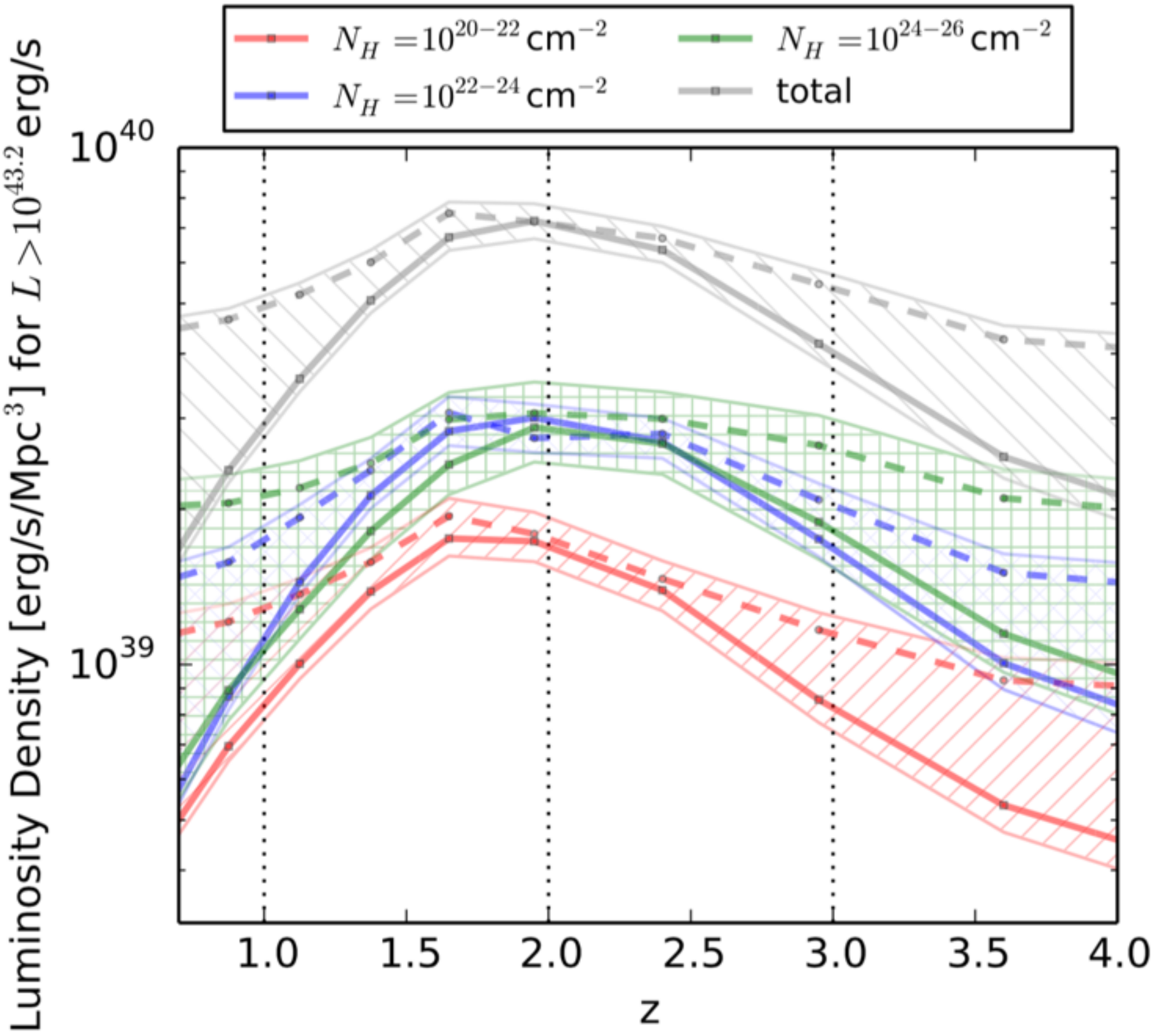
MID-IR AGN

WHAT COULD WE LEARN WITH JWST?

David Rosario (Durham University)

OBSCURED BLACK HOLE GROWTH

A substantial amount of black hole (SMBH) growth in the Universe is likely to be obscured. Best estimates ~ 30-50%.



Buchner+ 2015

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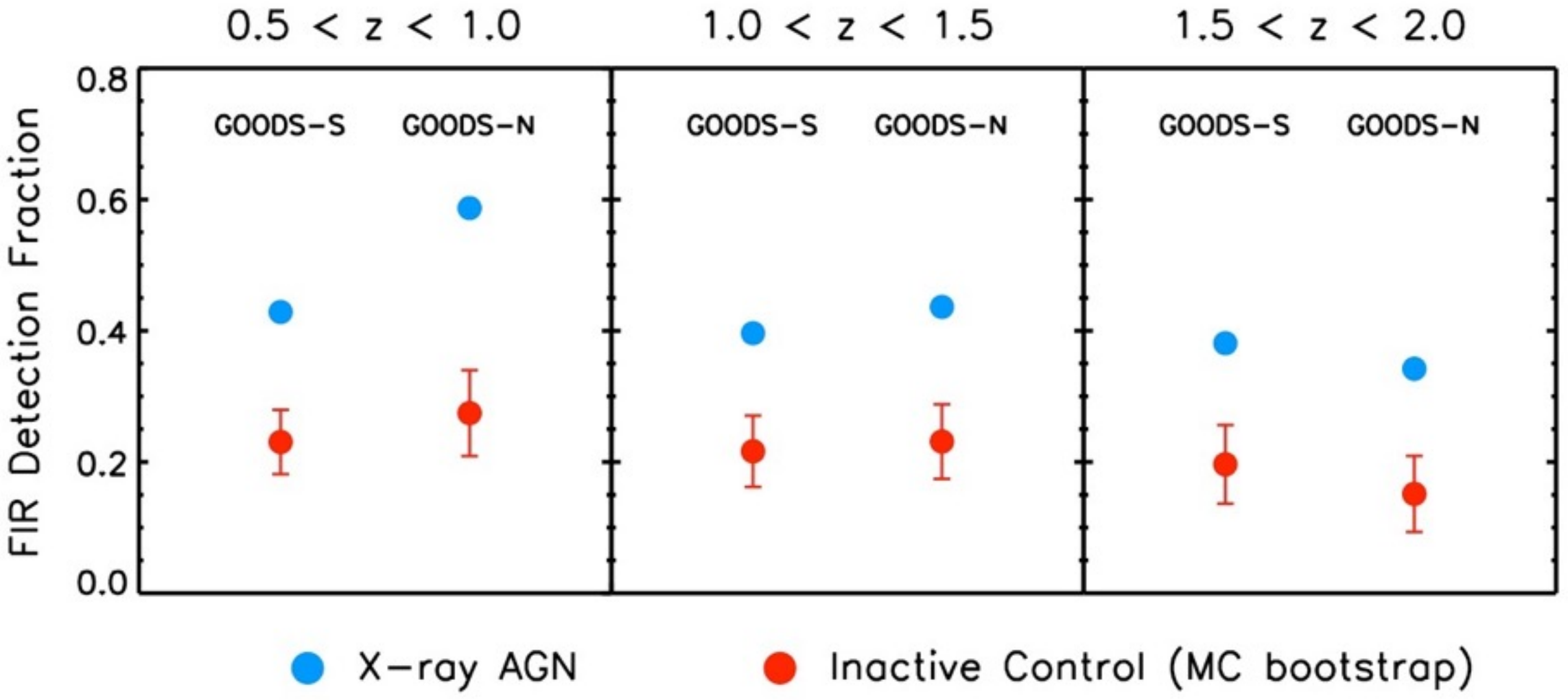

Rosario+ 2013

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JWST themes:

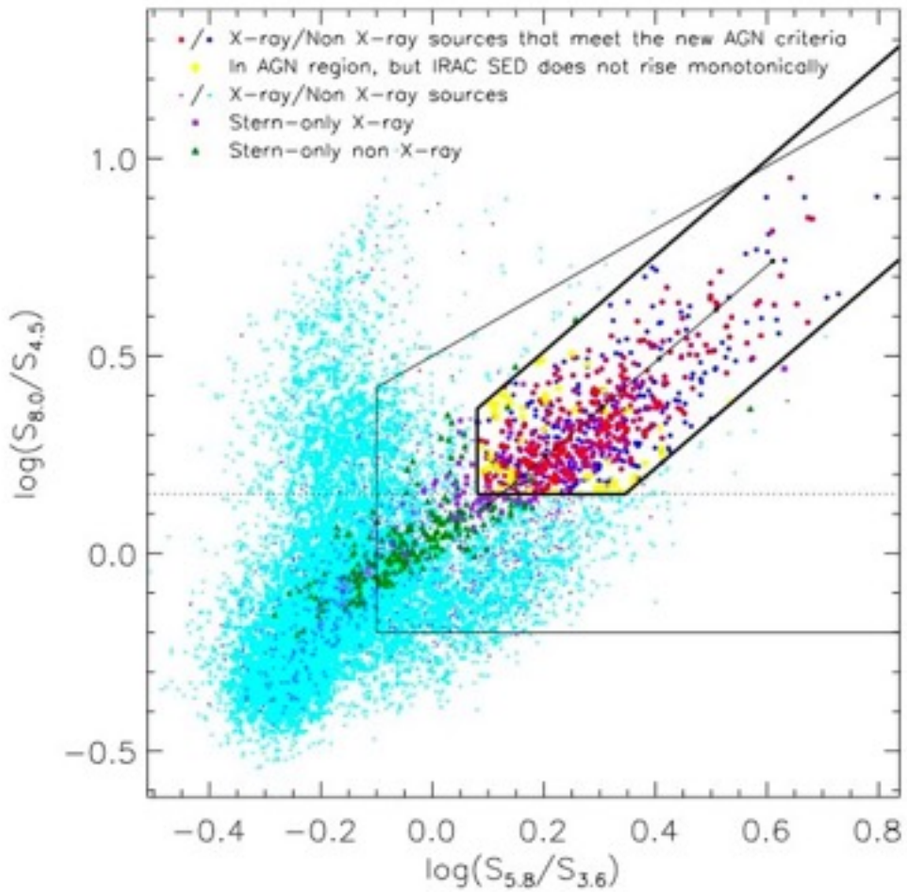
- Cosmic Noon: Are obscured AGN a special pathway for SMBH-galaxy co-evolution?
- Cosmic Dawn: Is a large fraction of SMBH growth obscured?

