

Massive black holes in low-mass galaxies: what happened to the X-ray Corona?



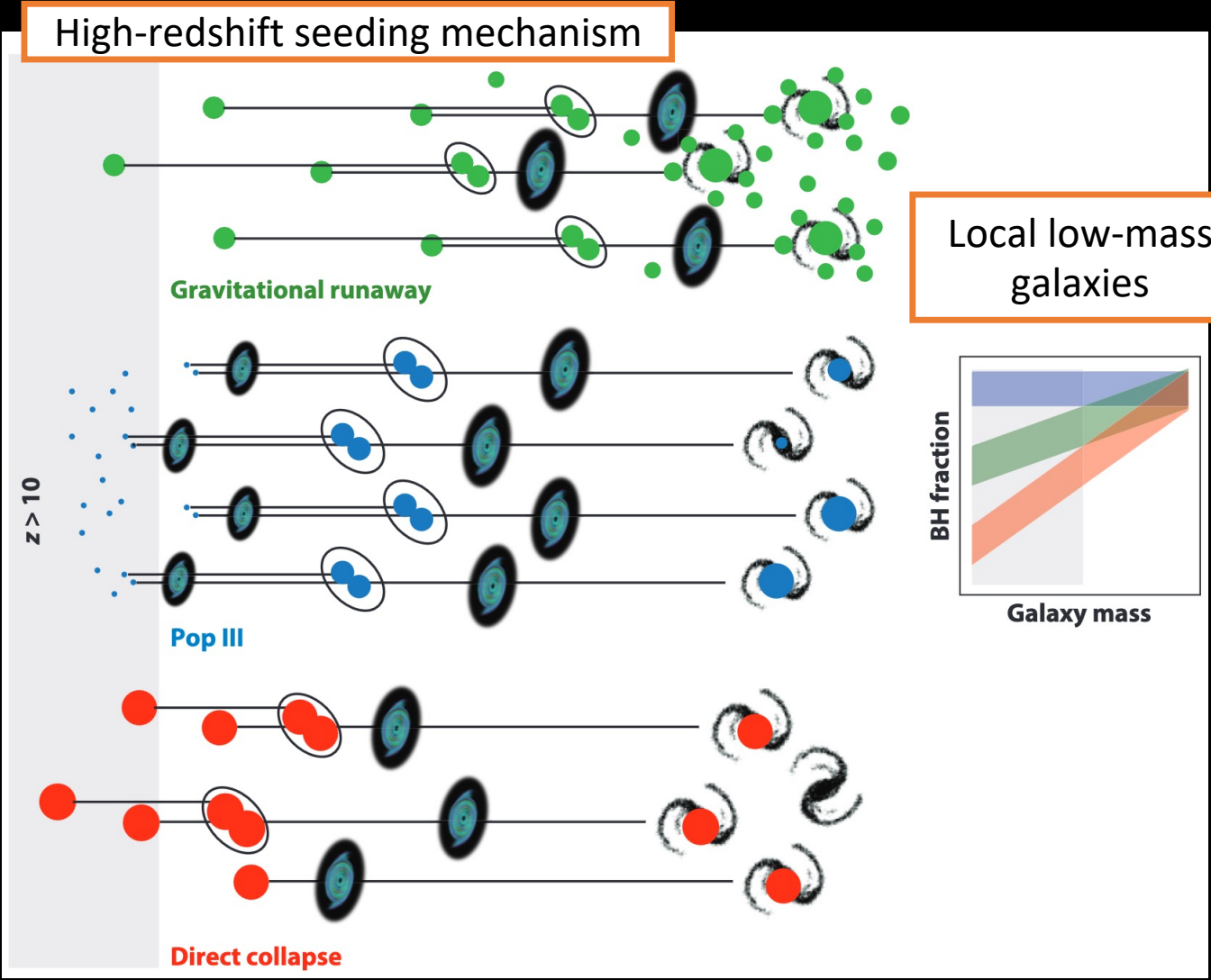
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In collaboration with: A.Merloni, K.Nandra, J.Buchner, M.Salvato, J.Comparat (**MPE, Munich**) & others

Why study MBHs in low-mass galaxies?

