AGN in ZFOURGE

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Michael Cowley

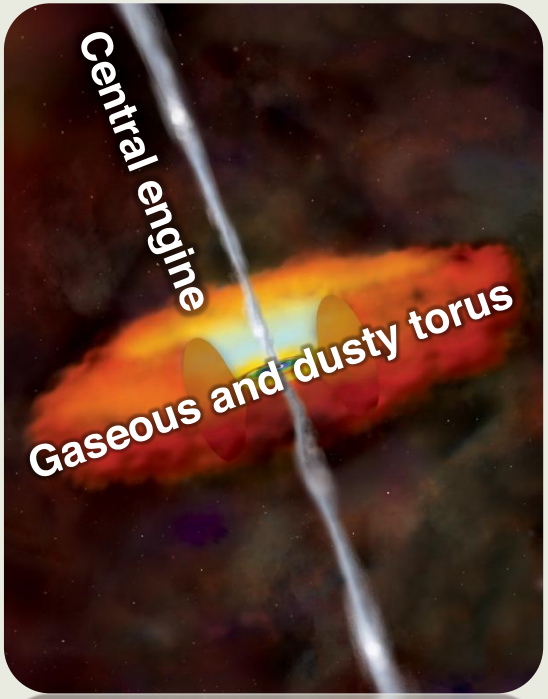
MACQUARIE UNIVERSITY

Goal

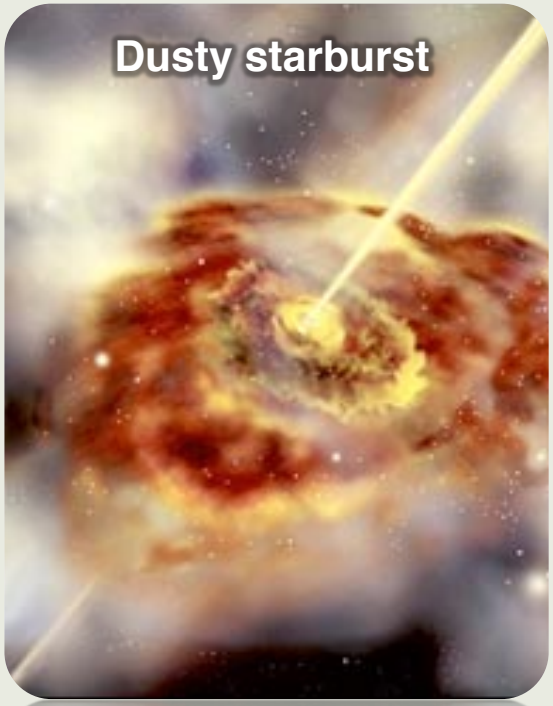
AGN will be identified using various detection techniques with the goal of selecting AGN across a broad range of luminosities, AGN/host galaxy flux ratios, and obscuration levels. The sample will lay the foundation for my future projects, which will include looking for trends between galaxies hosting AGN and environment, galaxy stellar populations, star-formation and stellar mass.

AGN Identification is a multi-component, multi-wavelength problem

Problem: obscuration changes the observed AGN signatures



Problem: host galaxy can dilute/extinguish AGN signatures



AGN Selection

- No single selection technique can identify a complete parent sample of all AGNs
- X-ray, IR and radio emissions, originating from different regions of AGN or affected differently by dust obscuration, provide independent methods to reveal such activity
- Utilise multi-wavelength data and different techniques to identify and class varying AGN class across range of redshift
- Study how overlap between different samples vary to determine selection biases and incompleteness effects