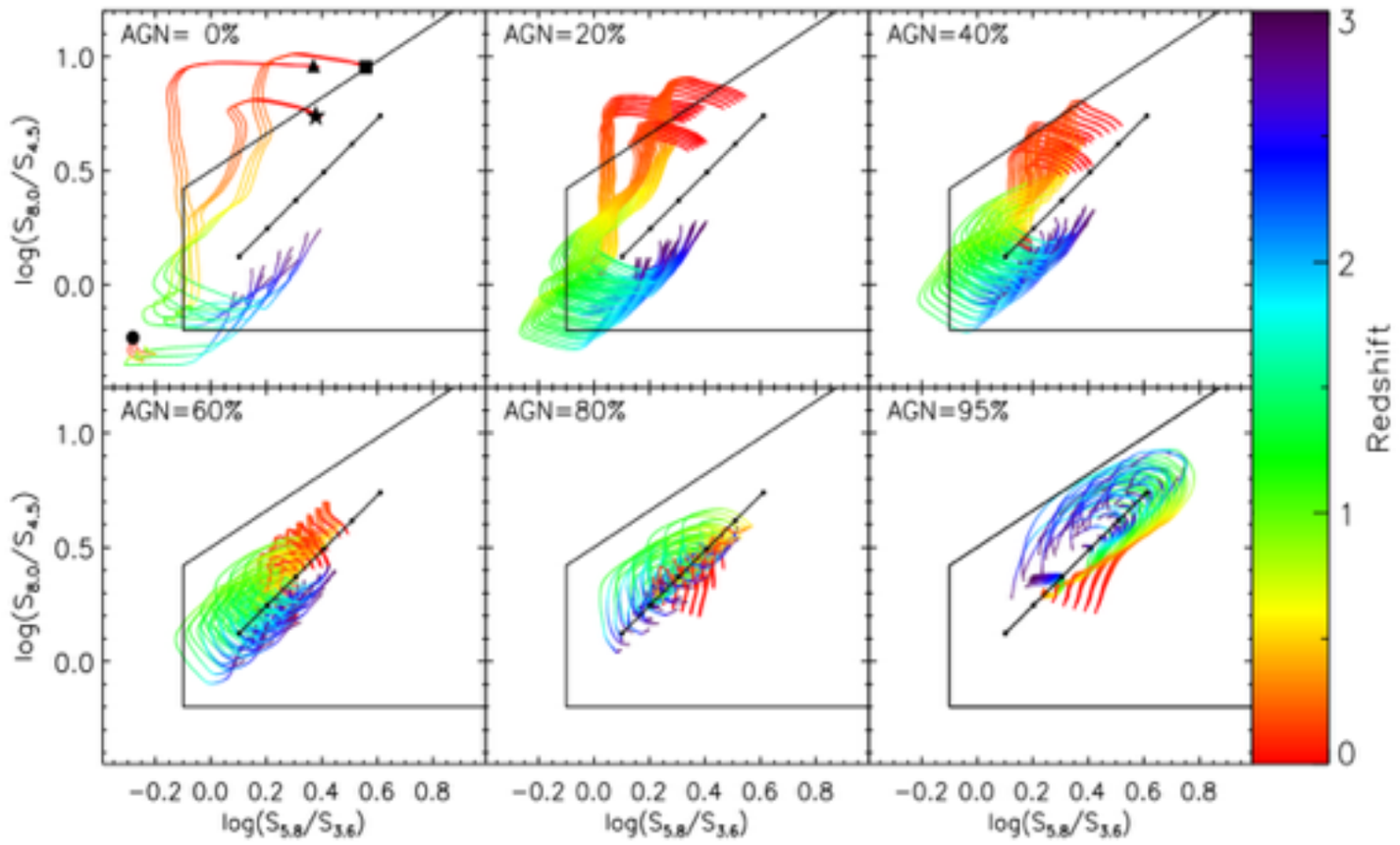
MID-IR SELECTED AGN

SELECTION SCHEMES

This simple selection picks out AGN-dominated sources,
but is quite free of contamination from star-forming galaxies to z∼3.

850 in ∼ 2 deg^2 of COSMOS => 1 per NIRSPEC MOS FoV.
10x more common in GOODS-S/CANDELS, but 10x fainter as well.





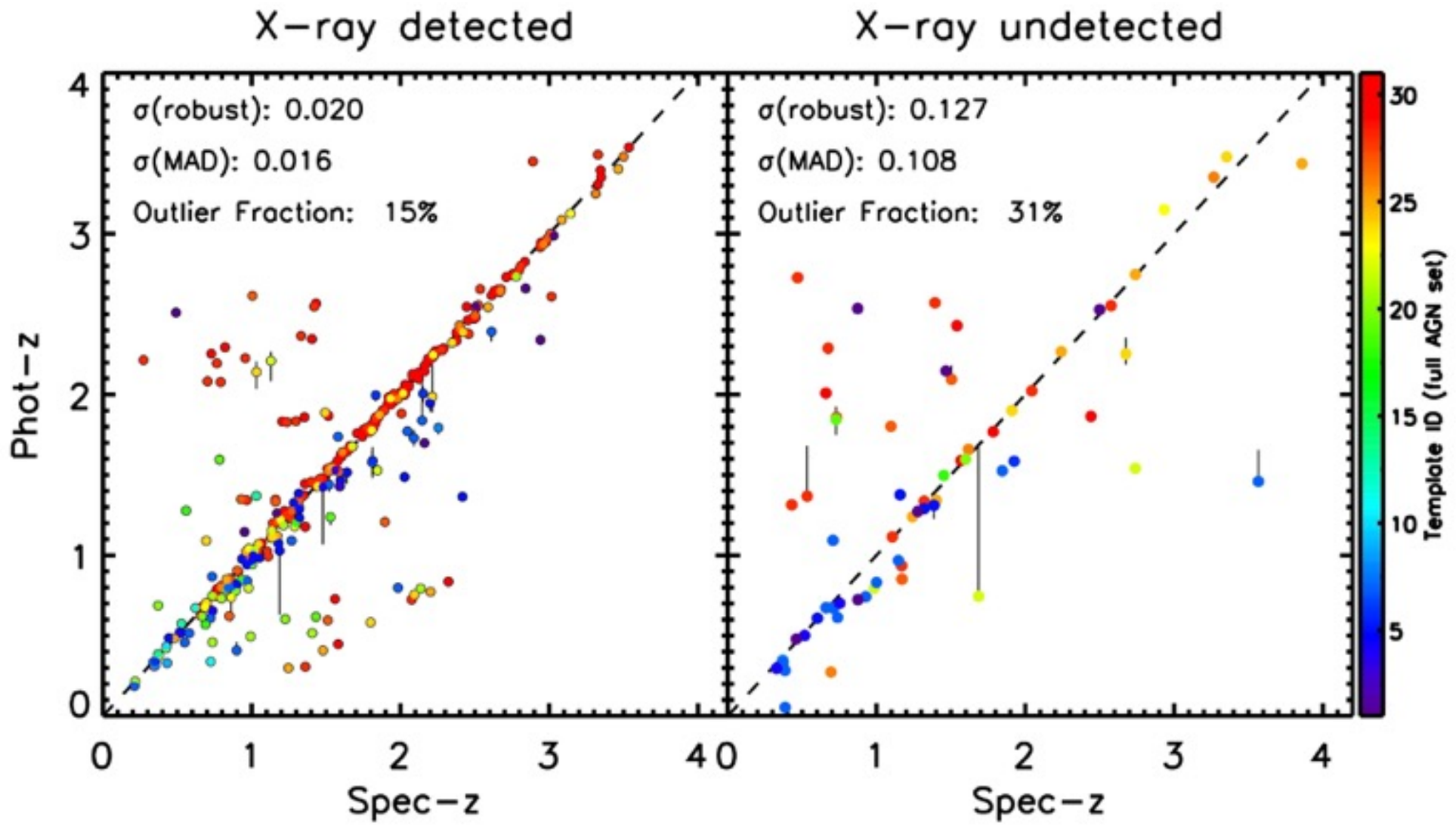
Donley+ 2012

MID-IR SELECTED AGN

NEW PHOTOMETRIC REDSHIFTS

Follows the methodology of Salvato+ (2009, 2011).

