The impact of obcuration on the accretion rate of AGN

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Image: ESO/M. Kornmesser

Brief introduction

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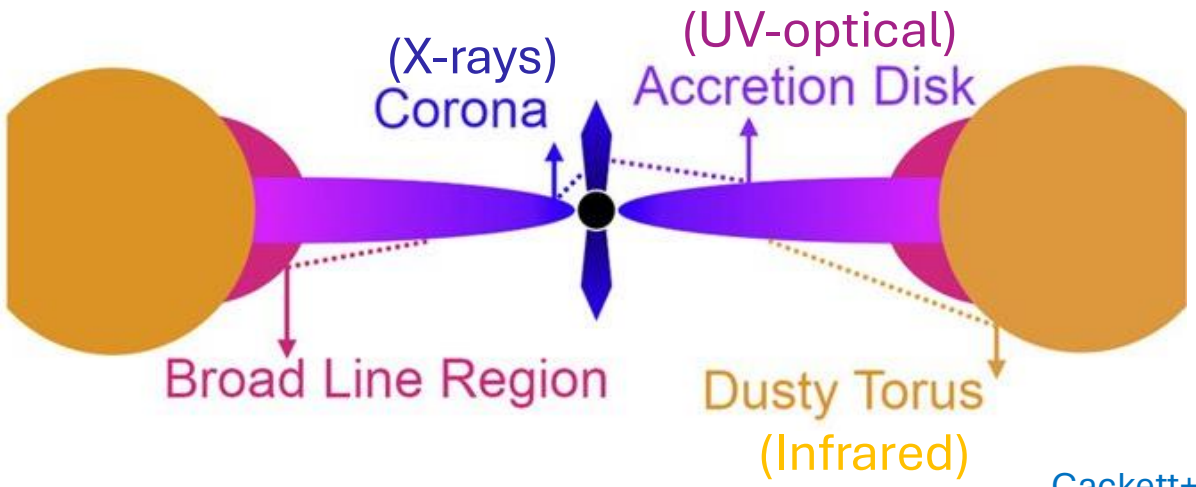

Cackett+21

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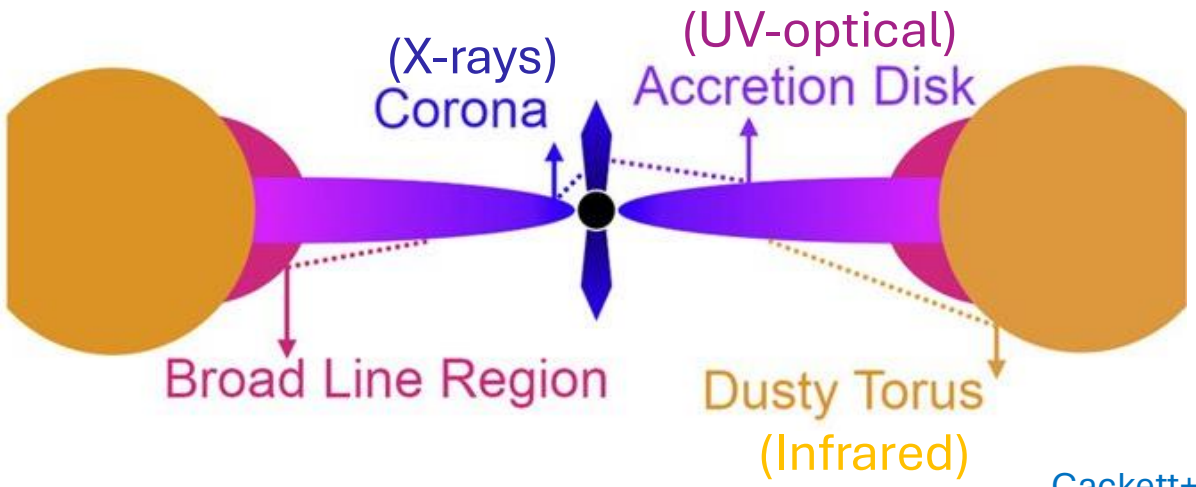

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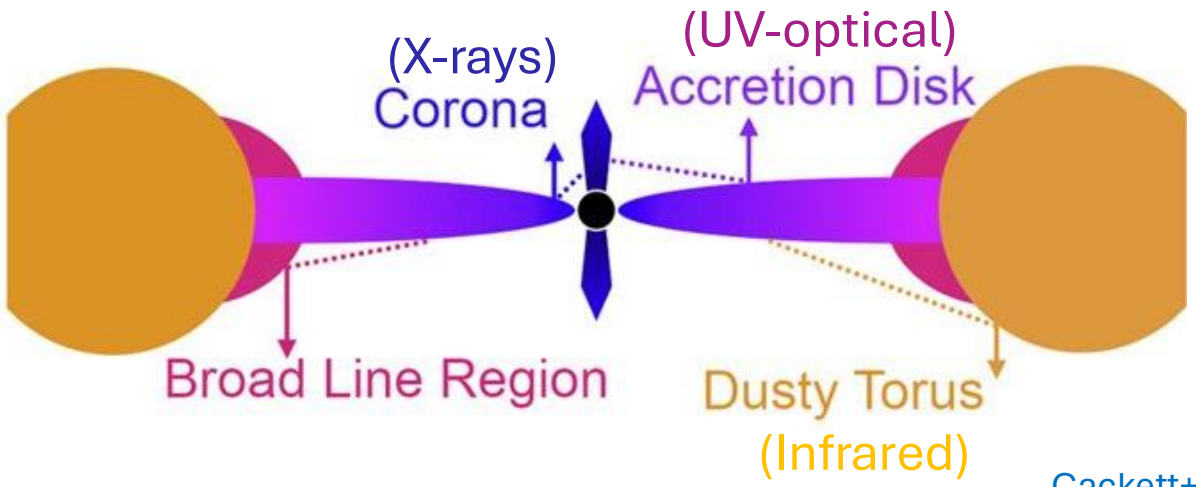
Other theories could expect differences:

- Evolution model (Hopkins+08)
- Radiation-regulated model (Ricci+17)



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Do obscured and unobscured AGN accrete differently?

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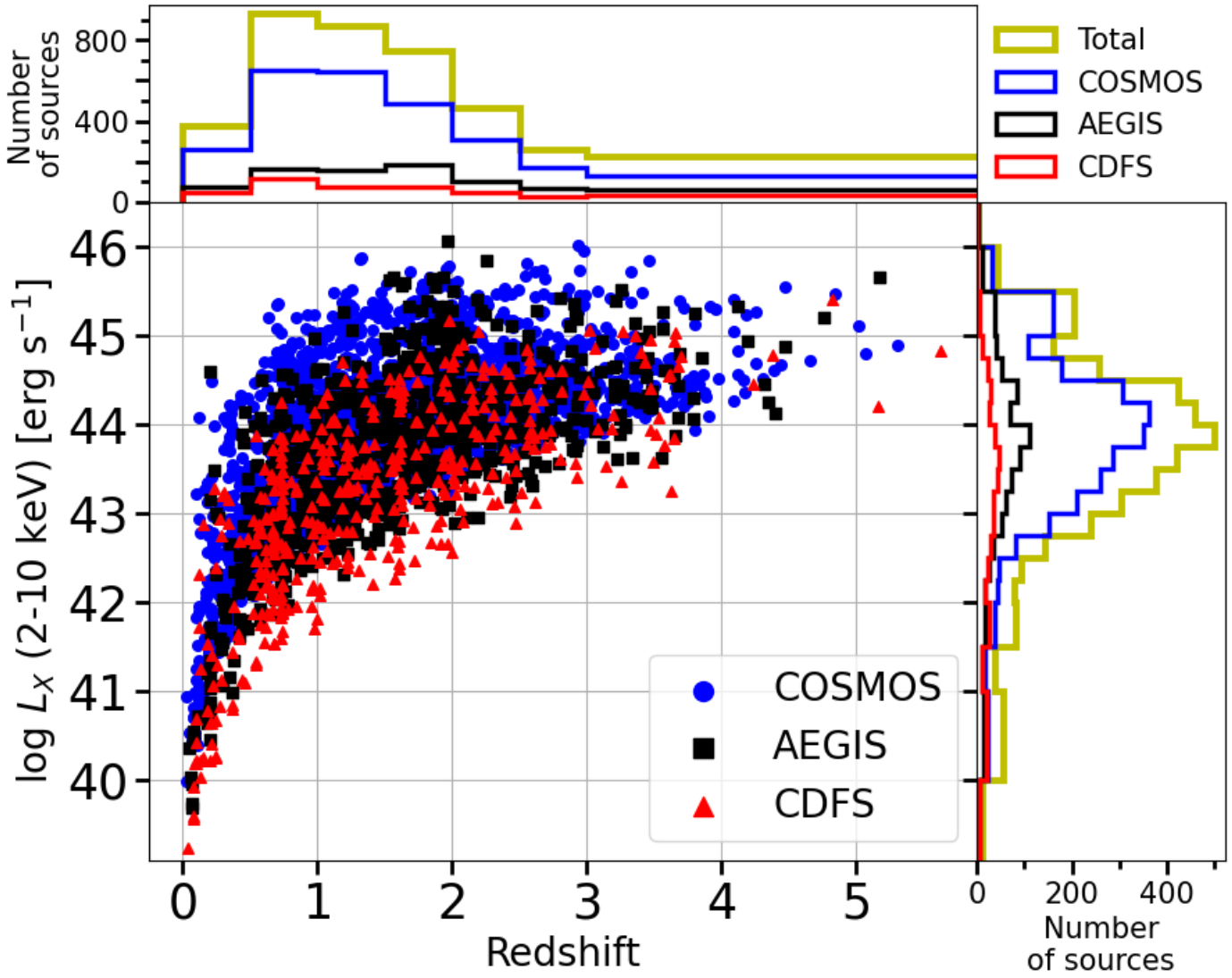
Specific accretion rate distribution (SARD): Probability of a galaxy, at a certain redshift with specific stellar mass M*, to host an AGN with a given accretion rate λ and with a certain **obscuration N_H**.