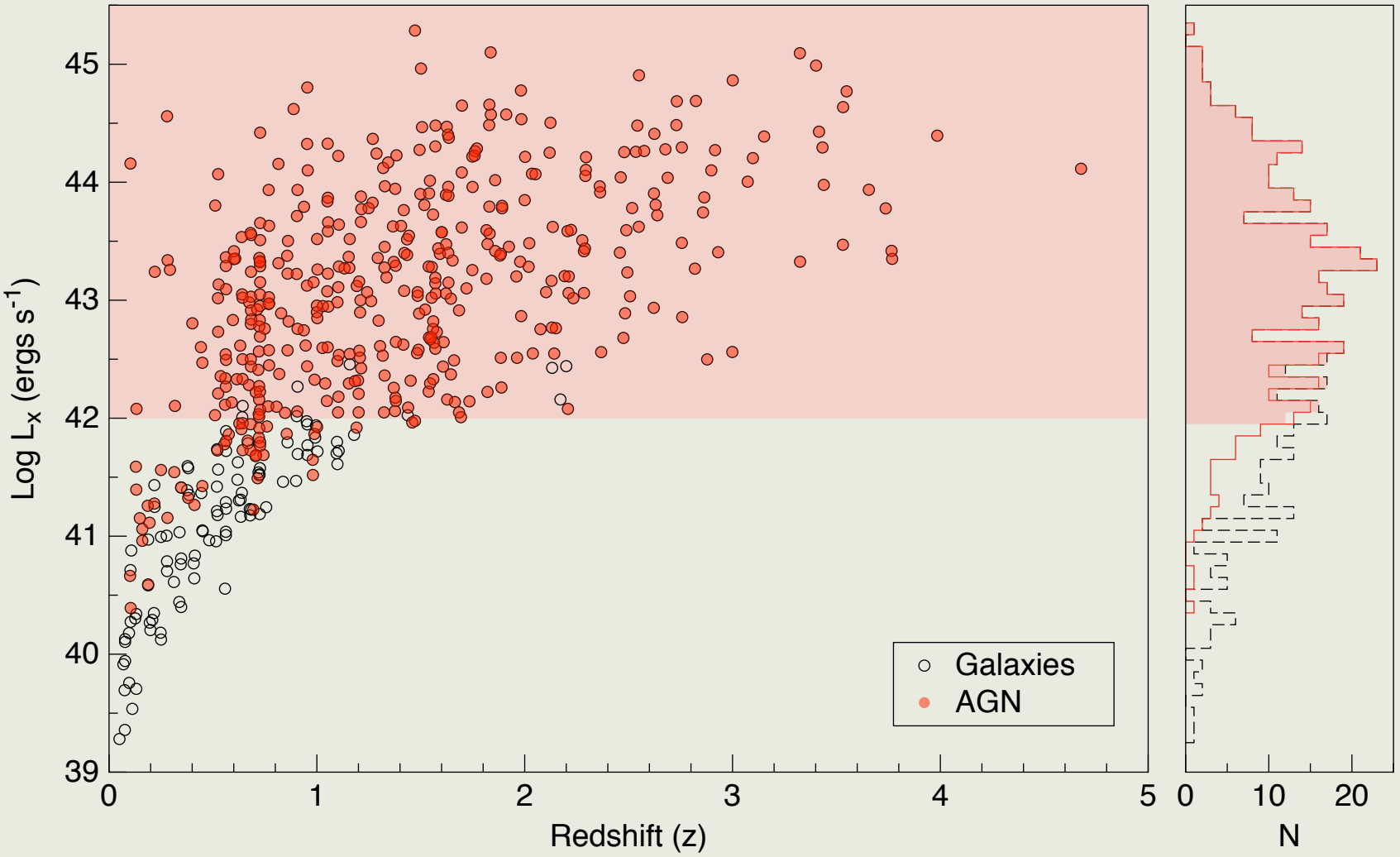
Multi-wavelength Selection

- **X-ray**
  1. **CDFS 4Ms Survey (CDFS)**
  2. **C-COSMOS Survey (COSMOS)**
  3. **SXDS Survey (UDS)**
- **Infrared**
- **Radio** – **thanks Glen**

X-ray AGN Identification

+ AGN more luminous in X-Ray than star-forming
+ X-rays can penetrate large amounts of absorption
+ Powerful AGN ($L_{0.5\text{-}8keV} > 10^{43}$ erg s^{-1}) can be detected out to z~7
– High column density gas ($N_H > 10^{23}$ cm^{-2}) absorbs X-rays
– Heavily obscured AGN fail to be identified

