On the connection of major mergers and AGNs

A closer look at high-accretion rate AGNs at z~2

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Victor Marian • MPIA

Advisor: Knud Jahnke

How to trigger and feed a black hole?

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→ Major mergers **most feasible** option (?)

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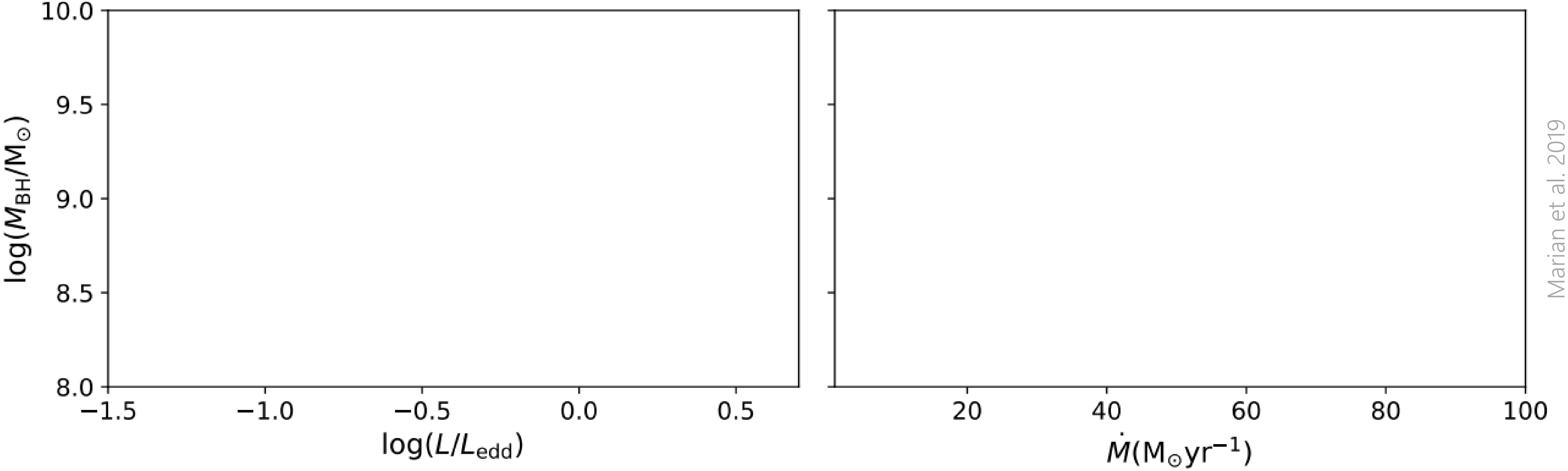
Matching control sample of inactive galaxies essential

Sample selection



Marian et al. 2019

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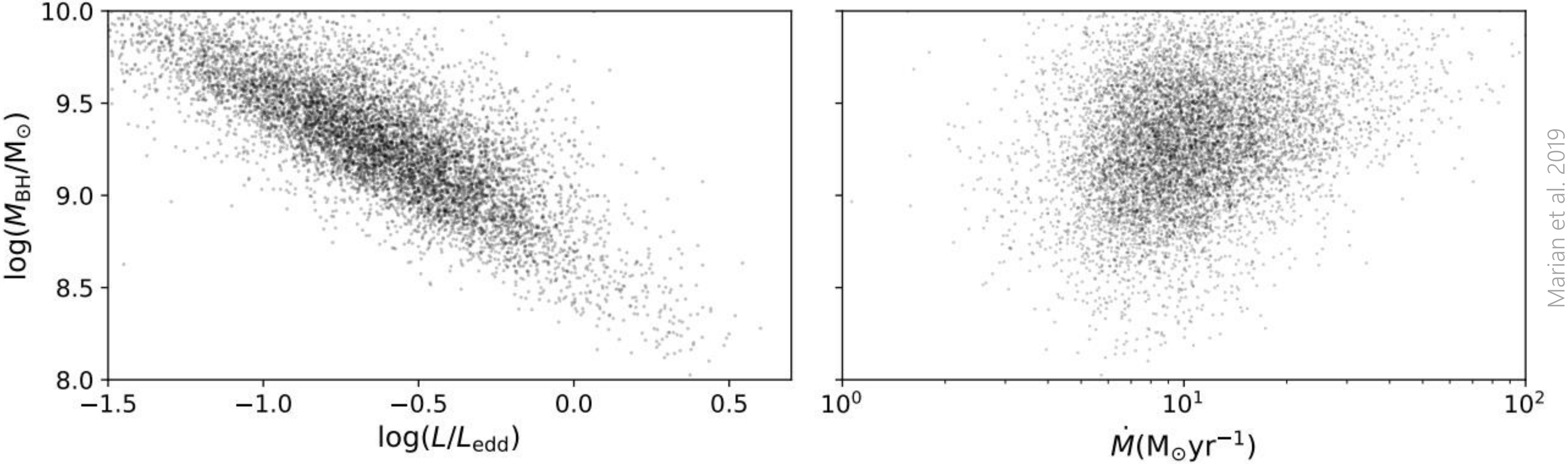

