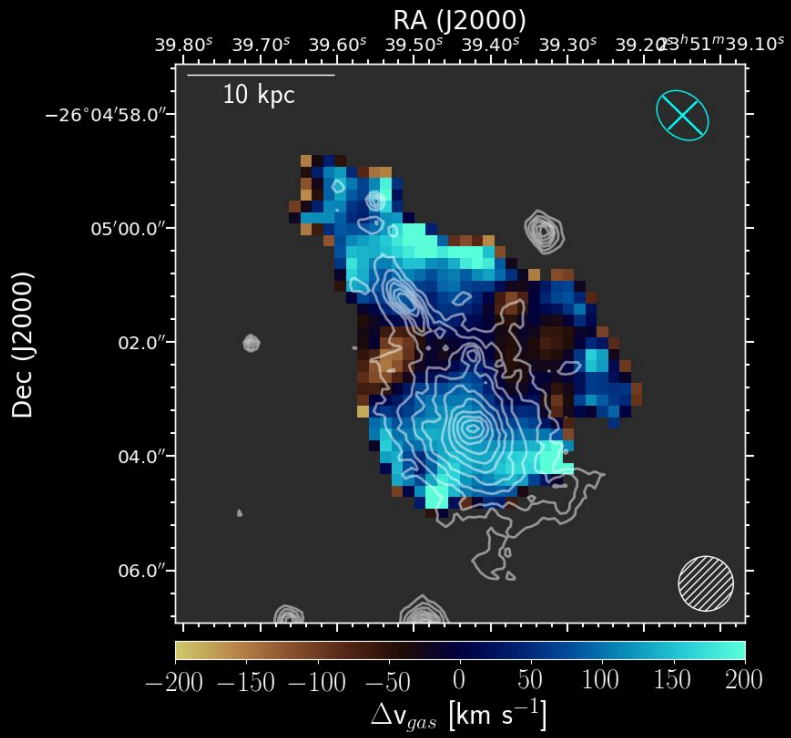

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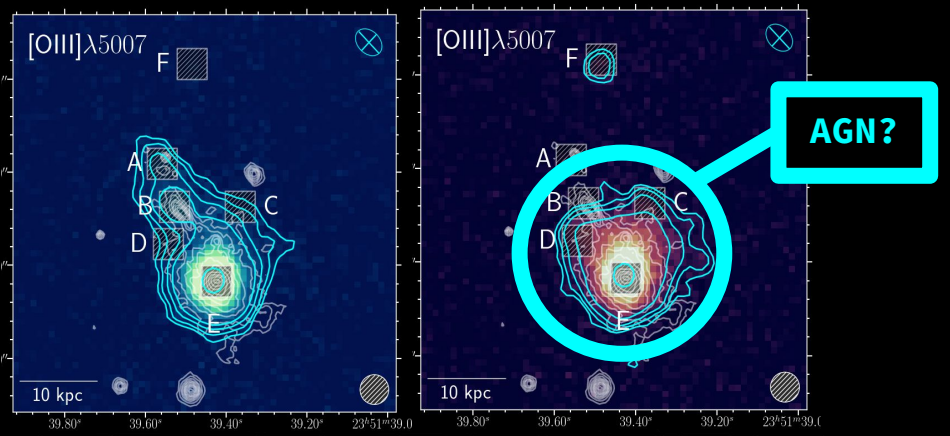