Dataset:

Chandra:

- *COSMOS-Legacy*: 2641 sources
- *AEGIS*: 783 sources
- *CDFS*: 418 sources

Total: 3842 sources

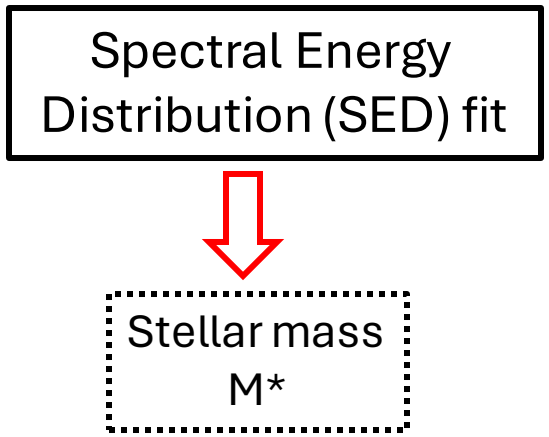


Laloux in prep

Recipe of SARD:

Spectral Energy Distribution (SED) fit

Recipe of SARD:



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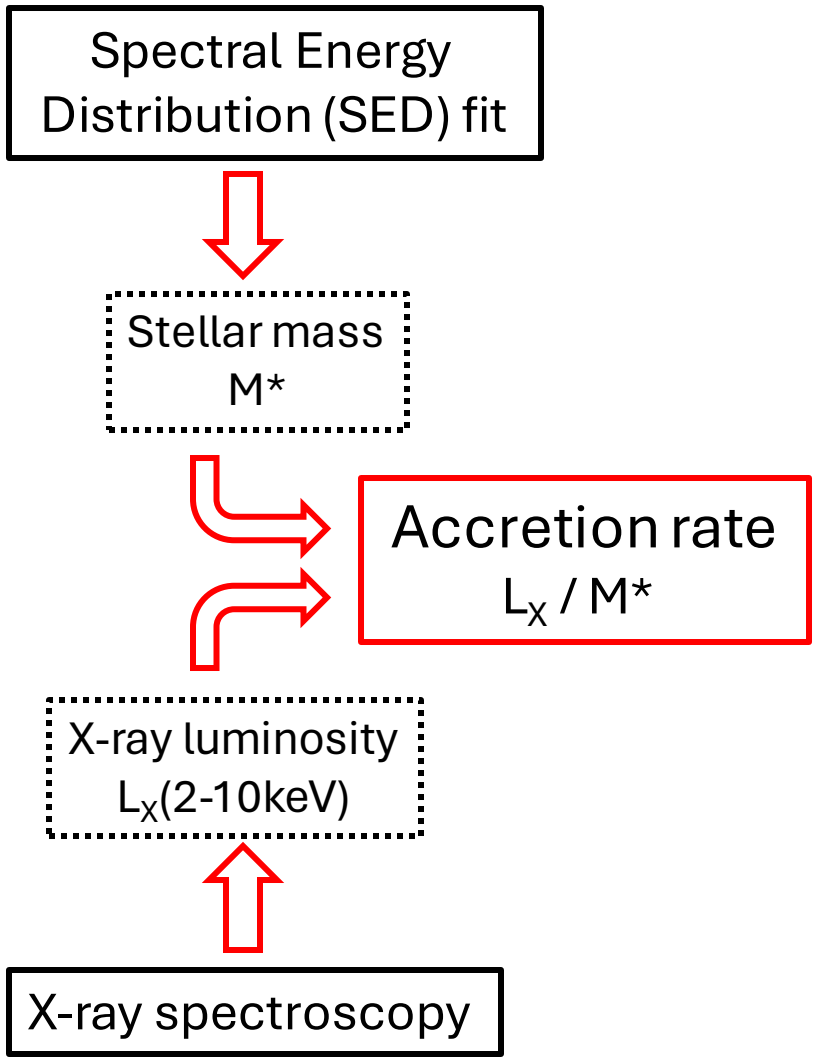

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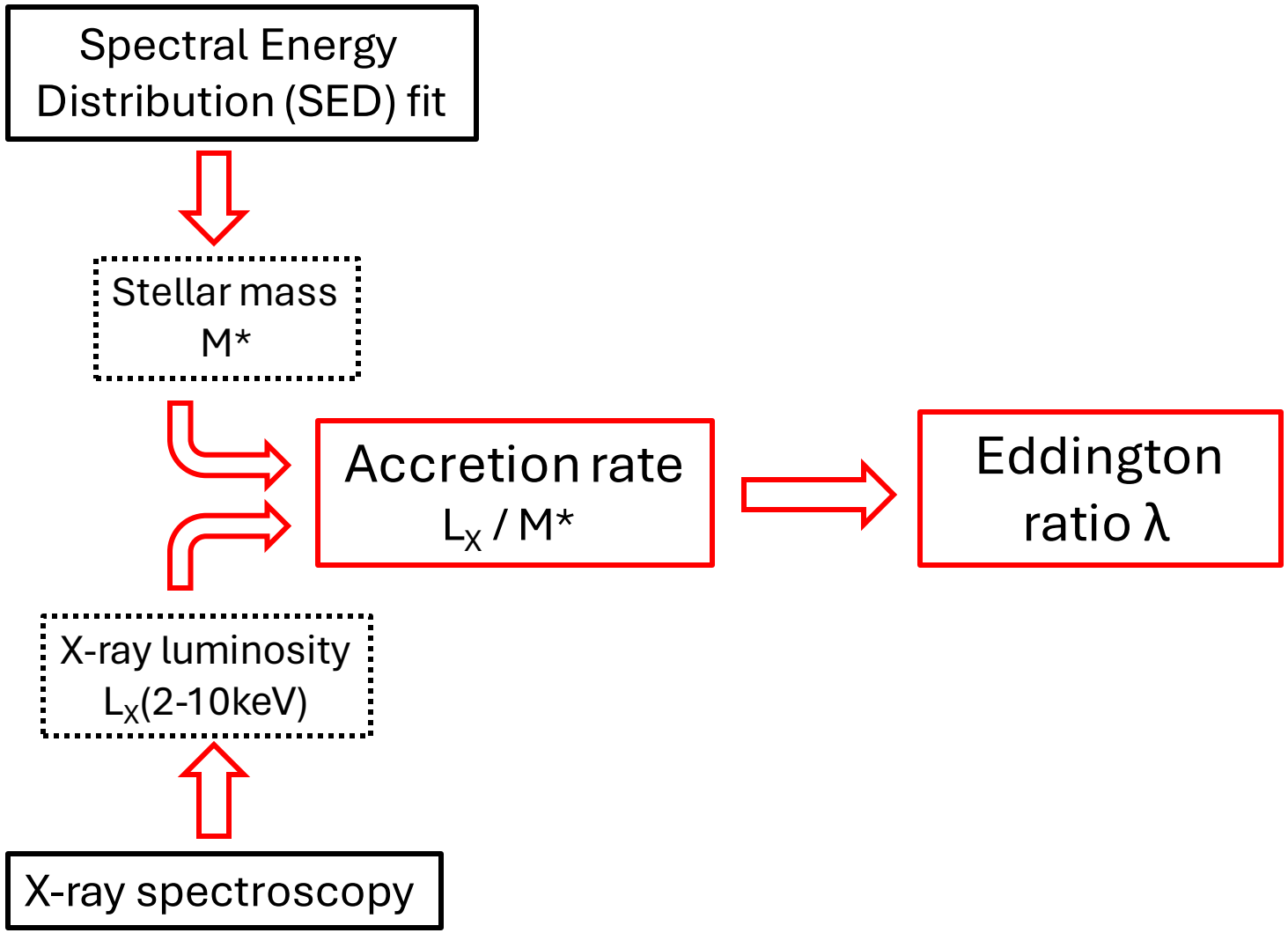

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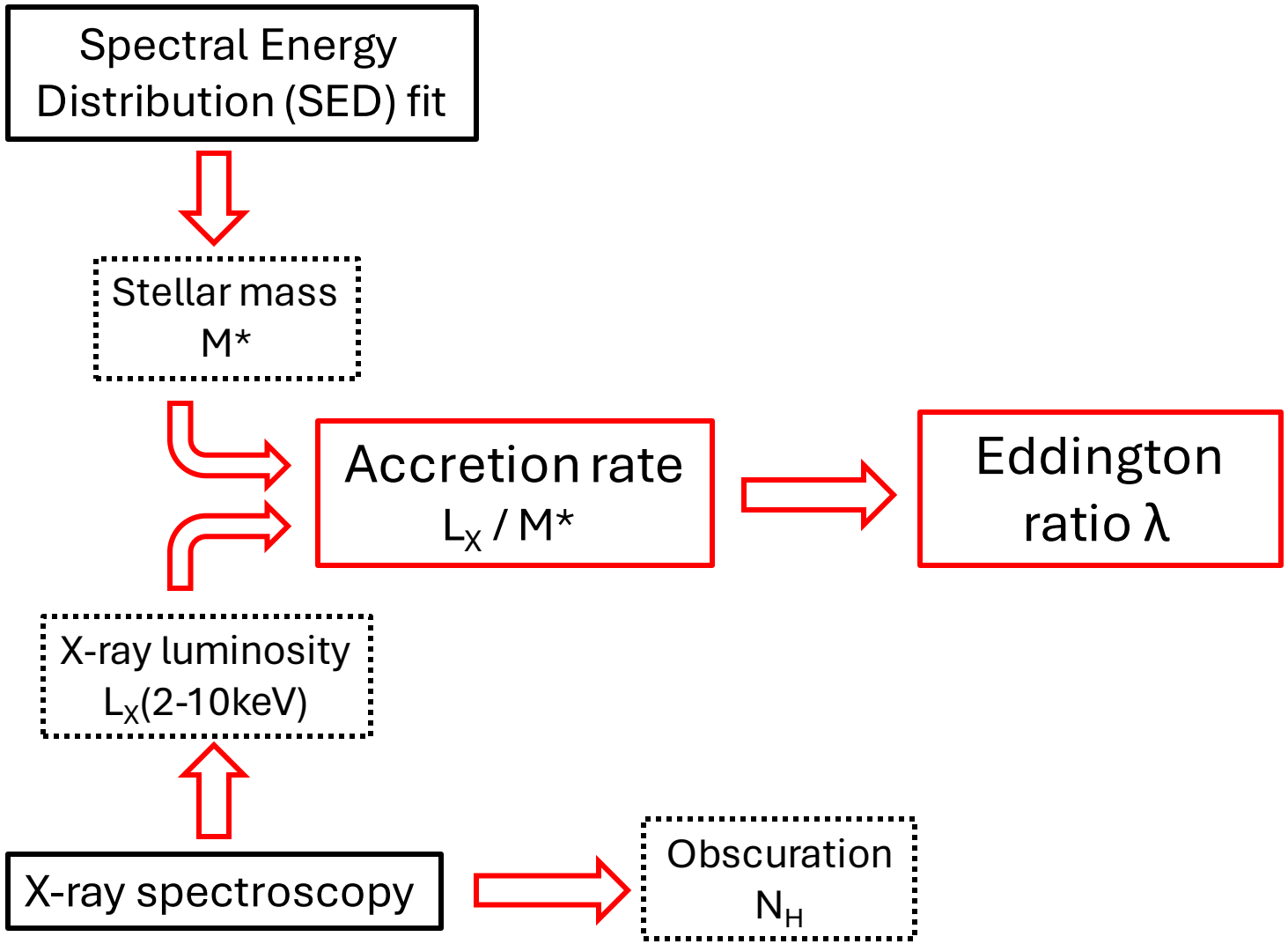