Percentage with spec-z: 53% of X-ray detected
7% of X-ray undetected

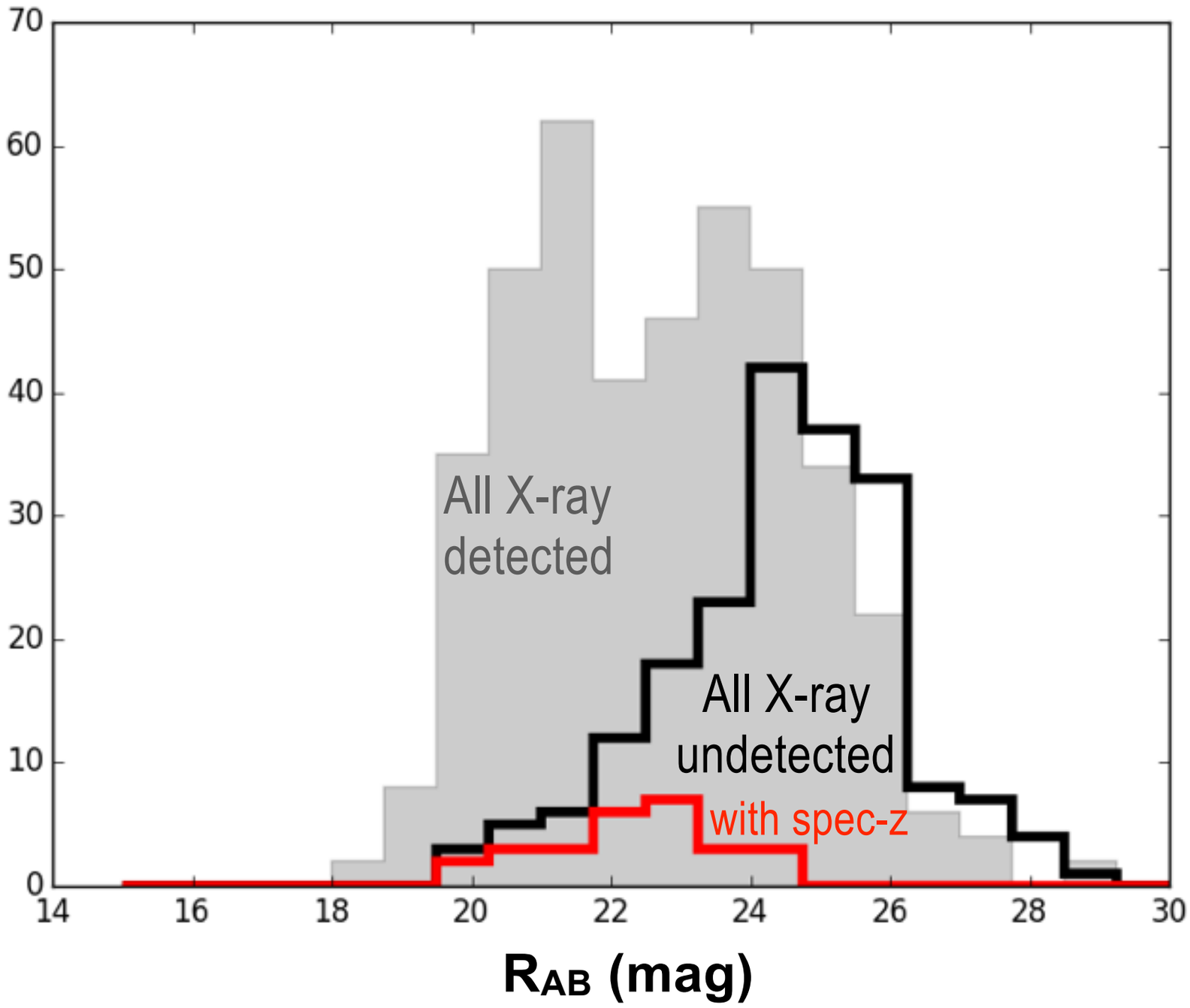


Blue (galaxies), low-mid green (QSO2 hybrids), late green to red (QSO1 hybrids).

Rosario+ in prep.

MID-IR SELECTED AGN

OPTICAL PROPERTIES



Rosario+ in prep.