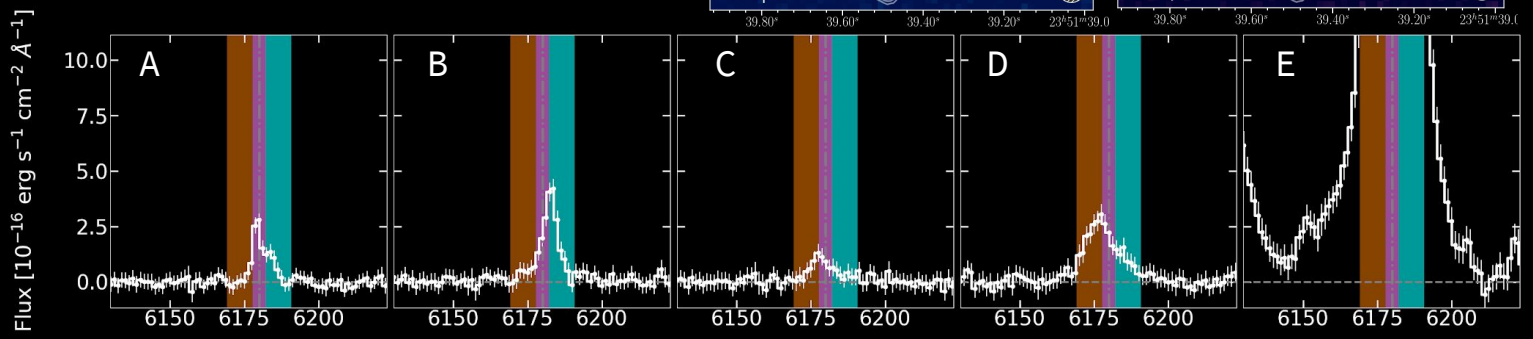

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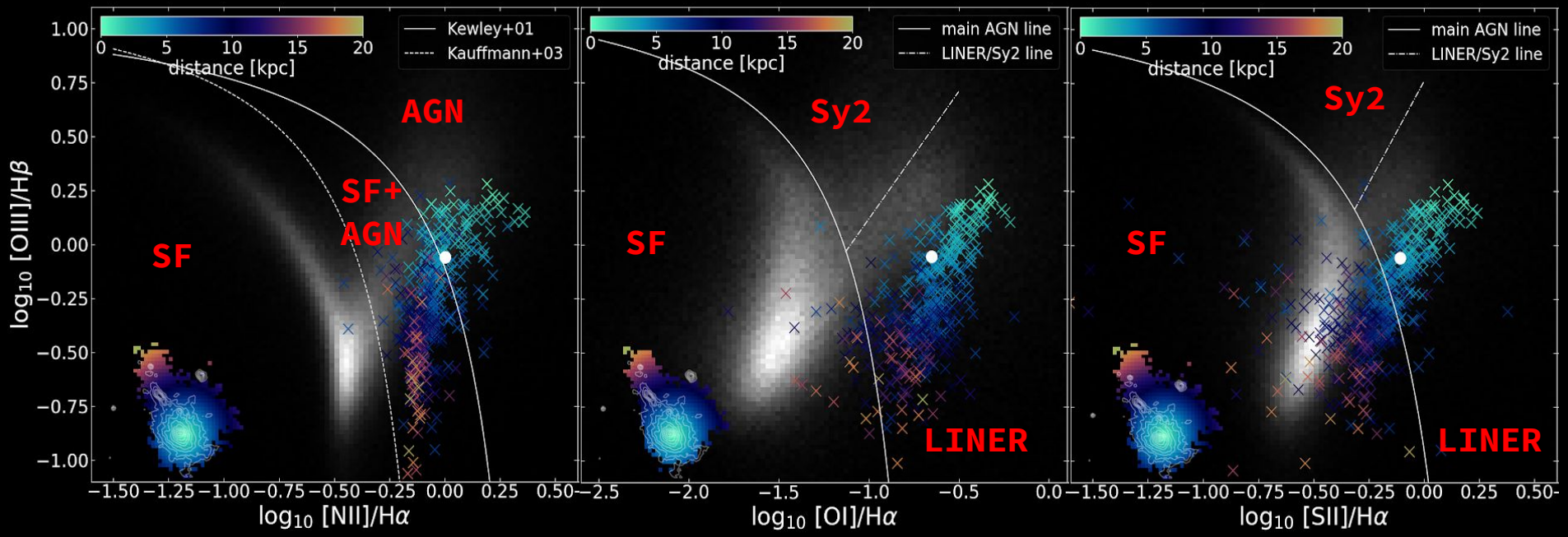
diagnostic diagrams



innermost BCG region → LINER emission

outermost regions (i.e. filament) → COMPOSITE emission (SF+AGN)