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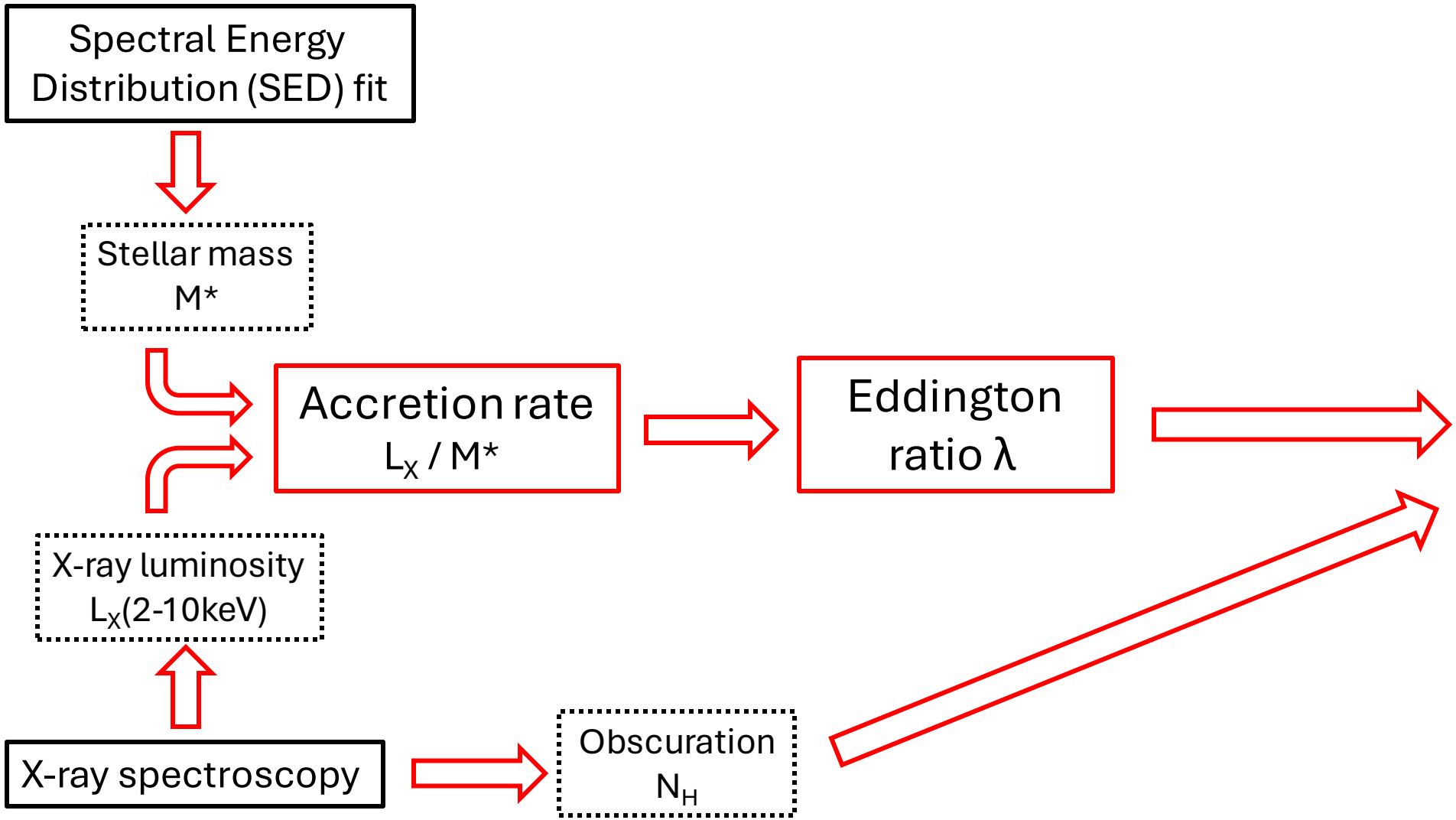

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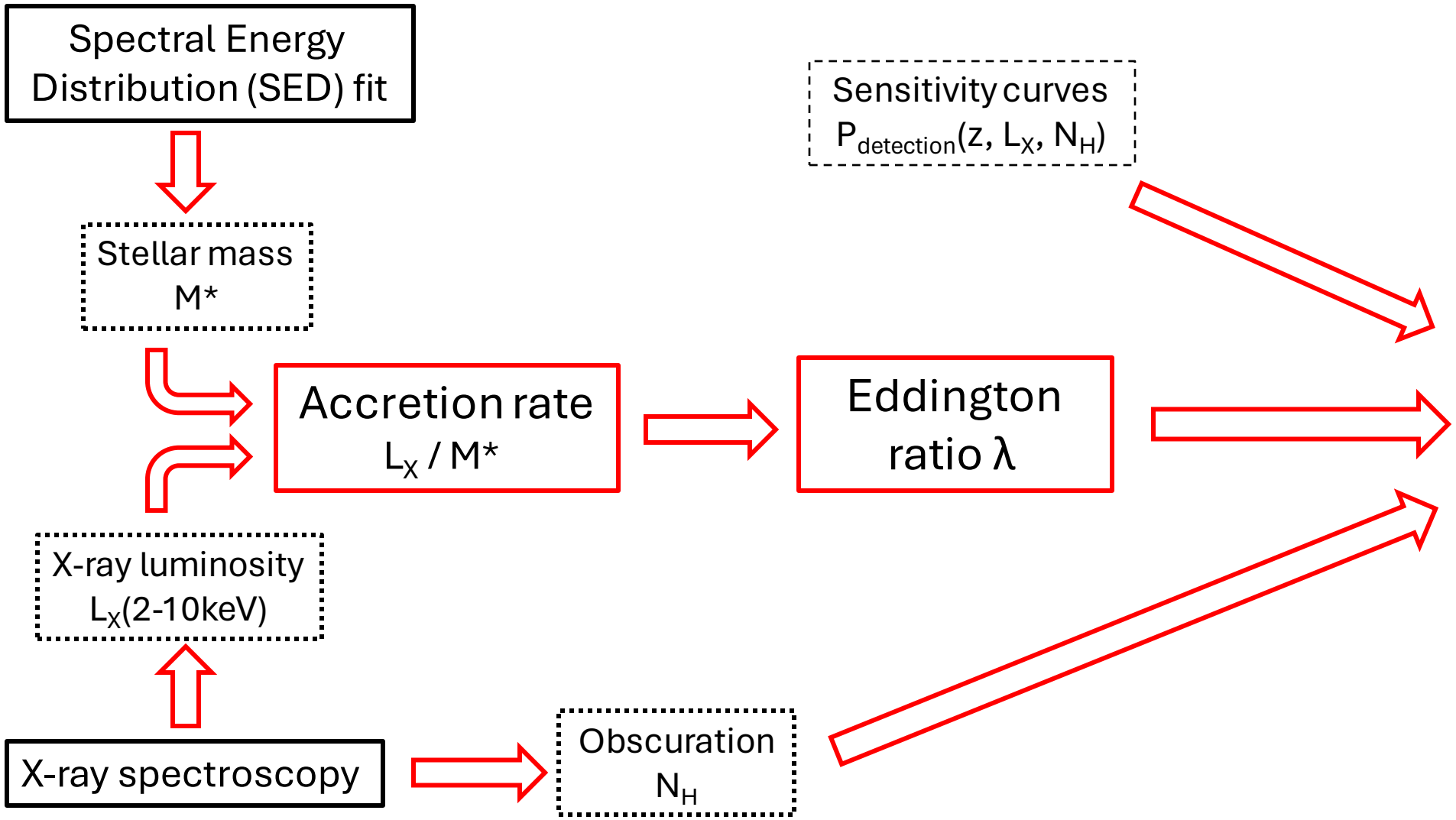

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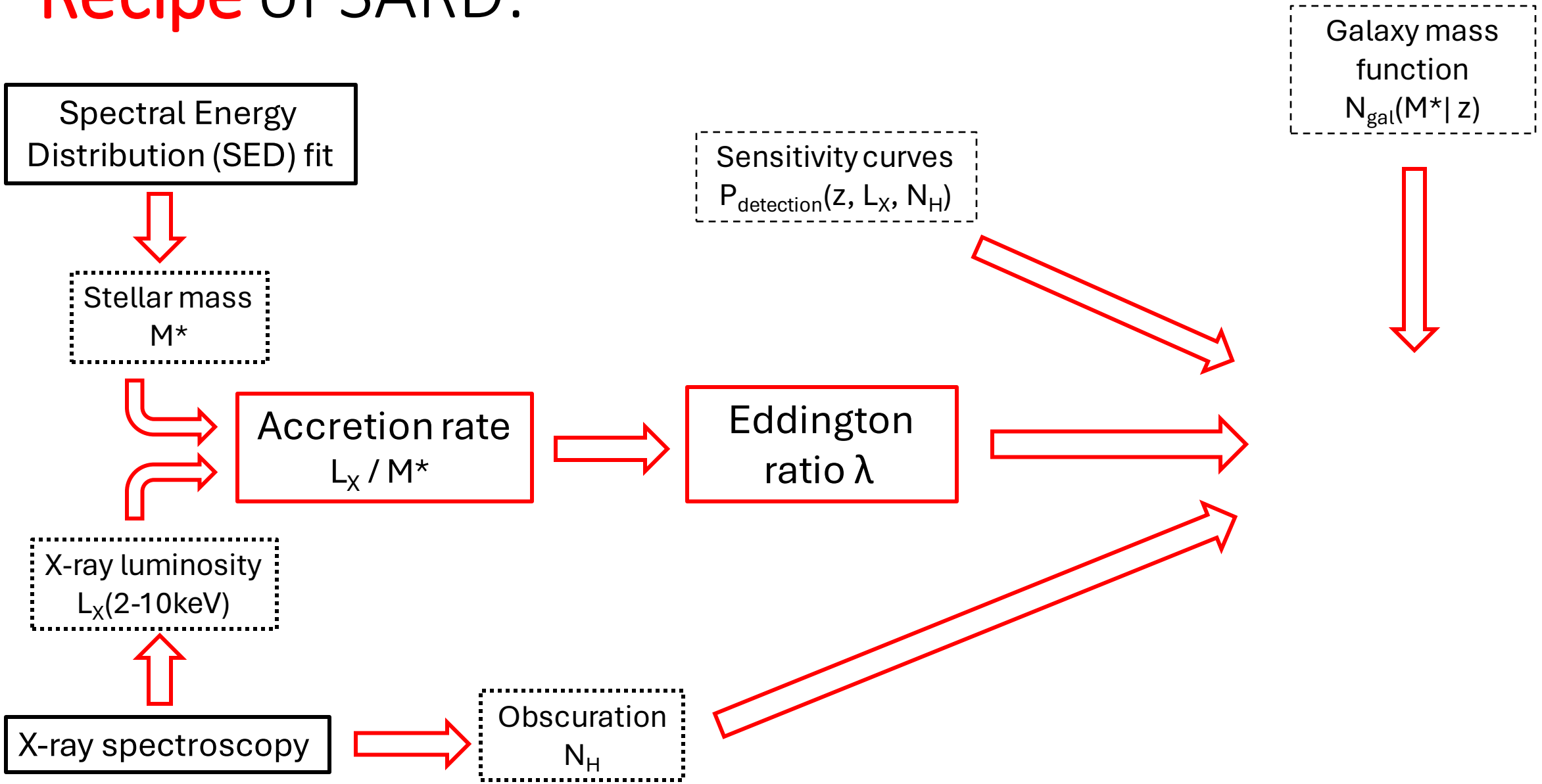