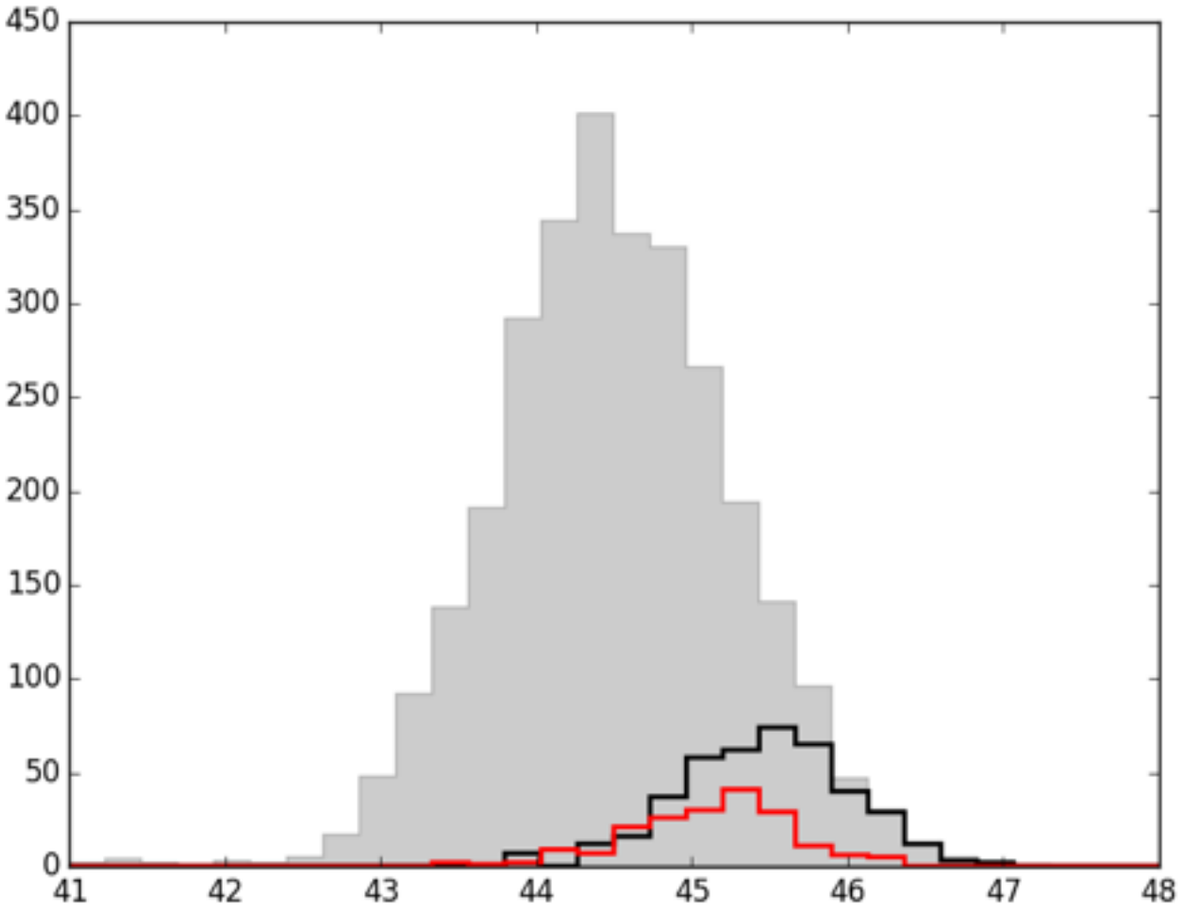
MID-IR SELECTED AGN

BASIC PROPERTIES

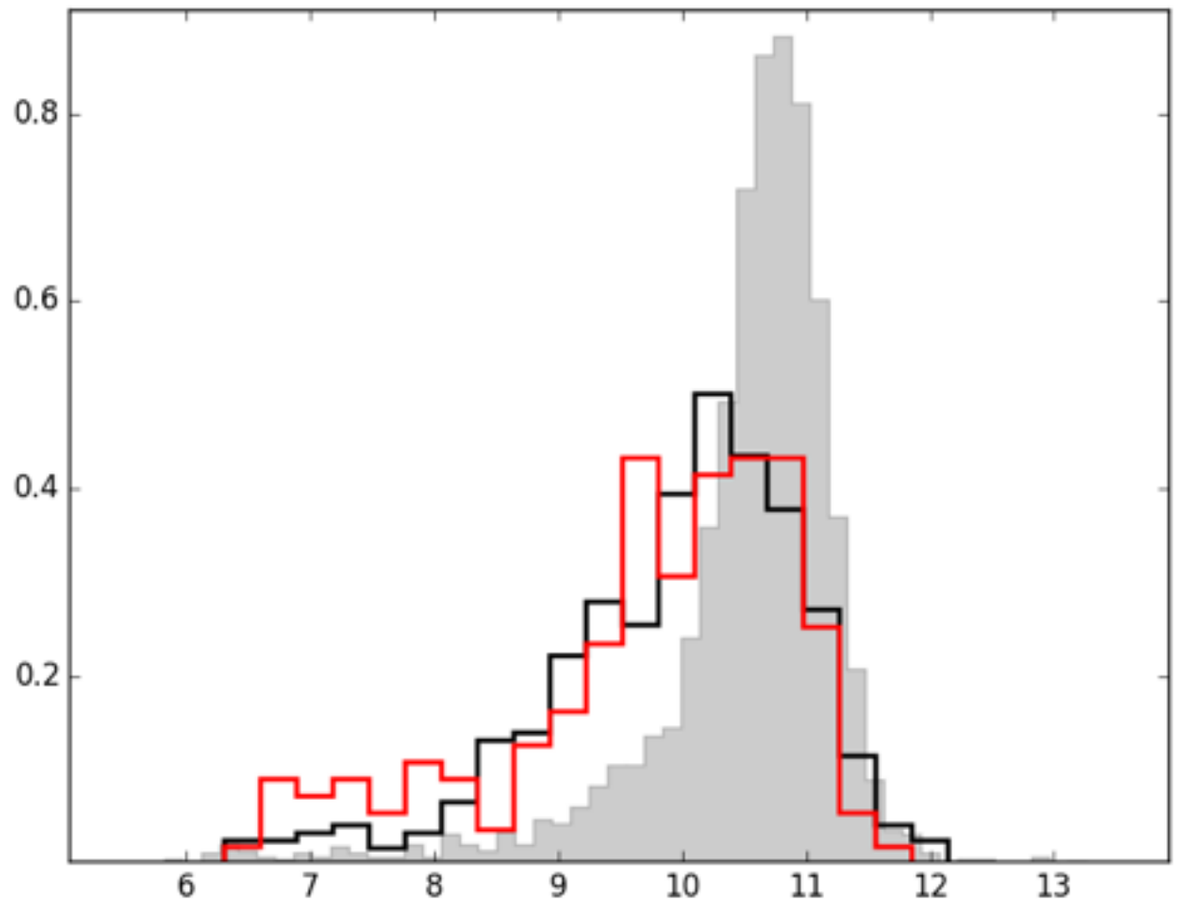
All X-ray AGN

X-ray detected IRAGN

X-ray undetected IRAGN



log L_{bol} (erg/s)



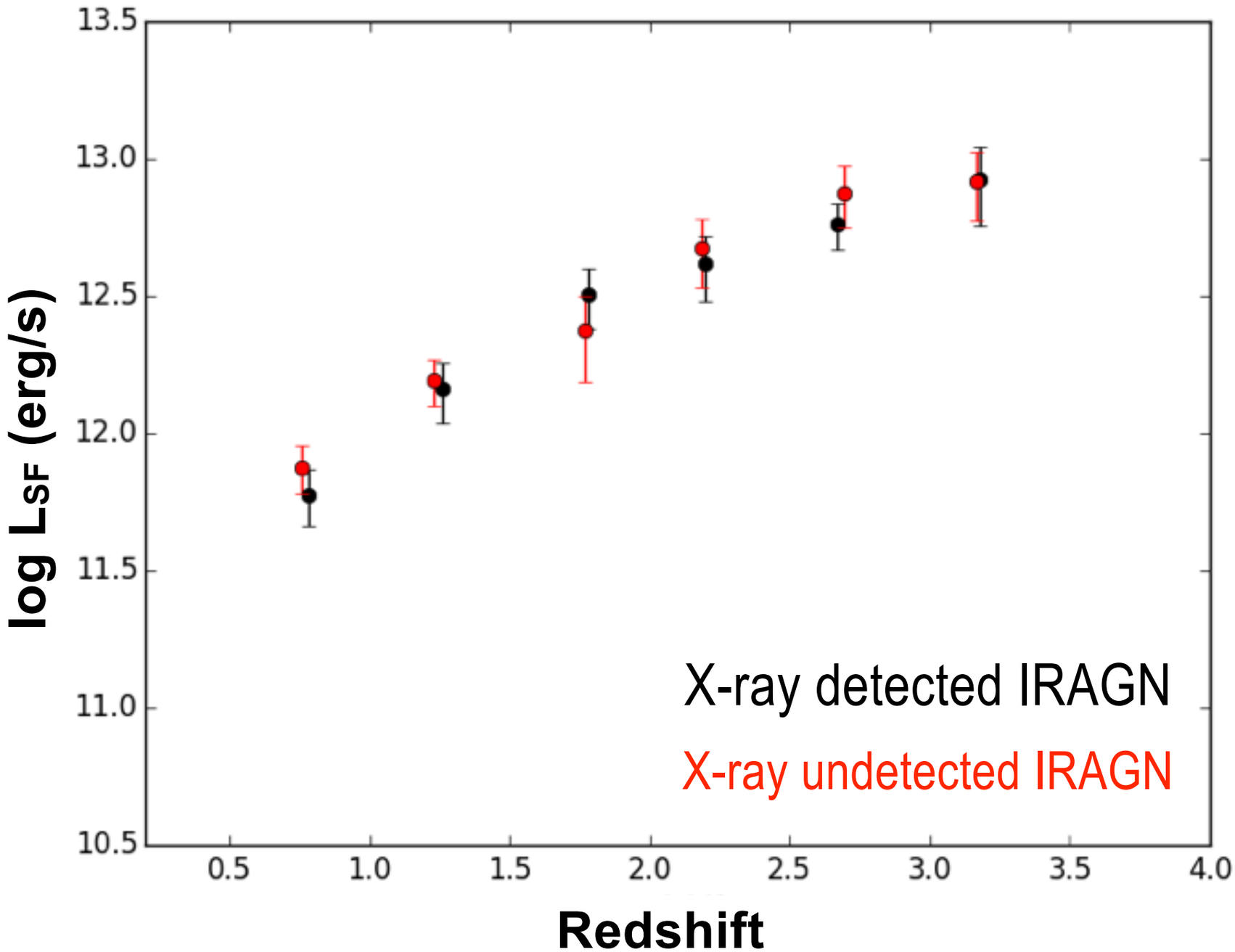
log stellar mass ($M_\odot$)

Based on CIGALE fits with a refined subset of smooth torus AGN dust models.

Rosario+ in prep.