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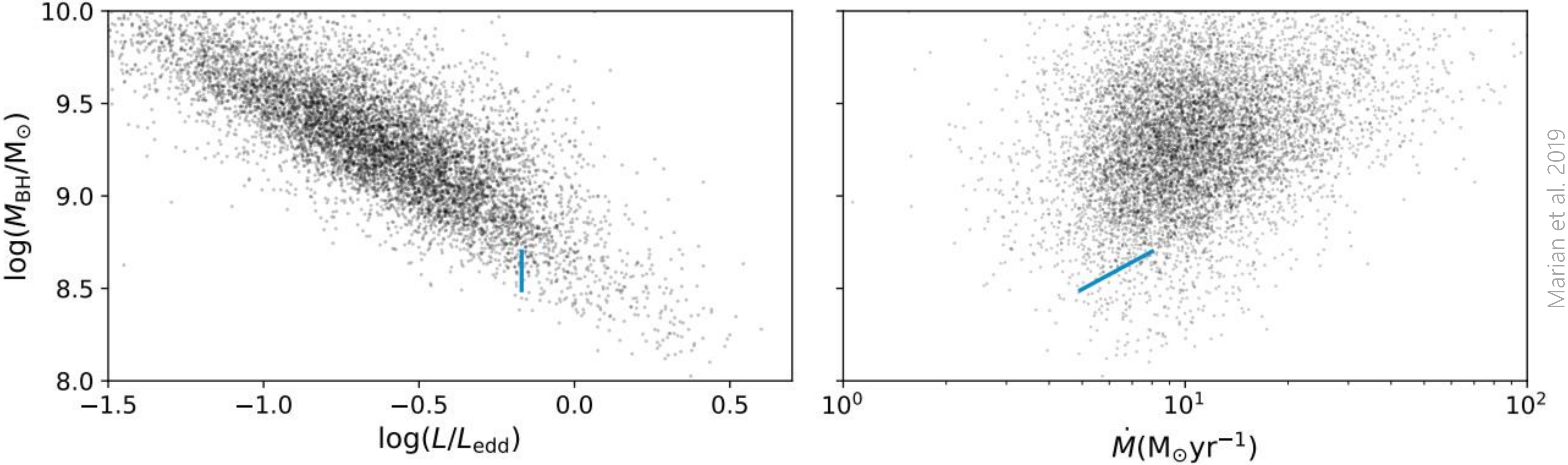
Redshift

$1.8 \leq z \leq 2.2$

Sample selection



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$8.5 \leq \log(M_{BH}/M_\odot) \leq 8.7$

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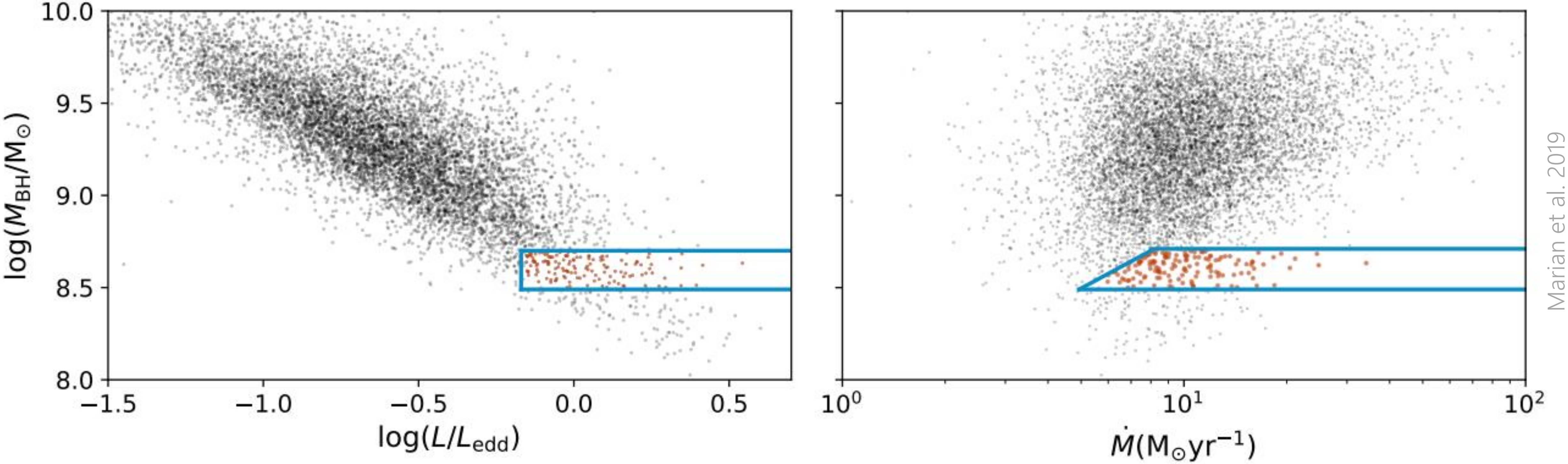