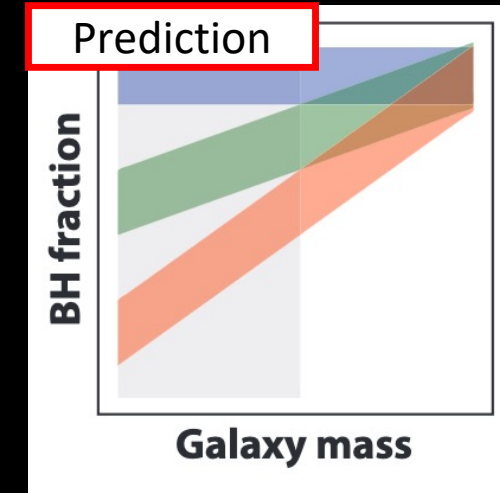
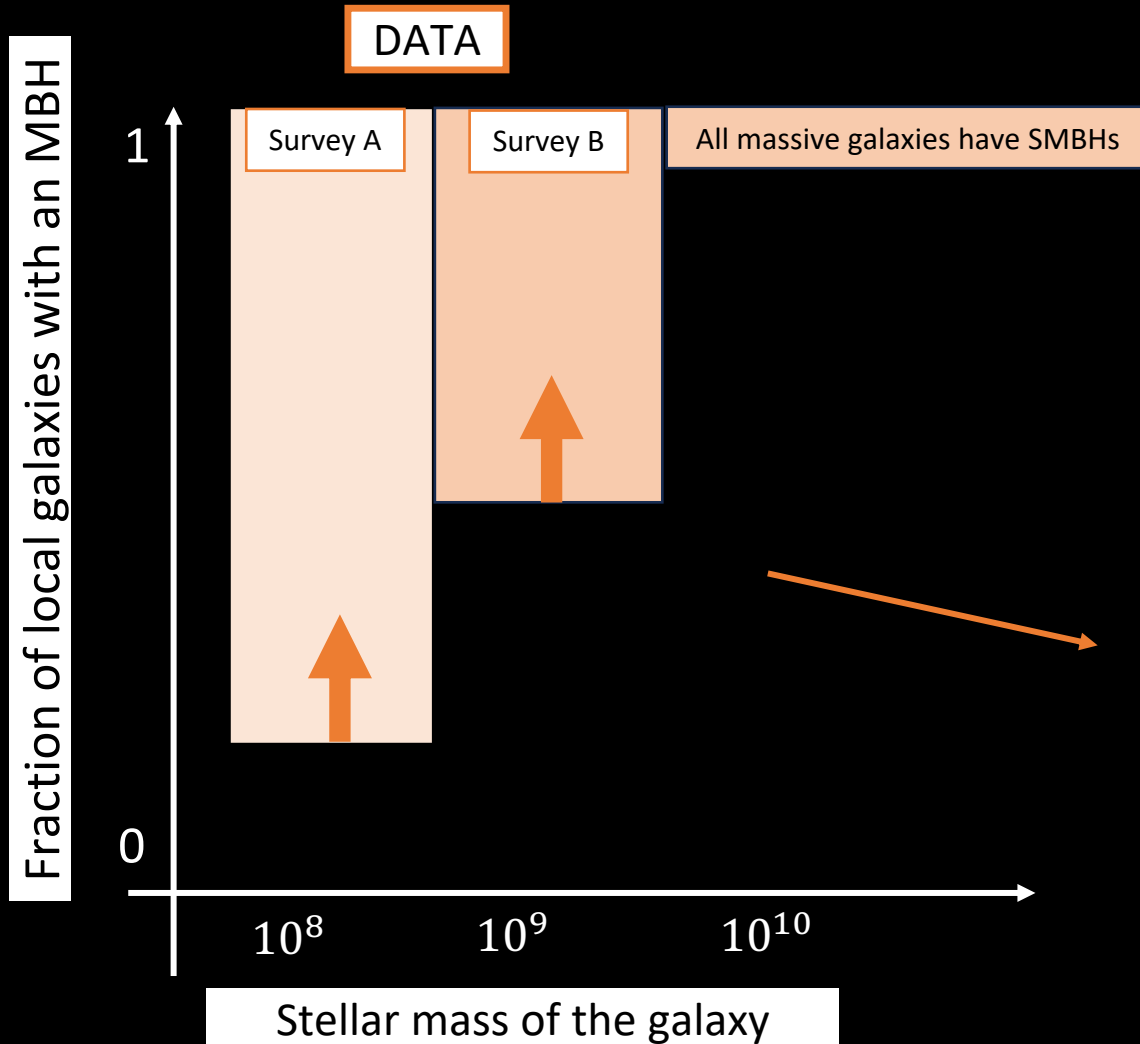
- Local MBHs can constrain high-redshift “BH seeding” models