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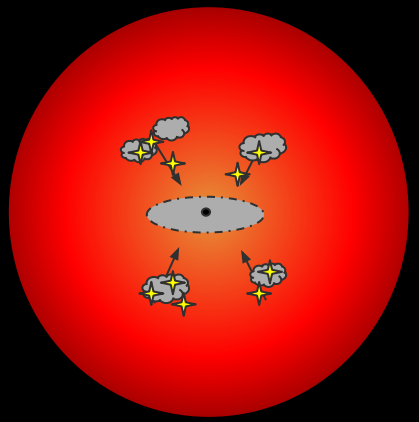
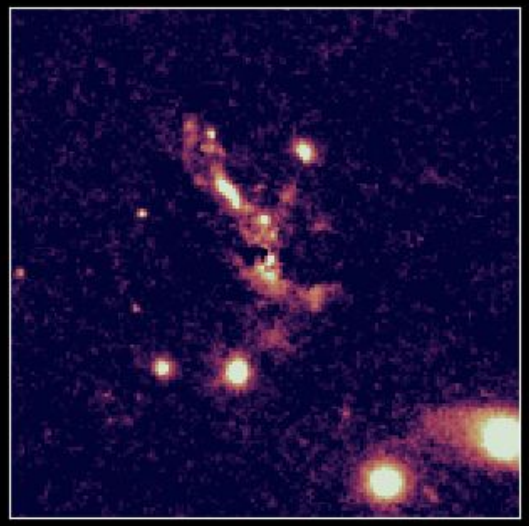
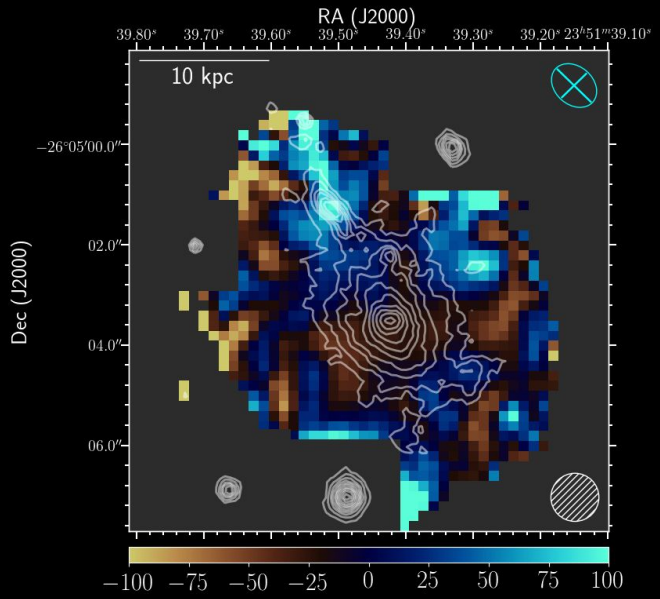
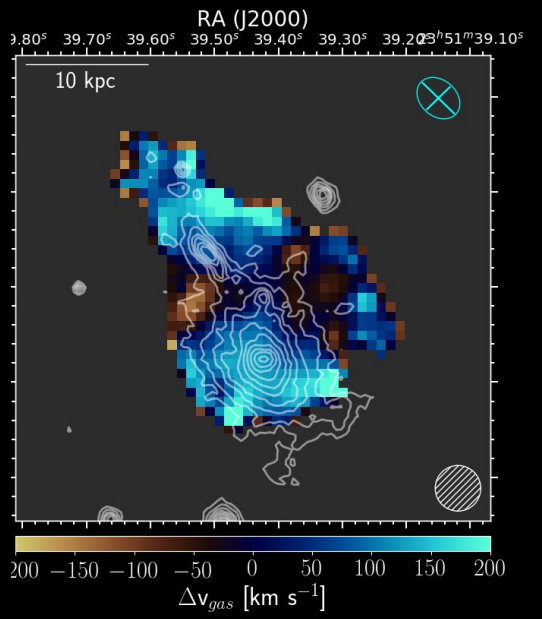
A plausible scenario

Why and where is star-formation taking place?