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$(L/L_{edd}) \geq 70\%$

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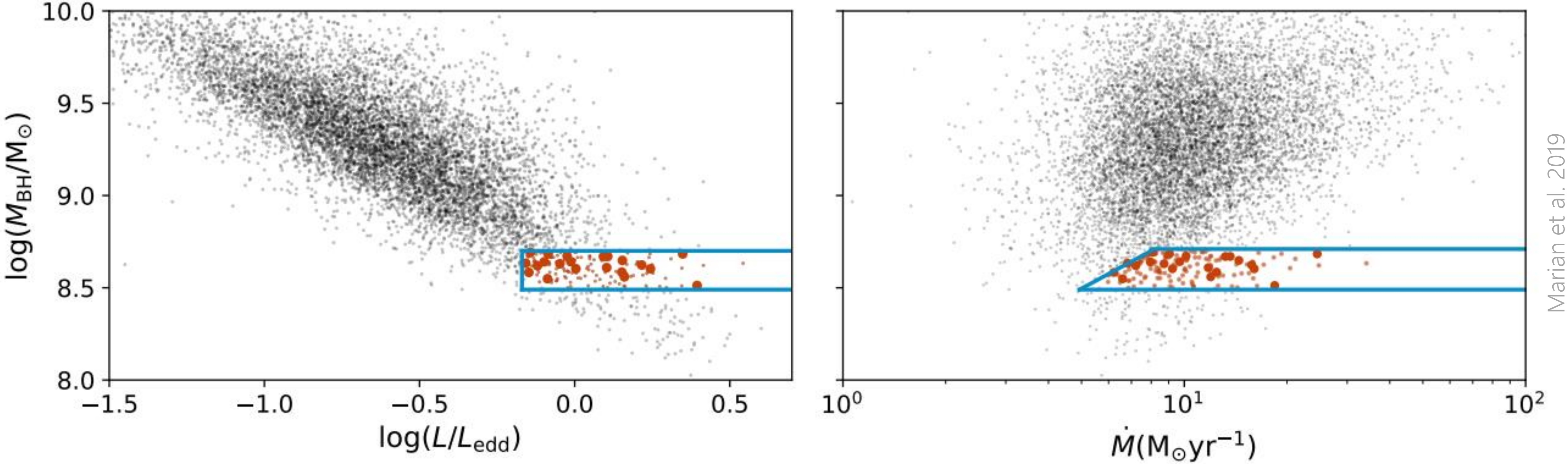

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Sample: **21 AGN, Type I**

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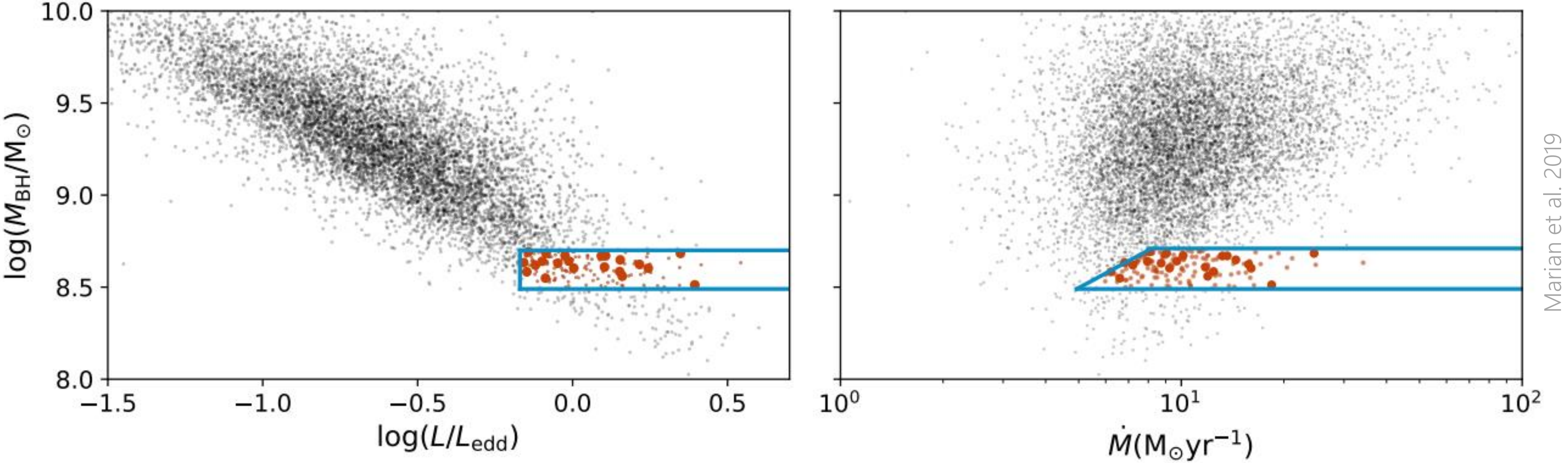

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Comparison sample: **92 inactive galaxies** from CANDELS

Modeling & Point-source subtraction

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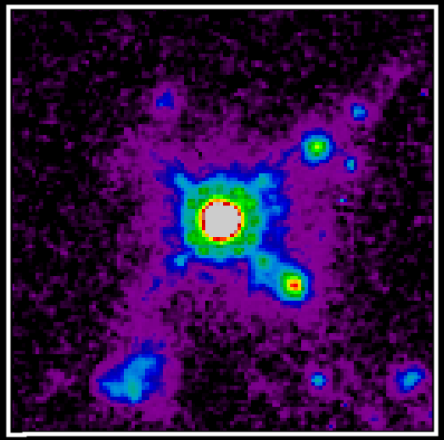

AGN + host galaxy

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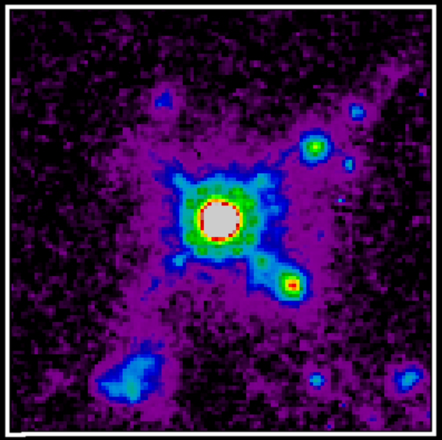

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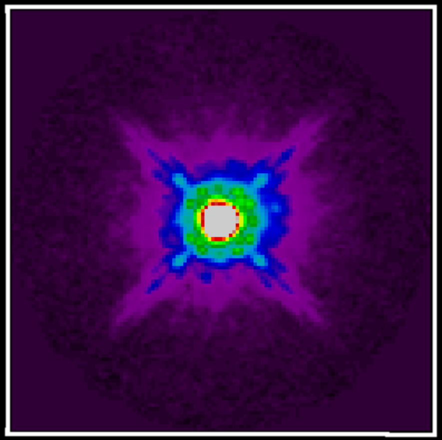