Local Universe should retain information about the dominant seeding mechanism at high- z

What to do with local MBHs?

- Incidence of MBHs in low-mass galaxies: useful **lower limits** to the **BH occupation fraction**



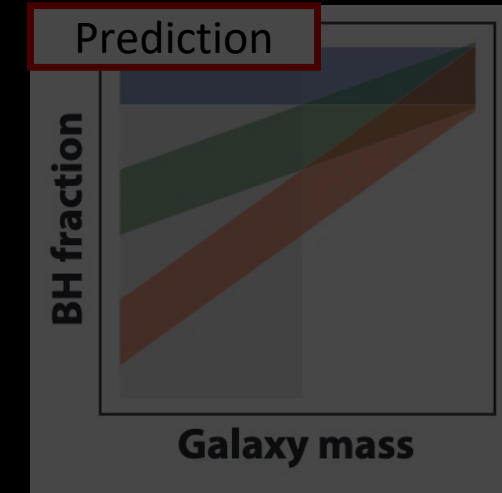
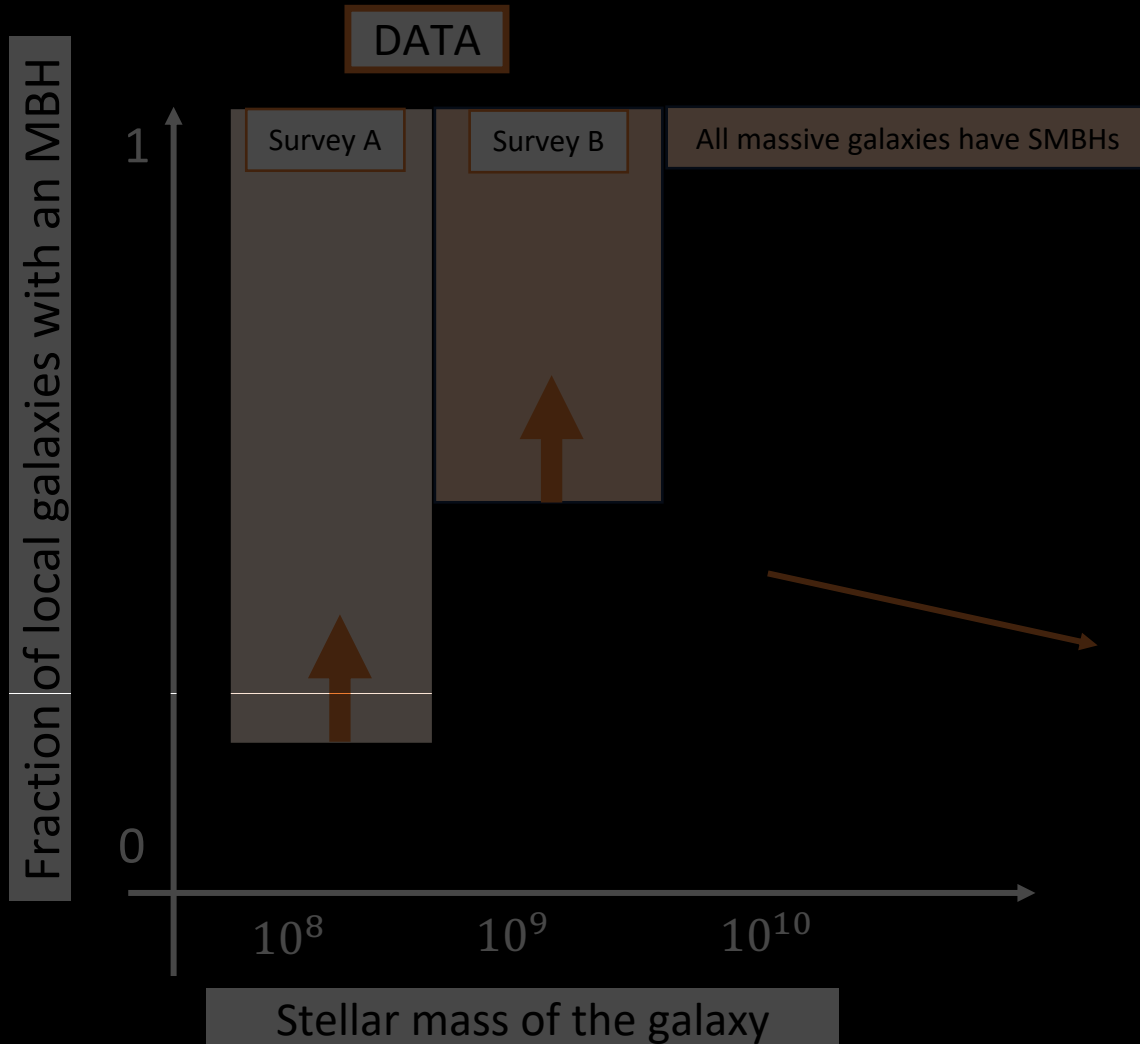
Why a lower limit?