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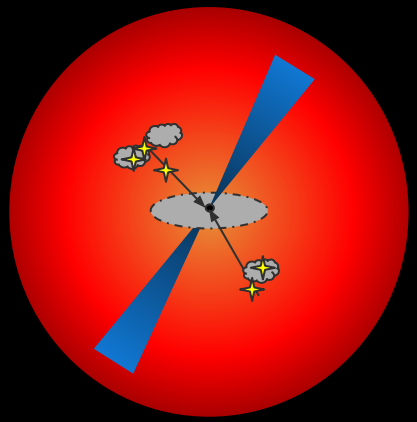
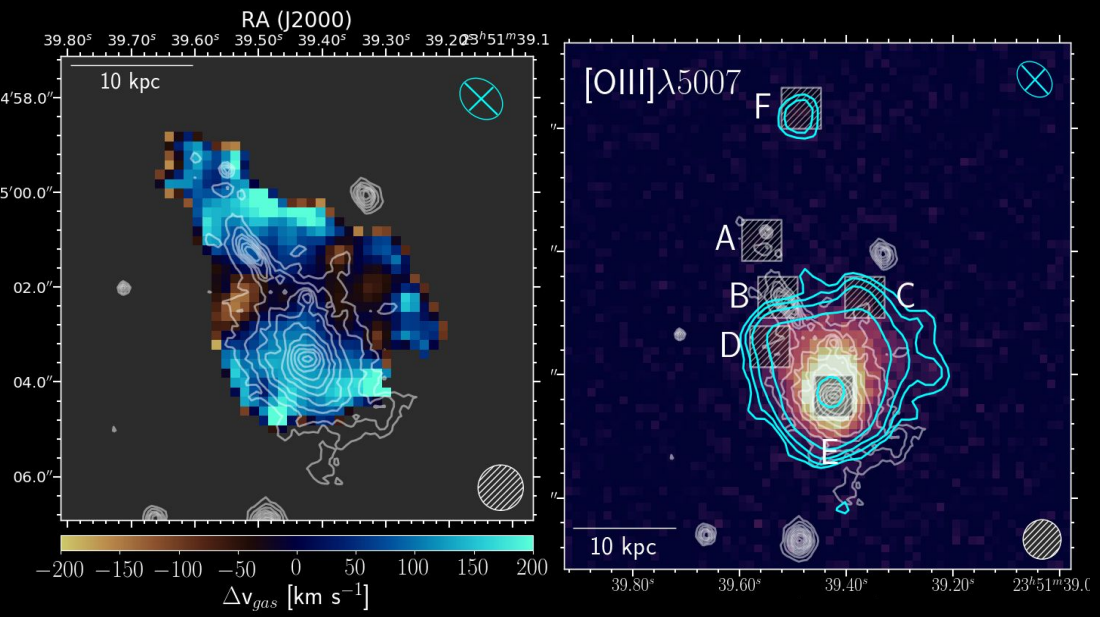
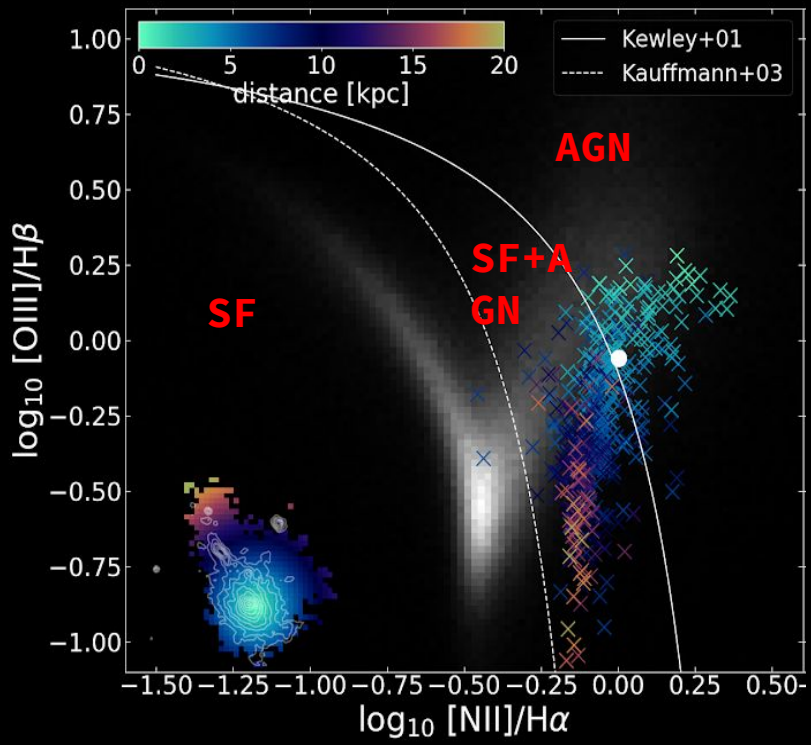