X-ray AGN Identification



X-ray AGN Identification

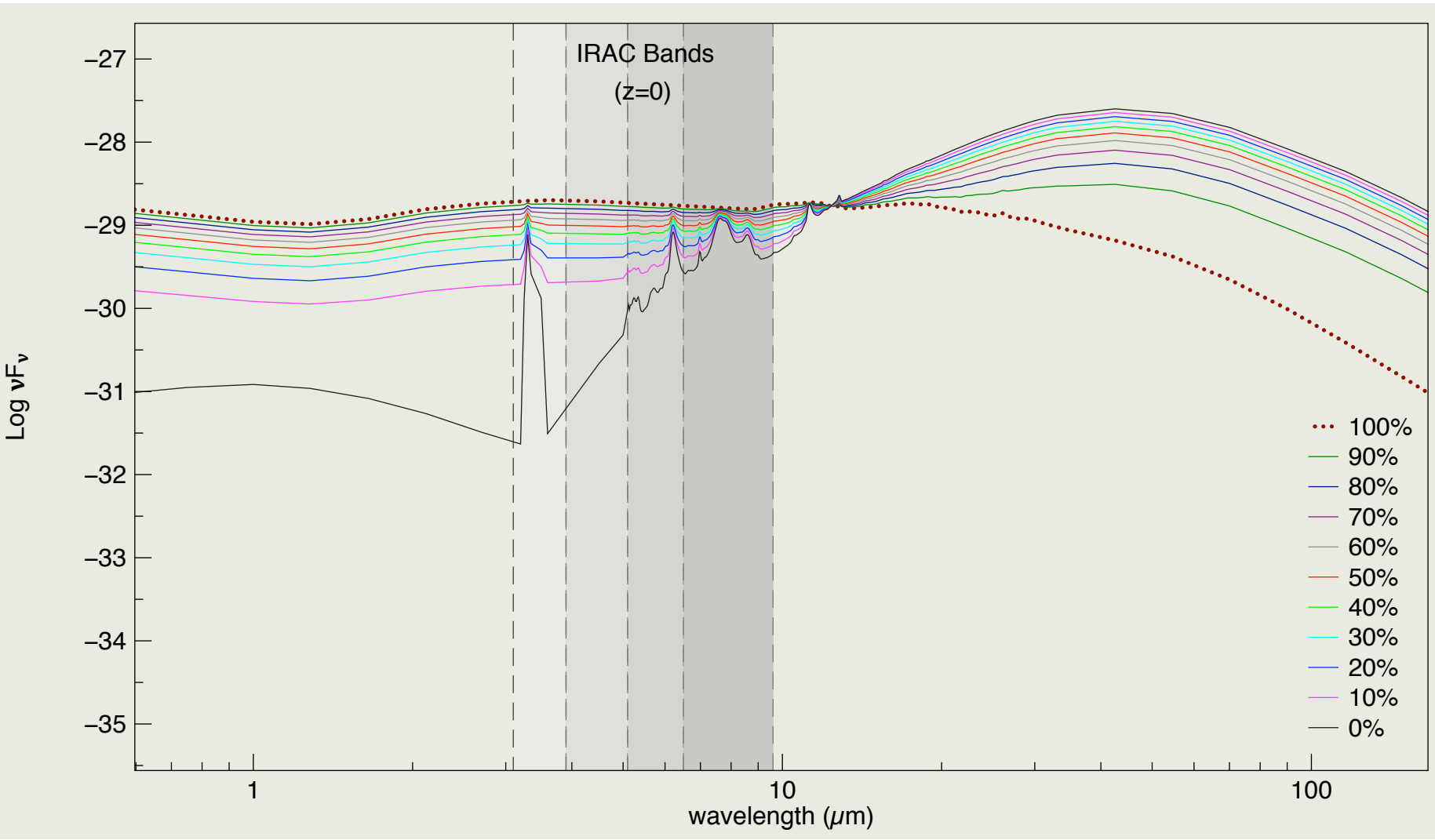
$L_{0.5\text{-}8keV}$ (erg s^{-1})	Hardness Ratio	Classification
> 10^{42}	< -0.2	Unobscured AGN ($N_H < 10^{22}$ cm^{-2})
> 10^{42}	> -0.2, < 0.8	Moderately obscured AGN ($10^{22} < N_H < 10^{24}$ cm^{-2})
> 10^{42}	> 0.8	Compton-thick AGN ($N_H > 10^{24}$ cm^{-2})
< 10^{42}	< -0.2	Star-forming galaxy
< 10^{42}	> -0.2	Low L obscured AGN / SF galaxy