At the low-mass end we don't know well:

Active fraction, BH-galaxy relations,
typical accretion mode

What to do with local MBHs?

- Incidence of MBHs in low-mass galaxies: useful **lower limits** to the **BH occupation fraction**



Why a lower-limit?

At the low-mass end we don't know well:

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Our work!

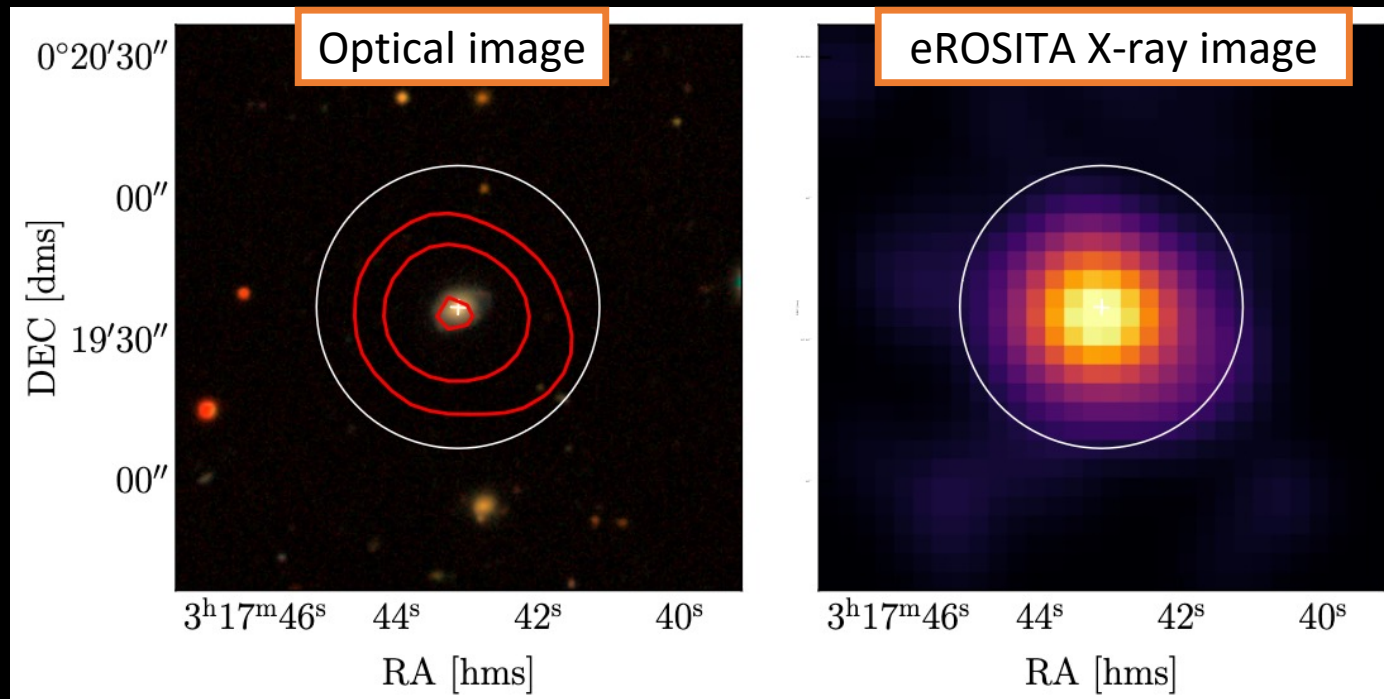
This work: studying the accretion mode of MBHs

- We studied X-ray data for >200 MBH candidates selected through optical and infrared variability

Baldassare+18;20; Ward+22; Burke+22; Kimura+20; Shin+22; Secret&Satyapal20; Harish+23; Wasleske+22

Why this choice?