MID-IR SELECTED AGN

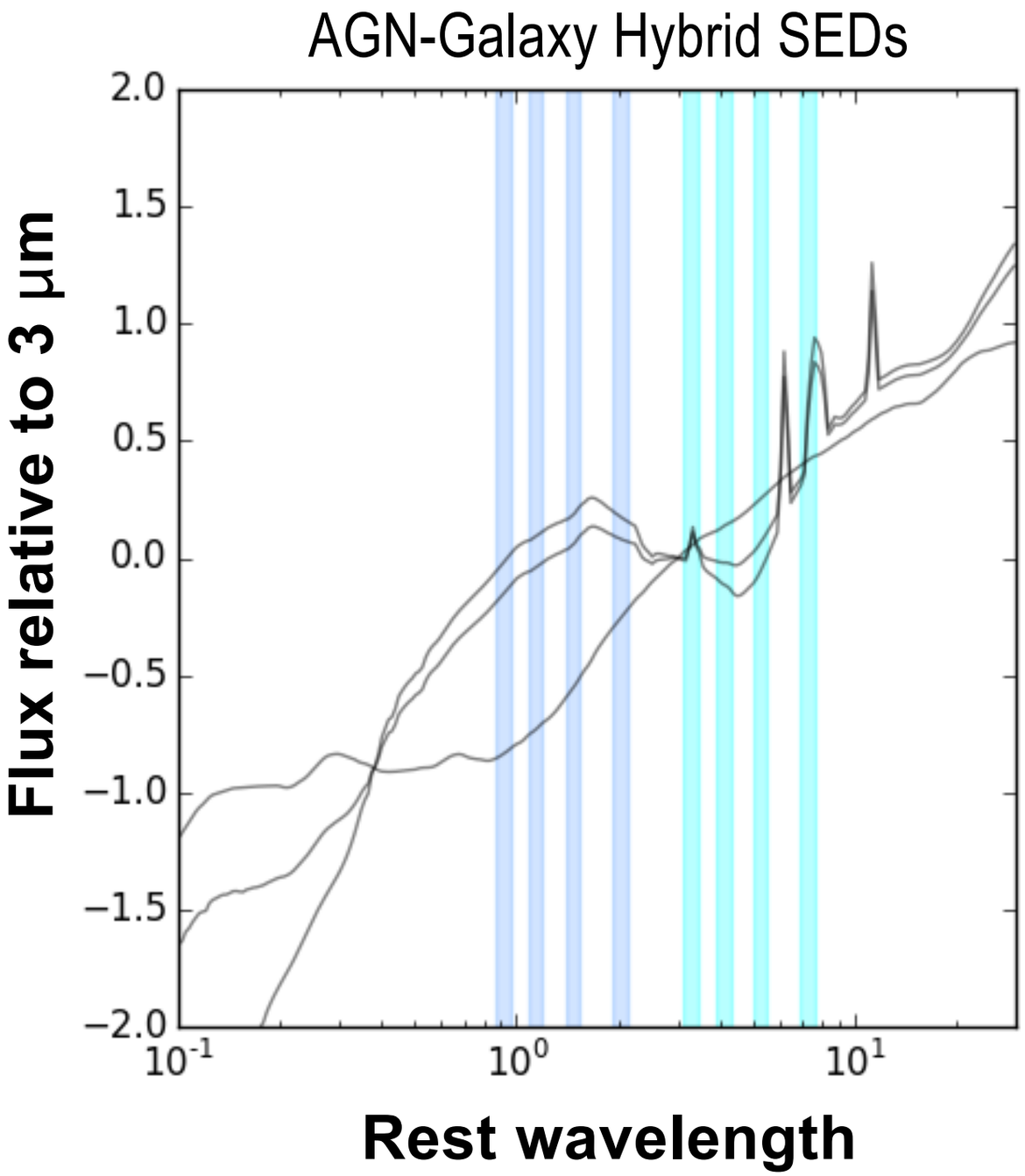
BASIC PROPERTIES

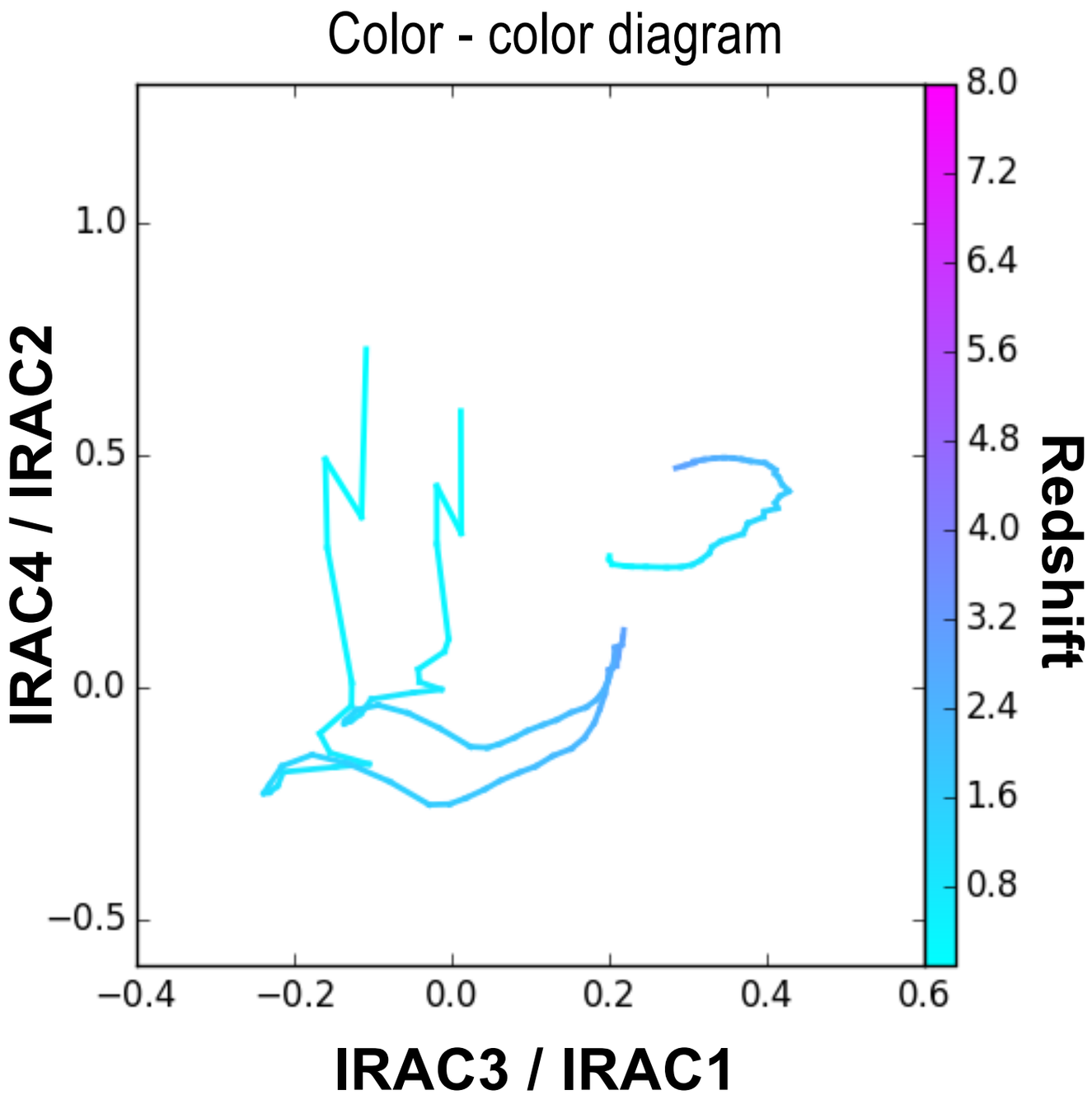


Rosario+ in prep.

MID-IR SELECTED AGN

HIGH REDSHIFT SELECTION





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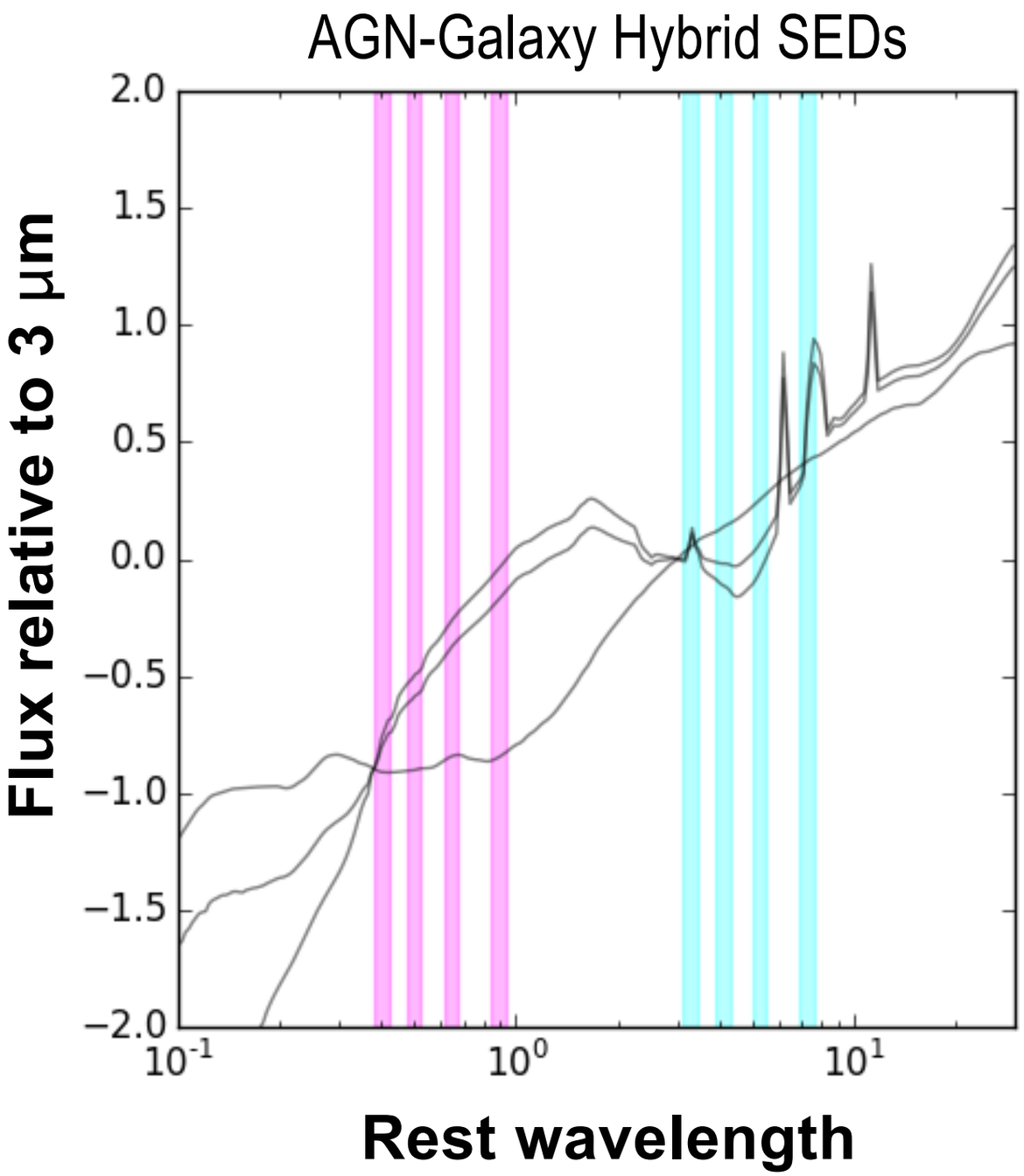