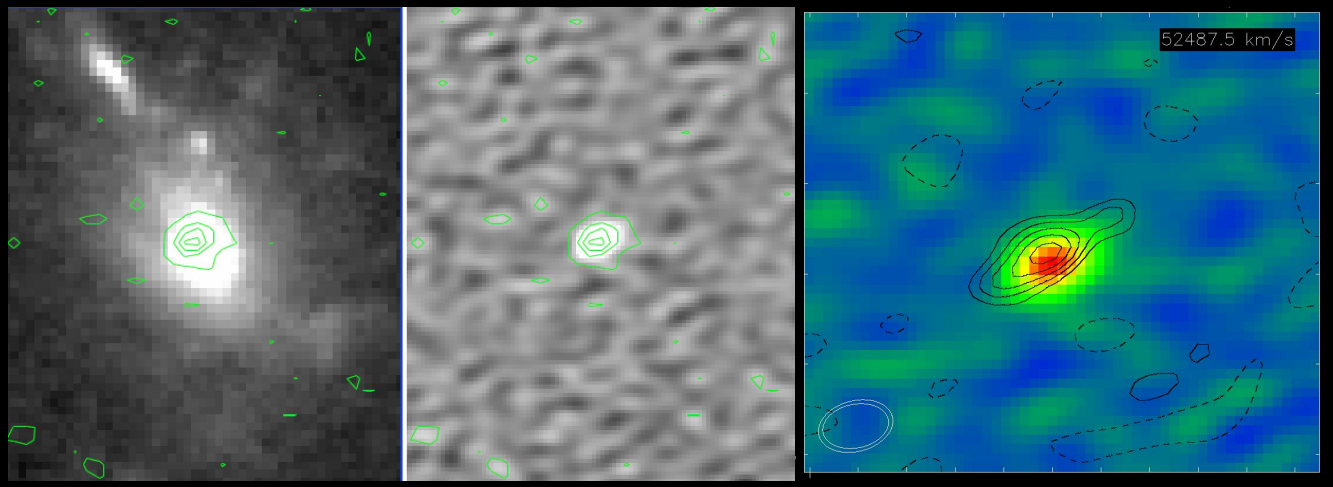
Is there any consequence of AGN activity (e.g. feedback)?

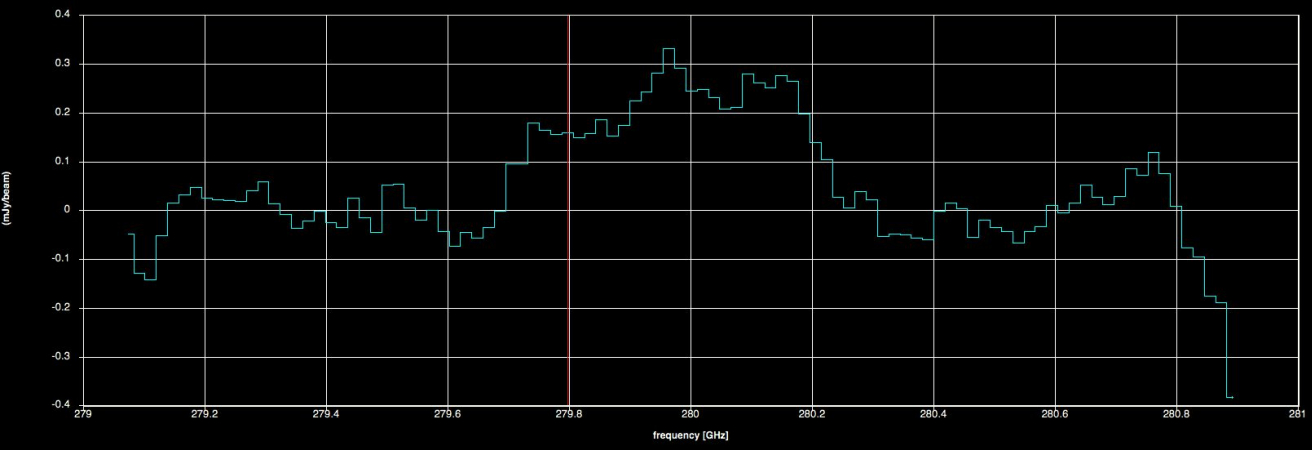




ALMA band 7 data

detection of the continuum (marginally resolved)





and…

CO[3-2] emission!