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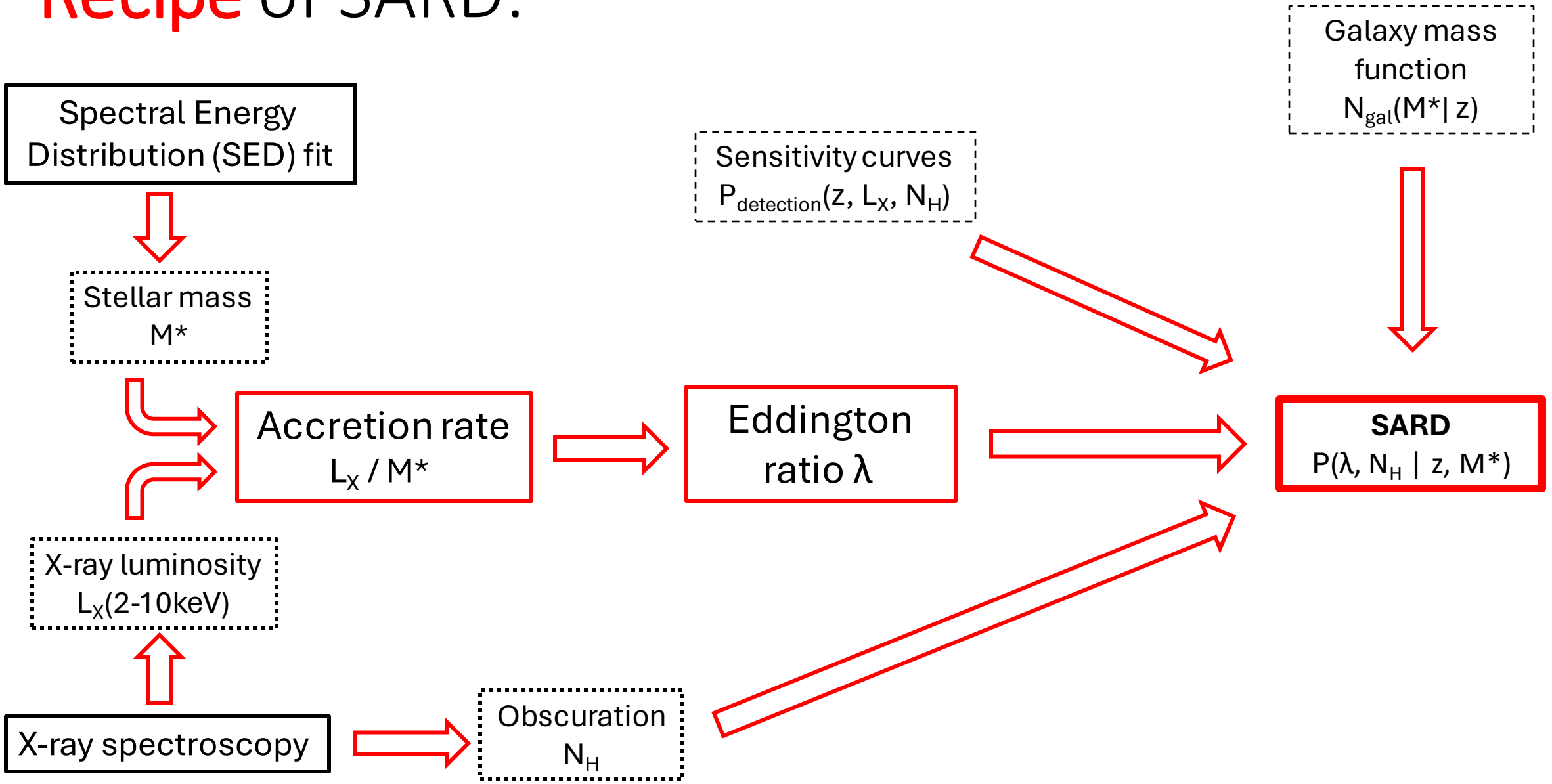
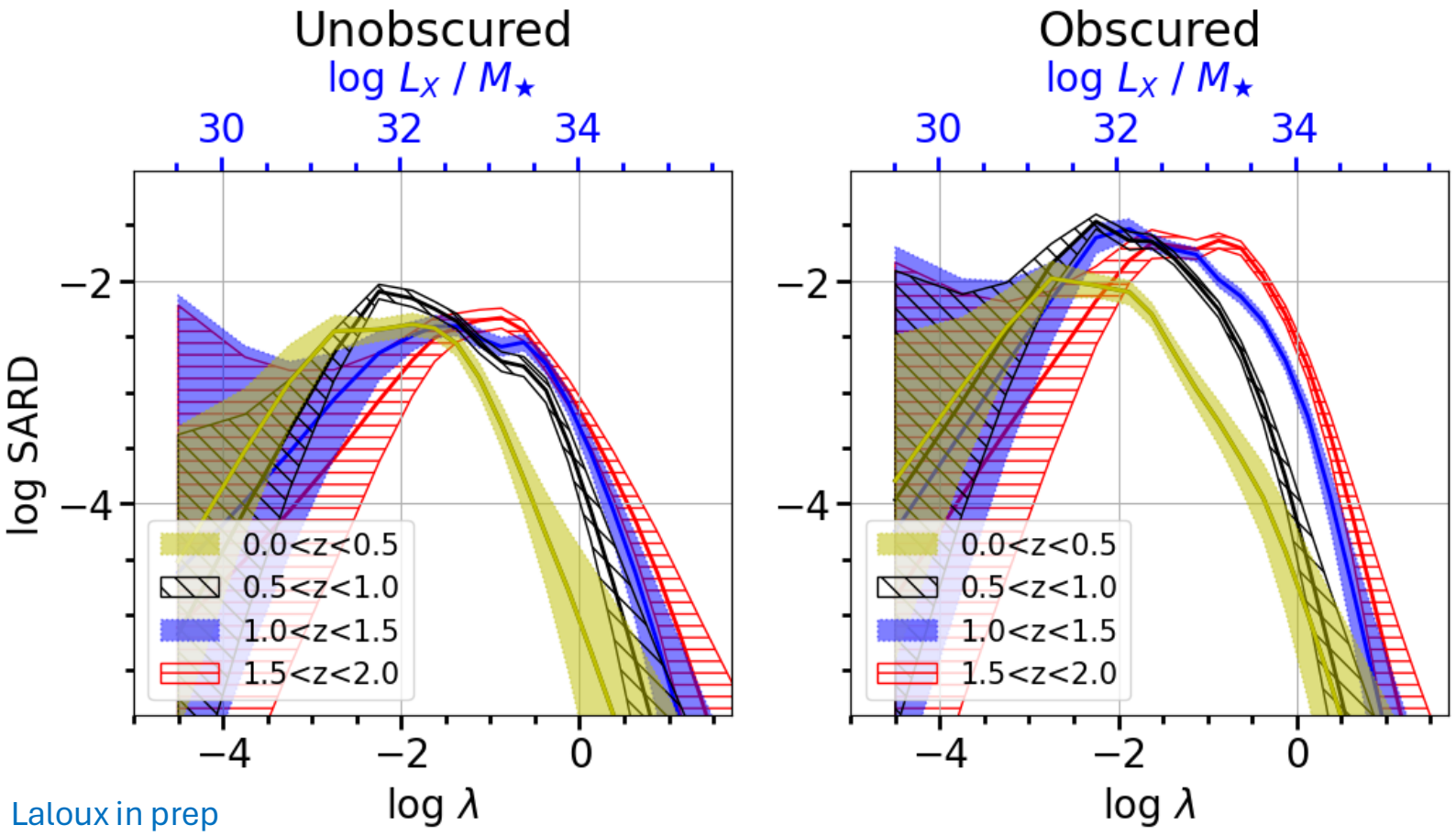


Specific accretion rate distribution (SARD)