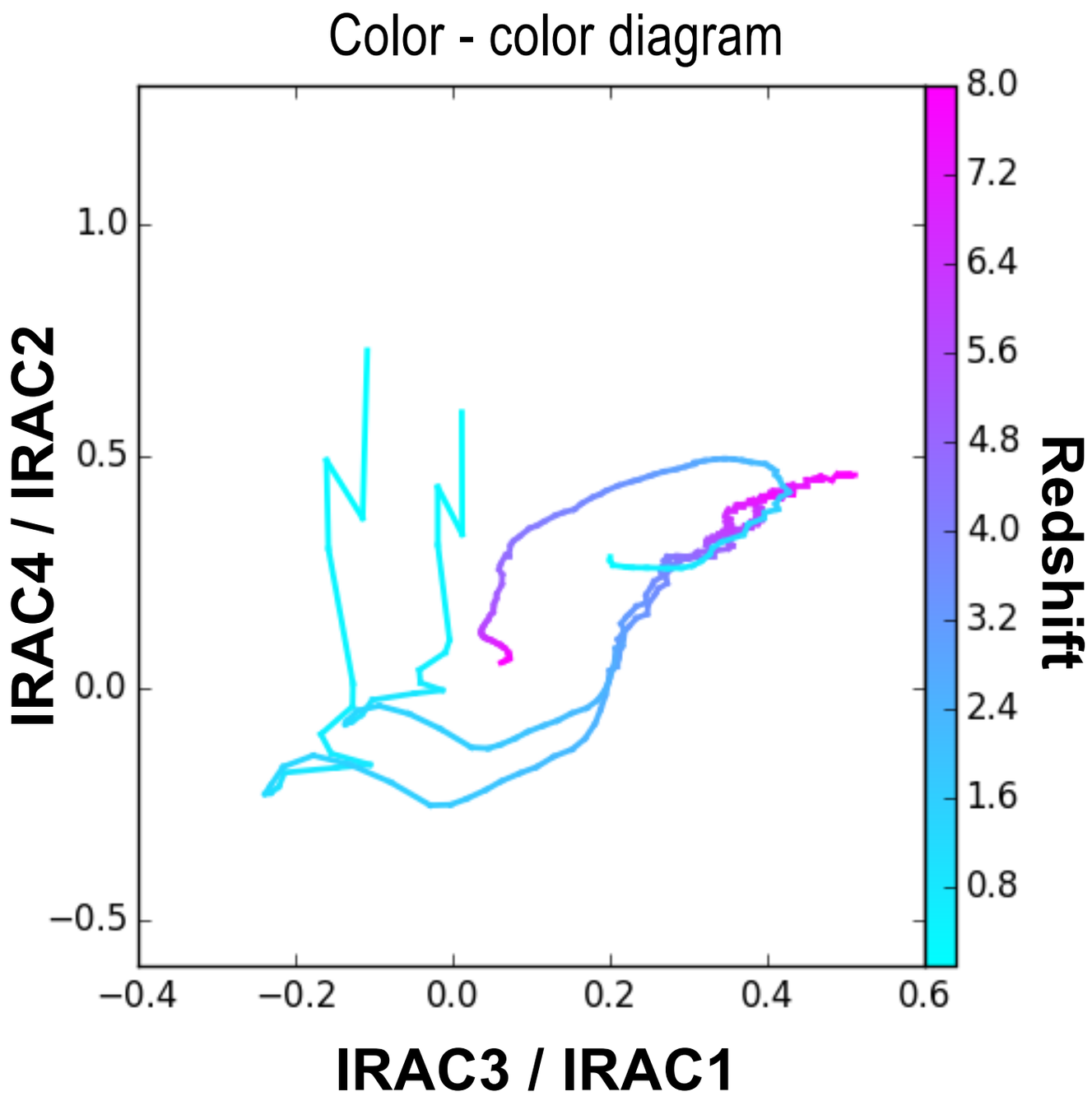

MID-IR SELECTED AGN

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