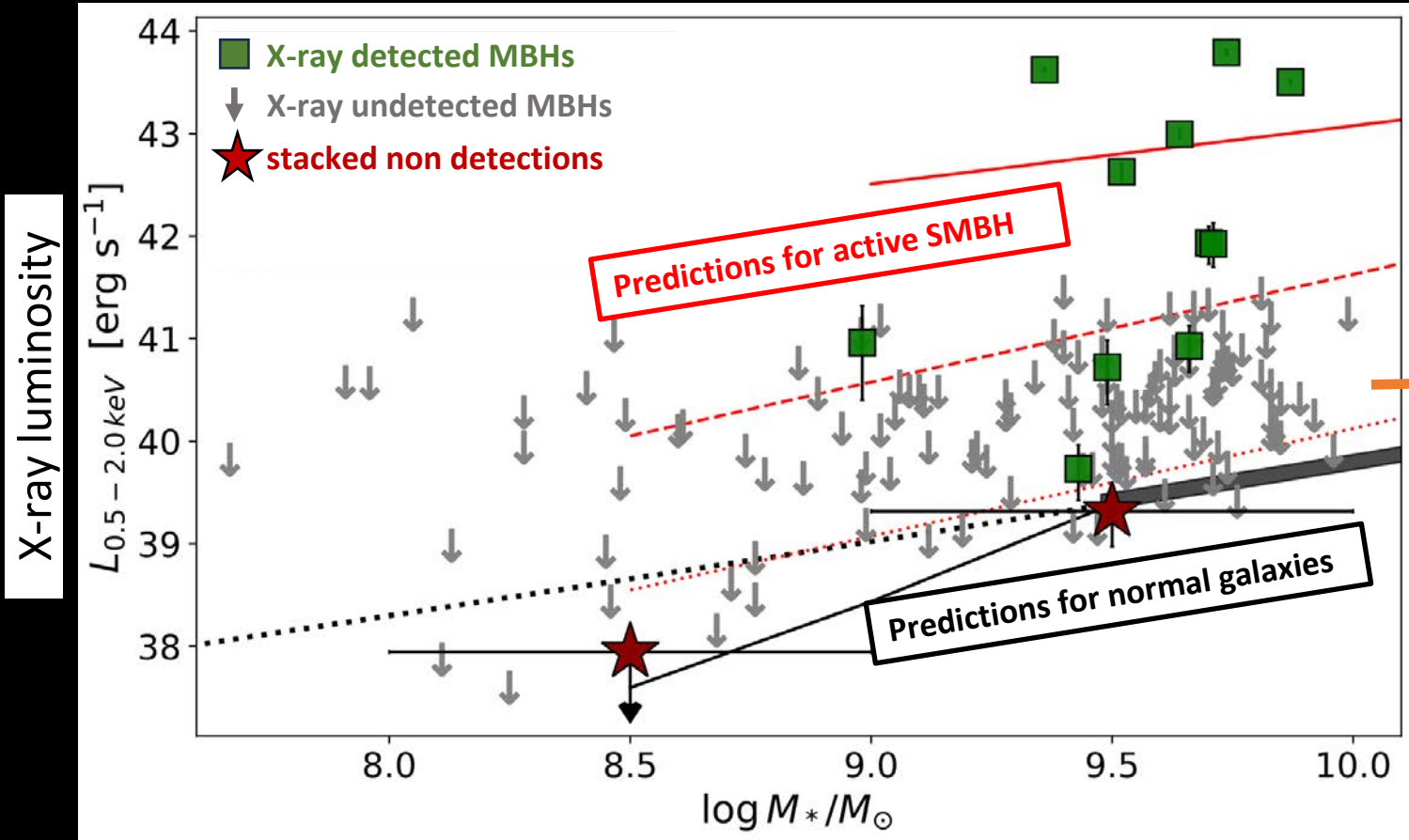
MBH from optical/IR \longrightarrow active/occupation fraction = 1
 \longrightarrow we can study their accretion mode



Arcodia+24

Result: O X-ray Corona, where art thou?

- X-rays are much fainter than the predictions (from optical and radio data)