The X-ray hardness ratio is defined as HR = (H-S)/(H+S),
where S and H are the soft (0.5 - 2.0 keV) and hard (0.5 - 8.0 keV) band counts.

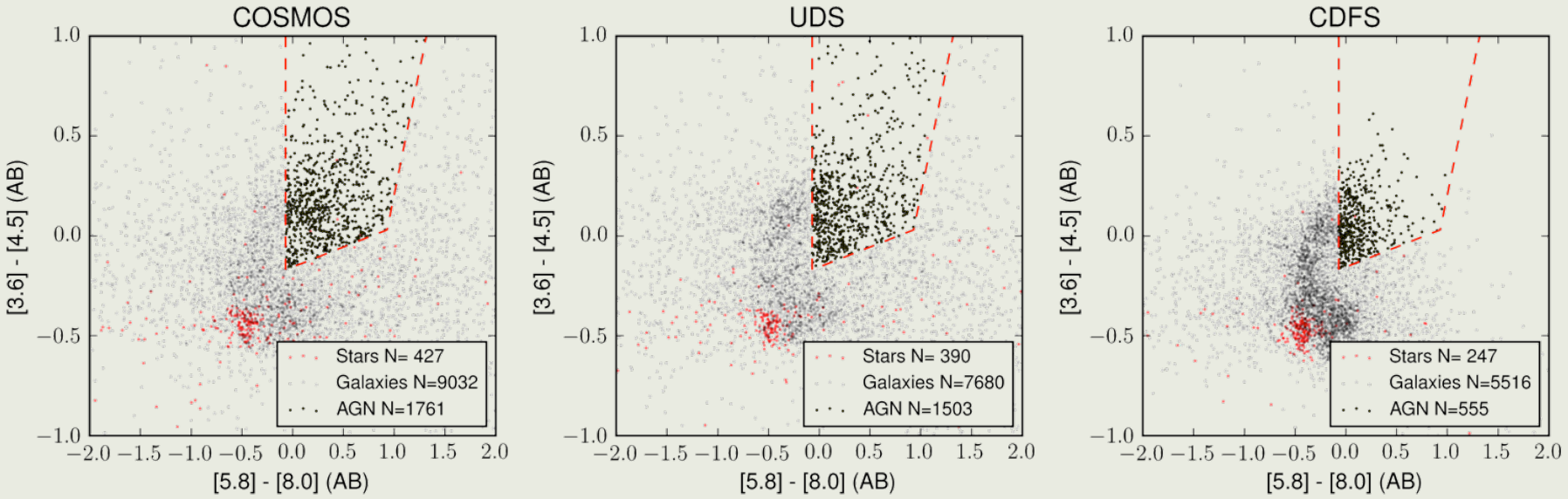
IR AGN Identification

+ Easy criteria to use requiring 4 mid-IR bands
+ Recover many of the AGN unseen in shallow/soft X-ray surveys
– At higher z, contamination by non-active galaxies becomes significant
– May miss some highly obscured and/or less active AGN

IR AGN Identification



IR AGN Identification



Stern Wedge
([5.8]-[8.0]) > -0.07
([3.6]-[4.5]) > 0.2([5.8]-[8.0])-0.156
([3.6]-[4.5]) > 2.5([5.8]-[8.0])-2.295

[3.6], [4.5], [5.8] and [8.0] are the AB mags in the respective IRAC wavebands.

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