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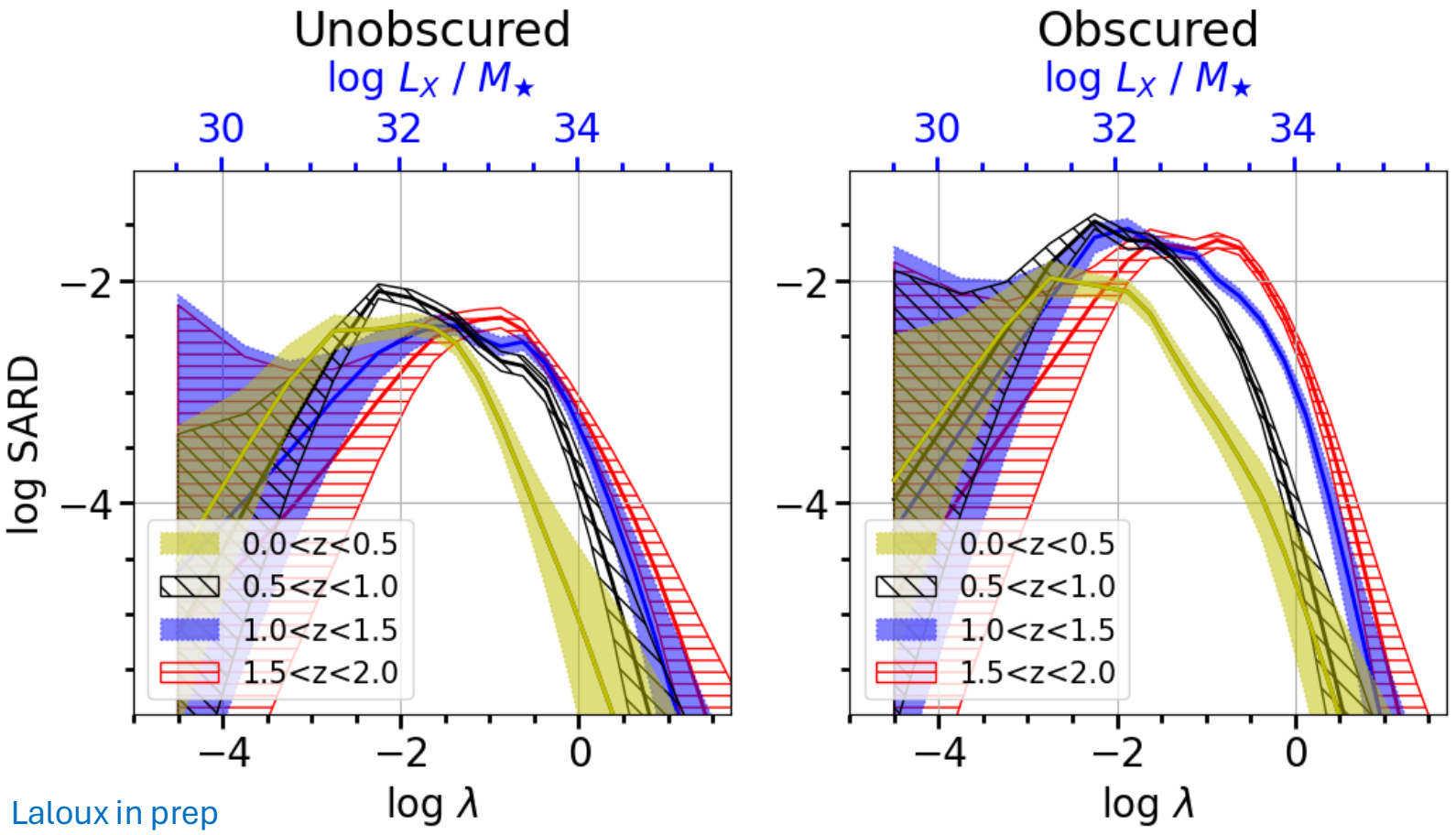

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Observations:

- Similar shapes => **similar accretion mechanism**

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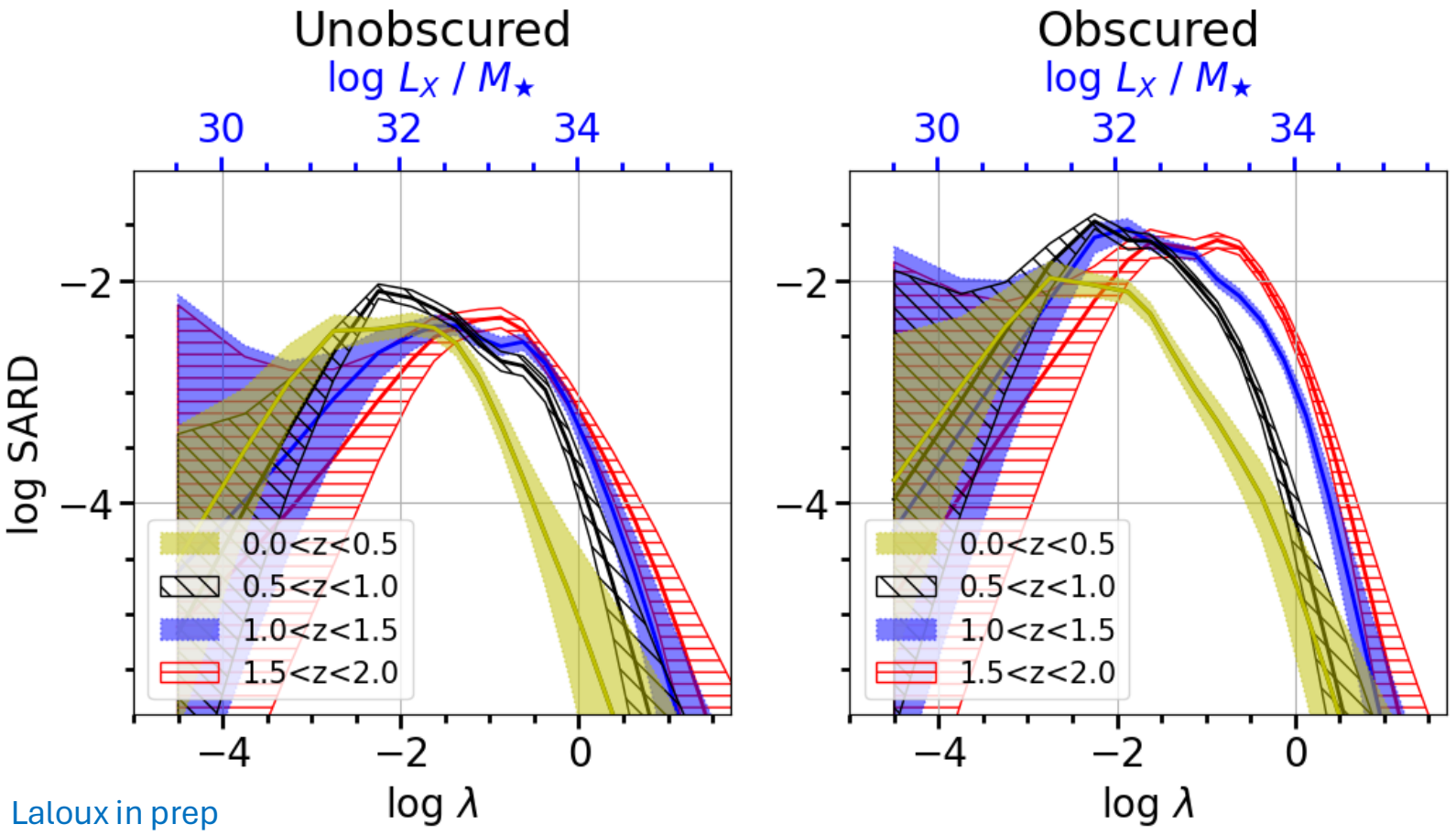

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- Higher normalisation for obscured AGN => **majority of obscured AGN**

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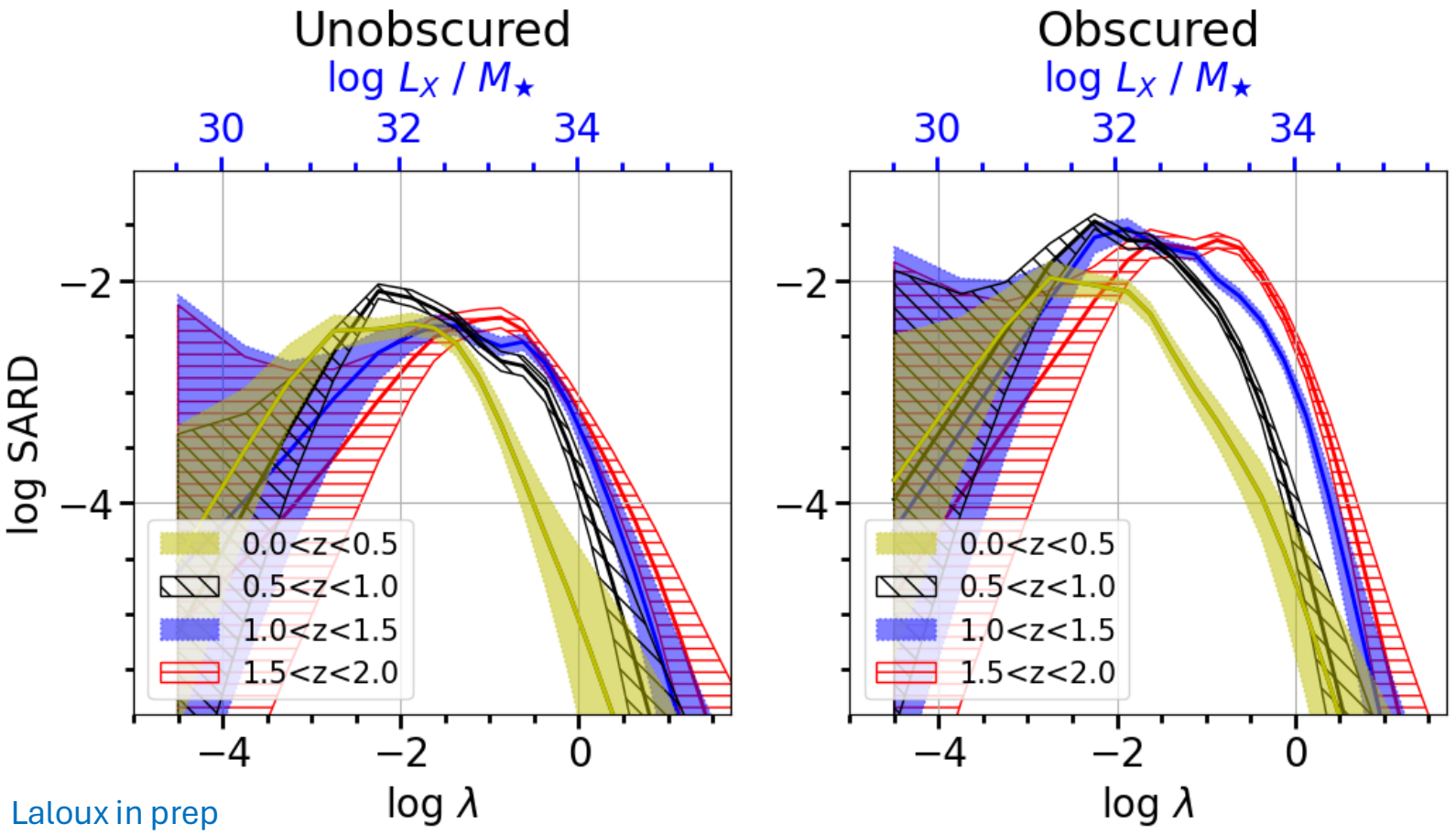