Convolved model

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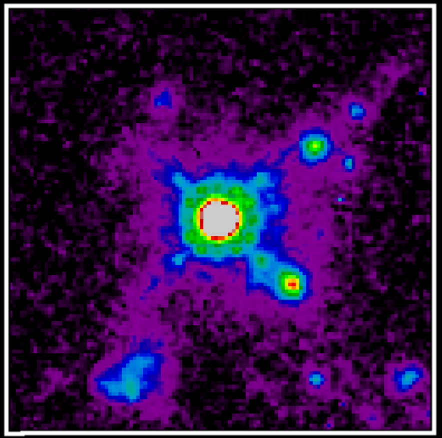

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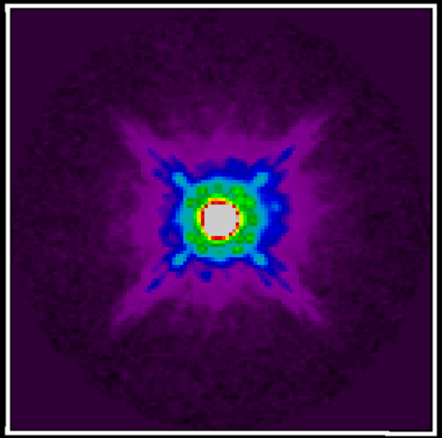

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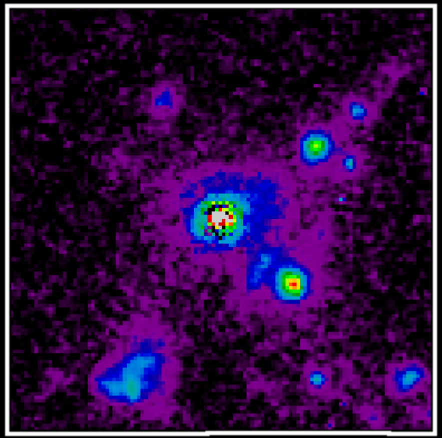
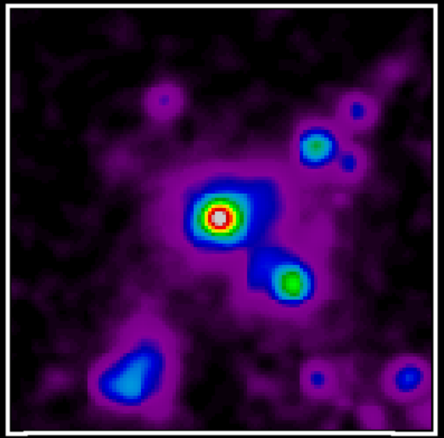
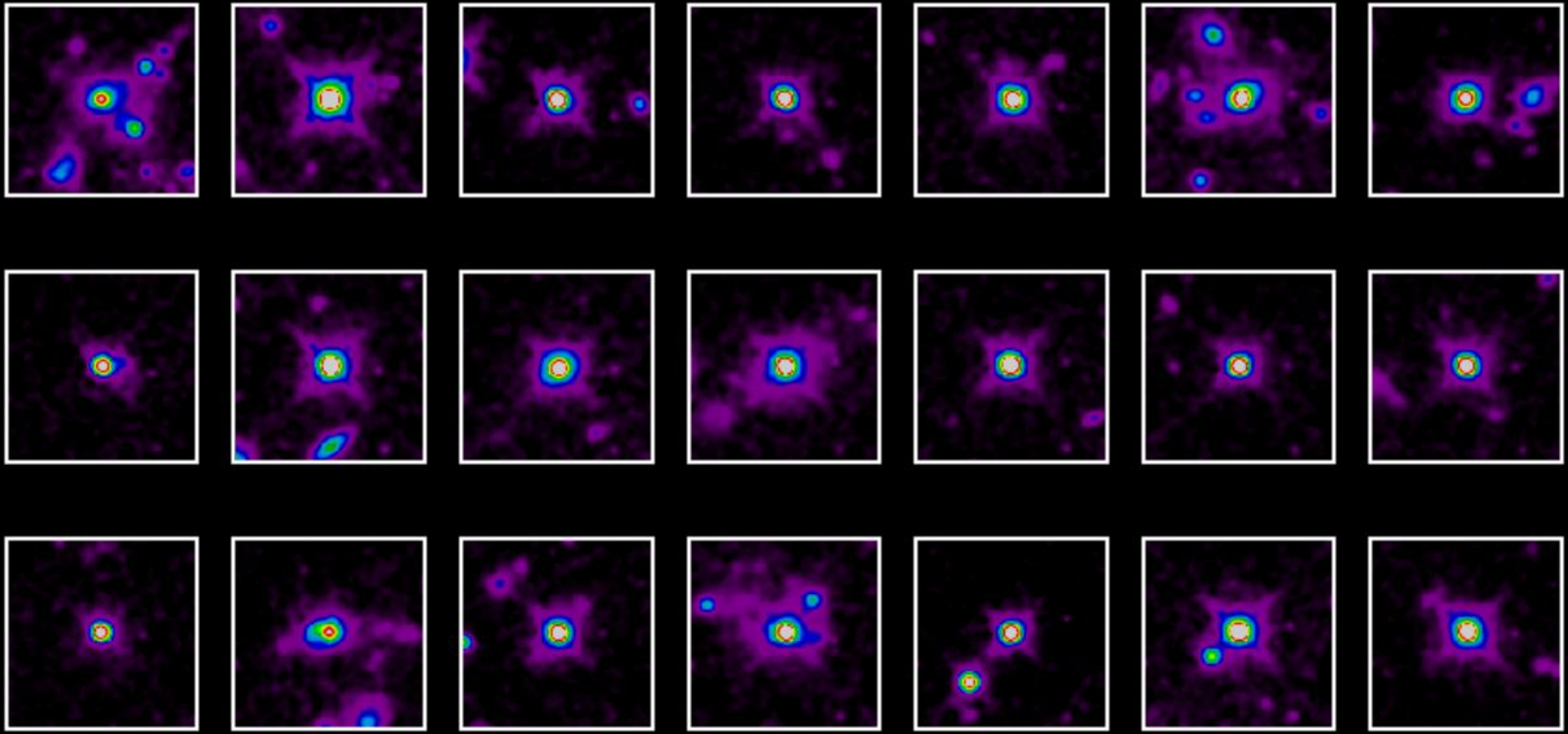