X-ray data are consistent with:

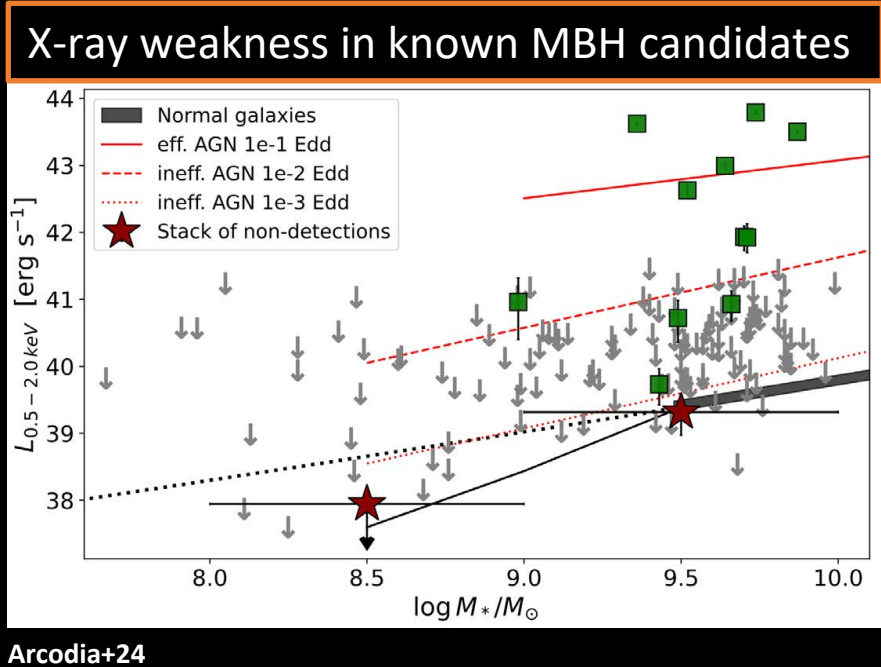
- Normal galaxies (no X-ray corona)
- Underluminous X-ray AGN (non-standard accretion mode)

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Stellar mass of the galaxy

Why are X-rays faint in this sample?