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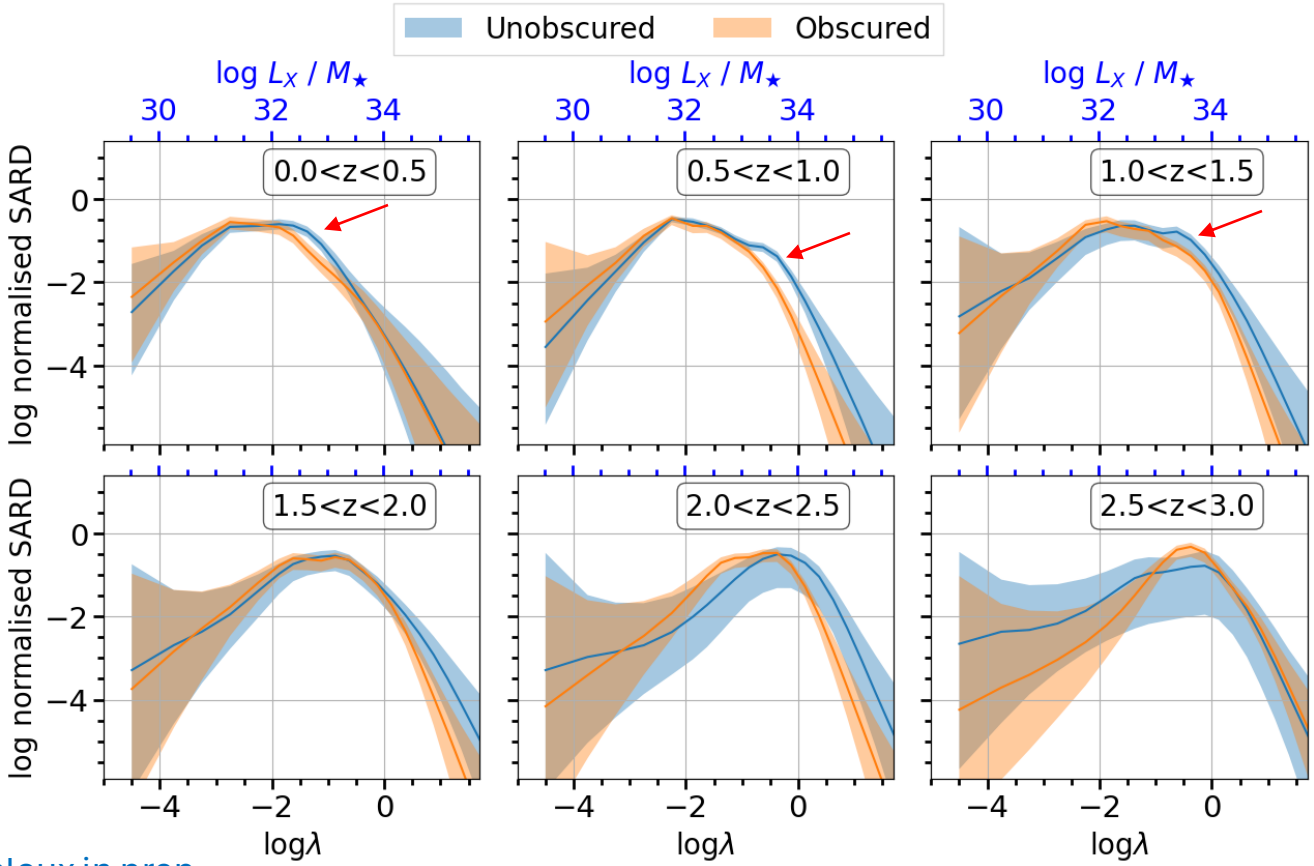
Observations:

- Similar shapes => **similar accretion mechanism**
- Higher normalisation for obscured AGN => **majority of obscured AGN**
- Shift toward higher λ with redshift => **faster accretion at higher redshift ("downsizing")**

Obscured vs Unobscured normalised SARD



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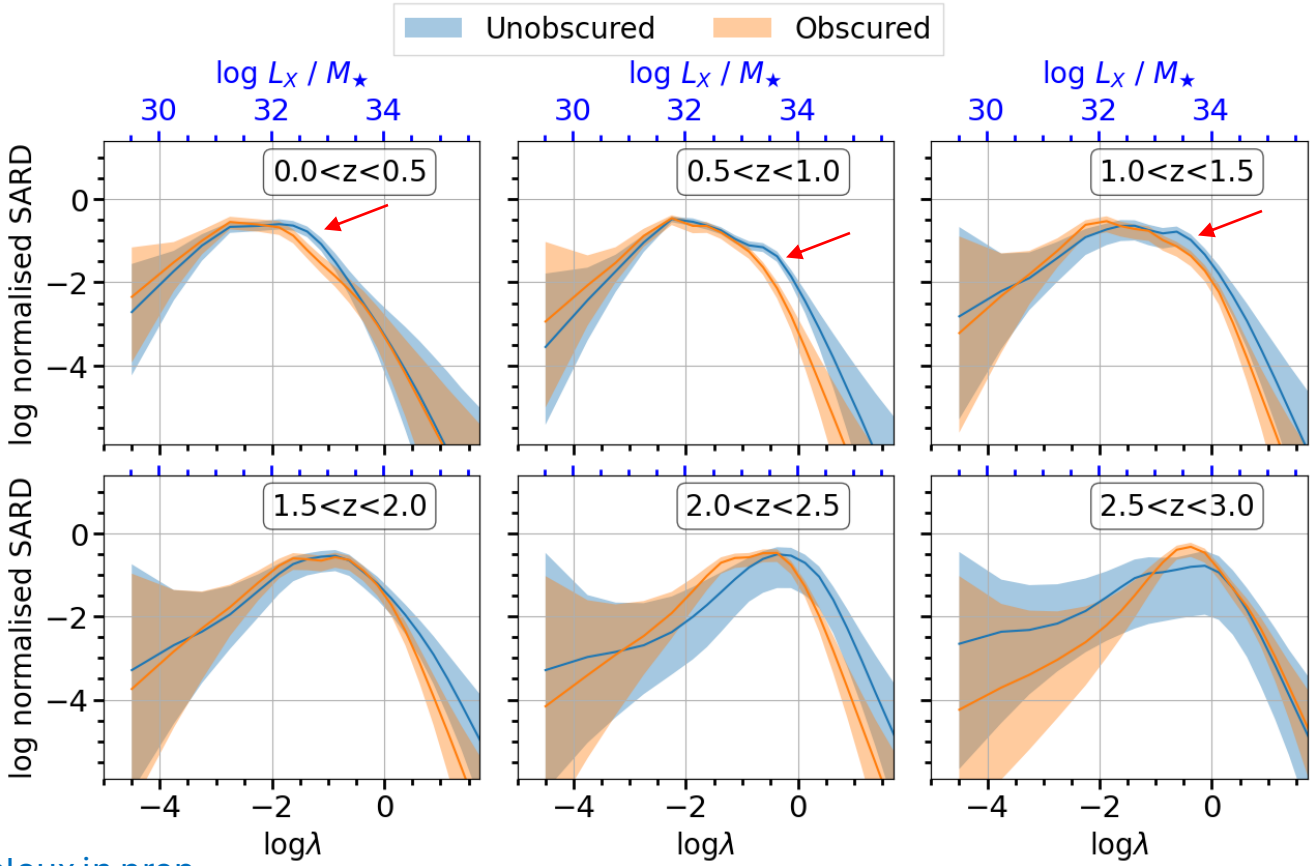
Small offset of the high-λ turnover for unobscured AGN

Obscured vs Unobscured normalised SARD



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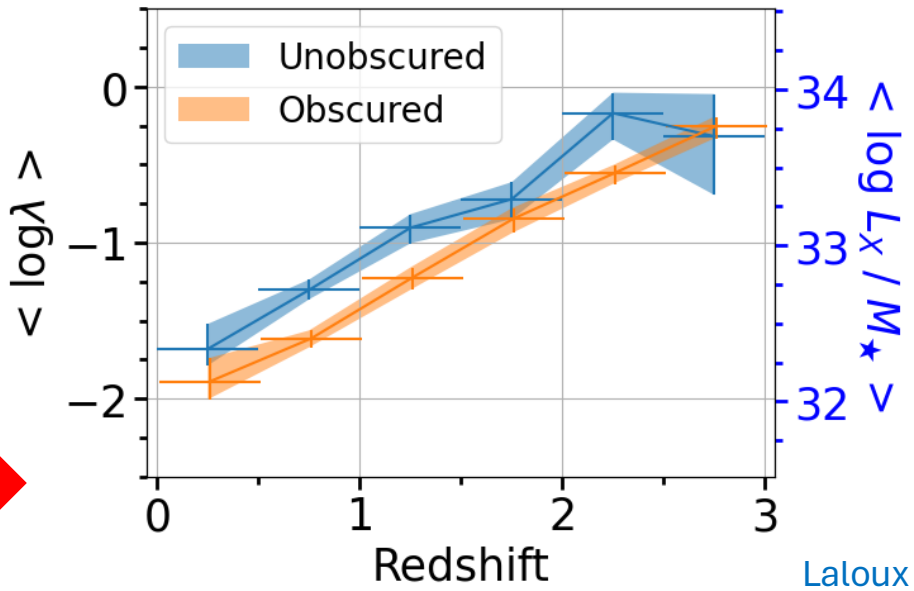
Higher mean accretion rate for unobscured AGN