Point-source subtracted



2x2 smoothed

Modeling & Point-source subtraction



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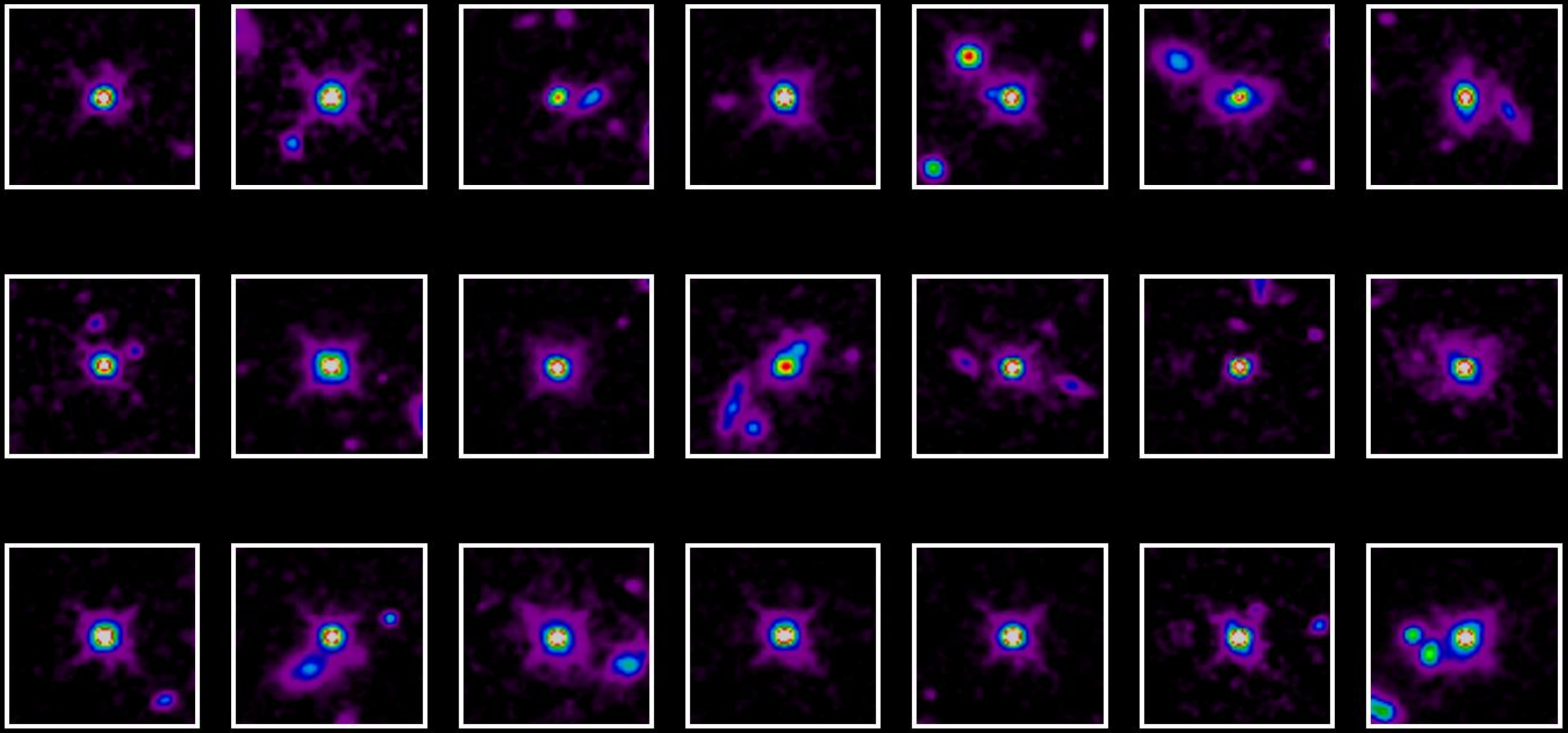

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Analysis

Main steps:

- Coauthors rank joint sample
  ↳ (S. Cohen, B. Husemann, K. Jahnke, V. Jones, A. Koekemoer, V. Marian, A. Schulze, A. van der Wel, C. Villforth & R. Windhorst)
- Combine individual rankings
- Determine cut-off rank
- Split sample
- Derive merger fractions