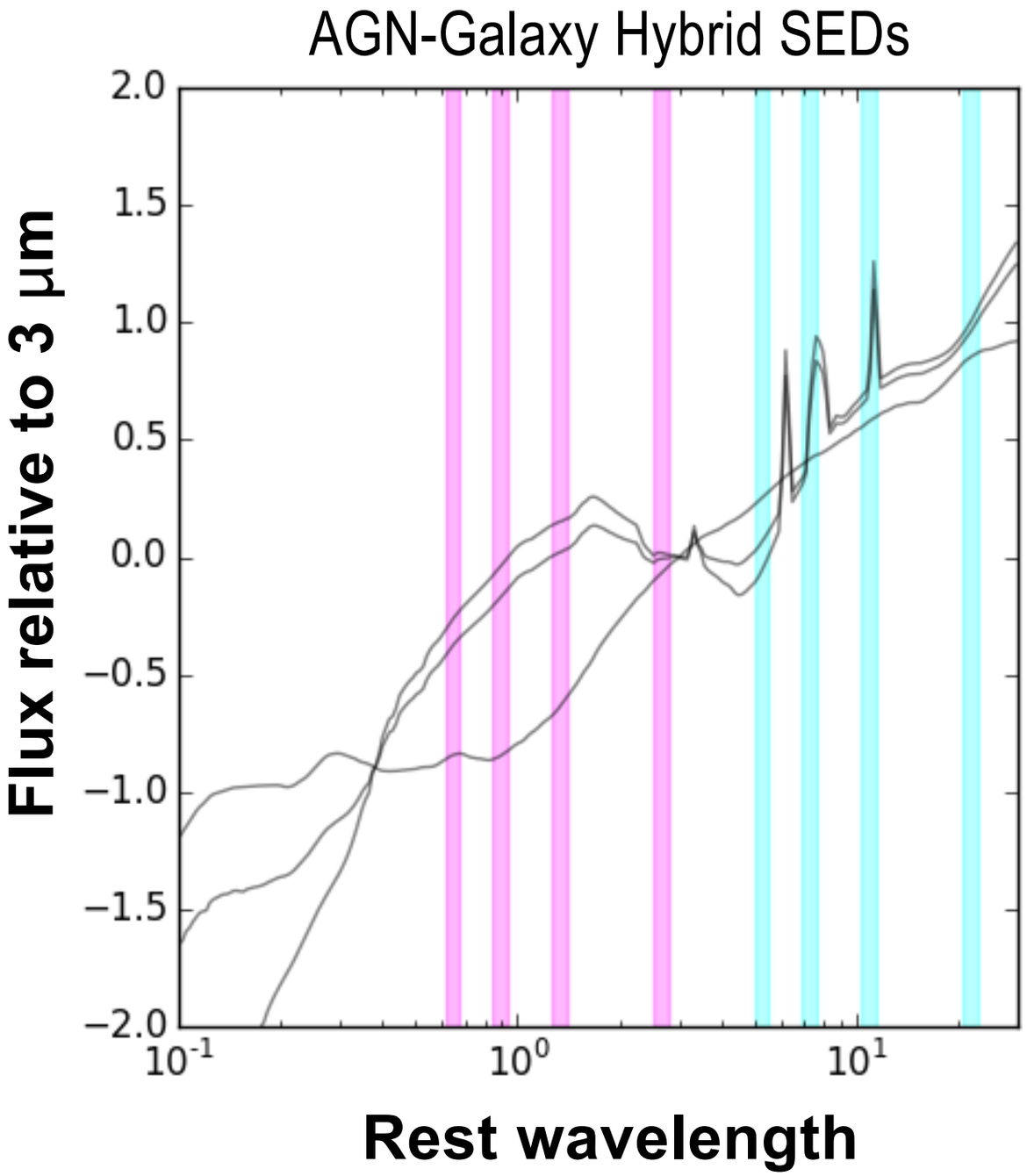
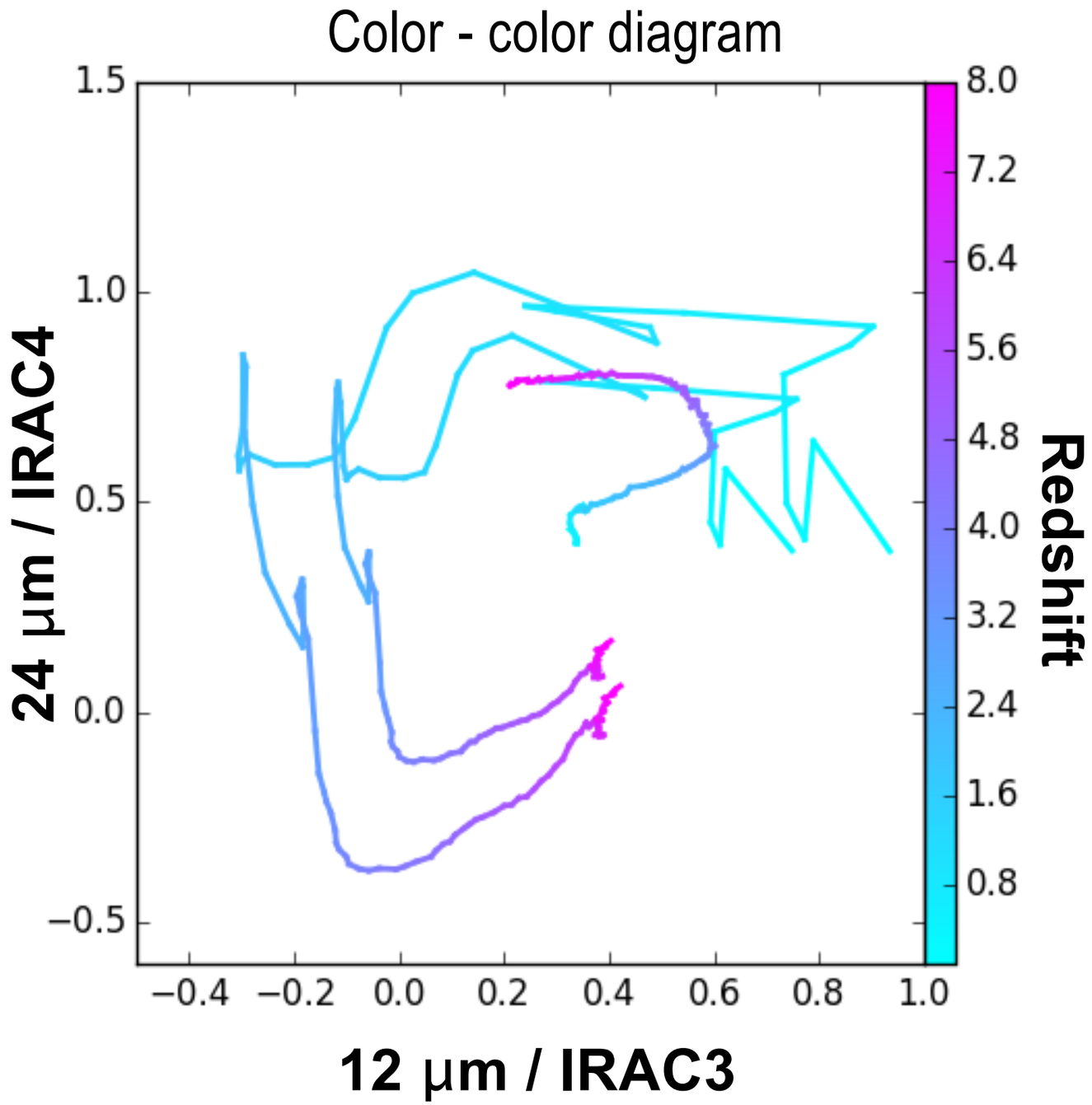
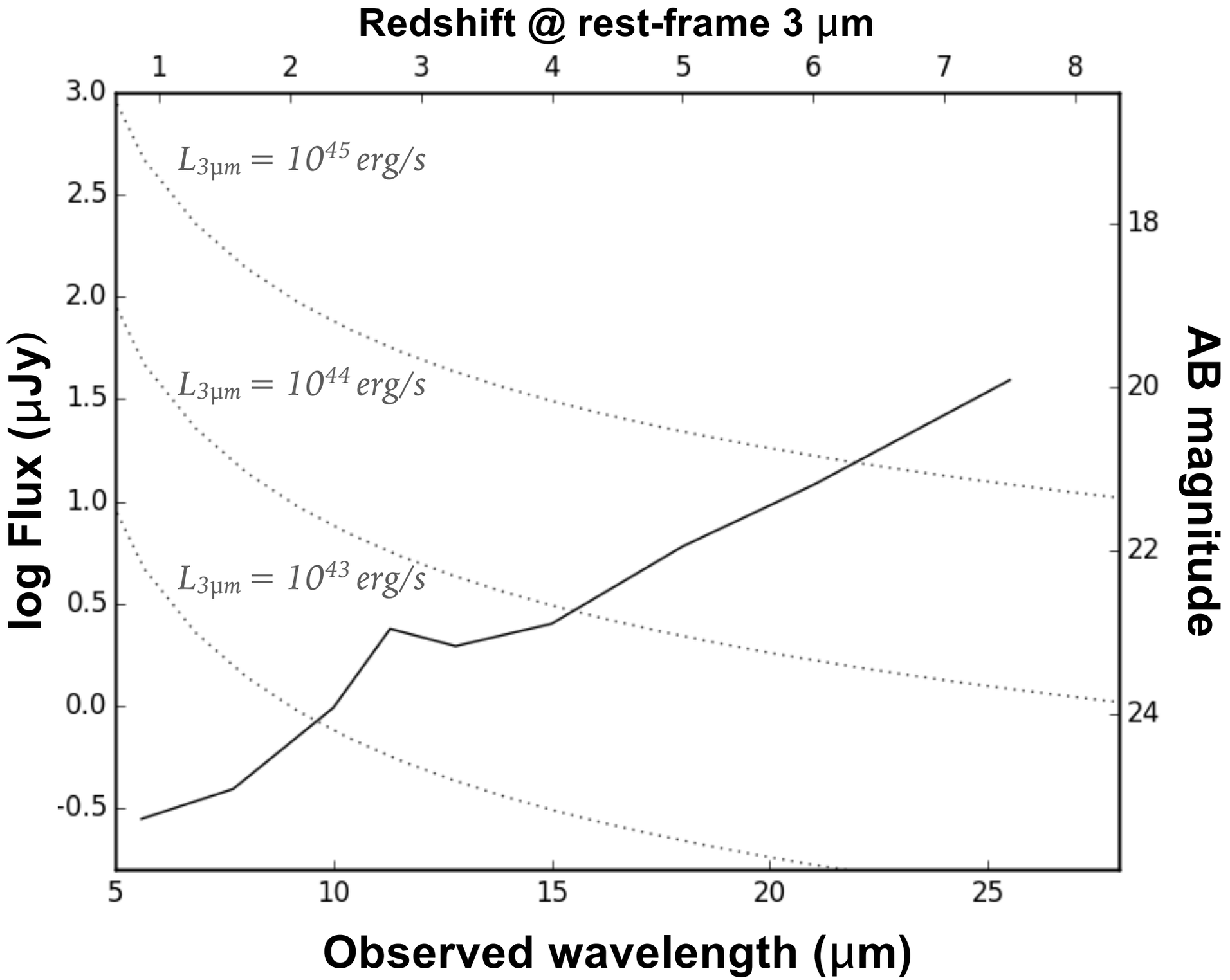