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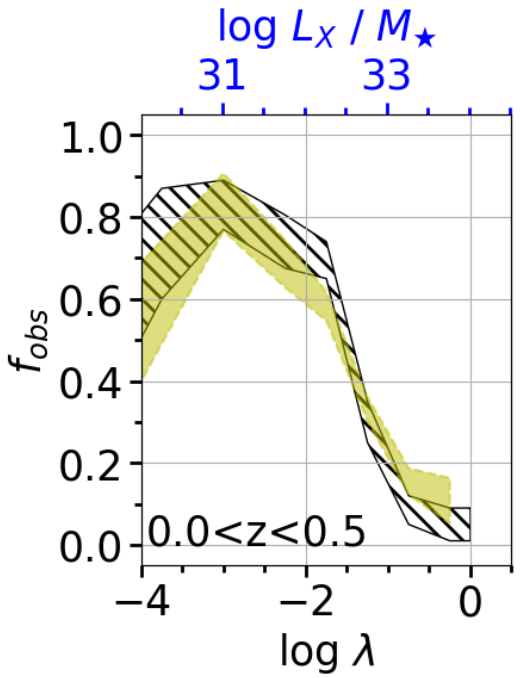
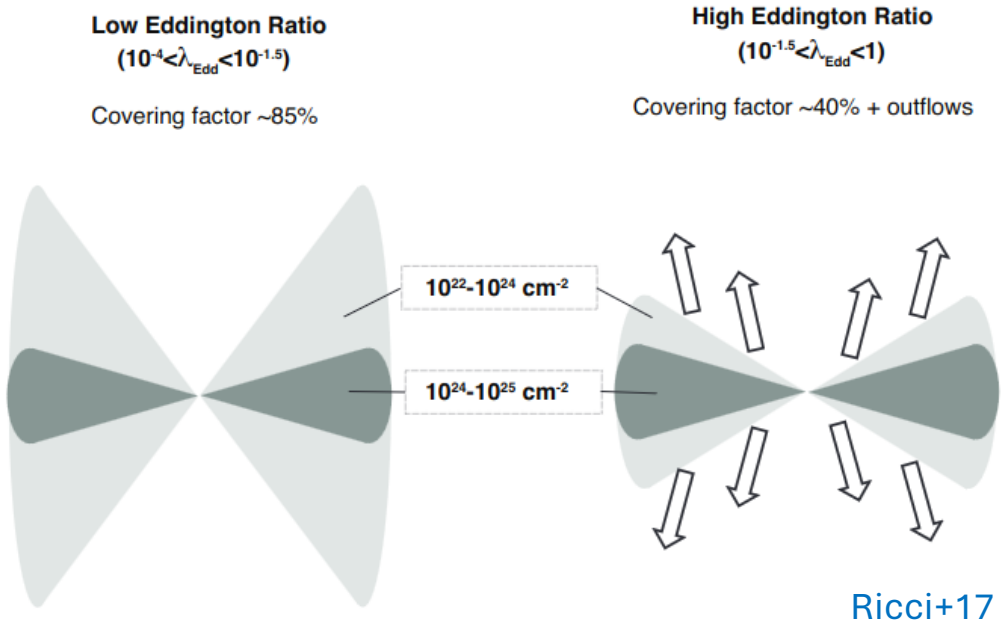
Obscured AGN fraction variation





Ricci+17 (z<0.3) | Ricci+22 (z<0.3) | Georgakakis+20 | This work

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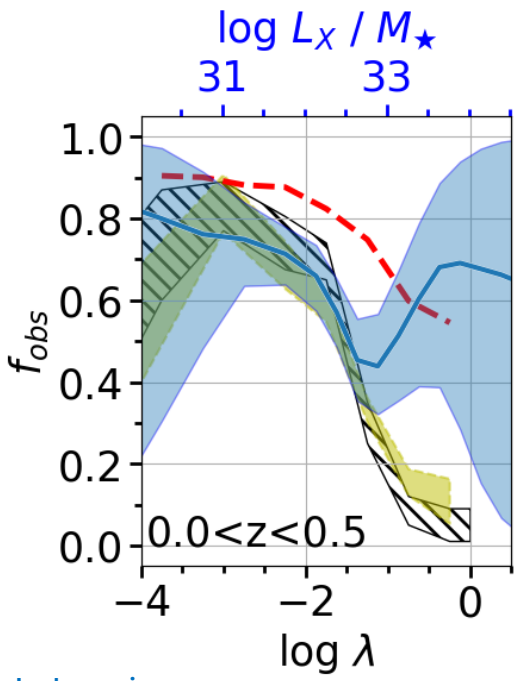

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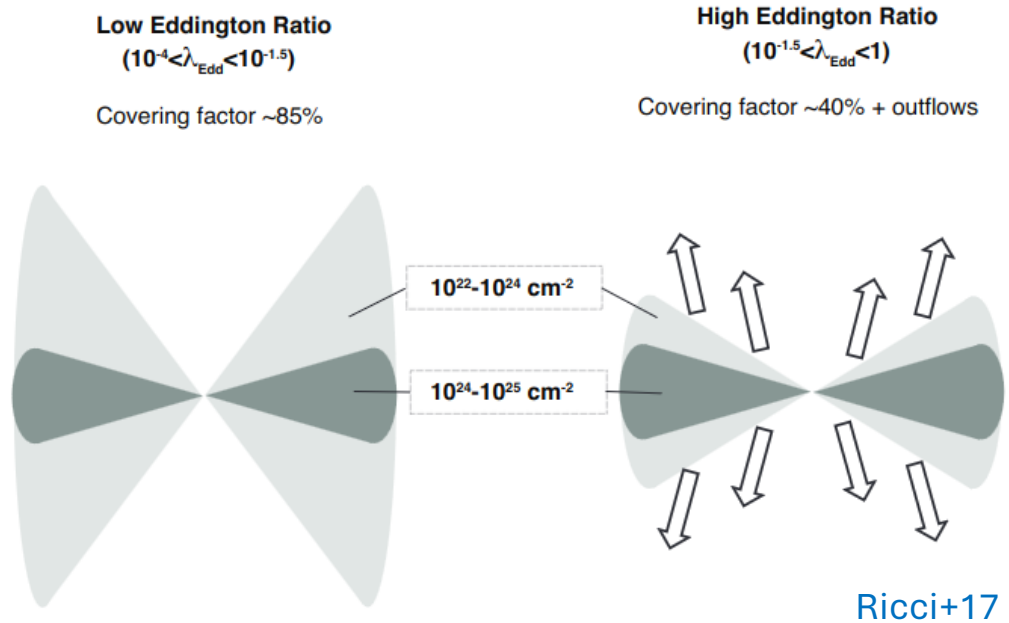

Ricci+17

Similar behaviour up to logλ < -1

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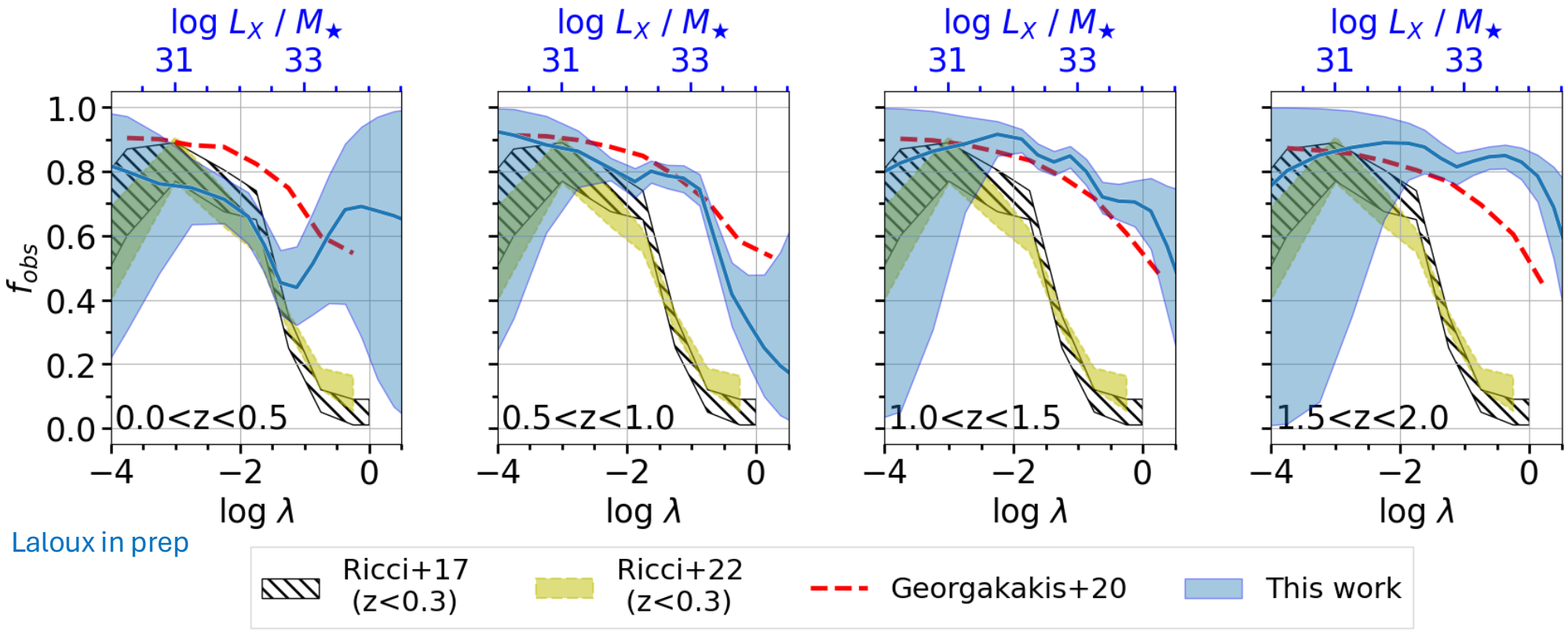

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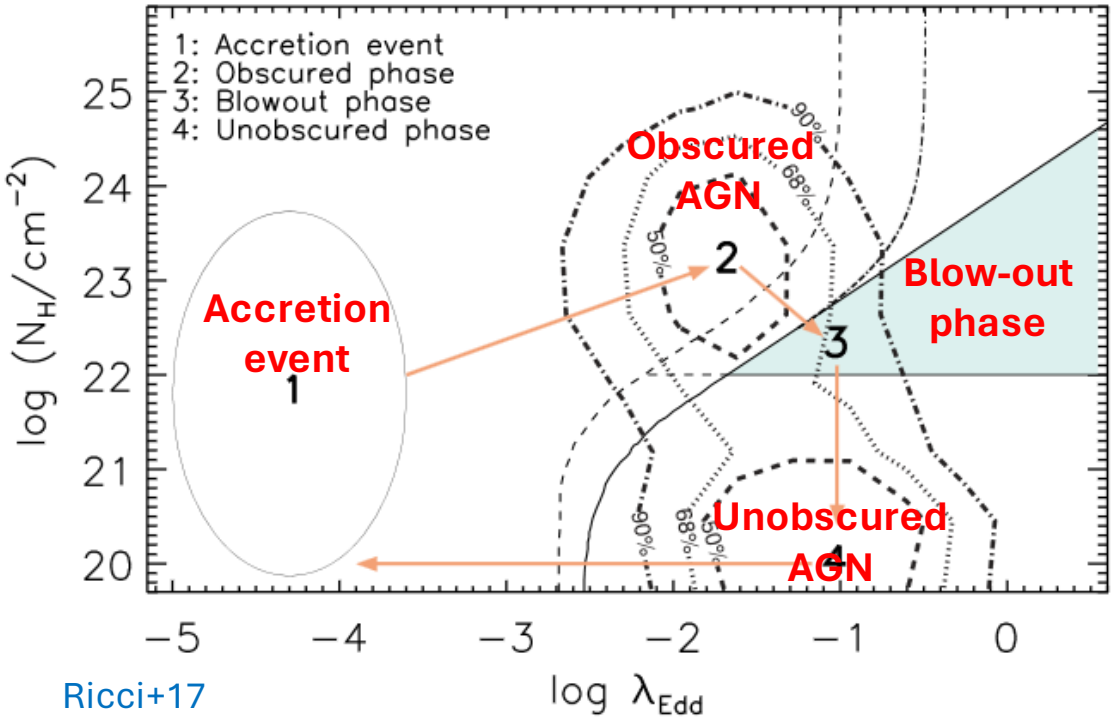
The λ-break value of the obscured AGN fraction increases with redshift.