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- Showing merger features:
  - 5 AGN host galaxies
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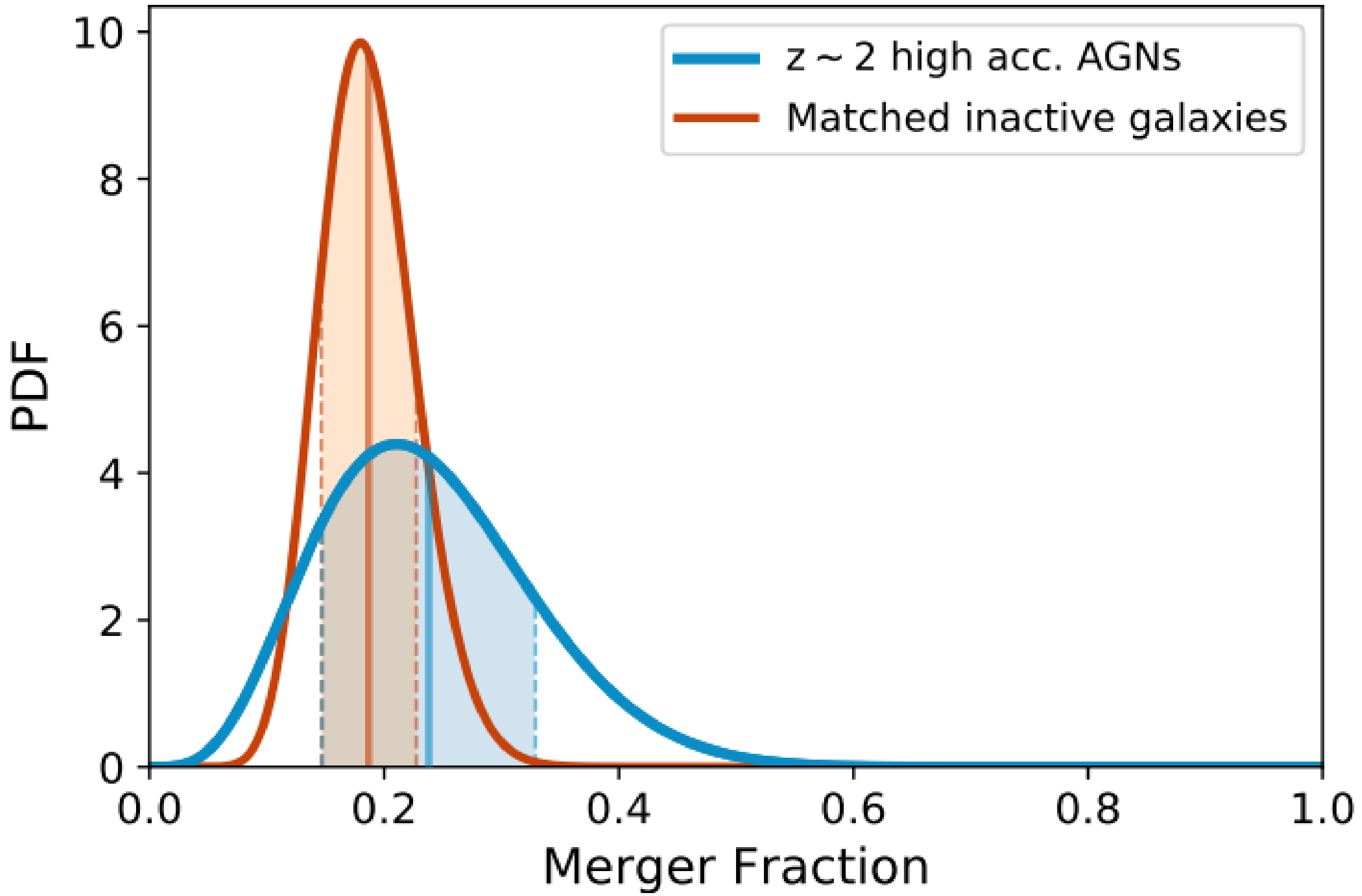

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    - Usual lifetimes of AGNs: 10^6 - 10^8 yr (Martini 04; Hopkins+ 05; Shen+ 07; Hopkins & Hernquist 09; Conroy & White 13; Cen & Safarzadeh 15)
    - Lifetime of merger features: 10^9 – 10^{10} yr (Conselice 06; Lotz+ 08; Ji+ 14; Solanes+ 18)
    - Visibility overlap of ≥ 500Myr, even with delay of ~300 Myr

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- ~~…a time lag between merger and AGN activity?~~
- … intermittence of AGN activity?
    - AGN timescales: ~10^5 yr
      or
    - ~20% of merging inactive galaxies host intermittent AGN