MID-IR SELECTED AGN

PREDICTIONS FOR HIGH-Z



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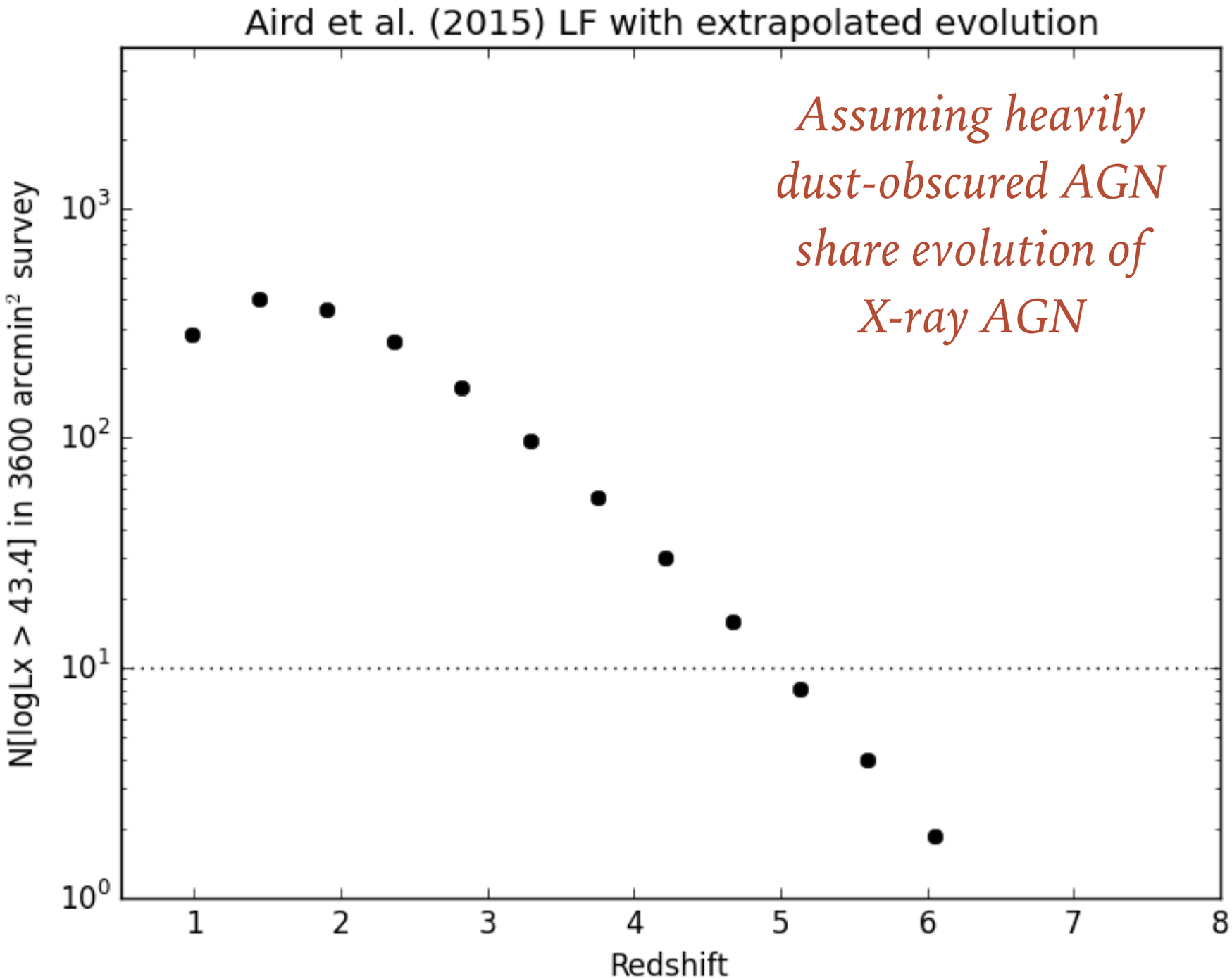
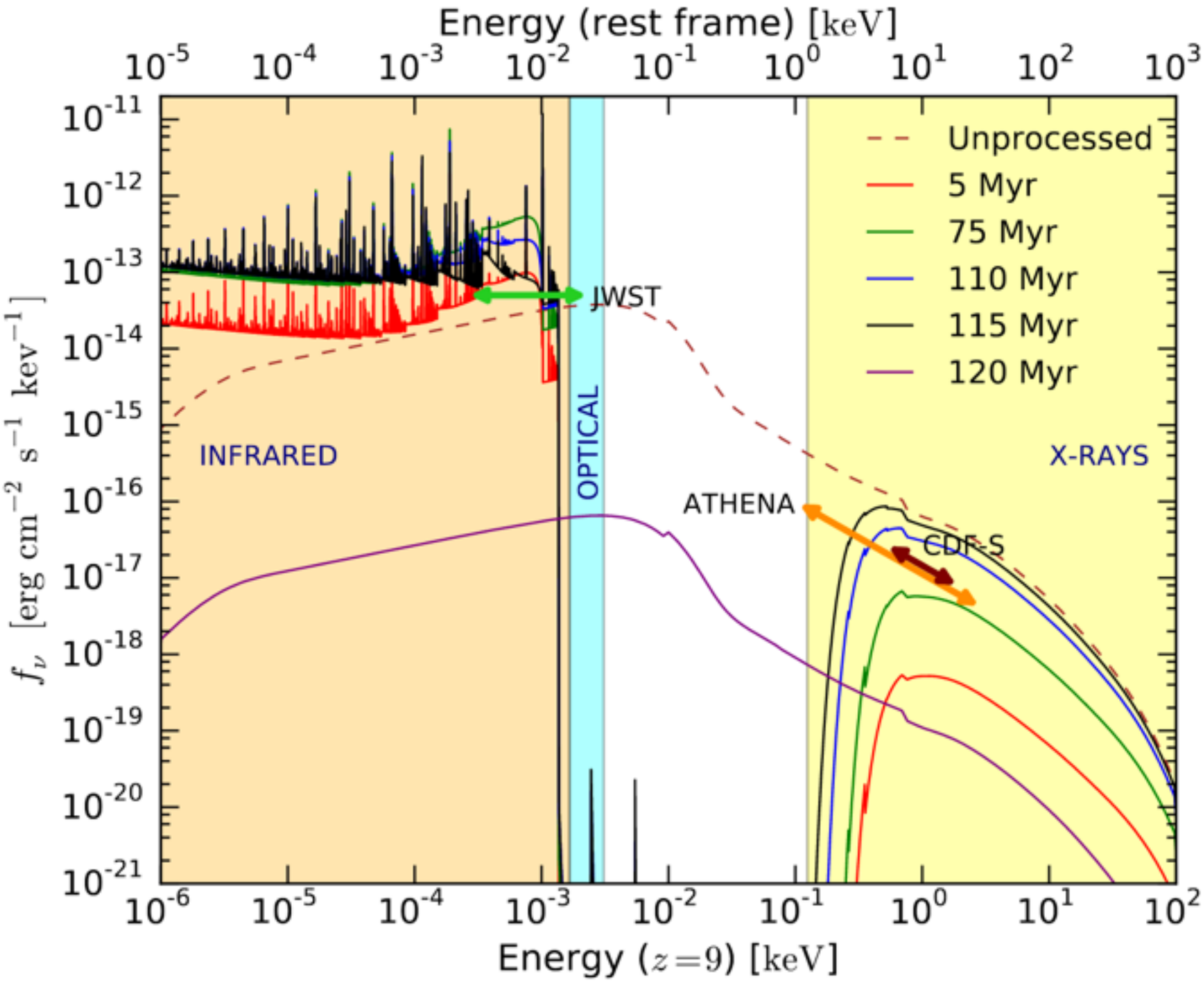


Assuming heavily dust-obscured AGN share evolution of X-ray AGN

DIRECT COLLAPSE BLACK HOLES



Pacucci+ (2015)

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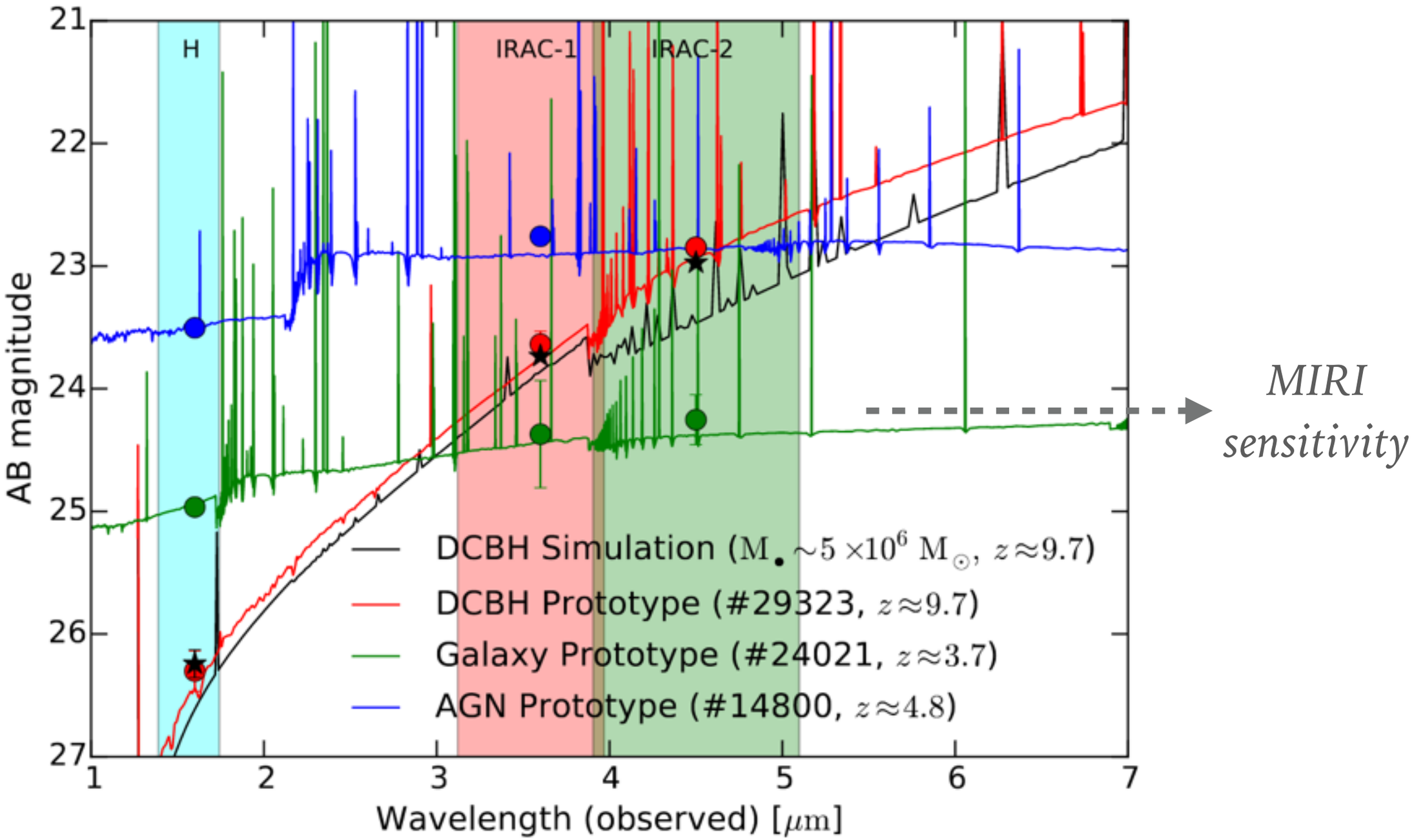

Pacucci+ (2016)

SUMMARY

- MIR selection works well at “low” redshift to pick out systems with AGN-heated dust. It will need to be adapted for z>4. JWST will help, especially with redshifts.

- MIR selection picks out luminous AGN in low-mass hosts. Important to keep in mind when studying star-formation, clustering, evolution.

- Broadly, SFR appears to be comparable between obscured and un-obscured IRAC-selected AGN.

- Multiple-band coverage from HST (including Ly break constraints) will be very useful.

- Predictions for MIRI-detectable AGN at z>6 are rather low. However, there are no current empirical constraints, so ample scope for serendipity.

- Direct-collapse black holes may reveal themselves with NIRCAM and MIRI surveys. What are the predictions for number densities?