Evolution of the blow-out region



Ricci+17

Following Fabian+09

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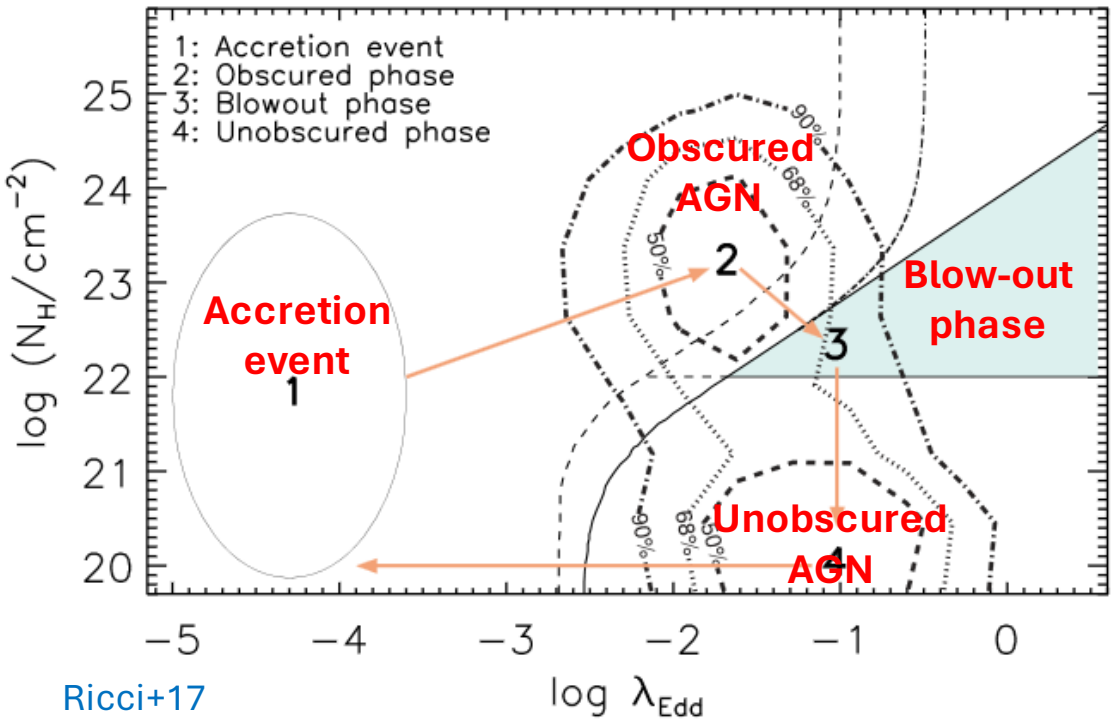

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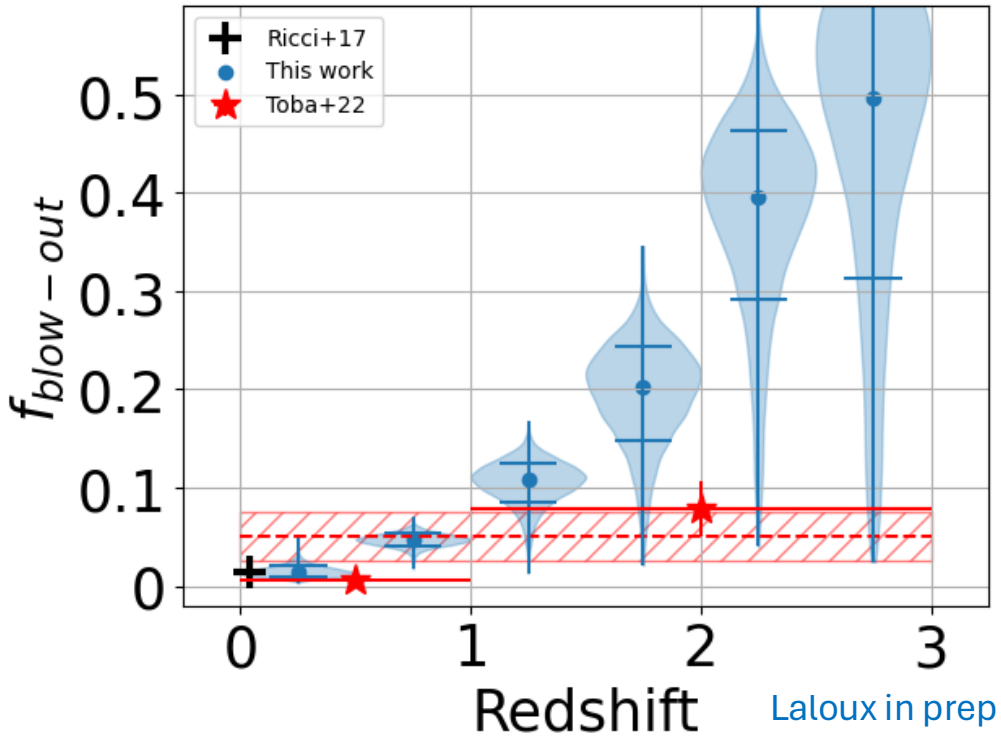

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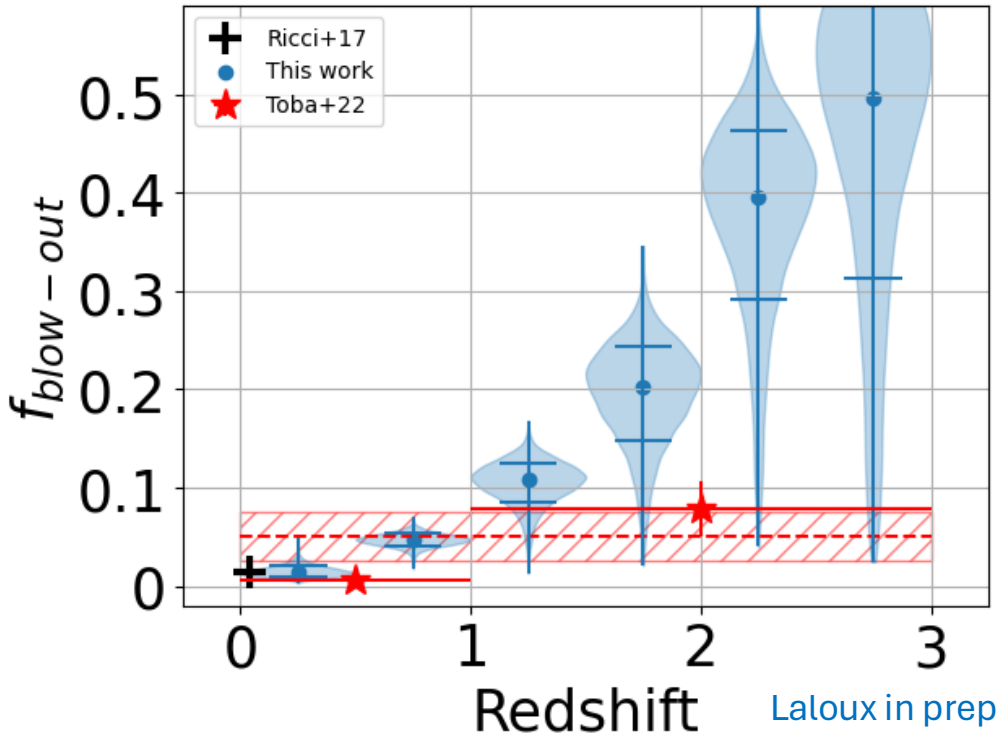
Strong increase of the fraction of AGN in the blow-out region

Evolution of the blow-out region

Increased incidence of outflows

or

Increased ISM obscuration contamination



Laloux in prep

Strong increase of the fraction of AGN in the blow-out region

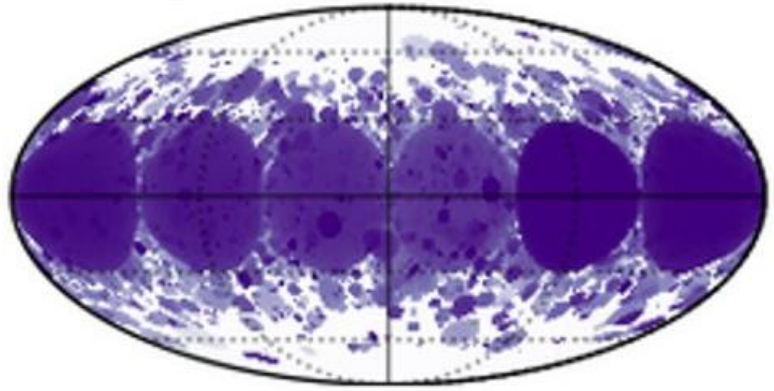
Main results

- Similar SARD for obscured and unobscured AGN ➡ **Similar accretion mechanisms**
- Higher-λ offset for unobscured SARD ➡ **Reject simplest orientation model**
- The mean accretion rate increases with redshift for both obscured and unobscured AGN ➡ **Evidence for AGN downsizing**
- The λ-break of the obscured AGN fraction and the blow-out fraction increase with redshift ➡ **Increased incidence of outflows** or **ISM obscuration contamination**

Thank you for your attention!

Back up slides

Models and Algorithms



https://github.com/JohannesBuchner/xars/blob/master/doc/uxclumpy.rst

X-ray:

- X-ray fitting algorithm: BXA (Buchner+14)
- X-ray model: Uxclumpy (Buchner+19)

Infrared:

- SED fitting algorithm: - CIGALE (Boquien+19, Yang+22)
- SED models: - Stellar emission
  - Star-formation emission
  - Dusty torus IR emission