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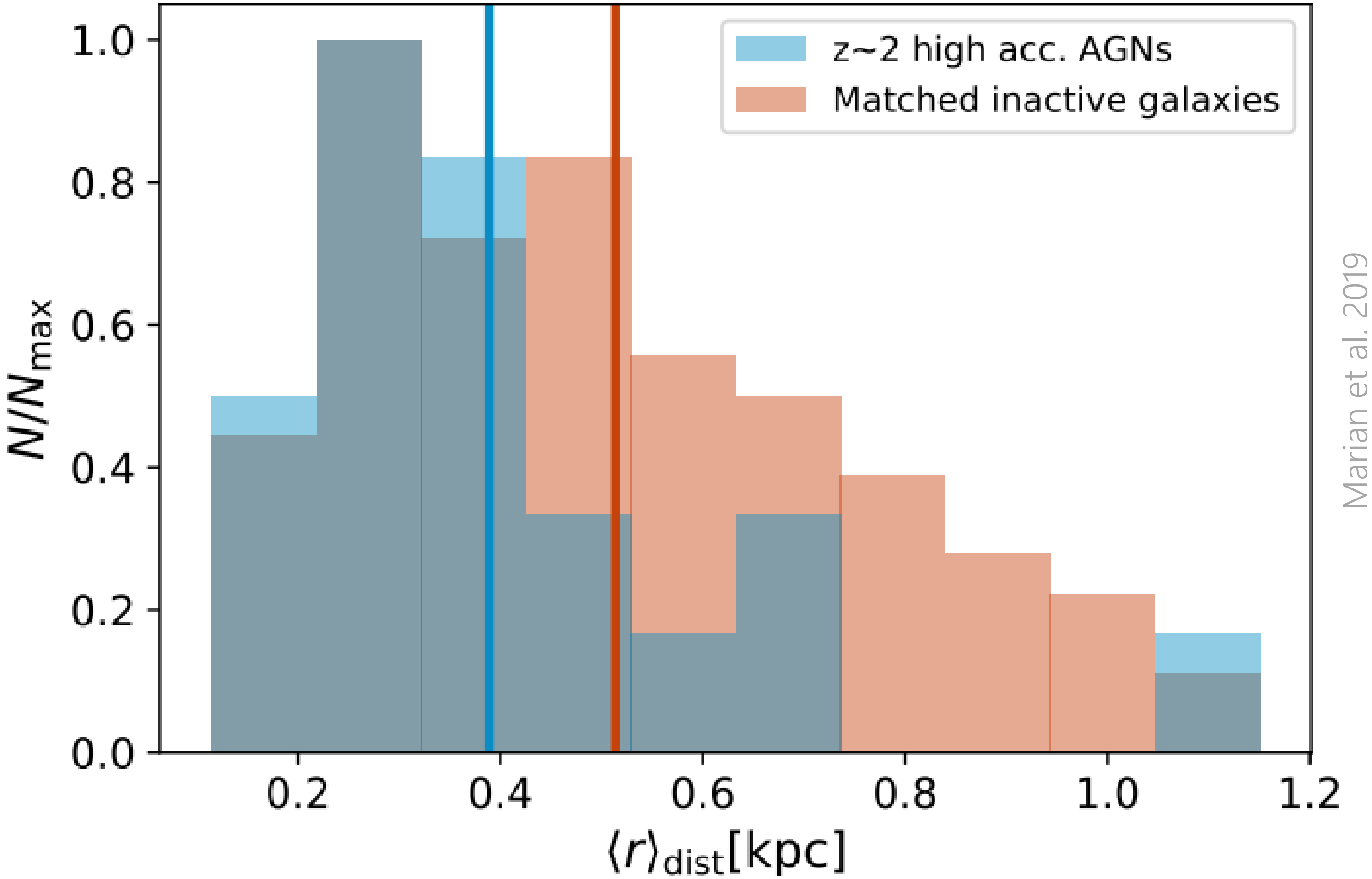
- ... a potential offset between AGN position and host galaxy flux center

Spatial offset between AGN and host galaxy nucleus



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More details in

Marian V., Jahnke K., Mechtley M., Cohen S., Husemann B., Jones V., Koekemoer A., Schulze A., van der Wel A., Villforth C., Windhorst R.

(subm. to ApJ, arXiv:1904.00037)

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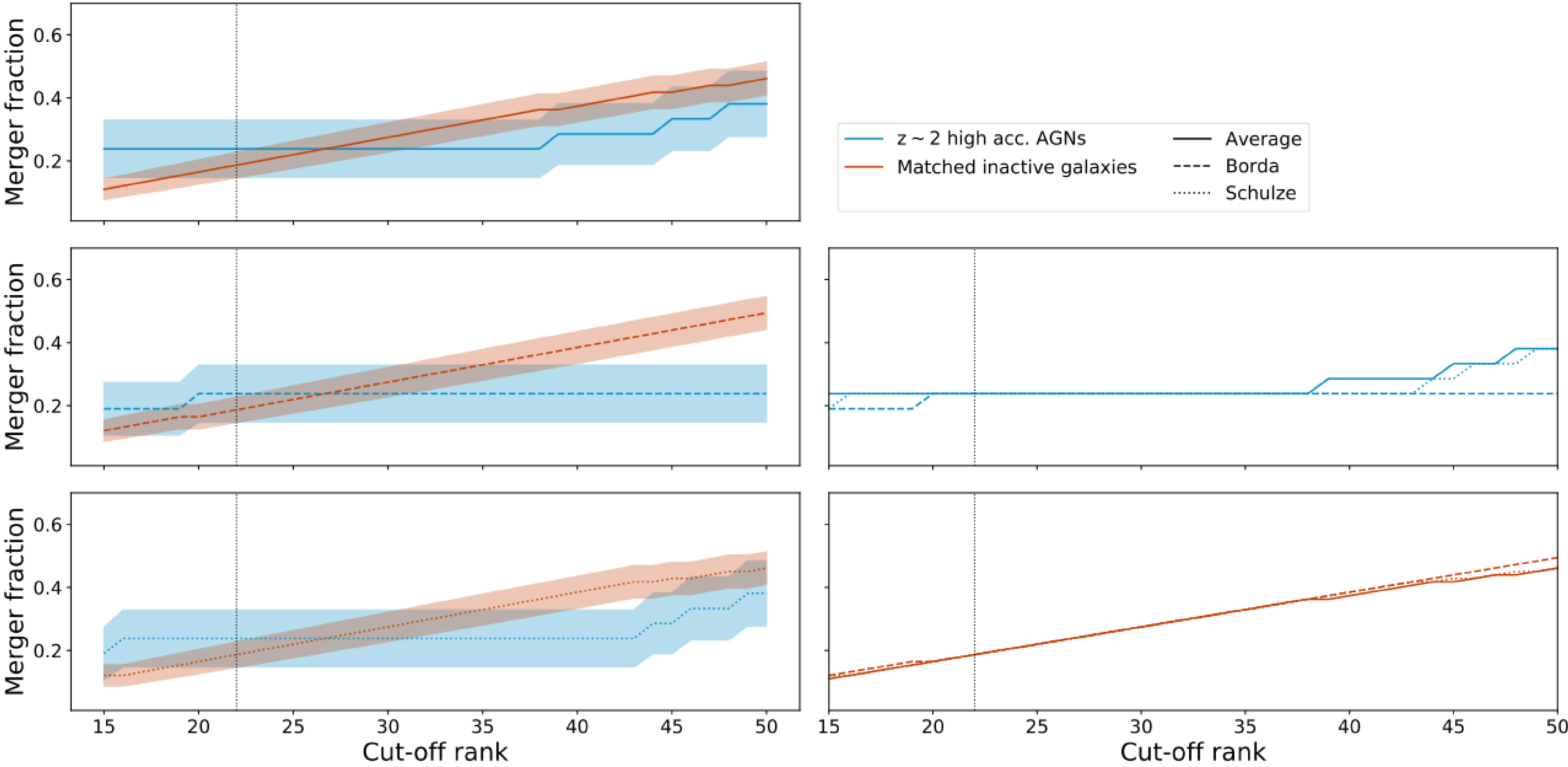