- After ruling out potential biases (obscuration? variability? spurious classification?), what are the possible physical explanations?



MBHs in low-mass galaxies do not efficiently power an X-ray corona

“X-ray-only” problem

Their accretion mode is significantly different compared to more massive SMBHs

no single-band selection is representative of all MBHs,
all selection techniques should be combined

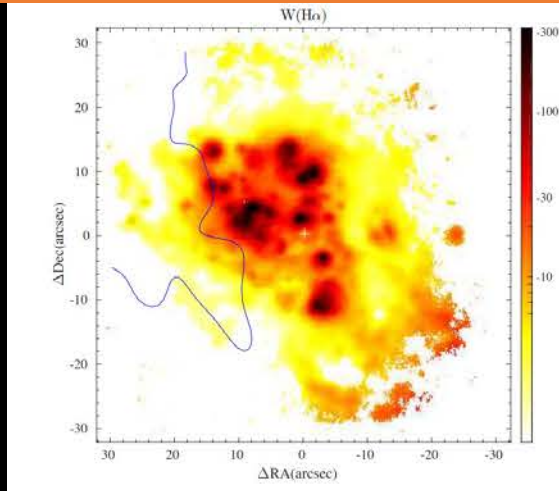
See e.g. Wasleske & Baldassare 24

Why are X-rays faint in this sample?

→ Why would there be a different accretion mode in low-mass galaxies?

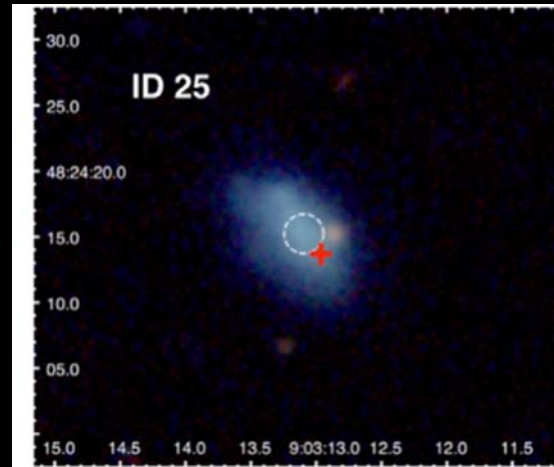
Why?

Clumpier interstellar medium



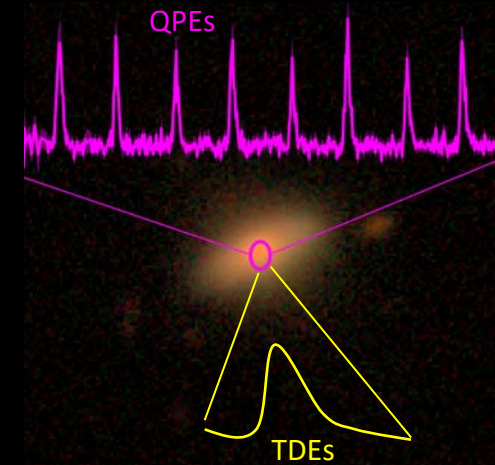
Cairos+21

BH is offset from gas/stars



Reines+20

Nuclear transients vs AGN



Cr: R. Arcodia

- X-ray view of MBHs selected through optical-infrared variability unveils systematic X-ray weakness
- Lack of X-ray corona or unusual accretion mode in low-mass galaxies?

O Corona, where art thou? eROSITA's view of UV-optical-IR variability-selected massive black holes in low-mass galaxies

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Thank you!