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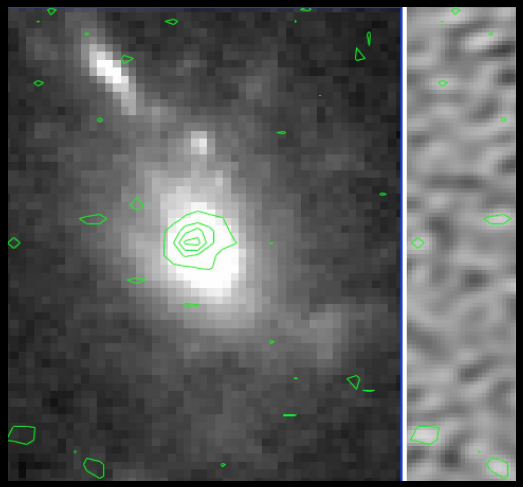
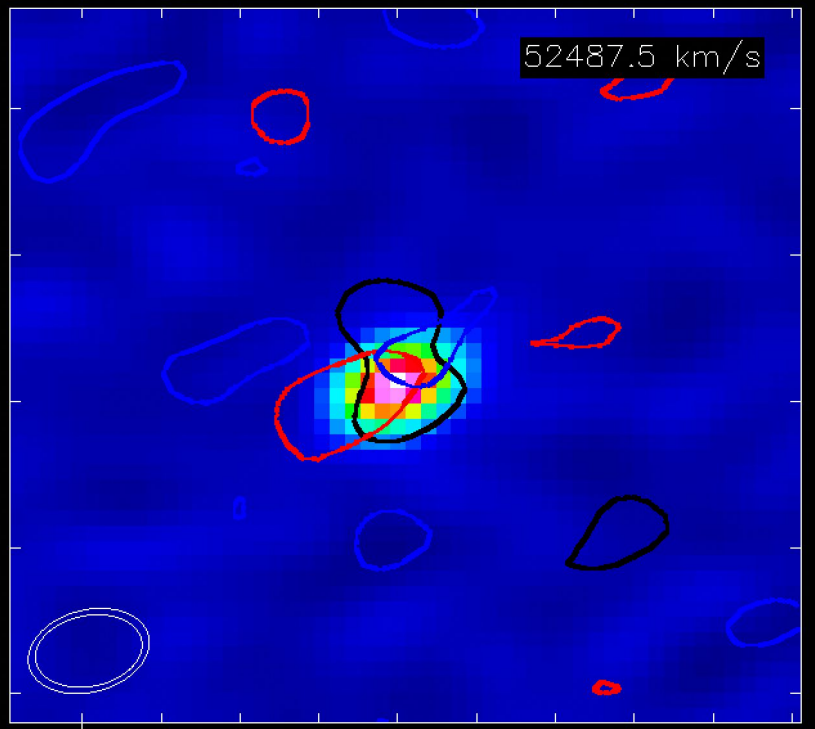
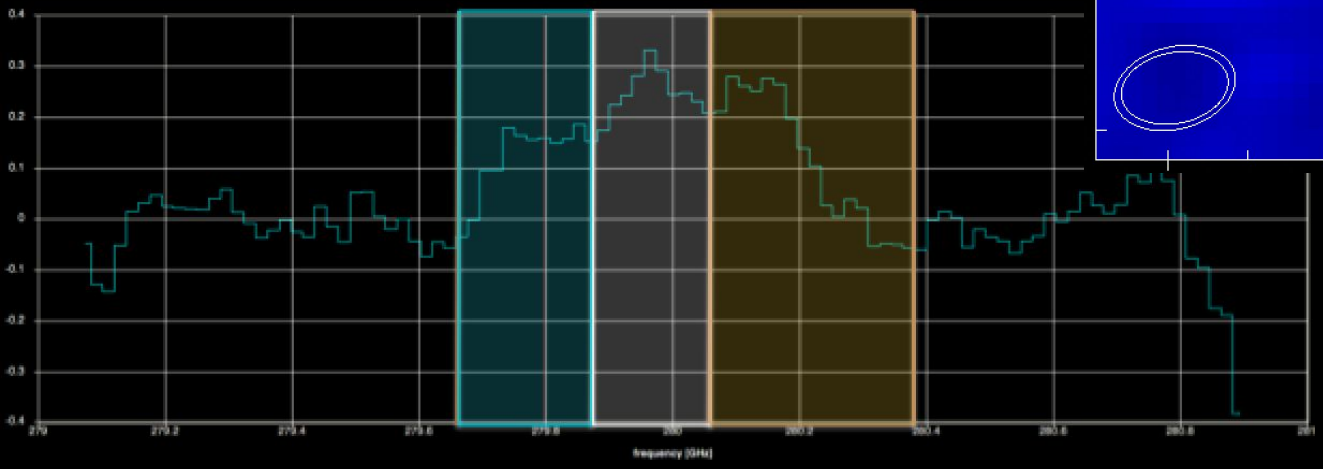
detection of the continuum (marginally resolved)







CO[3-2] emission with **complex kinematics (3 components at least!)**

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Take Home Message

A multi-wavelength analysis of BCGs allows for a complete characterisation of their properties and can shed light onto the mechanisms at the basis of galaxies baryon cycle.

Due to their intrinsic characteristics (size, luminosity, mass) BCGs can be used as ‘candels’ to probe baryon cycle phenomena beyond the Local Universe.

Thank you for your attention!

For more details:
Iani et al. 2019
(link to the ArXiv)

Scan me

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