Credit: Marian et al. (2019)

Intermittent AGN

Total fraction of AGN within our constraints

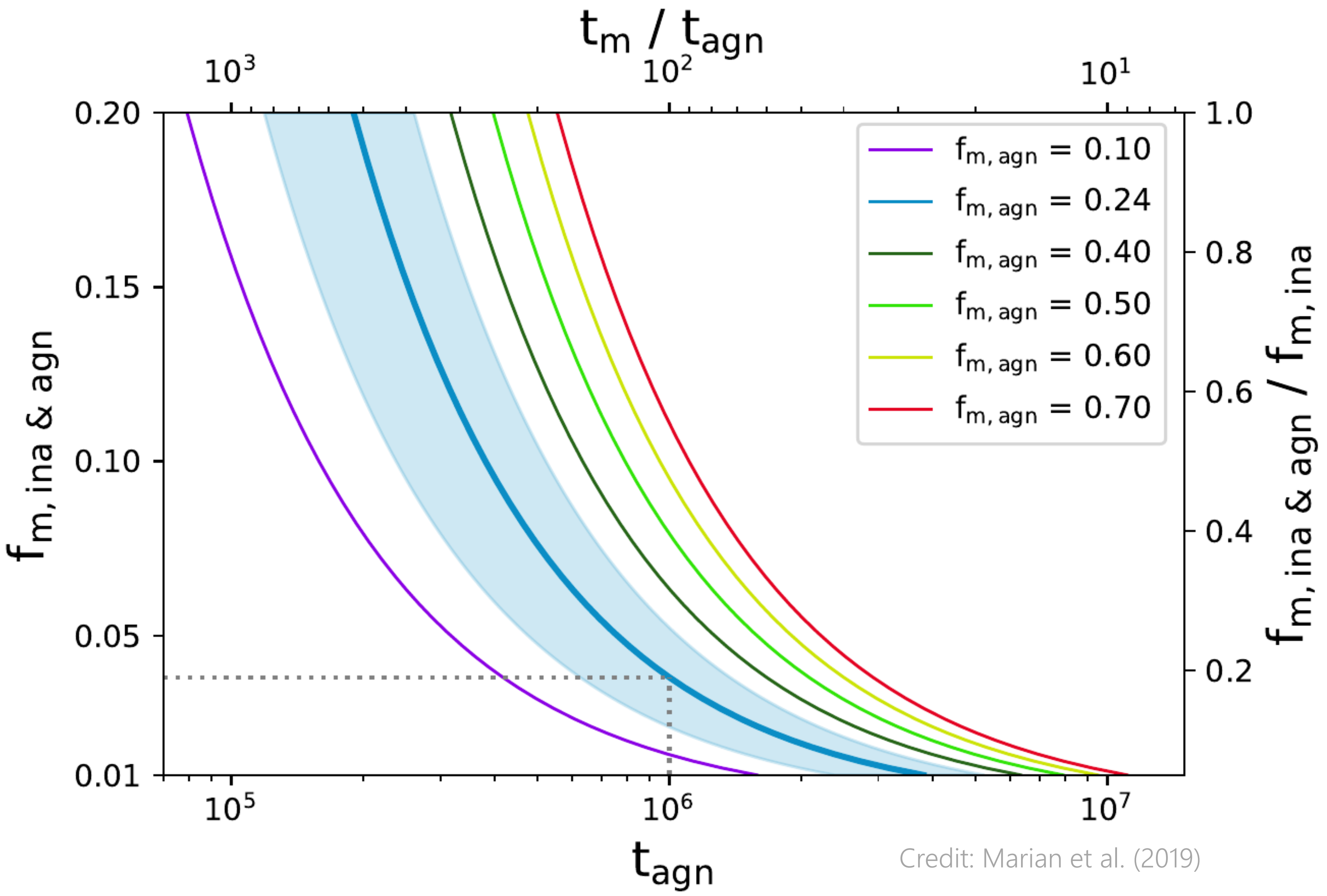
Merger timescale

$$f_{m,ina\,\&\,agn} = f_{agn} \times f_{m,agn} \times \frac{t_m}{t_{agn}}$$

Fraction of merging, inactive galaxies that host an intermittent AGN

AGN merger fraction

AGN timescale



Credit: Marian et al. (2019)